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Fostering Creativity in School Makerspaces: Principles and a Framework for Assessing Creativity-Supportive Design

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Abstract
School-based makerspaces are increasingly recognized as powerful contexts for fostering creativity, collaboration, and problem-solving. However, educational research on creativity has often prioritized individual traits or final products, underemphasizing the environmental conditions - physical, social, emotional, and cognitive - that shape creative engagement. This paper argues for re-centering Press, the environmental dimension of Rhodes' Four Ps model, as a central driver of creativity in educational makerspaces. Drawing on interdisciplinary literature from creativity studies, learning sciences, and educational psychology, the paper identifies six interrelated principles that characterize creativity-supportive learning environments: a supportive socio-emotional atmosphere, learner autonomy, inspirational stimuli, collaborative culture, teacher support and guidance, and equitable access to technology and resources. These principles are synthesized into the Creative Educational Environment Assessment Model, a prospective conceptual framework designed to evaluate and enhance makerspaces in ways that are context-responsive, equitable, and pedagogically robust. The model emphasizes process as well as product, incorporates intellectual resources as a dimension of creative support, and situates teacher capacity as a systemic driver. Intended as both a theoretical scaffold and a practical tool, the framework offers researchers, educators, and policymakers actionable guidance for transforming makerspaces into environments where creativity is structurally supported and democratically accessible.

Keywords
Makerspace, creativity assessment, environment, education, pedagogy

Introduction
School makerspaces have gained substantial traction in recent years, offering technology-rich environments that emphasize hands-on, student-led, and project-based learning through the act of making (Blikstein, 2014; Korhonen et al., 2022; Gravel & Puckett, 2023). These spaces are specifically designed to teach and foster essential 21st-century skills—such as critical thinking, collaboration, problem-solving, technological proficiency, and creativity—skills that are critical for the evolving job markets of the future (Binkley et al., 2011; Larsson & Miller, 2012; Piirto, 2011). Creativity, which involves generating and evaluating possibilities by connecting information in new ways or finding viable alternatives to problem solutions (Beghetto, 2020), lies at the heart of both the concept of 21st-century skills and maker-centered learning (Clapp et al., 2016). As the maker movement has entered the educational context (Davies & Seitamaa-

Hakkarainen, 2024), school makerspaces offer unique opportunities for students to develop their creative capacities. Makerspaces thus also provide us with a context for assessing creative environments, and for studying how environments can be better equipped to facilitate teaching for developing creative capacities.

General creativity research has disproportionately emphasized individual traits (e.g., persistence, divergent thinking), cognitive processes (e.g., ideation, iteration), or the originality of products. Far less attention has been devoted to the environmental conditions, the Press in Rhodes' (1961) Four Ps framework, that shape, enable, or constrain creative engagement. This imbalance is not a mere oversight; it limits both our theoretical understanding of creativity and the capacity to design inclusive, equitable, and effective learning environments that could support sharing creative ideation and communication.

Existing approaches to creativity assessment further reflect this gap. While assessment of creativity (typically summative) and assessment for creativity (typically formative) have their place in educational design (Bolden et al., 2019; Beghetto & van Geffen, 2024), both approaches often operate without a robust framework for understanding the interplay between environmental factors and learner agency. Without such a framework, efforts to evaluate creativity risk overlooking the socio-emotional, material, and cultural contexts that influence participation and innovation.

In school makerspaces, environmental factors are often assumed rather than intentionally designed. Access to advanced tools or open-ended tasks is not, on its own, a guarantee of creativity, (Niinimäki et al., 2025). Instead, creativity emerges when physical, social, emotional, and cognitive dimensions of the environment are deliberately aligned to foster curiosity, collaboration, and risk-taking (Kumpulainen & Kajamaa, 2020). Treating the environment as a constitutive force rather than a passive backdrop requires both conceptual clarity and practical strategies for design and evaluation (Juurola et al., 2022) Especially the theoretical influence of embodied learning has directed researchers' attention to the environment when it comes to its affect on the learning activities in the classroom, especially in the creative subjects (Hughes & Morrison, 2020). However, little research has been focusing on the environment's effect on creativity and how to design learning environments for enhancing creativity in students.

