DOVILEARN® RESEARCH

DOVILEARN® RESEARCH TECHNICAL WHITE PAPER

Designing Learning That Adapts

A practical framework for adaptive, scenario-based learning across classrooms, e-learning platforms and AI-supported education

Developed from the Immersion3 research project by DoviLearn® Research.

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> **This technical white paper presents a proposed adaptive-learning framework and evaluation agenda. It is not a completed outcome or efficacy study.**

Abstract

Adaptive learning is most useful when it connects a clear goal and context to meaningful practice, observable evidence, timely feedback and a transparent next step. This paper turns that sequence into a practical framework for learning designers, educators, institutions and specialist AI tutoring builders.

The framework combines instructional design, a non-sensitive system architecture and an evaluation agenda. Wider evidence shows that immersive technology can support learning in some settings, but presence, enjoyment and learning do not always move together [2-6]. The source proposal contains no controlled outcome dataset. This technical white paper is not a completed outcome or efficacy study.

How to use this paper

EVIDENCE KEY

Source proposal means a concept documented in the 2024 source. External evidence means a bounded finding from cited work. New DoviLearn® Research model means a framework proposed here. Proposed evaluation means work that could be conducted in future. None of these labels represents a completed outcome or efficacy study.

The distinction matters because a proposal, a research finding and a design recommendation do different jobs. Source claims retain their exact page locators. External findings remain limited to the studies that produced them. Design recommendations are open to challenge. Evaluation steps describe future methods rather than completed activity.

Why adaptive learning matters

A fixed sequence may not respond well to different goals, prior knowledge, demonstrated performance, contexts or access needs. That does not mean every learner needs a unique technology stack. It means the route through an objective should respond to relevant evidence, learner choice and support.

Technology can help or hinder learning, depending on the problem, setting and intervention [6-7]. The practical question is not whether adaptation or immersion sounds engaging. It is whether a defined design improves learning or access against a fair alternative, for a known group, without creating larger costs or harms.

Research origin and history: Immersion3.org

Immersion3.org is the project site at the time of publication. Checked 24 October 2026, the site was available and presented the project as inviting collaborative research.

Site availability does not establish current research activity, implementation, participants, activity cadence, efficacy or outcomes.

This paper uses the unpublished Immersion3: Technical and Innovation Proposal from September 2024 as its principal archival document because it consolidated design concepts, a proposed architecture and evaluation questions [1]. The proposal is not the sole research source, a complete research record or a controlled outcome study.

Visit the Immersion3.org project site (HTTP connection) (opens in a new tab)

This external site currently uses an unencrypted HTTP connection and opens in a new tab.

View a historical snapshot (opens in a new tab)

The wider evidence is deliberately balanced. Reviews report promising results for some immersive-learning designs, alongside neutral and detrimental outcomes and substantial differences in interventions and assessments [2,5]. Individual experiments show that greater presence or liking can coincide with no learning gain or lower measured learning [3-4]. These studies did not evaluate the source project.

The source proposal referred to matching content to learning styles. This paper does not carry that mechanism forward. Evidence does not support matching instruction to self-reported learning styles [8]. Goals, prior knowledge, demonstrated performance, access needs, preferences and learner choice remain relevant, but they should not be collapsed into a fixed style label.

FORMATIVE DESIGN EXPERIENCE

DoviLearn®'s practical design experience included small-cohort virtual delivery designed to resemble workplace situations, using scenarios and applied decisions or tasks. This was design experience, not a controlled study, and it is not evidence of effectiveness, scale, measured outcomes or generalisability.

