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# Beyond VR: A Multi-Modal Ecology of Artmaking Technologies for Student Well-Being and Digital Creativity in Exam-Oriented Schools

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**Abstract**

Schools increasingly face a dual mandate: to support students' socio-emotional well-being under high-stakes academic pressure while also developing creative competencies that matter for learning, identity and future work. Educational technology research, however, often evaluates artmaking tools in isolation (e.g., VR painting, tablets, paper drawing, or generative-AI co-creation), leaving educators with limited guidance on how combinations of modalities can be sequenced and orchestrated within real-world classrooms—especially in exam-oriented school systems. This theoretical article addresses that gap by proposing a multi-modal ecology framework for artmaking technologies in schools. The framework treats each modality as an interacting node and specifies six cross-cutting mechanism dimensions that shape both well-being and digital creativity: immersion/presence, agency/authorship, emotional expressiveness, cognitive load/entry barriers, social visibility/evaluation dynamics, and practical scalability/equity. Drawing on interdisciplinary literature in learning sciences, digital well-being, arts-based approaches and XR/AI research, the article advances theory-driven propositions about how different modality configurations may enable short-term stress relief and longer-term creative development. It concludes with implications for ecological instructional design and a research agenda for comparative, longitudinal and design-based studies in exam-oriented schools.

**Keywords:** Multi-Modal Ecology, VR Painting, Generative Ai, Digital Creativity, Student Well-Being, Exam-Oriented Schooling

## Introduction

In recent years, research in educational technology has increasingly recognised that questions of student well-being, motivation and engagement are deeply intertwined with questions of learning. Emotional distress, anxiety and burnout are not only mental health concerns; they also affect attention, persistence, participation and long-term educational trajectories (Liverpool et al., 2020, 2025). In many systems, these issues are particularly salient in exam-oriented schooling, where high-stakes testing, dense curricula and competitive selection

procedures structure students' everyday experience and contribute to sustained pressure and time scarcity (Chen et al., 2024; Fernández-Batanero et al., 2025).

At the same time, schools are expected to cultivate so-called 21st-century competencies, including creativity, collaboration and digital literacy, alongside traditional academic outcomes (Cojocariu & Boghian, 2024; Wulan et al., 2025). Educational technology is frequently positioned as a way to support this expanded agenda. Yet the same digital infrastructures that promise enhanced learning opportunities also mediate new forms of pressure, comparison and distraction. This raises a core question for the educational technology community: how can digital tools be designed and orchestrated so that they do not simply deliver content more efficiently, but also support students' creative engagement and socio-emotional well-being within authentic school environments?

Artmaking is a natural candidate for such a dual role. Across traditions in art education, digital creativity and arts-based learning, creative production is understood as a way for learners to explore ideas, experiment with representations and express personal meanings (Cojocariu & Boghian, 2024; Wulan et al., 2025). When appropriately scaffolded, creative tasks can foster curiosity, intrinsic motivation, self-expression and problem solving. Digital tools extend these possibilities by enabling new forms of manipulation, iteration and sharing (Carlton, 2014; Zubala et al., 2021).

There is also growing interest in the potential of creative activity to support emotion regulation and well-being, particularly when embedded in everyday learning environments rather than isolated therapeutic settings. Integrative reviews of digital art therapy and art psychotherapy in the digital world suggest that creative production—whether with traditional or digital media—can externalise difficult experiences, facilitate emotional processing and support reductions in distress (Hadjipanayi et al., 2023; Zubala et al., 2021, 2025). For adolescents who may be reluctant to seek formal psychological help, creative digital tasks can offer low-stigma opportunities to experience competence and agency and to temporarily disengage from performance pressure (Liverpool et al., 2020; Shojaei et al., 2024). Similarly, research in higher education suggests that participation in fine arts learning can have measurable benefits for student well-being by enhancing creativity and self-efficacy (Jin & Ye, 2022). From this perspective, digital artmaking is not only an aesthetic or technical activity but also a pedagogical resource for socio-emotional learning.

However, artmaking in contemporary schools increasingly takes place within a diverse technology ecology: traditional paper-based drawing and painting, tablet- or stylus-based digital drawing (e.g., on iPads), immersive virtual reality (VR) tools for three-dimensional painting and sculpting, and, more recently, AI-assisted co-creation in which text-to-image systems generate visual content that students curate, remix or elaborate (Radianti et al., 2020; Zhou & Lee, 2024). Teachers and school leaders therefore face a design and investment problem: with limited time and resources, which technologies should be prioritised, for which pedagogical purposes, and how should they be combined over time to support both learning and well-being?

Existing educational technology research has made substantial progress in understanding how specific tools support learning and engagement. Systematic reviews and overviews show, for example, that VR can increase students' sense of presence, engagement and, in some cases, learning outcomes, particularly when embedded in well-designed activities (Acevedo et al., 2024; Di Natale et al., 2020; Hamilton et al., 2021; Radianti et al., 2020; Craig & Kay, 2023). Work on digital creativity has synthesised how software tools, platforms and pedagogical models can scaffold students' creative thinking and production in domains ranging from STEM to media and design (Cojocariu & Boghian, 2024; Wulan et al., 2025). Recent discussions of creative technologies in teacher and student education emphasise that digital tools are not inherently creative or beneficial; their educational value depends on how their affordances for expression, iteration, collaboration and reflection are activated through instructional design (Cojocariu & Boghian, 2024; Radianti et al., 2020).