This paper responds to the need of strategically designing learning environments to enhance creativity in students by re-centering Press as a primary lens for both understanding and improving creative engagement in school-based makerspaces. In doing so, it addresses two central research questions:

- What role does the learning environment - encompassing physical, social, emotional, and cognitive factors - play in fostering student creativity within school-based makerspaces?
- What principles can be derived from interdisciplinary research to guide the design and assessment of creative learning environments?

To answer these questions, we synthesize theoretical insights from creativity studies, learning sciences, and educational design to articulate a set of interconnected principles for cultivating creativity through environmental design. These theoretical principles are summoned in our prospective Creative Educational Environment Assessment Model, a flexible, evidence-informed framework designed to guide educators, researchers, and policymakers in fostering and assessing creative learning environments. By advancing this model, we aim to contribute both to the scholarly discourse on creativity and to the practical transformation of makerspaces into environments where creativity is structurally supported, equitably accessible, and meaningfully assessed.

Re-centering environment: Theoretical Foundations and Empirical Gaps in Creativity Research

Creativity remains a cornerstone of contemporary education, increasingly valued for its role in preparing learners to navigate the demands of a rapidly evolving world. In educational design, particularly within school-based makerspaces, creativity is often viewed as both a pedagogical aim and an indicator of meaningful engagement (Olafsson, 2022). While extensive research has explored learner characteristics, cognitive processes, and final outputs, the environmental dimension, and especially its assessment, has received significantly less theoretical and empirical attention in educational contexts (Jordanous, 2016). In educational contexts, creativity has traditionally been viewed through the lens of individual traits such as motivation or divergent thinking, or cognitive processes like problem-solving and iteration (Runco & Jaeger, 2012). Evaluative tools often center on final outputs, using instruments such as the Consensual Assessment Technique (CAT) (Amabile, 1982) or domain-specific rubrics. However, this person-process-product emphasis has led to a skewed understanding of creativity that overlooks the contextual affordances and constraints embedded within learning environments (Beghetto & Kaufman, 2007; Henriksen et al., 2019).

Too frequently, the learning environment is treated as a static backdrop or a neutral container for activity, despite robust evidence from the learning sciences suggesting otherwise. However, situated, embodied, and socio-material learning theories challenge this assumption (Schilhab & Groth, 2024). Situated Learning Theory (Lave & Wenger, 1991) asserts that knowledge and skills are developed through active participation in specific cultural and material contexts, highlighting how learning is inherently relational and situated. Similarly, socio-material perspectives (Fenwick, 2013) argue that cognition and creativity emerge from dynamic interactions between individuals, tools, artefacts, and spatial configurations. These approaches shift the focus from creativity as a purely internal phenomenon to one shaped by the interplay of material, social, and symbolic factors (Keune & Peppler, 2018; Mehto & Kangas, 2023).

From this perspective, the environment is not simply a backdrop but a constitutive element of creativity itself. The concept of affordances (Gibson, 1979) from ecological psychology, that has formed a basis for embodied cognition theories and related learning theories underscores how learners perceive opportunities for action based on what their environment offers. Whether or not students pursue creative pathways is deeply influenced by how accessible and supportive their physical and social context is. This is echoed in Hutchins' theory of a shared socially distributed cognition (Hutchins, 1995) and Vlad Glăveanu's distributed creativity concept (Glăveanu, 2014) that similarly demonstrates that thinking—including creative ideation and problem-solving—is not confined to the mind but is distributed across tools, representations, and social interaction which has formed a basis for embodied cognition theories and related learning theories, ns. These theoretical foundations support the embodied view on learning that the environment actively mediates creative engagement, shaping what learners notice, value, and attempt.