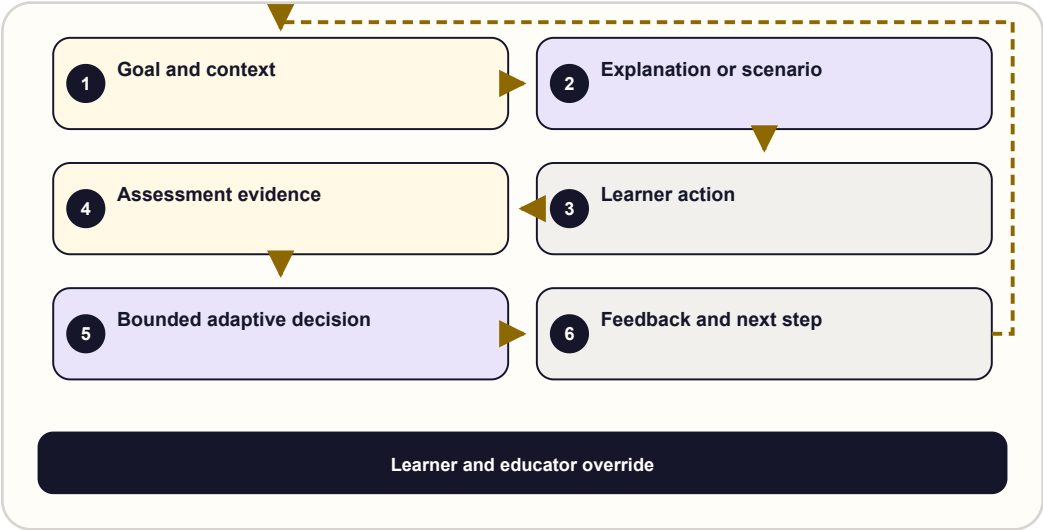
The adaptive learning loop

A useful adaptive journey begins with the learner's goal and context, offers a meaningful explanation or scenario, invites a decision or task, gathers relevant evidence, provides feedback and selects a bounded next step. The cycle can operate in a classroom, an e-learning platform, a workplace simulation or a tutoring conversation.

Adaptation should answer an instructional need rather than personalise for its own sake. The learner and educator need to understand why a route changed and how to override it. The model is a proposed design, not a reconstruction of a deployed system or a measured result.

CONCEPTUAL MODEL

Figure 1. Adaptive learning loop



A proposed cycle connects a defined objective to activity, evidence, a bounded decision and a revisable next step. The cycle is a design hypothesis, not a measured result.

Long description. Six numbered boxes form a loop. Goal and context lead to an explanation or scenario. The learner acts. Assessment evidence is checked against the objective. A bounded decision recommends continue, revisit, another explanation, supported practice or educator review. Feedback explains the recommendation and returns to the next objective. Learner and educator override applies to the decision and feedback stages.

Source: DoviLearn® Research. The goal, interaction, adaptation and feedback concepts are adapted from the 2024 Immersion3 proposal, pp. 5, 8-9. The bounded six-stage loop and override model are new DoviLearn® Research models proposed in this paper.

Practical design principles

Start with one competency or objective that matters in the learner's context. Establish the destination, relevant prior knowledge, constraints and access needs. Then choose an explanation, example or scenario that helps the learner act.

- Define the objective and what acceptable evidence would look like.
- Use a meaningful scenario or task rather than decorative interaction.
- Invite an observable decision, explanation, action or artefact.
- Assess evidence with a transparent rule and stated limits.
- Recommend continue, revisit, another explanation, supported practice, educator review or pause.
- Explain the recommendation and allow learner or educator override.

Keep adaptation bounded and reversible. A recommendation can organise practice, but it should not conceal the objective, remove meaningful choice or turn an uncertain signal into a high-stakes judgement.

Selecting and combining learning methods

Immersive delivery is one option, not the organising purpose. A useful programme may combine reading and explanations, hands-on projects, task-based learning, gaming-style practice, and conversation or Q&A. Each method should earn its place by serving the objective and the learner's context.

- Reading and explanations can introduce concepts, worked examples and accessible alternatives.
- Hands-on projects can produce artefacts that show planning, synthesis and application over time.
- Task-based learning can make a process observable in realistic steps.
- Gaming-style practice can use rules, feedback and repetition where they support the skill rather than distract from it.
- Conversation and Q&A can support explanation, reflection and checks for misunderstanding.

More methods are not automatically better. The learner should be able to continue, revisit, request an alternative explanation, move to supported practice, ask for educator review or pause.