In art and design education specifically, empirical studies and reviews document promising uses of VR to support aesthetic learning, spatial thinking and creative problem solving, often reporting positive effects on engagement and creativity (Di Natale et al., 2020; Hamilton et al., 2021; Radianti et al., 2020). Other work has explored the integration of tablets and digital drawing tools into art and media curricula and, more recently, the use of generative AI to augment students' digital creativity skills and creative workflows (Cojocariu & Boghian, 2024; Wulan et al., 2025; Zhou & Lee, 2024). Across these literatures, however, evaluations are typically single-technology: a VR module is compared to a non-VR control, a tablet-based activity to a traditional one, or a generative-AI enhanced sequence to a non-AI sequence. There is limited conceptual work that views these technologies as interrelated modalities within a single learning ecology and systematically compares their affordances and trade-offs for creative engagement, socio-emotional support and classroom scalability, particularly in exam-oriented school systems (Liverpool et al., 2025; Radianti et al., 2020). For practitioners, this creates an evidence gap. A school considering investing in VR labs, tablet sets or AI tools for creative projects needs not only effect sizes for each technology in isolation, but also a comparative, theory-driven map of how these modalities differ and how they might be combined over time.

This theoretical article responds to that gap by conceptualising adolescent artmaking for well-being and engagement as a multi-modal, technology-rich ecology spanning four broad modalities: immersive VR painting, tablet-based digital drawing, traditional paper media and AI-assisted co-creation. Building on work in digital creativity, VR in education, digital mental health and generative AI in learning contexts (Cojocariu & Boghian, 2024; Di Natale et al., 2020; Liverpool et al., 2025; Radianti et al., 2020; Wulan et al., 2025; Zhou & Lee, 2024), the article argues that each modality affords a distinct configuration of:

- **immersion and presence** (the felt sense of "being in" a creative environment);
- **agency and authorship** (the extent to which learners experience themselves as primary creators);
- **emotional expressiveness and symbolic depth** (how easily complex feelings and ideas can be externalised);
- **cognitive load and entry barrier** (the demands and prerequisites for productive use);
- **social visibility and classroom dynamics** (how work is shared, seen and evaluated by others); and

- **practical scalability and equity** (feasibility of implementation at class, school and system levels) (Liverpool et al., 2025; Radianti et al., 2020; Wulan et al., 2025).

Rather than reporting new empirical data, the article develops a comparative conceptual framework and a set of testable propositions about how these modalities may differentially support immediate stress relief and mood regulation during or after demanding school activities, sustained creative engagement and digital creativity development over weeks or semesters, and scalable, equitable integration into everyday teaching and learning in exam-oriented contexts (Chen et al., 2024; Fernández-Batanero et al., 2025; Liverpool et al., 2020, 2025). Accordingly, the article is guided by four interrelated questions tailored to the concerns of educational technology research. It asks how immersive VR painting, tablet-based drawing, traditional paper media and AI-assisted co-creation theoretically differ in their capacity to support immediate stress relief and positive affect as part of technology-enhanced learning activities; how they might differentially support ongoing participation in creative digital tasks and the development of creative self-efficacy and digital creativity skills; through which psychological and experiential mechanisms—such as immersion, flow, agency, authorship, emotional expressiveness and cognitive load—these differences can be explained; and how these insights can be integrated into an ecological model of artmaking technologies for learning and well-being in exam-oriented schools (Cojocariu & Boghian, 2024; Csikszentmihalyi, 1990; Ryan & Deci, 2000, 2020; Wulan et al., 2025; Zubala et al., 2021, 2025).

**Conceptual Framework**

The core theoretical contribution of the article is a mechanism-based ecological framework for school-based artmaking technologies in exam-oriented systems. Rather than treating immersive VR painting, tablet-based drawing, paper-based artmaking and AI-assisted co-creation as isolated tools and asking which one is "best," the framework focuses on how they differentially configure a set of key mechanisms—immersion and affective intensity, learner agency and authorship, cognitive load and entry barriers, social visibility and evaluation anxiety, and practical scalability and equity. The subsections below conceptualise the four modalities as interacting nodes in a shared ecology, unpack these mechanisms in detail, and locate the modalities within a common conceptual space (Figure 1), a comparative summary of modality–mechanism–context alignments (Table 1) and a practitioner-oriented synthesis of design implications (Box 1). Taken together, these elements move the argument beyond simple technology comparison toward an ecological account of how different configurations of mechanisms can be orchestrated over time to support creativity and well-being in exam-oriented classrooms.

*Four Modalities as Interacting Nodes in the Ecology*

Immersive VR painting involves head-mounted displays and motion controllers that enable three-dimensional drawing or sculpting in virtual space. Typical classroom implementations use short, timetabled sessions in a dedicated VR room or corner, with small groups rotating through. VR affords a high degree of sensory immersion and embodied interaction: students can draw at full body scale, move around their creations and manipulate virtual objects in ways that are difficult to replicate with flat screens or paper (Acevedo et al., 2024; Di Natale et al., 2020; Hamilton et al., 2021; Radianti et al., 2020). From an educational perspective, immersive VR painting is best viewed as an intensive, episodic modality. Hardware cost, safety constraints and supervision requirements make whole-class continuous use unlikely in most

schools, but the same constraints mean that even brief sessions can be experienced as unusually engaging, special and "different from normal class." This positions immersive VR painting as a potential "booster" experience for affective impact and engagement.

Tablet-based drawing refers to stylus-enabled devices (e.g., iPads, pen tablets) running art or design applications. In many schools, such devices are already present for other instructional purposes, making incremental adoption for artmaking relatively straightforward. Compared to VR, tablets are less immersive but more routinisable: they can be used at desks, in standard classrooms and at home. Educationally, tablets support a continuum from low-stakes sketching to sophisticated digital illustration. Features such as layers, undo, colour palettes and export functions align well with iterative design processes and portfolio-based assessment. In the proposed ecology, tablet-based drawing represents a mid-intensity, high-frequency modality that can underpin everyday creative practice and digital creativity skill development (Cojocariu & Boghian, 2024; Wulan et al., 2025).

