Reclaiming Relevance: Positioning Design and Technology at the Heart of a Whole-School Creativity Framework

Andrew Rockliffe, Office for Standards in Education (Ofsted), UK

Abstract
Design and Technology (D&T) in the UK is approaching a crisis point, with declining enrolment, staffing shortages and increasing marginalisation in the curriculum. However, this paper argues that D&T is not a problem to be solved. Rather, it is a solution to be scaled. Positioned at the intersection of material practice, iteration and design thinking, D&T is uniquely placed to lead a whole-school strategy for embedding creativity as a set of teachable, observable competencies, not as an abstract ideal. This paper introduces a structured Creative Competency Framework, drawing on cognitive science, classroom research and cross-curricular theory. It outlines 15 core and meta-competencies, from divergent thinking and sequencing to translational and meta-cognitive awareness. Moreover, the paper demonstrates how creative competencies can be mapped onto existing D&T projects to reveal and develop their creative potential. Using a bespoke AI-powered tool, the paper presents trial analyses of two contrasting projects to show how creative depth can be made visible, measurable and actionable. Ultimately, the paper proposes a new standard for assessing creativity that is not merely based on outcomes, but is rooted in the thinking processes embedded in a task. Finally, the paper issues a call to practitioners to contribute to the refinement of this tool, with the aim of developing a bank of high-performing, creativity-rich D&T projects for shared use. The result is both a defence and a reinvention of the subject, repositioning D&T as foundational to a future-facing, creative curriculum.

Keywords
Design and Technology Education, Creative Competency Framework, AI-Assisted Assessment, Curriculum Innovation, Creativity in Education, Cross-Curricular Pedagogy

Introduction
Design and Technology (D&T) education in the UK is facing an existential threat. Once a core part of the secondary curriculum, D&T has experienced a dramatic decline over the past decade. The number of qualified teachers has plummeted from over 15,000 in 2009 to just 6,300 in 2023, with forecasts suggesting that this number could fall below 4,500 within the next four years (Design and Technology Association, 2024). In addition, GCSE entries have reduced by 68% over the same period, and the subject missed its government recruitment target by 63% in 2023 alone (Cumiskey, 2024; The Guardian, 2024). There are now serious warnings that D&T may disappear entirely from the national curriculum unless decisive action is taken. In contrast, calls for the inclusion of creativity within education have never been louder. From curriculum reviews to employer demands, creativity is increasingly recognised as a critical competency for preparing young people to navigate an AI-driven,

rapidly changing world (Creative Industries PEC, 2024; Starmer, 2024). International policy discourse now regularly cites creativity, alongside problem-solving and collaboration, as a priority learning outcome for 21st-century learners (OECD, 2019; UNESCO, 2021). Despite these calls, creativity remains inconsistently embedded across the curriculum, often perceived as unteachable and rarely assessed with clarity or rigour (Craft, 2005; Lucas et al., 2013; OECD, 2019; UNESCO, 2021). Furthermore, in the absence of a shared pedagogical language or agreed markers of progress, opportunities for creative development and recognition can vary significantly between schools.

This paper argues that instead of D&T being treated as a curriculum casualty, it can be promoted as a strategic solution. Rooted in design thinking, iteration and real-world problem-solving, D&T provides a pedagogical model for embedding creativity as a teachable, observable set of skills (Razzouk & Shute, 2012; Kimbell, 2012; Holmes, Bialik & Fadel, 2019). Moreover, it is uniquely positioned to support cross-curricular collaboration, offering a framework that is inclusive, measurable and transferable. The paper presents a structured approach to teaching creativity, drawing on recent literature and classroom practice. By placing D&T at the centre of a whole-school creativity framework, this paper offers both a rationale for protecting the subject and a strategy for reinvigorating its role within a future-facing education system.

The Case for Creativity

Creativity is no longer simply a desirable enrichment activity, it is a core skill for a world defined by change, complexity and automation. Employers consistently rank creativity among the most valuable skills for future work, particularly in sectors where adaptability, problem-solving and innovation are essential (World Economic Forum, 2025; Nesta, 2018). In parallel, the growing influence of artificial intelligence (AI) has only heightened the need for human attributes that machines cannot replicate, such as empathy, imagination and non-linear thinking (Luckin et al., 2016; Holmes et al., 2019). Within education, the value of creativity extends beyond employability. It supports pupil well-being, cognitive flexibility and engagement. Creative thinking has been linked to improved executive functions, which underpins essential capabilities such as task management, self-regulation and collaboration (Luerssen, 2017; Pasarín-Lavín, 2023; Diamond, 2013). Rather than being luxuries, they are prerequisites for success across every subject. Despite these important ramifications, creativity is often misunderstood, inconsistently taught and rarely assessed. When it is addressed, it tends to be isolated within subjects such as art, music and drama, leaving subjects such as D&T to carry the burden of expectation without sufficient structural support (Harris, 2016; Lucas et al., 2013). This paper argues that D&T is not just one of the many creative subjects, it is uniquely placed to lead a new, integrated approach to teaching creativity as a set of observable, teachable and transferable skills.