While several theoretical models have been developed to define creativity, there is still a lack of sufficient attention to concrete environmental aspects. Where environmental considerations are addressed, they are often treated broadly or inconsistently. Among existing frameworks, we find Rhodes' definition of the environment—captured in the concept of Press—to be the most developed to date. For this reason, we use it as the starting point for our model. Rhodes (1961) conceptualised creativity through four interrelated components: Person, Product, Process, and Press, each highlighting a distinct facet of creativity. In the educational context, each of these components can be targeted and assessed independently to yield a more comprehensive understanding of creative development. The Four Ps model is a comprehensive framework that has been used extensively to contextualize creativity in a variety of disciplines and enables a detailed analysis of how these elements interact to stimulate or hinder creativity. A significant advantage of the 4P model is its applicability in educational settings, particularly for facilitating creativity among students. Studies suggest that integrating the 4P framework into teaching practices can enhance creative outcomes in students by recognizing the importance of personal attributes, process methodologies, environmental factors, and product evaluations in nurturing creativity (Jiang et al., 2020; Liu & Chang, 2017).

The Person dimension of Rhodes (1961) creativity framework considers the traits, characteristics, and behaviours that are typically associated with creative individuals. For instance, research from the Centre for Real-World Learning (CRL) has identified five core habits linked to creativity: inquisitive, persistent, imaginative, collaborative, and disciplined (Spencer et al., 2012). These characteristics have been validated through extensive field trials. The core habits can be used to plan, execute, and assess different aspects of teaching and learning (e.g., Lutnæs, 2018) and can serve as indicators of creative potential in students.

Several tools have been designed to measure individual creative capacities through tests that focus on cognitive and expressive aspects, such as the Critical Thinking Assessment Test (CAT) and the Abreaction Test (Geist et al., 2018; Carbonell-Carrera et al., 2017). However, such tests assume that creativity is a domain-general trait that can be measured. However, many researchers have described creativity as domain-specific (e.g., Baer, 2010), and the link between creativity and personality can differ across domains.

The Product refers to the tangible outputs of the creative process, with a commonly accepted definition of a creative product as something that is both novel and task-appropriate (Runco & Jaeger, 2012). In educational makerspaces, the emphasis is generally on ideas that are new to the individual, rather than on groundbreaking contributions to a field. One of the most widely used methods for evaluating creative products is the Consensual Assessment Technique (CAT), which relies on expert evaluations to rank the creativity of students' work (Amabile, 1982). The products are compared to other products within a group rather than an ideal. This model has proven effective across multiple fields (Plucker et al., 2019), but determining who qualifies as an "expert" remains an ongoing challenge.

In the Rhodes model, the Process dimension refers to the sequence of cognitive and collaborative steps involved in creative thinking (Batey, 2012; Beghetto, 2020). For example, Beghetto (2020) outlines a seven-step process, from problem identification through to evaluation. In a makerspace setting, each stage can be assessed to understand how students generate, refine, and share creative ideas. However, understanding the creative process should not lead to overplanning and assessing but to developing what the students already have and do (Beghetto, 2020).

When we shift our focus from individuality, products, and process to the surrounding context, it becomes clear that creativity is not an isolated phenomenon. Creativity is a response to needs in society and/or builds on other creative constructs. Typically, workplace environments are evaluated based on features that support or inhibit creativity (Sundquist et al., 2025). This is the final dimension, Press (environment), in Rhodes' model. The psychological climate that is conducive for creativity has been measured in organizational settings (Ekvall, 1996; Amabile et al., 1996; Dul & Ceylan, 2011) and home environments (Harrington et al., 1987). However, the interplay between the individual and environment in creativity assessment in school makerspace remains largely unexplored (Abdulla Alabbasi, et al., 2025; Runco & Acar, 2024)

The neglect of environmental factors that affect creativity is particularly evident in research on educational makerspaces, which are often idealized as inherently creative spaces. While these settings offer access to materials, tools, and open-ended tasks, such provisions alone do not guarantee deep or sustained creative engagement (Sälzer & Roczen, 2018). Instead, factors such as classroom layout, peer interaction, emotional safety, and the presence of cognitive scaffolds play crucial roles in determining whether and how creativity emerges (Kumpulainen & Kajamaa, 2020).