Paper-based artmaking includes pencils, pens, markers, paints and other analogue materials. It requires minimal technological infrastructure and is deeply embedded in existing art curricula and classroom routines. From an access and equity standpoint, paper-based artmaking remains the baseline modality: it can reach all students, in almost any setting, without relying on digital devices. At the same time, traditional media are not neutral. For some students, especially those who perceive themselves as "not good at drawing," paper-based artmaking can carry strong connotations of performance and evaluation. In exam-oriented systems, art tasks may also be tightly linked to assessment criteria, further blurring the line between expressive and performance-oriented activity (Carlton, 2014; Liverpool et al., 2025).

AI-assisted co-creation refers to workflows in which students collaborate with generative models—typically text-to-image systems—to produce visual material, then curate, annotate, refine or remix it. In a classroom, this might involve students writing prompts that metaphorically describe their stress, examining generated images and then selecting or editing outputs as the basis for further reflection or manual drawing. Unlike the other modalities, AI-assisted co-creation introduces an additional non-human agent into the creative process. This can lower technical skill barriers and rapidly expand the visual repertoire available to students, but also raises questions about authorship, agency and the role of algorithmic suggestion in shaping expression. Within the ecology, AI-assisted co-creation is conceptualised as a co-creative overlay that can be combined with immersive VR painting, tablet-based drawing or paper-based artmaking, rather than as a stand-alone replacement (Shojaei et al., 2024; Zhou & Lee, 2024; Zubala et al., 2025).
Together, these four modalities form a space of possibilities that educators can navigate and combine. The framework's task is to clarify how they differ—and how they can be orchestrated—along analytically useful mechanism dimensions.

*Key Mechanism Dimensions*
To make cross-modality comparison tractable, the framework identifies six dimensions that capture how each technology shapes students' experience, expression and participation in artmaking activities. These dimensions resonate with theories of motivation, cognitive load, digital creativity and digital well-being (Acevedo et al., 2024; Cojocariu & Boghian, 2024;

Odgers & Jensen, 2020; Radianti et al., 2020; Ryan & Deci, 2000, 2020; Sweller, 2020; Wulan et al., 2025).

*Immersion and Affective Intensity*

The first dimension concerns the extent to which a modality supports immersion and affective intensity: the experience of "being in" a creative environment that is perceptually and emotionally absorbing. Immersion can facilitate psychological distance from ongoing stressors, support focused engagement and alter time perception. Immersive VR painting sits at the upper end of this dimension: head-mounted displays occlude the physical classroom and place students in enveloping virtual spaces, often accompanied by spatial audio (Acevedo et al., 2024; Di Natale et al., 2020; Hamilton et al., 2021; Radianti et al., 2020). Tablet-based drawing offers moderate immersion: attention is constrained to a screen, but the surrounding physical environment remains salient. Paper-based artmaking is minimally immersive; attention is shared between the page, peers and classroom stimuli (Carlton, 2014). AI-assisted co-creation typically occurs on flat screens, but the rapid generation of rich imagery in response to prompts can be experienced as mentally immersive even in non-immersive hardware contexts (Shojaei et al., 2024; Zhou & Lee, 2024).

*Agency and Authorship*

The second dimension pertains to learners' sense of agency and authorship: the degree to which they feel they are the primary originators and controllers of the artwork. This is closely linked to constructs such as autonomy, self-efficacy and ownership (Ryan & Deci, 2000, 2020). Paper-based artmaking and tablet-based drawing typically afford a strong sense of personal authorship—every mark can be traced back to the student's hand, even when tools offer digital conveniences. Immersive VR painting extends agency into three-dimensional, embodied action. Students may experience heightened control over spatial composition and gesture, but may also feel constrained by unfamiliar interfaces. AI-assisted co-creation complicates authorship because visual content is partly generated by the model. Students' agency shifts towards specifying prompts, selecting outputs and editing, which can be experienced as empowering (new capabilities) or disempowering (the system "does the real drawing") depending on how activities are framed and scaffolded (Shojaei et al., 2024; Zhou & Lee, 2024; Zubala et al., 2025).

*Emotional Expressiveness and Symbolic Richness*

The third dimension captures each modality's affordances for emotional expressiveness and symbolic richness: how easily and richly students can externalise complex feelings, experiences and identities. Art therapy and digital art psychotherapy literature suggests that medium characteristics shape how individuals "carry" and "transform" emotion in their work (Hadjipanayi et al., 2023; Zubala et al., 2021, 2025). Immersive VR painting supports large-scale, spatial and kinetic forms of expression. Students can step into their work, surround themselves with colours and forms, and use movement as expressive material. Tablet-based drawing and paper-based artmaking provide fine-grained control over line, texture and composition, supporting detailed symbolic work, narrative sequences and iterative refinement (Carlton, 2014). AI-assisted co-creation can generate highly symbolic or metaphorical imagery in response to textual descriptions of emotion, providing starting points that students might not have been able to draw manually and inviting critical reflection on how algorithms represent their prompts (Shojaei et al., 2024; Zhou & Lee, 2024).

*Cognitive Load and Entry Barriers*

The fourth dimension concerns cognitive load and entry barriers. It reflects both the mental and motor demands of using the modality and the perceived skill threshold required to produce satisfying results. Cognitive load theory emphasises a distinction between intrinsic load (the complexity of the expressive task itself), extraneous load (demands imposed by the interface and task design) and germane load (resources devoted to meaning-making and schema construction) (Sweller, 2020). Immersive VR painting often carries high initial extraneous load: students must manage navigation, controller mappings and spatial awareness in addition to creative decisions. Once basic operations are learned and interfaces are streamlined, extraneous load can drop, allowing germane resources to be directed toward symbolic exploration and focused engagement. Tablet-based drawing tools vary—some applications are simple, others complex—but many students are familiar with touch interfaces and stylus input, reducing initial barriers relatively quickly (Cojocariu & Boghian, 2024). Paper-based artmaking has minimal technical load but may present a psychological entry barrier for students who fear judgement of their drawing ability. AI-assisted co-creation lowers manual skill requirements but introduces cognitive demands related to prompt formulation, iterative decision-making and critical evaluation of multiple outputs (Shojaei et al., 2024; Zhou & Lee, 2024).