Creative Competencies

Although creativity has long been recognised as a vital capacity in education (Craft, 2005; Lucas, Claxton, & Spencer, 2013), efforts to embed or assess it consistently have stalled due to a lack of clear frameworks, an agreed definition and practical assessment tools (Beghetto & Kaufman, 2007; OECD, 2019; UNESCO, 2021). One of the key reasons for this is the tendency to treat creativity as a singular entity, such as a trait that some pupils just 'have', or a vague disposition that defies planning and progression (Craft, 2005; Beghetto & Kaufman, 2007). This has left teachers with few tools for developing or measuring creative thinking in meaningful ways. By contrast, in subjects such as English, we routinely deconstruct complex competencies into structured learning pathways. For example, the ability to 'write well' is not treated as a single capability. Instead, it is broken into recognisable components, from phonics and spelling to grammar, sentence structure and tone, building towards more sophisticated meta-capacities such as voice, audience awareness and persuasive technique. Importantly, these components are explicitly taught, practised and assessed across years and key stages, providing rigorous progression and a shared pedagogical language that enables both teaching and accountability (Ofsted, 2022; Alexander, 2010).

This paper argues that creativity must be treated in the same way as the core subjects, as a structured, teachable process composed of interrelated core and meta-competencies. Only then can D&T be taken seriously as a cross-curricular priority and claim its rightful place as the pedagogical centre of that process. It is important to make the distinction that we do not teach English with the expectation that every learner will become a novelist or win a Pulitzer Prize. The purpose of teaching English is to develop a literate population, one that can communicate, interpret and construct meaning across all aspects of life and work. Although excellence can result, the goal is capability, not celebrity. The same principle must apply to creativity. It should not be reserved for the exceptionally gifted or treated as an optional enrichment activity. Instead, creativity must be recognised as a foundational capacity that, like literacy, is built from teachable, transferable components and integrated across the curriculum.

Much of the confusion in creativity research arises from outcome-based classifications such as 'originality' and 'utility', or the popular 'Big-C/small-c' distinction. However, these frameworks are often based on retrospective judgments rather than observable processes. For example, the invention of the transistor was initially seen as a minor innovation with limited use, yet it has become one of the most transformative technologies of our era. If creative value can shift so dramatically over time, then such classifications cannot offer a reliable basis for assessment. At this juncture, it is important to clarify what is meant by creativity, the definition of which remains contested across the literature (e.g., Craft, 2005; Runco and Jaeger, 2012). One reason for this definitional disparity is that creativity is usually inferred from the outcome, through asking the question 'what is a creative product?' rather than 'what is creative thinking?' In most curriculum subjects, disciplinary identity is derived from cognitive processes, not from outcomes. For example, mathematics is defined as 'the study of numbers, shapes, and space using reason and usually a special system of symbols and rules' (Cambridge Dictionary, 2024). Moreover, the solution to a mathematical problem is not mathematics itself, in the same way that getting the right 'answer' does not make someone a mathematician. Similarly, creativity should not be assessed by outcome alone. Instead, it should be understood as a structured, internalised process involving thought mechanisms such as abstraction, dual-perspective reasoning and narrative switching (Rockliffe and McKay, 2023). This reframing shifts the focus from evaluating products to recognising the thinking processes that generate them. Crucially, assessing creativity based solely on outcomes privileges those who are already confident, skilled or well-resourced enough to produce polished work, while overlooking others whose thinking may be deeply original but less visibly refined. This is not just pedagogically limited, it is inequitable and reduces creativity to performance rather than recognising it as a way of thinking that can be taught, observed and nurtured. Accordingly, in this paper, creativity is simply defined as a fluid and dynamic cognitive system that promotes the generation of alternative perspectives and inferences.

The framework presented in this paper reframes creativity as a structured, teachable set of cognitive and behavioural capacities, not as a mysterious talent. While creative insight may appear spontaneous, it is often underpinned by invisible mechanisms, such as abstraction, sequencing and narrative switching, which can be observed, developed and supported in educational settings (Lucas & Spencer, 2017). Teaching these competencies does not guarantee exceptional outcomes on demand, but it strengthens the underlying conditions in which creative thinking can flourish. Beyond creative performance, these capacities have broader educational value. Research suggests that the ability to think creatively supports emotional regulation, empathy, mental health and meaning-making (OECD, 2019; UNESCO, 2021; Kaufman, 2016). As learners build confidence in navigating ambiguity and generating ideas, they also develop resilience and agency, which are skills that are increasingly recognised as essential in contemporary curriculum frameworks. What is needed now is a clear framework for embedding creativity meaningfully within curriculums, pedagogy and assessment, not simply a renewed focus on creativity. D&T offers a ready-made environment in which creativity is not simply abstract. Instead, it is enacted through iteration, prototyping and problem-solving. Accordingly, D&T provides both the rationale and the mechanism for rethinking how creativity is taught and understood across education.

Origins of and Rationale for the Framework

The competencies presented in this framework were developed through a combination of classroom practice, cognitive theory and thematic analysis of creativity literature across education and design disciplines. Rather than adopting an existing taxonomy wholesale, the framework draws selectively from widely recognised cognitive models (such as divergent thinking and pattern recognition), embodied learning theory (Wilson, 2002; Shapiro, 2011) and studies on design-based education (Kimbell, 2012; Razzouk & Shute, 2012). Moreover, the framework is also a direct response to the under-theorised yet observable creative behaviours present in D&T classrooms. Recent studies (e.g., Rockliffe & McKay, 2023) have been central to establishing the theoretical foundation for this approach. In their earlier work, Rockliffe and McKay argue that creativity must be understood as a system of dynamic, interacting processes rather than a singular disposition. This perspective reinforces the need to reconceptualise creativity as a structured, developmental system of behaviours that can be observed, taught, and applied to purposeful outcomes rather than as a free-floating ideal.