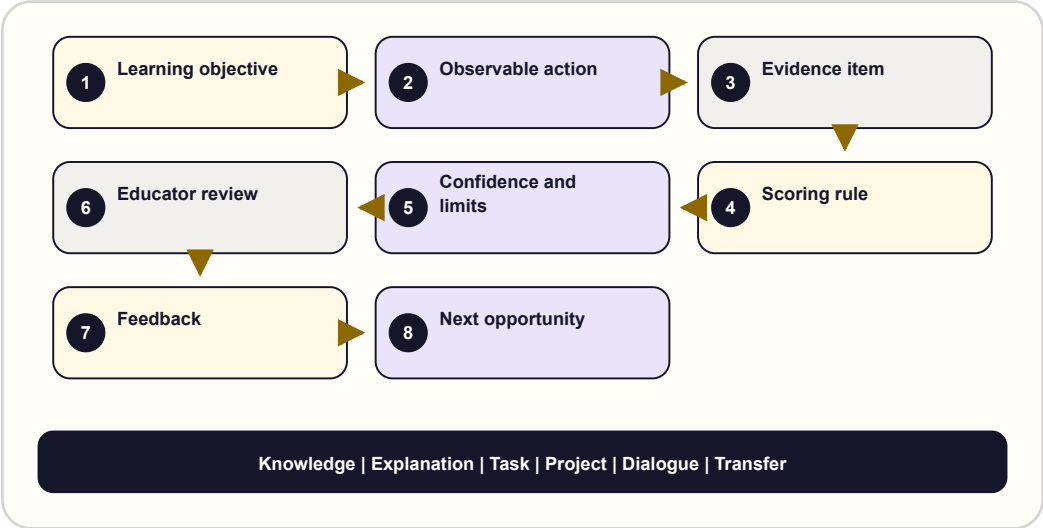
From practice to demonstrated competency

Activity is not the same as competency. Evidence may include recall, explanation, task performance, a project artefact, dialogue-based reasoning or transfer to a new problem. Each evidence item needs a criterion, provenance, relevant attempt context, a transparent scoring rule, confidence limits and a review path.

Automated signals may recommend a next step. They should not independently certify high-stakes competence. Uncertain or consequential judgements need human review and another opportunity for the learner to demonstrate the objective.

CONCEPTUAL MODEL

Figure 2. Competency evidence pathway



Competency evidence needs an objective, observable action and transparent scoring rule before it can inform a next step.

Long description. A left-to-right pathway begins with one objective and an observable action. Knowledge, explanation, task, project, dialogue and transfer are example evidence types. A scoring rule records confidence and limits. High-stakes or uncertain evidence moves to educator review. Feedback leads to another opportunity to demonstrate competency.

Source: DoviLearn® Research. The assessment and feedback concepts are adapted from the 2024 Immersion3 proposal, pp. 8-9. The competency evidence pathway is a new DoviLearn® Research model proposed in this paper and informed by ref. 9.

Applying the framework across learning settings

The same adaptive loop can support physical classrooms, blended or hybrid learning, asynchronous e-learning and LMS delivery, workplace or vocational simulations, and AI-supported tutoring. These are proposed applications to design and test, not claims that any institution has adopted or validated the framework.

- Physical classrooms can use teacher-led branching cases, role-play, observation, feedback and differentiated next tasks.
- Blended and hybrid courses can connect in-person practice with online explanations, evidence capture and planned follow-up.
- Asynchronous e-learning and LMS routes can offer transparent branching, alternative explanations and educator escalation.
- Workplace and vocational simulations can rehearse consequential decisions with safe boundaries and human review.
- AI-supported tutoring can explain, question and recommend practice while keeping objectives, evidence and override visible.

What remains constant and what changes by setting

Learning setting	Meaningful practice	Evidence and feedback	Adaptation and oversight
Physical classroom	Teacher-led branching cases and role-play	Observation, learner explanation and direct feedback	Differentiated next tasks chosen with the teacher
Blended or hybrid	Linked in-person and online tasks	Shared artefacts, checks and scheduled discussion	Route changes coordinated across both environments
Asynchronous e-learning or LMS	Self-paced scenarios, worked examples and projects	Recorded attempts, automated feedback and educator escalation	Transparent rules offer revisit, alternative explanation or review
Workplace or vocational simulation	Realistic, bounded decisions and practical rehearsal	Performance evidence against job-relevant criteria	Safe retries and supervisor review for consequential judgement
AI-supported tutoring	Conversation, questions, examples and generated practice	Reasoning traces, task responses and explicit uncertainty	Recommendations remain explainable, contestable and human-governed