*Social Visibility and Evaluation Anxiety*

The fifth dimension focuses on how each modality shapes social visibility and evaluation anxiety: who can see a student's work in progress, how easily it is shared and how it is situated within peer and teacher relationships. In exam-oriented schools, where students are routinely ranked and inspected, this dimension is tightly coupled with evaluation apprehension and performance anxiety. In immersive VR painting, work in progress is largely hidden inside the headset; peers may see only a two-dimensional projection. This affords a rare pocket of privacy within otherwise highly surveilled classrooms and can temporarily suspend the "exam gaze" of peers and teachers. On tablets, screens can be turned toward or away from others; sharing is relatively easy but remains under students' control, allowing them to modulate visibility as they gain confidence. Paper-based artefacts are physically visible and can be difficult to hide, especially during classroom monitoring, which can make art tasks feel like yet another site of judgement. For some students, this publicness activates the same evaluative mindset associated with written tests. AI-assisted workflows may be shared as collaborative experiments ("look what this prompt produced"), reframing ownership as joint exploration and sometimes diluting personal exposure, but they can also introduce new forms of comparison around "who can get the best output" (Liverpool et al., 2020; Odgers & Jensen, 2020; Shojaei et al., 2024; Zhou & Lee, 2024).

*Practical Scalability and Equity*

The sixth dimension addresses practical scalability and equity. It considers hardware and software costs, maintenance, teacher expertise, lesson time, policies and inclusivity. Immersive VR painting requires dedicated hardware, safety protocols and staff training; access is typically limited to small groups and scheduled sessions (Acevedo et al., 2024; Radianti et al., 2020). Tablet-based drawing may be supported by shared devices or one-to-one programs; maintenance and classroom management are non-trivial but more familiar. Paper-based artmaking is inexpensive, robust and widely accessible, but quality of materials and space can still vary across schools (Carlton, 2014). AI-assisted co-creation depends on

access to appropriate models and platforms, alongside clear policies on data, content moderation and ethical use (Liverpool et al., 2025; Odgers & Jensen, 2020; Shojaei et al., 2024; Zhou & Lee, 2024). In exam-oriented systems with constrained budgets, these factors strongly shape which modalities can realistically support universal versus targeted provision.

Taken together, these six dimensions can be read as a set of core mechanisms—immersion and affective intensity, agency and authorship, cognitive load and entry barriers, and social visibility and evaluation anxiety—embedded within the practical constraints of scalability and equity. In exam-oriented systems, this combination is particularly consequential: high-stakes assessment cultures amplify the salience of evaluation, time scarcity and resource limitations, thereby shaping how each mechanism is experienced in practice and how schools can realistically orchestrate the four modalities.

For ecological reasoning, the six dimensions can be collapsed into two higher-order axes that are depicted in Figure 1. The vertical axis captures Immersion/Affective Intensity, combining the first and third dimensions, while the horizontal axis captures Routinisability/Scalability within everyday classroom practice, integrating cognitive load, social visibility and practical scalability considerations. When plotted along these axes, paper-based artmaking sits in the low-immersion/high-scalability quadrant; tablet-based drawing occupies a moderate-immersion/high-scalability position; immersive VR painting appears in the high-immersion/low-scalability quadrant; and AI-assisted co-creation is represented as a semi-transparent overlay that can augment each of the other modalities rather than occupying a single fixed point. This two-dimensional representation makes visible the trade-offs between "peak" affective impact and "floor" scalability, and provides a visual anchor for the propositions that follow.

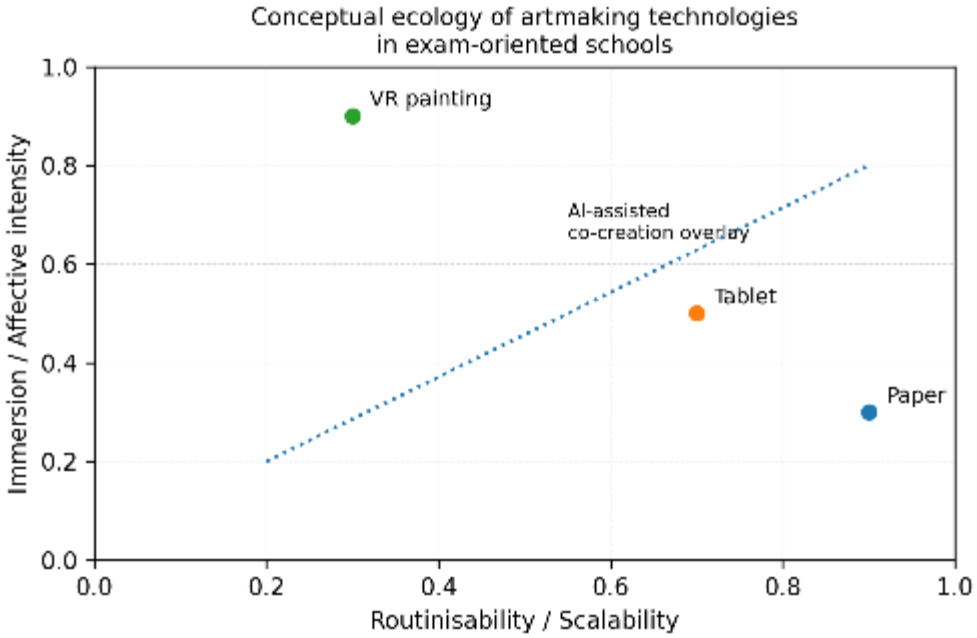


Figure 1. Conceptual ecology of artmaking technologies in exam-oriented schools.
*Note.* The two axes operationalise the collapsed mechanism dimensions discussed above: Immersion/Affective Intensity (y-axis) and Routinisability/Scalability (x-axis). Point locations are schematic and intended to support comparative reasoning rather than to report empirical

estimates. The dashed line indicates an AI-assisted co-creation overlay that may shift affective intensity and routinisability depending on implementation.