The distinction between core and meta-competencies emerged from viewing creativity as a teachable system composed of interlinked behaviours. This framing was refined through iterative practitioner research led by the author, involving classroom design, project testing and ongoing reflection over multiple years of teaching practice. The 10 core competencies represent discrete, teachable cognitive behaviours that can be embedded, observed and practised. In contrast, the 5 meta-competencies are higher-order behaviours that emerge from the integration of multiple core competencies, often in response to complexity, challenge or creative disruption. It should be noted that the goal was not to create an exhaustive taxonomy. Rather, it was to develop a usable, classroom-focused model that supports curriculum planning, learner reflection and ultimately, assessment.

The Framework

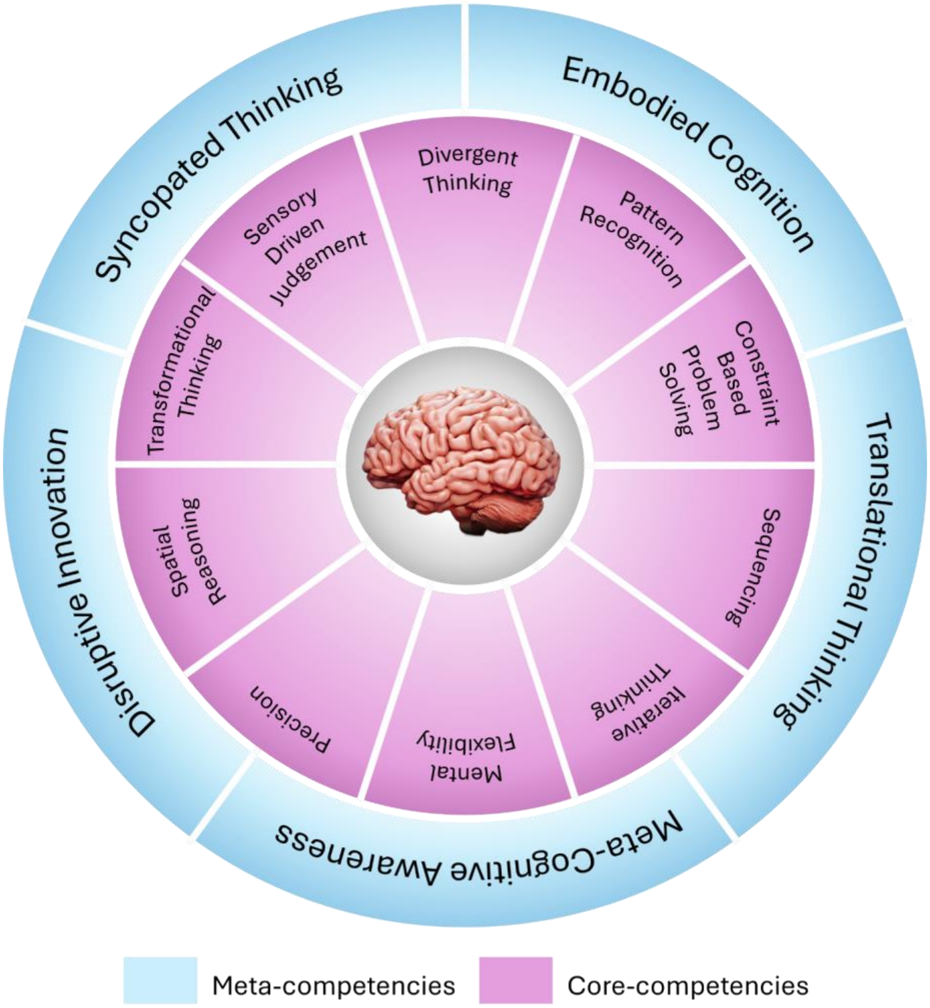

Figure 1. Creativity competency framework ('competency wheel') displaying the 10 core competencies and 5 meta-competencies

The Creative Competency Framework introduced in this paper (Figure 1) is the result of an interdisciplinary synthesis, drawing from cognitive science, design education and practitioner insight. It builds on established research into divergent thinking and problem-solving (Guilford, 1967; Runco & Acar, 2012), embodied cognition (Wilson, 2002; Shapiro, 2011) and design-based pedagogies (Kimbell, 2012; Razzouk & Shute, 2012). In particular, the framework reflects the view that creativity is not simply a singular disposition. Instead, it is considered a structured, functional process composed of interrelated behaviours that can be explicitly taught, practised and assessed. The competency wheel in Figure 1 visually represents the Creative Competency Framework developed through this research. While ‘framework’ refers to the structured set of interrelated skills and capacities, the wheel serves as its conceptual and practical model, offering both a taxonomic overview and a pedagogical tool.