A recent scoping review by Soomro et al. (2023) offers empirical confirmation of this imbalance. They analyzed 34 peer-reviewed studies related to creativity in STEAM education, and the authors found that the majority of studies focused heavily on the Person, Process, and Product dimensions (Soomroo et al. 2023). Further, none utilized established tools to measure environmental variables such as social norms, spatial affordances, or access to emotional support (Table 1). This empirical gap limits our understanding of how creativity is enabled or constrained by environmental conditions.

Table 1. Method for creativity assessment and corresponding aspect of creativity
From: Makerspaces Fostering Creativity: A Systematic Literature Review (based on Soomro et al., 2023)

S. No	Creativity assessment method	Aspect of creativity	References
I	The creative solution diagnosis scale (CSDS)	Product	(Cropley & Cropley, 2004; Cropley et al., 2011; Timotheou & Ioannou, 2021)
II	Critical thinking assessment tests (CAT)	Person	(Geist et al., 2019; Harris et al., 2014)
III	The abreaction test	Person	(Carbonell-Carrera et al., 2019; Saorín et al., 2017)
IV	The Torrance test for creative thinking (TTCT)	Process	(Noh, 2017; Torrance, 1972)
V	Rubric-based assessments of creativity	Process	(Lille & Romero, 2017 ; Clark et al., 2018)
VI	Summative assessment of prototypes	Product	(Fleischmann et al., 2016)

VII	Export jury assessment	Product	(Chekurov et al., *2020*)

Treating Press as an influential component of creativity aligns not only with theoretical developments but also with growing awareness of how equity, inclusion, and access intersect with creative learning. Heredia and Tan (2021) have shown that minoritized learners often face invisible barriers in makerspaces, ranging from unfamiliarity with technical tools to social exclusion from collaborative groups. These experiences cannot be fully understood or addressed without considering the environmental and cultural conditions of the learning setting.

Press, in this context, becomes a valuable analytical and design tool. It allows practitioners to interrogate how different elements of the environment—emotional safety, teacher mediation, physical accessibility, or intellectual scaffolding—shape the conditions for participation. By centering Press, educational design can move from a narrow focus on individual aptitude or project outputs toward a systems-level approach that recognizes creativity as co-produced by learners and their environments.

Designing Creative Learning Environments in School-Based Makerspaces: Principles for Practice

The evaluation and enhancement of school-based makerspaces require a balanced consideration of pedagogical theory and practical application (Korhonen et al., 2022). Makerspaces have been consistently positioned as fertile grounds for integrating STEAM learning while fostering creativity, critical thinking, collaboration, and problem-solving (Kay & Buxton, 2023; Bertrand & Namukasa, 2022). These environments provide not only access to technical tools but also opportunities for social interaction and experiential learning, aligning closely with constructionist principles. For instance, Eldebeky and Hughes (2025) illustrate how a laser cutter station in a school makerspace can advance subject-specific learning and career readiness, especially when collaborative engagement between students is prioritized.

Motivational factors also play a crucial role in shaping the success of makerspace-based learning. Positive emotional experiences have been shown to enhance students' self-efficacy and situational interest, ultimately improving project performance (Vongkulluksn et al., 2018). These findings echo Bandura's social cognitive theory, which highlights the central role of affective experiences in shaping learners' perceptions of competence. Consequently, makerspaces should be designed not only as technical workspaces but also as emotionally supportive environments that promote well-being, confidence, and sustained engagement.

Assessment in makerspaces must go beyond conventional academic metrics. Traditional measures are often insufficient for capturing the full spectrum of learning in these complex, project-based contexts. Alternative approaches, such as collaborative problem-solving rubrics and structured reflective practices, have emerged as more effective tools for understanding student learning dynamics. Herro et al. (2018) offer a framework for assessing collaborative problem-solving behaviors among primary students, showing how task-specific observation can illuminate critical social and cognitive processes. Similarly, Rosenheck et al. (2021) advocate for embedded, student-centred assessment tools that produce nuanced evidence of learning, adapted to the distinctive qualities of maker pedagogy.