As summarised in Table 1, each modality occupies a distinct position in terms of immersion and affective intensity, cognitive load profile, agency and authorship experience, social visibility in exam-oriented classrooms and typical ecological role. Rather than searching for a single best technology, the framework suggests that schools can combine these modalities into an ecology in which immersive VR painting provides high-intensity but episodic relief, tablet-based drawing and paper-based artmaking support routinised practice and reflection, and AI-assisted co-creation functions as a flexible overlay that redistributes cognitive work towards prompting and evaluation. Box 1 distils these insights into key mechanism-oriented takeaways for educators designing creative activities in exam-oriented schools.

Table 1
*Modality profiles across key mechanism dimensions in exam-oriented school ecologies.*

| Modality | Immersion and affective intensity | Cognitive load profile | Agency and authorship experience | Social visibility in exam-oriented classrooms | Typical role in the exam-oriented ecology |
|---|---|---|---|---|---|
| **Immersive VR painting** | Very high 3D presence; intense, short "peak" affective episodes. | High initial extraneous load; after training, more resources for focused symbolic exploration. | Embodied agency in 3D space; early use can feel technically constraining. | In-headset privacy; work largely shielded from peers' and teachers' direct gaze. | Targeted booster for stress relief and memorable creative peaks around exam periods. |
| **Tablet-based drawing** | Moderate, screen-focused immersion; sustained but not fully enveloping engagement. | Moderate extraneous load, quickly reduced by familiarity with touch devices and stylus input. | High manual control; supports iterative refinement and gradual skill-building. | Visibility can be adjusted; sharing is largely under students' control. | Everyday practice medium linking VR peaks to routine coursework and reflection. |
| **Paper-based artmaking** | Low technological immersion; still capable of deep absorption for some students. | Minimal extraneous load; emotional load can be high if drawing feels judged or talent-based. | Direct control of materials; no safety net for students with low drawing self-efficacy. | Constant visibility on desks; work is easily inspected and compared. | Baseline, low-tech channel that requires careful framing to avoid triggering an exam mindset. |
| **AI-assisted co-creation overlay** | Indirect, screen-based immersion; | Cuts motor demands; shifts load to | Expands expressive reach but can | Impressive outputs often invite | Co-creative overlay for reflective |

| Modality | Immersion and affective intensity | Cognitive load profile | Agency and authorship experience | Social visibility in exam-oriented classrooms | Typical role in the exam-oriented ecology |
|---|---|---|---|---|---|
| | intensity shaped by prompt framing and narrative use. | prompting, choice among outputs and critical evaluation. | dilute authorship if AI is treated as the main creator. | comparison over whose prompts and results are best. | prompting and AI literacy across other modalities. |

*Note.* The entries are conceptual syntheses intended to support ecological instructional design; they do not report empirical effect sizes. Terminology is aligned with the axis labels used in Figure 1.

**Box 1. Key mechanism takeaways for exam-oriented schools**

**Immersion and affective intensity**

- Use immersive VR painting sparingly but deliberately for short, high-intensity sessions during peak stress periods (e.g., before or after high-stakes exams).
- Treat immersive VR painting as a "booster" modality rather than a universal solution: short, well-scaffolded sessions can offer a strong sense of temporarily stepping outside the exam world.
- Rely on tablet-based drawing and paper-based artmaking for lower-intensity but more frequent opportunities to externalise emotions and experiment with ideas.

**Cognitive load and entry barriers**

- Distinguish between intrinsic load (the complexity of the expressive task) and extraneous load (technical friction, confusing interfaces).
- For immersive VR painting, invest in basic training and streamlined interaction designs so that extraneous load drops quickly; otherwise, the technology itself can become another stressor.
- Use tablet-based drawing and paper-based artmaking as low-friction channels for everyday creative tasks; they keep extraneous load low and free up germane resources for meaning-making and reflection.
- With AI-assisted co-creation, remember that cognitive load shifts towards planning prompts, choosing outputs and critically evaluating them; design explicit scaffolds for these steps.

**Agency and authorship**

- Design activities that preserve students' sense of "this is my work", even when tools are highly automated.
- In immersive VR painting and tablet-based drawing contexts, prioritise open-ended tasks where students make genuine choices about content, composition and style.
- With AI-assisted co-creation, foreground prompting, editing and curating rather than simply accepting the first output; make clear that the human is the author and the AI is a tool.
- Avoid classroom norms that reward only polished or spectacular products; focus feedback on process, reflection and experimentation.

**Social visibility and evaluation anxiety**

- Recognise that in exam-oriented schools, visibility is never neutral: who sees the work, when and how strongly shapes evaluation anxiety.
- Use immersive VR painting's relative privacy to create low-judgement spaces where students can explore personally significant themes without feeling watched.
- Use tablets' flexible visibility (screen sharing, screenshots, digital portfolios) to gradually increase exposure as confidence grows.
- Be cautious with public display of paper-based work in high-stakes environments; make sharing optional or anonymised where appropriate and decouple creative tasks from summative grading.