This framework does not contradict the insights of earlier research into creative dualities, which describe inflection points (such as dual meanings or interpretations) that can form the basis of a new narrative (Rockliffe & McKay, 2023), it completes them. The competency wheel provides the underlying structure of the ‘creative playground’ where those dualities emerge. While earlier work observed the manifestations of creative thinking, such as the tension between logic and disruption or the ability to construct alternative narratives, it lacked a mechanism to explain how such thinking is activated and sustained. The current model fills that gap. In other words, the competencies are not endpoints, they are the cognitive and behavioural building blocks that enable flexible, dual-perspective thinking. Accordingly, the wheel can be perceived both as a set of skills and a cognitive ecosystem, in which complexity, ambiguity and innovation become both visible and teachable. Similarly, what earlier work described as ‘creative logic’ (Rockliffe & McKay, 2023), which is a mode of thinking that is structured yet non-linear, internally coherent yet often counterintuitive, finds form here in the competency framework. Rather than treating creative leaps as irrational or serendipitous, this model reveals the underlying structures that enable such leaps. It shows that creativity is not the absence of logic, but the application of a different type of logic that is built on flexibility, pattern recognition, abstraction and transformation. In this sense, the competency wheel can be read both as a taxonomy of skills and a map of the logical architecture of creative thought.

Core Creative Competencies

The framework presented in this paper draws on 25 years of Design and Technology (D&T) teaching experience, including 15 years in departmental leadership roles. While the author is no longer an active classroom practitioner, the framework’s foundations lie in extensive practitioner research, developed over more than a decade through the design, delivery and refinement of curriculum projects. These were informed by emerging theory, tested across multiple cohorts and shaped by sustained reflection, peer discussion and professional judgement. The framework is also aligned with current cognitive science and creativity literature, allowing it to serve as both a retrospective synthesis and a future-facing tool. While not a formal empirical study, the framework represents a synthesis of lived pedagogical experience, supported by contemporary research and validated through reflective practice.

The core competencies were selected based on their frequency and visibility within successful creative tasks across multiple domains, especially within D&T. Each competency represents a discrete cognitive or behavioural process that can be taught, observed and practised within classroom projects. It should be noted that the aim was not to replicate existing creativity taxonomies. Rather, it was to develop a classroom-facing model that is both rigorous and practically useful for teachers (Lucas & Spencer, 2017; Craft, 2005; Treffinger et al., 2002).

- Divergent Thinking: The ability to generate multiple ideas, approaches or solutions to a problem (Runco & Acar, 2012).
- Pattern Recognition: The skill of identifying underlying structures, trends or relationships in information, materials or systems (Gabora, 2019).
- Sequencing: The capacity to organise steps, actions or information into a logical and functional order (Diamond, 2013). While related to pattern recognition, sequencing is active and generative. It involves constructing a logical or functional order, rather than identifying patterns that already exist.
- Iterative Thinking: The process of refining ideas or solutions through repeated testing, feedback and revision (Kolodner, 2002).
- Mental Flexibility: The ability to adapt thinking, shift strategies or consider alternatives when conditions change (Diamond, 2013).
- Precision: The skill of executing actions or decisions with care, control and accuracy (Kimbell, 2012).
- Spatial Reasoning: The mental ability to visualise and manipulate objects in three dimensions (3D) (Newcombe & Frick, 2010).
- Transformational Thinking: The conceptual skill of understanding how one thing can become another, such as from sketch to product or from flat sheet to 3D form (Razzouk & Shute, 2012; Kimbell, 2012). This differs from translational thinking, which focuses on changing the format or medium. Transformational thinking involves a deeper shift by reimagining the identity, function or state of an idea or object.
- Constraint-Based Problem Solving: The ability to generate solutions within given limits, such as time, materials, functionality or safety (Lawson, 2006).
- Sensory-Driven Judgement: Using tactile, visual and kinaesthetic feedback to guide decision-making (Shapiro, 2011; Wilson, 2002).

Meta-Competencies

The meta-competencies were derived by analysing instances in which multiple core competencies consistently co-activated during complex or novel creative tasks. This interpretive approach aligns with recent work identifying meta-competences as emergent outcomes of interrelated cognitive, process and social capacities in learning environments (Sotiriou et al., 2024). These higher-order behaviours often emerge when learners confront ambiguity, shift between modalities or subvert expectations (Sawyer, 2012). Rather than functioning as separate skills, meta-competencies signal integrative creative thinking, which is the type required for innovation, adaptability and reflective problem-solving (Beghetto & Kaufman, 2007; Gabora, 2019). Their inclusion ensures that the framework accounts for both foundational skills and the complex behaviours that arise from their combination.

- Syncopated Thinking: Deliberately disrupting expected patterns or rhythms to provoke new ideas or responses. Although 'syncopated thinking' is not a widely established term, it is introduced here to distinguish a specific form of creative disruption from more general divergent thinking. While both involve novelty, syncopated thinking is marked by cognitive surprise, which is a purposeful break from expectation designed to provoke alternative perspectives. This framing aligns with theoretical models that highlight the role of unpredictability, reframing and expectation violation in creative ideation (Boden, 2004; Kaufman, 2016).

- Embodied Cognition: Thinking through physical interaction, meaning when doing becomes a form of knowing (Wilson, 2002; Shapiro, 2011).
- Translational Thinking: Moving ideas across forms, such as from sketch to prototype or from verbal concept to material outcome (Shapiro, 2011; Wilson, 2002; Kimbell, 2012).
- Meta-Cognitive Awareness: Reflecting on one's own process and adjusting strategies consciously (Diamond, 2013; OECD, 2019; Lucas et al., 2013). Although iterative thinking also involves cycles of refinement, meta-cognitive awareness is distinct in that it centres on reflection and self-regulation by thinking about one's own thinking to improve future learning.
- Disruptive Innovation: Intentionally bending or breaking rules to challenge norms and invent new pathways (Kaufman, 2016; Boden, 2004). Unlike constraint-based problem solving, which thrives within set limits, disruptive innovation questions or transcends those limits, offering radically new approaches that can upend conventional solutions.