The role of the teacher is central in realizing the potential of school makerspaces. Stevenson et al. (2019) argue that structured pedagogical frameworks not only increase teacher confidence but also strengthen the integration of maker-based approaches across the curriculum. Well-prepared teachers can facilitate richer student experiences, ensure equitable participation, and connect makerspace activities to broader educational goals.

Drawing together these insight points to a multi-dimensional framework for designing creative learning environments in makerspaces one that addresses emotional engagement, collaborative practice, innovative assessment, and sustained teacher development, while accounting for the social and physical conditions that nurture creativity.

Such environments thrive when they foster a supportive atmosphere in which students feel welcomed, valued, and encouraged to take intellectual risks. A positive emotional climate, underpinned by peer support and inclusive engagement, builds trust and creative confidence (Baeten et al., 2012). They also benefit from promoting freedom and autonomy, allowing learners genuine control over project design and execution. Autonomy-supportive teaching nurtures intrinsic motivation, aligning work with personal interests and sustaining creative persistence (Vansteenkiste et al., 2012; León et al., 2015).

Equally important is providing inspiration and stimulus through challenging tasks, diverse perspectives, and curated environments that spark curiosity and innovative thinking (Bieraugel & Neill, 2017). A collaborative culture enhances this by encouraging peer-to-peer interaction, feedback exchange, and joint problem-solving, embedding collaboration as a core skill.

Within this culture, teacher support and guidance remain pivotal. Educators provide strategic feedback, encourage experimentation, and supply the intellectual resources necessary for translating ideas into viable outcomes (Belland et al., 2016). Finally, equitable access to technology and resources ensures that all students can participate fully, with inclusive provision of tools, materials, and training aligning with the broader goal of high-quality, equitable education (Andrews & Boklage, 2023).

From this evidence base, six interrelated principles are embedded that we can use for guiding the creation and evaluation of creative learning environments in school makerspaces. These six principles were identified through a thematic synthesis of key concepts recurring across interdisciplinary literature on creative learning environments, particularly in the context of school-based makerspaces. While not derived from a formal systematic review, they reflect converging theoretical insights and practical considerations highlighted in recent studies.

A **supportive atmosphere** underpins all creative engagement. This is characterized by peer support, a strong sense of inclusive community belonging regardless of background or skill level, and encouragement to take intellectual and creative risks. When students feel welcomed, included, and safe to explore new ideas, they are more likely to participate actively, share their perspectives, and persist through challenges, ultimately fostering both creativity and academic success.

Freedom and autonomy empower students to take ownership of their creative work. This includes having control over project management, the authority to make key creative decisions, and the autonomy to pursue personal interests. Such freedom builds intrinsic motivation, responsibility, and resilience—qualities essential for sustained creative practice.

Inspiration and stimulus ensure that students are exposed to diverse ideas and physical and digital materials, that they are invited to tackle challenging tasks that promote skill growth, and that they are provided with physical spaces designed to spark creativity. These conditions stimulate curiosity, expand creative repertoires, and encourage learners to approach problems from multiple perspectives.

A **collaborative culture** strengthens creativity through shared endeavor. Opportunities for joint projects, an open exchange of ideas and feedback, and recognition that working with others enhances creative outcomes are all vital. This culture builds collective intelligence, strengthens problem-solving, and fosters a sense of shared ownership over the creative process.

Teacher support and guidance provide the intellectual scaffolding necessary for sustained innovation. Educators play a crucial role by helping students develop their creative ideas, remaining available to answer questions, and encouraging experimentation with novel approaches. This guidance also encompasses the provision of intellectual resources required for making informed technical design decisions—supporting students in navigating the complexities of tool use, materials selection, and process optimization. By combining pedagogical insight with technical expertise, teachers enable learners to integrate conceptual thinking with practical execution, ensuring that creative ambitions can be translated into functional, high-quality outcomes.