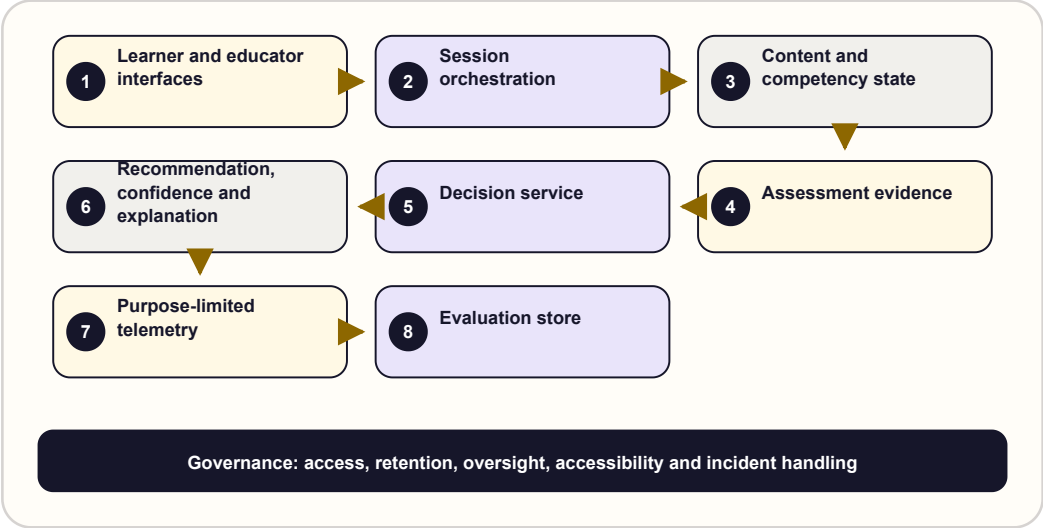
Instructional and system architecture

A credible architecture separates interfaces and external I/O, session orchestration, instructional state, adaptive decisions, evidence, evaluation and governance. Learner and educator routes should remain usable when an optional immersive device or decision service is unavailable.

Orchestration selects content and schedules assessment. Domain state holds content metadata, competency definitions, learner context and purpose-limited evidence. A decision service returns a recommendation, confidence and explanation rather than an opaque verdict. Low-confidence or failed decisions return a fixed safe route and optional educator review instead of blocking learning.

PROPOSED ARCHITECTURE

Figure 3. Instructional and system architecture



The proposed architecture separates delivery, orchestration, learning state, adaptive decisions, evaluation and governance. It is a design model, not a depiction of a deployed system.

Long description. Learner, educator, optional immersive-device and LMS interfaces connect to orchestration. Orchestration reads content and competency definitions, schedules assessment and writes purpose-limited evidence. The decision service returns a recommendation, confidence and explanation. Unavailable or uncertain decisions use a fixed safe route or educator review. Telemetry enters a separate evaluation store. A governance rail spans every layer.

Source: DoviLearn® Research. Interfaces, adaptive logic, assessment and feedback are adapted from the 2024 Immersion3 proposal, pp. 8-9. Separation of orchestration, confidence, fallback, telemetry and governance is a new DoviLearn® Research model informed by refs. 10-12.

Accessibility, inclusion, privacy, safety and responsible AI

An immersive route needs an equivalent non-VR route for the same objective [7,12]. Keyboard and assistive-technology access, captions or equivalent transcripts, readable text and reflow belong in accessibility acceptance criteria [12]. Where interaction animation is not essential, a reduced-motion option should be available [12]. Immersive delivery can introduce discomfort and access barriers [2-4,7]. Device availability and bandwidth can also constrain equitable access [7].

Privacy starts before data collection. A concrete implementation would need a defined purpose, minimum necessary data, lawful basis, access controls, retention and deletion rules, and lifecycle review [11]. AI-enabled adaptation also needs explanation, override, monitoring and incident review [10].

PROPOSED OBLIGATIONS

These controls are requirements for future design and evaluation. They are not claims that the 2024 proposal implemented them or that any complete system already meets a standard or legal obligation.

Questions for educators, institutions and researchers

A framework becomes useful research only when its assumptions can be challenged. Educators and institutions should ask what problem is being solved, what evidence matters and who can contest a decision. Directional hypotheses may fail, and null or adverse outcomes remain possible.