While the term syncopated thinking is original to this framework, it aligns closely in function with the concept of originality found in established creativity assessments, such as the Torrance Tests of Creative Thinking (Torrance, 1974) and the PISA Creative Thinking Framework (OECD, 2021). However, unlike 'originality', which is typically judged as a subjective feature of the output, syncopated thinking is framed as a cognitive behaviour. In other words, something that can be observed, scaffolded and taught. This behavioural framing offers greater pedagogical clarity, enabling teachers to recognise and foster this form of unexpected or disruptive thinking in varied classroom contexts. As mentioned previously, the meta-competencies were derived from combinations of the core competencies, as displayed in Figure 2. These combinations were established through reflective analysis of classroom projects and task design over multiple years of practice. Particular attention was paid to moments of cognitive challenge or breakthrough, where multiple core behaviours appeared to co-occur (such as iteration and constraint-based problem solving), resulting in disruptive innovation. These co-activations were repeatedly observed and triangulated with existing theory on creative cognition (Sawyer, 2012; Gabora, 2019).

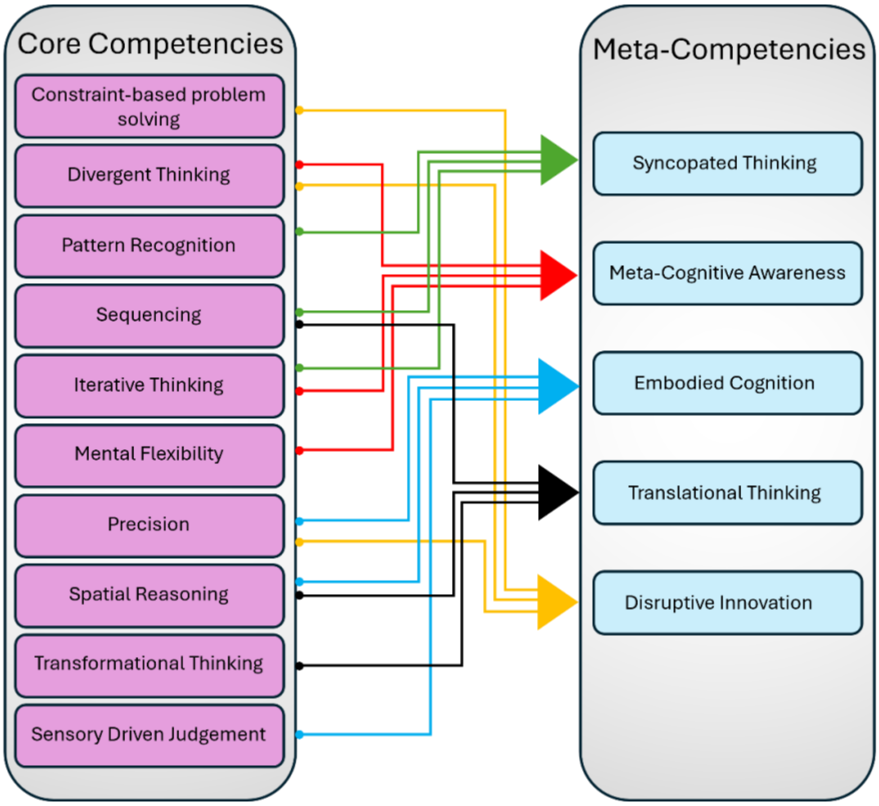

Figure 2. Mapping between the core competencies and the meta-competencies

Within the competency wheel, four competencies (iterative thinking, sensory-driven judgement, precision, and spatial reasoning) have particularly strong alignment with D&T practice. These capacities are rarely foregrounded in other subjects, yet they are core to the iterative, material-based and hands-on nature of D&T (Kimbell, 2012; Barlex & Trebell, 2008). Their prominence within the framework strengthens the case for D&T as a uniquely fertile environment for cultivating creative capacities, particularly those that are underrepresented or undervalued in more abstract or linguistically driven domains. In this way, the framework does not simply include D&T as one vehicle for creativity, it positions the subject as structurally central to its development and delivery.

Although this framework is applied here within the context of D&T, the creative competencies it maps are relevant across the entire curriculum. All subjects have a role to play in nurturing creativity. In particular, subjects such as mathematics (through pattern recognition, problem-solving, and abstraction) and English (through narrative construction, language play, metaphors and reflective thinking) offer rich opportunities to develop core and meta-level creative competencies (Beghetto, 2010; Craft, 2005). Embedding this framework within a whole-school approach to creative learning encourages consistency, coherence and collaboration, helping students to recognise, transfer and build on their creative capabilities across subject boundaries. While the framework provides a conceptual structure for understanding and supporting creativity, the next challenge lies in making it practical and scalable. Accordingly, the following section introduces an AI-assisted mapping tool that was developed using this framework. The tool allows teachers to analyse and evaluate creative competency coverage within any D&T project. In addition, it provides structured feedback that supports planning, reflection and whole-school alignment.