Finally, **access to technology and resources** ensures that students are equipped with the tools, materials, and training they need to realize their ideas. Equitable access to resources, combined with opportunities to learn how to use them effectively, is fundamental to fostering inclusion, enabling diverse forms of creativity, and levelling the playing field for all learners.

Taken together, the six guiding principles - supportive socio-emotional atmosphere, freedom and autonomy, inspiration and stimuli, collaborative culture, teacher support and guidance, and equitable access to technology and resources - offer a theoretically grounded foundation for reimagining creative learning environments in school-based makerspaces. Developed from interdisciplinary literature and established theory, these principles address the pedagogical, social, and material factors that shape creative engagement.

The challenge, however, lies in moving from a conceptual framework to a practical tool that can inform decision-making in diverse school contexts. Without a structured model to guide application, such principles risk remaining abstract ideals. Makerspaces are complex, context-dependent settings in which creativity emerges from the interplay of multiple environmental conditions - requiring an approach that reflects this interdependence and supports context-sensitive adaptation.

In response, this paper introduces *the theoretical foundations for a prospective Creative Educational Environment Assessment Model*. This model operationalizes the six principles into a flexible yet structured tool that is intended to enable educators to identify strengths and gaps, pending empirical validation in future iterations. Its design is deliberately adaptable to diverse institutional and cultural contexts, while retaining the coherence necessary for systematic evaluation.

Figure 1 illustrates the proposed framework, mapping the six principles and their interrelations as an integrated, system-oriented approach to assessing and enhancing creative learning environments in school-based makerspaces.