- Does a meaningful scenario improve delayed retention or transfer against an equivalent lesson?
- Does performance-based adaptation improve mastery, time or retention against fixed sequencing?
- Does combining methods add value beyond a simpler well-designed alternative?
- Which elements support authentic practice, and which add distraction, cognitive load, discomfort or exclusion?

- Are assessment signals reliable and valid enough to guide a next step?
- Do decisions perform consistently across groups, settings, devices, bandwidth conditions and access needs?
- Can learners and educators understand, override and contest recommendations?
- What minimum interaction data is needed to provide useful support?
- Can the architecture meet predefined reliability, completion, latency and accessibility criteria?
- What authoring, teaching and oversight effort keeps content accurate and current?

Proposed evaluation framework

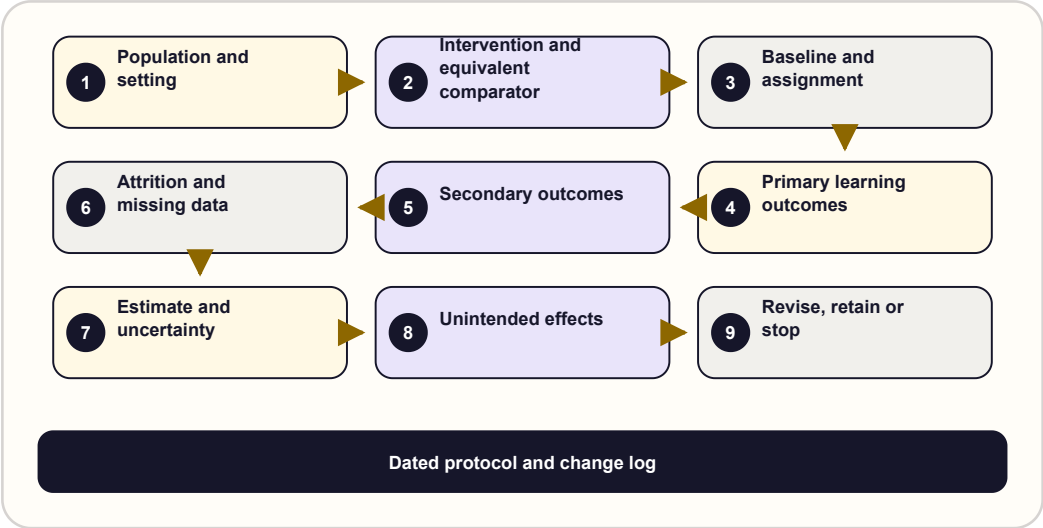
A protocol should define population, setting, inclusion, recruitment and sample rationale before outcome inspection. It should specify the intervention and an equivalent comparator, assignment method, baseline, attrition, missing-data handling, instruments, timing, scoring and analysis across physical classrooms, blended or hybrid learning, asynchronous e-learning or LMS delivery, workplace or vocational simulations, and AI-supported tutoring [9].

Delayed retention and transfer are suitable proposed primary outcomes. Immediate learning, time to mastery, task completion, usability, cognitive load, presence, engagement, discomfort, accessibility, agency, educator workload, decision accuracy and system reliability can remain secondary. Presence and engagement do not substitute for learning.

Reporting should include estimates and uncertainty, protocol changes, null findings, adverse outcomes and distributional effects. Privacy, accessibility and governance review should precede recruitment. The final decision may be to revise, retain or stop the intervention.

EVALUATION FRAMEWORK

Figure 4. Evaluation framework



The evaluation framework turns a proposed benefit into a test with a comparator, predefined outcomes, transparent analysis and room for null or adverse findings.

Long description. A population and setting lead to side-by-side intervention and comparator specifications. Baseline and assignment feed both conditions. Primary learning outcomes remain separate from secondary experience and operational outcomes. Attrition, missing data, estimates, uncertainty and unintended effects are reported under a dated protocol. The final decision may be revise, retain or stop.

Source: DoviLearn® Research. The intent to evaluate prototypes, learning and technical criteria is adapted from the 2024 Immersion3 proposal, pp. 10, 12, 17-18, without accepting its outcome claims. The auditable comparator, outcome and decision model is a new DoviLearn® Research framework informed by refs. 9-12.