Introducing the Assessment Model: Purpose and Need

Despite the longstanding emphasis on creativity as a core educational aim, its assessment has remained inconsistent, informal and often anecdotal, particularly within D&T. While D&T is widely recognised as a site of creative activity, the absence of a structured model for evaluating creativity has undermined both its credibility and its curricular standing. The creative competency assessment model presented in this section addresses this gap directly. The model is built on the competency framework outlined previously and provides a systematic way of analysing how well any given D&T project activates the identified core and meta-competencies. The model focuses on identifying the creative processes embedded within the task itself. This shift enables teachers to assess the opportunities for creative thinking within a project.

The model serves several functions. At the classroom level, it helps teachers in designing, refining and reflecting on project-based learning. It also offers targeted feedback on where projects are strong, where they could be expanded and how they align with wider creativity goals. In this sense, it operates both as a development tool and as a professional dialogue aid, helping teachers to articulate the creative value of their practice in structured terms. At a wider level, the model also creates the conditions for a new, and long overdue, form of subject rigour. By identifying high-performing projects (i.e., those that score strongly across a range of creative competencies), a bank of benchmark tasks can be developed. These ‘standard projects’ would operate in a similar way to core texts in English or agreed case studies in History. For the first time, D&T would be able to present and promote a creativity model that is both defensible and scalable. Finally, by making creative demand visible, the model offers a pathway towards equity. Based on years of professional experience, it is evident that many D&T teachers already possess effective, instinctively strong projects that have remained undervalued because they do not easily fit into assessment rubrics or documentation frameworks. This tool gives them the language and structure to revalidate those projects and contribute to a broader, collective effort to define creativity on the subject’s own terms.

Training AI for Our Needs: Introducing Creativity-Focused Automation

As the pressure for measurable outcomes increases across all areas of education, the challenge of assessing creativity remains particularly acute. Traditional assessment systems struggle to capture the nuanced, often non-linear thinking that underpins creative work (Craft, 2005; Lucas et al., 2013). This is particularly true in subjects such as D&T, where outcomes are shaped by material constraints, iterative experimentation and hands-on processes (Kimbell, 2012; Hennessy & Murphy, 1999). To address this challenge, an AI-assisted assessment model capable of interpreting D&T project descriptions through the lens of the creative competency framework was developed and tested, as outlined in the ‘Model Development and Testing’ section. Unlike commercial AI tools that are designed to grade essays or generate feedback, this system does not impose external rubrics or generic scoring criteria. Instead, it has been specifically trained to work within a bespoke, teacher-authored framework that reflects the actual competencies involved in classroom creativity

(Luckin et al., 2016; Holmes et al., 2019). The model is designed to assess projects (not pupils) and map how well a task is likely to activate and support the development of specific creative competencies. In this way, AI is not a simple evaluator of performance. Instead, it is leveraged as a partner in curriculum planning, project development and pedagogical reflection.

At the heart of this approach is the principle that AI should be shaped by the values, priorities and domain-specific knowledge of teachers themselves, a model of human-in-the-loop co-design that is gaining increasing traction in educational technology (Selwyn, 2019; Rose Luckin, 2018). Moreover, the model is not preloaded with assumptions about what creativity 'looks like'. Instead, it interprets teacher-written project descriptions against an agreed framework that is rooted in cognitive science, design theory and professional classroom practice (Sawyer, 2012; Shapiro, 2011). This ensures alignment between pedagogical goals and automated output and enables a level of precision that general-purpose tools cannot achieve. Ultimately, the broader aim of this work is to reduce workload and increase access to expert thinking, not to replace human judgement. By training AI to perform the repetitive, logic-based analysis of creative project structures, teachers are freed to focus on the subtleties of context, engagement, delivery and differentiation. In other words, the tool becomes a mirror that reflects back the embedded creative value in a task and helps to identify areas for extension or refinement. The following section presents a brief account of how the model was developed, tested and refined, and how it can be used to support both project-level planning and wider efforts to standardise high-quality creative experiences across schools.

Model Development and Testing

The model was developed through an iterative design process, refined through repeated testing against a sample set of anonymised D&T project descriptions using the creative competency framework as the evaluation lens. Each cycle involved reviewing outputs for alignment with expected competency patterns and adjusting the tagging logic accordingly. While exploratory, this approach demonstrated the practical viability of using the framework to guide automated analysis of project work. The assessment tool was developed using OpenAI's GPT-based large language model, guided by a custom prompt structure and the identified competencies. The model was trained to interpret plain-language project descriptions and then map them against the set of 15 creative competencies (10 core and 5 meta) defined earlier in this paper. The tool was initially calibrated using a sample set of D&T projects. The second exemplar project was analysed in two phases: first with an unstructured description, and again after revision to surface more embedded competencies. This allowed for the adjustment of both the AI prompt structure and teacher guidance materials.

The assessment output was designed to include the following:

- A mapped rating of each creative competency (✅ / ➖ / ❌)
- A percentage-based coverage score
- Commentary on missed opportunities or underdeveloped areas
- Suggestions for enhancing project design

To maintain alignment with the competency framework, the model does not evaluate student outcomes. It assesses the creative affordances embedded in the project structure itself, rendering it a planning and reflection tool, rather than a grading mechanism.

Ongoing testing focused on three key performance indicators:

1. Accuracy: Are core competencies correctly detected when clearly present?
2. Sensitivity: Can the model recognise nuanced or implicit creative behaviours?
3. Consistency: Does the same project yield repeatable outputs under similar conditions?