**Routinisability, scalability and equity**

- Plan the ecology with resource realities in mind: immersive VR painting will remain scarce; tablets may be shared; paper is ubiquitous.
- Aim for a pattern in which paper-based artmaking and tablet-based drawing form the everyday backbone, immersive VR painting provides targeted peaks and AI-assisted co-creation is added when infrastructure and policy allow.
- Ensure that access to "premium" experiences (VR sessions, AI labs) is not restricted only to already high-performing or confident students; otherwise, existing inequalities may be reinforced.

Note. The entries are conceptual syntheses intended to support ecological instructional design; they do not report empirical effect sizes

**Theoretical Propositions**

Within this multi-dimensional space, the framework advances three core propositions about how different combinations of mechanisms are likely to relate to student well-being and digital creativity outcomes in exam-oriented school contexts.

*Proposition 1: Immersive VR painting – high-intensity relief under low extraneous load*

This proposition foregrounds immersion and affective intensity, cognitive load and entry barriers, and social visibility and evaluation anxiety as the central mechanisms. Immersive VR painting combines very high immersion with relatively low social visibility but also high initial extraneous load, so its value for short-term stress relief in exam-oriented classrooms is explicitly conditional on reducing that extraneous load through training and design.

*For immediate, short-term relief from exam-related stress and negative affect during or after demanding learning activities, immersive VR painting is theoretically positioned to produce the strongest affective shift for students who have passed a basic familiarisation threshold.* This follows from its unique configuration of high immersion and affective intensity, embodied agency and low social visibility. Short, carefully designed VR sessions can create a sense of "stepping out" of the exam world into a bounded, absorbing creative environment in which peers' evaluative gaze is temporarily suspended. Within a cognitive load perspective, however, this claim is explicitly conditional: if extraneous load from the interface remains high—because students are unfamiliar with the controllers or software—the attentional resources required to manage the technology may blunt or even reverse the intended stress-relief effect (Sweller, 2020). Proposition 1 therefore assumes prior scaffolding and streamlined interaction designs that reduce extraneous load so that immersion can primarily

serve to redirect germane resources toward symbolic exploration and emotion regulation (Chen et al., 2024; Hadjipanayi et al., 2023; Liverpool et al., 2020; Zubala et al., 2021).

For these reasons, and because immersive VR painting scores low on scalability and requires substantial resources and expertise, it is unlikely to function as a universal everyday modality. In exam-oriented systems, VR is better conceptualised as a targeted, episodic booster within the broader ecology—for instance, scheduled brief sessions during peak exam periods for students identified as needing additional support—rather than as a continuously available classroom tool (Acevedo et al., 2024; Radianti et al., 2020).

Proposition 2: Tablets and paper – scalable everyday scaffolds for creativity and regulation
This proposition foregrounds routinisability and scalability, cognitive load and entry barriers, and agency and authorship as the central mechanisms. In contrast to immersive VR painting, tablet-based drawing and paper-based artmaking score lower on immersion but higher on routinisability, making them better candidates for everyday integration into exam-oriented classrooms.

*For sustained creative engagement and gradual development of emotion regulation strategies in exam-oriented schools, tablet-based drawing and paper-based artmaking are theoretically best positioned as the baseline modalities that can be woven into regular lessons.* Tablet-based drawing occupies a mid-point on the immersion–scalability continuum: it offers more focus and expressive flexibility than paper, while maintaining manageable extraneous load that can be reduced quickly through familiar touch-based interactions. This allows teachers to embed frequent, low-threshold sketching and annotation activities without substantial disruption to existing routines. Paper-based artmaking, in turn, has almost no technical entry barrier and is available in virtually all classrooms; it therefore remains a practical medium for quick expressive tasks, especially when time and resources are constrained.

From a cognitive load perspective, tablet-based drawing and paper-based artmaking minimise ongoing extraneous load, freeing up germane resources for students to experiment with visual metaphors, revisit earlier work and link artmaking to academic content. Their everydayness also matters: by normalising small, repeated acts of expression, these modalities can gradually build creative self-efficacy rather than relying solely on rare “peak” experiences. At the same time, in exam-oriented contexts, paper-based artefacts are more exposed to teachers’ and peers’ gaze and can activate evaluation anxiety, while tablets offer more controllable visibility (e.g., screens can be turned away, shared selectively or submitted in digital portfolios). Proposition 2 therefore implies that, when designing an ecology of tools, schools should treat tablet-based drawing and paper-based artmaking not as competitors to VR, but as the primary scaffolding layer that connects episodic VR experiences and AI-assisted reflection to the day-to-day texture of classroom life (Cojocariu & Boghian, 2024; Liverpool et al., 2025; Wulan et al., 2025).

*Proposition 3: AI-assisted co-creation – shifting cognitive load toward reflective prompting*
This proposition foregrounds agency and authorship, cognitive load and entry barriers, and AI literacy as the central mechanisms. AI-assisted co-creation redistributes cognitive work away from motor execution toward planning, prompting and evaluation, which can either

strengthen or undermine students' sense of autonomy and authorship depending on how activities are designed.

*AI-assisted co-creation, when introduced into school artmaking, is theorised to function as a double-edged amplifier.* On one hand, generative systems can lower manual skill barriers and rapidly generate rich symbolic imagery, allowing students with low drawing self-efficacy to see compelling visual representations of their ideas. This can bolster perceived competence, especially in exam-oriented cultures where artistic "talent" is easily equated with fixed ability. The cognitive work shifts from fine-motor execution toward higher-level planning and evaluation: students must decide how to phrase prompts, which outputs to keep and how to modify or build on them. On the other hand, if classroom practices frame the AI as the primary creator and minimize opportunities for students to rework or critique outputs, students' sense of autonomy and authorship may be eroded, and relational dynamics may centre on competition for the "best" algorithmically produced image.