Implementation trade-offs and limitations

The framework could introduce distraction, cognitive load, discomfort, unequal device or bandwidth access, content error, authoring effort, privacy risk, unfair decisions, over-adaptation, reduced learner agency, weak assessment validity and additional educator workload. A richer route may also cost more than an equivalent simpler route without adding learning value.

The source proposal has no bibliography, protocol, participant description, instruments, dataset, analysis, implementable algorithm or independent validation. Page 10 describes a completed pilot with 100 users, while page 17 presents a pilot of at least 100 users as a future target [1]. With no records to resolve that conflict, neither statement is evidence of a completed study or result.

The external literature supports careful testing rather than a conclusion about this framework. The architecture, competency model and evaluation recommendations still require implementation, expert review and empirical testing. Institutions should compare authoring effort, infrastructure, educator workload and accessibility against the simplest credible alternative.

Progression to specialist AI tutoring

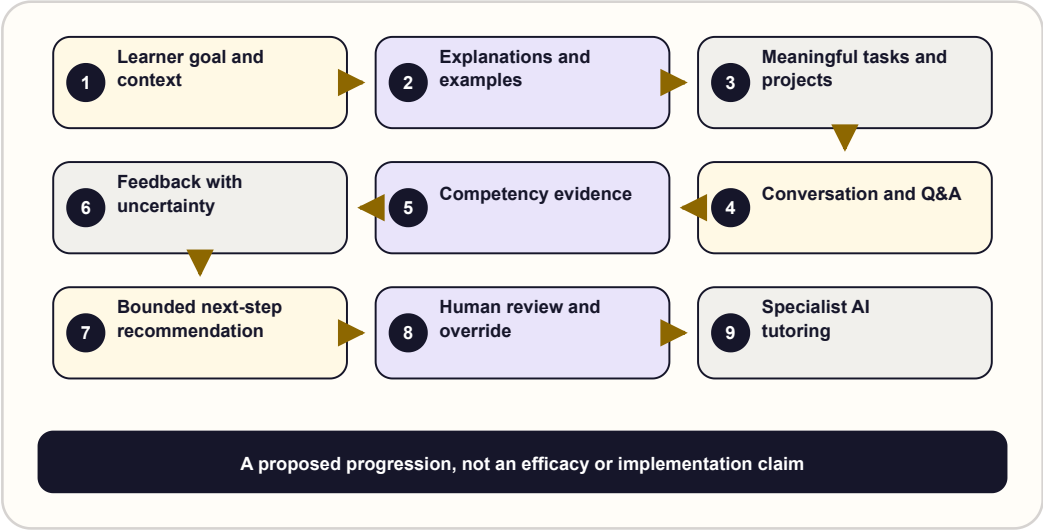
NEW DOVILEARN® RESEARCH MODEL

Specialist AI tutoring can extend the adaptive loop by establishing a learner's destination, explaining in more than one way, turning knowledge into tasks, projects, gaming-style practice and conversation, making competency evidence visible, and using that evidence to recommend the next step.

The progression is a design direction rather than evidence of effectiveness. It does not imply that any current software, algorithm or tutoring result has been validated by the earlier source project.

CONCEPTUAL MODEL

Figure 5. Progression to specialist AI tutoring



The adaptive learning framework can progress from clear goals and varied explanations to practice, evidence, feedback and governed specialist AI tutoring. The progression remains a proposal to implement and evaluate.

Long description. The pathway begins with a learner goal and context, then offers explanations, examples, tasks, projects, conversation and questions. Competency evidence supports feedback that communicates uncertainty. A bounded recommendation can suggest the next step. Human review and override remain available before the pathway reaches specialist AI tutoring.

Source: DoviLearn® Research. Goals, varied content, practice, adaptation and feedback are adapted from the 2024 Immersion3 proposal, pp. 4, 5, 8-9. The governed progression to specialist AI tutoring is a new DoviLearn® Research model. It does not claim inherited software, implementation or efficacy.

Conclusion and research agenda

A useful adaptive-learning system keeps six things connected: the learner's goal and context, meaningful practice, observable evidence, timely feedback, bounded adaptation and demonstrated competency. Its quality depends less on novelty than on whether those connections are clear, accessible and open to review.

The next responsible step is small and auditable. Select one setting and objective, publish a protocol, create equivalent accessible routes, compare against a credible alternative, and report null and adverse findings. Replication should then test what transfers across classrooms, e-learning, workplace practice and AI-supported tutoring.