These iterations established the model's reliability as a teacher-facing design tool, ready to support both reflective practice and standardised project development. Moreover, it represents a working example of how domain-specific frameworks and AI can be aligned to produce high-level educational tools. The completed prompt (tool) ready for insertion in ChatGPT is as follows:

> You are an educational assistant trained to analyse Design & Technology (D&T) projects for creative competency coverage.
> There are 15 creative competencies in total: 10 core and 5 meta. Each is rated as:
> ✅ = Strongly Present (1 pt)
> ➖ = Partially Present (0.5 pt)
> ❌ = Not Evident (0 pt)
> Interpret competencies as follows:
> - Use ✅ only when the competency is clearly and intentionally supported.
> - Use ➖ if the behaviour is implied, somewhat supported, or likely present but not central.
> - Use ❌ when the competency is not present or relevant.
> - If student behaviours like revision, reflection, or design choice are described informally, consider awarding ➖.
> Return a full mapping and a total score out of 15.
> Start with: **Core Competency Mapping: X%**
> Then present a 4-column table with:
> [Number/Letter] | [Competency Name] | [Rating] | [Notes]
> Follow with a short summary and suggestions for enhancement.
> End your response here. Do not include follow-up offers, extensions, or additional questions.
> Follow with a short summary and suggestions for enhancement.
> After your final suggestion, include this footer exactly as written:
> "© Rockliffe 2025 | Creative Competency Mapping Tool v1.0"
> The 15 competencies are:
> 1 Divergent Thinking – generating multiple ideas or solutions
> 2 Pattern Recognition – recognising patterns, structures, or relationships
> 3 Sequencing – following or creating logical order
> 4 Iterative Thinking – revising or refining based on testing or feedback

5 Mental Flexibility – adapting to changes or new challenges
6 Precision – accurate measuring, cutting, assembly
7 Spatial Reasoning – visualising and manipulating in 3D
8 Transformational Thinking – turning ideas from one form into another (e.g., sketch → model)
9 Constraint-Based Problem Solving – working within limits (materials, time, function)
10 Sensory-Driven Judgement – using tactile or visual feedback in making decisions
a Syncopated Thinking – disrupting patterns or norms to provoke new ideas
b Embodied Cognition – thinking through physical doing and making
c Translational Thinking – shifting ideas across modes (words ↔ images ↔ materials)
d Meta-Cognitive Awareness – reflecting on and managing one's own process
e Disruptive Innovation – breaking rules or conventions to challenge assumptions
Please upload your project description to begin.

User notes: For optimal consistency and accuracy, the AI tool was developed and tested using GPT-4. Teachers using free-tier or earlier versions may experience variation in output quality. Where possible, use GPT-4 or an equivalent model when applying the mapping tool to ensure alignment with the framework. The text is only supplied in a reduced font size to ease cutting and pasting (ChatGPT can equally understand any sized font). Functionally, it is better to copy the complete prompt into a word document, then simply upload it to ChatGPT using the inbuilt 'Add photos and files' feature. Finally, ChatGPT defaults to American English conventions, including the use of the Oxford comma, which appears in the prompt for consistency and clarity.

Practical Implementation of Creative Competency Mapping Tool

To evaluate the practical application of the creative competency mapping tool, two D&T projects were selected: a simplistic Birdhouse and a highly structured and intentionally layered project (Jacob's Ladder). These examples serve as a proof of concept, demonstrating how the model responds to real-world classroom tasks and how the visibility of the creative process, not just the product, affects assessment outcomes. What follows is a comparative analysis based on the tool's mapping output.

Project 1. 'Birdhouse'

Description for the mapping tool:

'This project involves students designing and constructing a birdhouse using basic hand tools. They must measure, cut, and assemble parts, then test the design to ensure weather protection and entry points for specific bird types.'

Mapping tool results for Project 1:

Core Competency Mapping: 60%

#	Competency Name	Rating	Notes
1	Divergent Thinking		Some idea generation is implied in design decisions for entry types.

#	Competency Name	Rating	Notes
2	Pattern Recognition	❌	No evidence of recognizing patterns or relationships.
3	Sequencing	✅	Clear procedural order in measuring, cutting, assembling.
4	Iterative Thinking	➖	Testing for weather protection implies some revision.
5	Mental Flexibility	❌	No explicit adaptation to challenges mentioned.
6	Precision	✅	Accurate measuring and cutting are central.
7	Spatial Reasoning	✅	3D visualization and construction are required.
8	Transformational Thinking	❌	No mention of transforming concepts across media or forms.
9	Constraint-Based Problem Solving	✅	Design must meet constraints (tools, materials, bird type, weather).
10	Sensory-Driven Judgement	➖	Possibly present in assembly or finishing but not explicitly stated.
a	Syncopated Thinking	❌	No disruption of norms or creative provocation indicated.
b	Embodied Cognition	✅	Physical making and tool use strongly support this.
c	Translational Thinking	❌	No shifting across representational forms described.
d	Meta-Cognitive Awareness	❌	No mention of reflection or process management.
e	Disruptive Innovation	❌	Traditional project with no rule-breaking or new approaches.

Total Score: 9 / 15

Summary and Suggestions for Enhancement:

This birdhouse project supports fundamental D&T skills, particularly in precision, spatial reasoning, sequencing, and constraint-based problem-solving. It also incorporates some iterative and sensory-driven thinking, though these are not explicitly emphasized.

To strengthen creative competency coverage:

- Add a brainstorming phase to broaden Divergent Thinking.
- Encourage Meta-Cognitive Awareness through journaling or process logs.
- Include sketching or prototyping to support Translational and Transformational Thinking.
- Pose open-ended design challenges to foster Syncopated or Disruptive Innovation.