Against this backdrop, the framework advances a more specific claim: the therapeutic and educational value of AI-assisted artmaking lies less in passively viewing generated images and more in the prompting and reflection processes that surround them. To write an emotionally meaningful prompt, students must label and externalise aspects of their internal state; to select from multiple outputs, they must articulate why some images resonate more than others. These activities can be designed to scaffold emotion identification, reappraisal and narrative construction, thereby contributing to stress relief and socio-emotional learning rather than mere consumption. Consequently, AI-assisted artmaking is best theorised not as a replacement for manual or embodied modalities, but as a co-creative overlay whose educational value depends on preserving and foregrounding human agency, reflective prompting and critical judgement (Shojaei et al., 2024; Zhou & Lee, 2024; Zubala et al., 2025; Ryan & Deci, 2000, 2020).

**Synthesis and Implications**

The ecological framework has direct implications for how educators and designers might integrate artmaking technologies into everyday teaching and learning, especially in systems where exam pressure and resource constraints are salient. It focuses on three areas: orchestrating modalities over time and across learner groups; designing tasks that exploit the distinct affordances of each modality for well-being and digital creativity; and supporting teachers through appropriate competencies and professional development.

*From Single-Tool Evaluations to Ecological Design Problems*

First, the framework invites a reframing of educational technology design problems. Instead of asking whether a particular technology "works," it asks how multiple creative modalities can be combined and sequenced within the constraints of a particular school ecology to support learning, creativity and well-being. This reframing echoes calls in VR education and digital mental health research to move toward multi-component, ecology-sensitive analyses of interventions (Acevedo et al., 2024; Liverpool et al., 2025; Radianti et al., 2020). For educational technology researchers, this means that the unit of analysis shifts from isolated VR modules or single tablet applications to dynamic configurations of technologies, practices, policies and cultural expectations. Umbrella reviews and meta-reviews of VR in education suggest that much of the variability in outcomes may be attributable to contextual and

implementation differences rather than to VR *per se* (Craig & Kay, 2023; Di Natale et al., 2020; Hamilton et al., 2021). The proposed framework aligns with this interpretation by treating "ecological fit" as a central consideration rather than a confound to be controlled away.

*Positioning Artmaking within Digital Well-Being Debates*

Second, the framework positions school-based artmaking within broader debates about digital well-being. Large-scale reviews of adolescent mental health in the digital age have challenged simplistic claims that "more screen time is inherently harmful," emphasising instead the importance of activity type, context and meaning (Liverpool et al., 2020; Odgers & Jensen, 2020). Within this perspective, VR painting, tablet drawing, paper art and AI-assisted co-creation can be understood as different "islands of activity" within the digital landscape, each with its own affordances and risks. Their psychological impact depends less on the presence of screens and more on how activities are structured, framed and integrated into life.

For school leaders and policy makers, this suggests a shift from primarily restrictive or protective approaches to technology toward more design-oriented strategies. Rather than focusing solely on limiting or monitoring digital use, schools can design structured, purposeful creative activities that leverage technologies' expressive and collaborative affordances. Short VR or tablet-based art sessions during peak exam periods, for example, could be framed as part of a broader well-being and creativity agenda, provided they are accompanied by reflection and teacher support (Chen et al., 2024; Liverpool et al., 2025).

*Bridging art Education, Mental Health Promotion and AI Literacy*

Finally, the ecological framework offers a way to connect three relatively separate strands of research and practice: art and design education, school-based mental health promotion and AI literacy. Reviews of digital and VR-based art therapy indicate that creative activity can support emotion regulation and meaning-making outside clinical settings (Hadjipanayi et al., 2023; Zubala et al., 2021, 2025). At the same time, work on generative AI and creativity highlights the need for learners to understand algorithms' role in creative processes and to develop reflexive, critical approaches to AI-assisted work (Shojaei et al., 2024; Zhou & Lee, 2024). By treating the multi-modal creative ecology as the unit of analysis and design, schools can develop integrated programs in which creative artmaking supports both psychological and epistemic aims: students learn to express and regulate emotions, to experiment with digital tools and to interrogate the socio-technical conditions of their own creativity.

**Research Agenda**

Because the article is conceptual, an explicit research agenda is essential. The comparative, ecology-sensitive lens suggests several priority areas for empirical work in educational technology and learning sciences.

*Comparative Studies on Immediate Stress Relief and Mood*

One line of research concerns systematic comparison of different artmaking modalities' effects on short-term stress and mood, particularly in exam-oriented settings. Building on work in digital mental health and VR-based art therapy, future studies could, for example, assign students to brief creative sessions using VR, tablet, paper or AI-assisted modalities in the context of high-pressure academic tasks (Chen et al., 2024; Hadjipanayi et al., 2023;

Liverpool et al., 2020; Zubala et al., 2021). Short validated scales for perceived stress and affect, optionally complemented by basic physiological indicators such as heart rate variability, could be combined with qualitative accounts of students' experiences. Such designs would provide more precise evidence to guide schools' decisions about which modalities are best suited to which kinds of moments, rather than relying on general claims about "VR versus non-VR."

*Longitudinal and Mixed-Methods Studies on Engagement and Creativity*

A second priority is to understand how different technology configurations shape longer-term trajectories of creative engagement, digital creativity and well-being. Reviews of digital creativity in higher education argue that creative performance is shaped by technological, individual and socio-educational factors in combination, and that longitudinal and mixed-methods designs are needed to capture these dynamics (Cojocariu & Boghian, 2024; Wulan et al., 2025). Within a multi-modal creative ecology, researchers might track one or more cohorts over a semester or year as they engage in paper, tablet, VR and AI-based tasks at different times. Standardised measures of creative self-efficacy, digital creativity, school engagement and subjective well-being could be complemented by classroom observations, student interviews and artefact analysis. Such studies would help clarify whether, for example, VR functions best as an episodic motivational "spark," while tablets and paper support the accumulation of skill and portfolio evidence, and AI assists with stylistic exploration and critical reflection (Acevedo et al., 2024; Shojaei et al., 2024; Zhou & Lee, 2024).