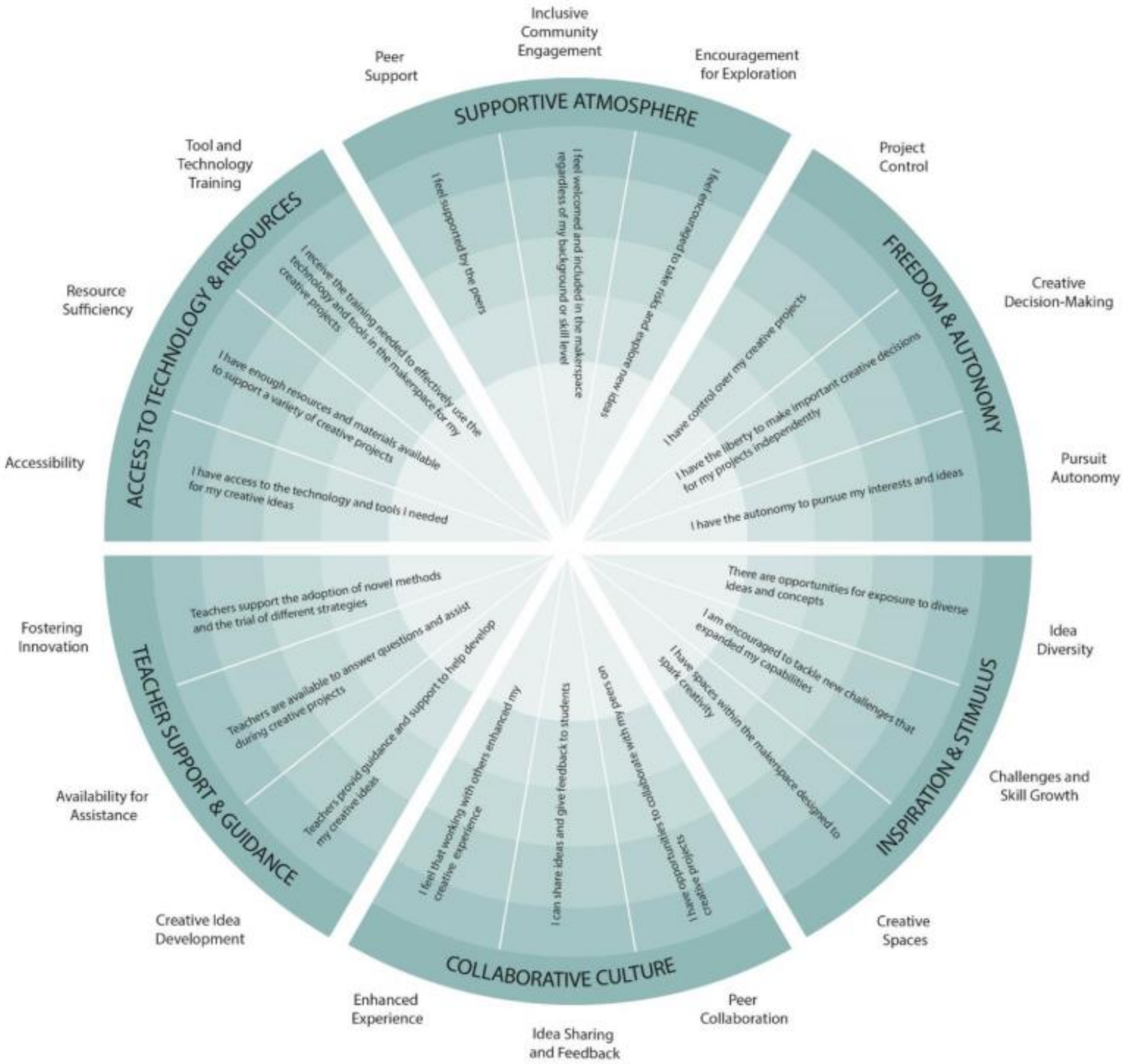

Figure 1. The creative educational environment assessment model (the CEEA Model)

Discussion

The articulation of the six principles within the Creative Educational Environment Assessment Model marks an important step towards bridging theory and practice in makerspace-based education. The model advanced herein extends existing theoretical and empirical work by articulating a comprehensive framework for the support and evaluation of the environment (Press) within makerspace classroom contexts. Although the environment has long been recognized as a critical dimension of creativity (e.g., Rhodes), it has remained comparatively underexplored in both empirical research and the domains of educational design and assessment (see Table 1). The model proposed in this article seeks to address this lacuna by conceptualizing press, thereby offering educators a robust framework through which to cultivate creativity across disciplinary domains, while simultaneously furnishing creativity scholars with a systematic instrument for the empirical examination of press as a constitutive factor in creativity. In this context, a model serves both as a conceptual scaffold, organizing theoretical insights into a coherent whole, and as an operational tool that educators, researchers, and policymakers can adapt to specific institutional and cultural contexts (Borko & Livingston, 1989).

The framework is deliberately systemic, recognizing the interdependence of its domains. Autonomy, for example, gains practical meaning only when embedded in a climate of trust and supported by pedagogical scaffolding (Amabile, et al.,1996). Similarly, access to advanced tools becomes transformative when paired with teacher expertise that enables students to use them creatively (Vygotsky, 1978; Turakhia et al., 2023). This interconnectedness positions the model as a network of mutually reinforcing conditions rather than a sequence of isolated variables.

The ‘Teacher Support and Guidance’ domain explicitly integrates intellectual resources, such as domain-specific knowledge, design reasoning strategies, and problem-solving heuristics, as key enablers of student decision-making. Without such scaffolding, even well-equipped makerspaces may fall short of their creative potential.

Institutional context represents another key structural element. As Gravel and Puckett (2023) note, teachers often operate across ‘systemic distances’ between policy mandates, curricular constraints, and their own pedagogical goals. The model must therefore be adaptable to a wide spectrum of school environments, acknowledging how local priorities, time structures, and accountability pressures affect the enactment of creative learning. Incorporating context-sensitivity into the model’s architecture ensures that it functions as a flexible framework rather than a rigid template (Fidan & Balcı, 2017).