References and endnotes

1. DoviLearn®. Immersion3: Technical and Innovation Proposal. Unpublished proposal, September 2024. Pages 4, 5, 8-10, 12 and 17-18. No public URL.

2. Hamilton, D., McKechnie, J., Edgerton, E. and Wilson, C. Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design. Journal of Computers in Education, 2021. Accessed 24 October 2026. https://doi.org/10.1007/s40692-020-00169-2 (opens in a new tab)

3. Makransky, G., Terkildsen, T. S. and Mayer, R. E. Adding immersive virtual reality to a science lab simulation causes more presence but less learning. Learning and Instruction, 2019. Accessed 24 October 2026. https://doi.org/10.1016/j.learninstruc.2017.12.007 (opens in a new tab)

4. Makransky, G., Andreasen, N. K., Baceviciute, S. and Mayer, R. E. Immersive virtual reality increases liking but not learning with a science simulation and generative learning strategies promote learning in immersive virtual reality. Journal of Educational Psychology, 2021. Accessed 24 October 2026. https://doi.org/10.1037/edu0000473 (opens in a new tab)

5. Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W. and Davis, T. J. Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. Computers & Education, 2014. Accessed 24 October 2026. https://doi.org/10.1016/j.compedu.2013.07.033 (opens in a new tab)

6. Escueta, M., Nickow, A. J., Oreopoulos, P. and Quan, V. Upgrading Education with Technology: Insights from Experimental Research. Journal of Economic Literature, 2020. Accessed 24 October 2026. https://doi.org/10.1257/jel.20191507 (opens in a new tab)

7. UNESCO Global Education Monitoring Report. Technology in education: A tool on whose terms? 2023. Accessed 24 October 2026. https://www.unesco.org/gem-report/en/publication/technology (opens in a new tab)

8. Pashler, H., McDaniel, M., Rohrer, D. and Bjork, R. Learning Styles: Concepts and Evidence. Psychological Science in the Public Interest, 2008. Accessed 24 October 2026. https://doi.org/10.1111/j.1539-6053.2009.01038.x (opens in a new tab)

9. U.S. Department of Education, Institute of Education Sciences. What Works Clearinghouse Procedures and Standards Handbook, Version 5.0. 2022. Accessed 24 October 2026. https://ies.ed.gov/ncee/WWC/Docs/referenceresources/Final_WWC-HandbookVer5_0-0-508.pdf (opens in a new tab)

10. National Institute of Standards and Technology. Artificial Intelligence Risk Management Framework 1.0. 2023. Accessed 24 October 2026. https://www.nist.gov/itl/ai-risk-management-framework (opens in a new tab)

11. UK Information Commissioner's Office. Data protection by design and by default. Updated 5 February 2026. Accessed 24 October 2026. https://ico.org.uk/for-organisations/uk-gdpr-guidance-and-resources/accountability-and-governance/guide-to-accountability-and-governance/data-protection-by-design-and-by-default/ (opens in a new tab)

12. World Wide Web Consortium. Web Content Accessibility Guidelines 2.2. W3C Recommendation, 2024. Accessed 24 October 2026. https://www.w3.org/TR/WCAG22/ (opens in a new tab)

13. Immersion3.org project site. Current first-party project context, checked 24 October 2026. Available over an unencrypted HTTP connection. http://immersion3.org/ (opens in a new tab)

Glossary

Immersion	A sense of being surrounded by or deeply involved in a mediated environment.
Adaptation	A bounded change to content, support or sequence in response to relevant evidence or learner choice.
Adaptive sequencing	Selecting a next learning opportunity using explicit objectives, rules and available evidence.
Assessment evidence	A recorded learner action or artefact interpreted against a stated criterion.
Competency	The ability to apply relevant knowledge or skill to a defined standard and context.
Learner model	A purpose-limited representation of relevant goals, prior knowledge, evidence and support needs.
Multimodal learning	Learning delivered through more than one suitable form, such as text, visual explanation, task, project or conversation.
Comparator	An alternative condition designed to make an evaluation question answerable.
Delayed retention	Evidence that knowledge or skill remains available after a defined period.
Transfer	Applying learning to a different but relevant problem or setting.
Human oversight	Meaningful review, intervention and accountability by an authorised person.

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