*Design-Based Research on Ecological Integration in Exam-Oriented Schools*

A third research direction is design-based research on integrating multi-modal creative ecologies into the routines and constraints of exam-oriented schools. Design-based research, with its iterative cycles of co-design, enactment, analysis and redesign, is well suited to exploring how creative technologies can be made to fit local conditions while still advancing theoretical understanding (Radianti et al., 2020; Ryan & Deci, 2020). Collaborations among teachers, school psychologists and administrators could begin with small pilots—for example, embedding a VR or AI-based creative unit into an existing art or technology course—and then gradually expand into more systematic programs, such as recurring "creative and well-being workshops" during exam periods. Throughout, attention would need to be paid not only to learning and well-being outcomes but also to issues of equity, sustainability and teacher workload (Liverpool et al., 2025; Odgers & Jensen, 2020; Sweller, 2020).

**Conclusion**

This theoretical article has proposed a framework for understanding how four artmaking modalities—immersive VR painting, tablet-based digital drawing, traditional paper media and AI-assisted co-creation—can be orchestrated as a multi-modal ecology to support student well-being and digital creativity in exam-oriented school systems. Rather than evaluating a single technology in isolation, the framework situates these modalities as distinct but interacting nodes characterised by specific configurations of immersion and presence, agency and authorship, emotional expressiveness, cognitive load, social visibility and practical scalability. By doing so, it responds to calls in educational technology research to move beyond generic debates about "screen time" and single-tool interventions toward more nuanced, activity- and mechanism-focused analyses (Acevedo et al., 2024; Cojocariu &

Boghian, 2024; Liverpool et al., 2020, 2025; Odgers & Jensen, 2020; Radianti et al., 2020; Sweller, 2020; Zubala et al., 2021, 2025; Zhou & Lee, 2024).

A central implication of the framework is that no single technology can, or should, carry the full burden of enhancing learning, creativity and well-being. Immersive VR painting appears particularly well suited for short, intensive episodes that provide immediate affective relief and memorable creative experiences, but its cost and logistical constraints limit its suitability as a universal, everyday solution. Tablet-based drawing and traditional paper media, by contrast, are more routinisable and widely accessible, making them strong candidates for the baseline layer of frequent, low-threshold creative practice. AI-assisted co-creation introduces powerful new possibilities for expanding students' expressive repertoires and engaging with emerging forms of digital culture, while simultaneously raising questions about authorship, agency and ethics. Taken together, these modalities form a palette of tools that schools can combine and sequence rather than a menu from which they must choose a single "winner."
For instructional design, the ecological perspective highlights the importance of aligning modality with pedagogical purpose, time scale and target population. VR-based activities may function best as episodic "booster" experiences embedded within broader units that include preparation, reflection and transfer to other media. Tablet and paper work can anchor ongoing creative journaling, visual explanation and exploratory sketching that normalise expression and support the gradual development of digital creativity skills (Cojocariu & Boghian, 2024; Wulan et al., 2025). AI-assisted workflows are likely to be most educationally valuable when framed as co-creative and critical literacy opportunities that invite students to interrogate how generative systems represent their prompts, to remix and reinterpret AI outputs, and to reflect on the boundaries of human and machine creativity (Shojaei et al., 2024; Zhou & Lee, 2024; Zubala et al., 2025). Across all modalities, designs that foreground learner choice, narrative and reflection are more likely to yield both socio-emotional and academic benefits than those that treat artmaking as decorative or purely recreational.

The framework also points to a substantial research agenda. Multi-arm and within-subject comparative studies can empirically test propositions about the immediate and longer-term effects of different modalities on affect, engagement and creative self-efficacy. Design-based research can explore how teachers implement multi-modal creative ecologies within their own curricula and constraints, generating context-sensitive design principles. Mixed-methods investigations can probe the mechanisms of immersion, agency, expressive depth and cognitive load that underlie students' experiences, including how these mechanisms differ across subgroups. System-level work can clarify how structural factors such as exam pressure, resource distribution and digital education strategies shape which modalities become central, peripheral or entirely absent from school practice (Acevedo et al., 2024; Chen et al., 2024; Di Natale et al., 2020; Fernández-Batanero et al., 2025; Liverpool et al., 2025; Radianti et al., 2020).

At the same time, the proposed framework has limitations. It is conceptual rather than empirical and necessarily abstracts from the diversity of specific tools, platforms and cultural contexts. The four modalities are ideal types that, in practice, may overlap and hybridise; the six comparison dimensions are not exhaustive and may interact in complex ways. The framework should therefore be treated as a starting point for iterative refinement, not a definitive taxonomy.

Despite these limitations, the ecological lens offered here underscores a broader message. As schools navigate rapid developments in VR, mobile devices and generative AI, decisions about technology adoption and curriculum integration cannot be made solely on the basis of novelty or isolated efficacy claims. For exam-oriented systems struggling to balance academic demands with student well-being and the cultivation of future-ready creative skills, the question is not simply whether to adopt VR, tablets, paper or AI, but how to orchestrate them over time and across learners so that each plays to its strengths within a coherent pedagogical design. By articulating a multi-modal ecology of artmaking technologies, this article aims to support more strategic, evidence-informed experimentation and to invite further work at the intersection of digital creativity, learning and student well-being.

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