Equity is embedded as a structural priority. The model calls for evaluating not only participation rates but also the quality of engagement—whose voices are heard, who drives decisions, and who feels confident to experiment (Bourdieu, 1986; Heredia & Tan, 2021). Access, in this sense, extends beyond physical tools to include mentorship, knowledge, and encouragement.

Assessment within the model places equal emphasis on process and product, acknowledging that creativity in makerspaces unfolds through iteration, collaboration, and reflection (Valgeirsdottir & Onarheim, 2017; Schön, 1992). Recommended instruments include design journals, collaborative problem-solving rubrics, and reflective interviews to capture the full arc of creative engagement.

Finally, the model situates the teacher’s capacity as a central driver of system performance. Teachers mediate both technical affordances and social climate, requiring pedagogical skill, technical expertise, and strategies for fostering agency, inclusivity, and productive collaboration (Wiggins & McTighe, 2005; Turakhia et al., 2023). Professional development is therefore integral to the model’s operation.

A central challenge in model design is achieving a balance between theoretical robustness and practical feasibility. If too abstract, the model risks becoming an aspirational checklist with little direct application; if overly prescriptive, it may fail to accommodate the contextual variations that define real-world makerspaces. The process of model-making must therefore be iterative, refining structure and indicators through cycles of empirical testing and practitioner feedback, so that the final framework reflects both research evidence and the lived experience of educators and students.

In sum, the Creative Educational Environment Assessment Model offers a structured yet adaptable framework for assessing and enhancing creativity in school-based makerspaces. This model will need to evolve through participatory design with educators and learners, ensuring that it remains both conceptually grounded and adaptable to the diverse realities of school-based makerspaces. Its ultimate value will lie in providing a framework that can guide reflective practice, inform policy, and support the intentional cultivation of creativity as a sustained, inclusive, and context-responsive process.

Conclusion

This paper has argued for re-centering the role of environment – Press – as an influential element in the design and evaluation of creative learning within school-based makerspaces. Through the articulation of six interconnected principles – supportive socio-emotional atmosphere, learner autonomy, inspirational stimuli, collaborative culture, teacher support, and access to technology and resources – we offer a coherent framework for interpreting, designing, and cultivating conditions where creativity can meaningfully flourish.

These principles are not presented as a prescriptive checklist, but as a reflective guide for educational stakeholders seeking to embed creativity into learning environments. Together, they collectively form the foundation of the Creative Educational Environment Assessment Model. The model offers researchers a theoretically robust yet adaptable framework for interrogating how environmental variables shape creative engagement, enabling assessment that attends to both process and product.

For educators, it provides actionable guidance for structuring inclusive, risk-permissive, and intellectually stimulating spaces where creativity can flourish. For policymakers, it serves as a blueprint for developing infrastructures and accountability systems that recognize creativity as an emergent, ecological process rather than a discrete, individual trait.

By positioning the environment as an active, designable component of creative learning, the framework promotes an ecological view of creativity — one that integrates spatial, social, emotional, and cognitive dimensions in the service of equitable participation. Crucially, the model is intended not as a static prescription but as a living tool, adaptable to diverse contexts and responsive to the evolving realities of schools.

The next phase of this work will involve empirical testing of the model across varied school makerspaces to evaluate its validity, reliability, and adaptability. At this stage, the interdependencies between principles and their relative influence on creative outcomes remain hypothetical and warrant empirical exploration. Results from these studies, together with refinements informed by practitioner feedback, will be presented in a subsequent publication. There are a variety of ways in which educators and researchers can use and develop the model introduced in this article. Through an iterative process, the framework aims to provide a durable yet flexible scaffold for research, policy, and practice, supporting the intentional cultivation of creativity as a sustained, inclusive, and context-responsive educational priority.

Future testing of the model will involve exploratory case studies in school makerspaces, including teacher-led assessments, observational studies of classroom dynamics, and student reflections. These iterative cycles will be used to refine the model's applicability and sensitivity to diverse contexts.

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