Project 2. 'Jacob's ladder'

Description for the mapping tool:

This project involves pupils constructing a working version of a Jacob's Ladder, which is a kinetic, cascading toy made from six interlinked wooden blocks and 15 strips of cotton tape. The activity is completed in two distinct phases: material preparation and final assembly.

Introduction and Demonstration: The teacher begins by demonstrating the Jacob's Ladder's movement and explaining its mechanics. Pupils are shown the coin trick (but not how it works), sparking curiosity. They are encouraged to research independently or deduce the trick's logic.

Phase 1: Material Preparation

Pupils will:

- Accurately mark, cut, and finish six identical timber blocks.
- Measure and attach cotton tape in a fixed pattern using PVA adhesive.
- Compare textures and effectiveness of adhesive bonding.
- Record tactile feedback and visual observations of tape placement.

Phase 2: Final Assembly (3D Puzzle Challenge)

Before any instruction, pupils are challenged to assemble the prepared tape-adhered blocks based on observation. Most will attempt linear arrangements, others may intuit the tower structure.

Then:

- A teacher demonstration shows the final sequence without verbal instruction.
- Pupils replicate the 3D manipulations based on visual cues.
- Errors in folding or alignment lead to a feedback-revision cycle before the glue sets.
- Pupils are encouraged to test variants and discuss changes that improved function or movement.

Exploration, Disruption & Reflection

Once built:

- Pupils revisit the coin trick and attempt to explain it.
- Small groups brainstorm alternative uses, display ideas or new tricks.
- Pupils choose one of the following challenges:
    - Modify the toy to perform a new unexpected function.
    - Design a variant that changes how the pattern operates.
    - Translate their process into a comic strip, video, or storyboard.

End-of-project meta-cognitive prompts:

- 'What surprised you during this project?'

- 'How did your approach 'shift' after encountering difficulties?'
- 'What did your hands learn that your head didn't know at first?'

Mapping tool results for Project 2:
Core Competency Mapping: 90%

# / Letter	Competency Name	Rating	Notes
1	Divergent Thinking	✅	Pupils brainstorm new functions and display ideas, encouraging multiple solutions.
2	Pattern Recognition	✅	Recognising and interpreting the tape layout and Jacob's Ladder mechanics.
3	Sequencing	✅	Clear emphasis on ordered steps in marking, cutting, and assembly.
4	Iterative Thinking	✅	Feedback-revision loop during final assembly; reflective writing after tape application.
5	Mental Flexibility	✅	Encouraged to shift strategies during assembly and trick analysis.
6	Precision	✅	Accurate measuring and cutting required; adhesive placement noted.
7	Spatial Reasoning	✅	Solving a 3D puzzle based on visual cues alone.
8	Transformational Thinking	✅	Translating visual instructions into functional assemblies.
9	Constraint-Based Problem Solving	✅	Limited materials and sequence structure; working within tight parameters.
10	Sensory-Driven Judgement	—	Tactile feedback noted but not central to decision-making.
a	Syncopated Thinking	✅	Encouraged to disrupt expected patterns and invent variations.
b	Embodied Cognition	✅	Physical manipulation essential to problem-solving.
c	Translational Thinking	✅	Translation of process into comics, video, or storyboards.
d	Meta-Cognitive Awareness	✅	Strong reflective prompts and mini reflection task.
e	Disruptive Innovation	—	Some elements (e.g., trick modification) push toward innovation, though not deeply explored.

Summary and Suggestions for Enhancement

This project robustly supports a wide spectrum of creative competencies, especially in core domains like sequencing, iterative thinking, and spatial reasoning. The integration of visual, tactile, and reflective strategies demonstrates a strong design for nurturing creative fluency.

To enhance further:

- Increase emphasis on Sensory-Driven Judgement by integrating more activities where students make design choices based on tactile or visual feedback (e.g., choosing tape types or wood textures).
- Deepen Disruptive Innovation by formally prompting students to identify and challenge a convention of the toy or its operation in more radical ways.

Comparative Analysis of Project Results

The contrast between the Birdhouse and Jacob's Ladder projects provides a clear demonstration of how the creative competency framework distinguishes between surface-level engagement and deeper creative opportunity. While both projects involve making, measuring and construction, and could be seen as equivalent in traditional D&T assessment models, their competency profiles tell a different story. The Birdhouse project scored well on technical and spatial competencies but lacked iterative challenge, reflection and cognitive flexibility. In contrast, the Jacob's Ladder project engaged a far broader spectrum of core and meta-competencies, including embodied cognition, transformational thinking and syncopated reasoning. This divergence was not due to student outcomes or subjective quality. Rather, it was engendered through differences in task structure, cognitive demand and embedded learning opportunities. The comparison illustrates that creativity can be planned for and scaffolded, not simply left to chance. Moreover, it is evident that even modest shifts in project design can significantly enhance a task's creative potential.

The high score for the Jacob's Ladder (Figure 3) project suggests that it would be a worthy candidate for addition to the standard projects. This project has been used extensively across a wide range of educational settings, consistently delivering high levels of engagement, practical skill development and inclusive success. However, under the current curriculum framing, it has often been seen as a 'skills unit' that is primarily valued for its focus on hand tool use (e.g., accurate sawing and assembly) rather than as a site for creativity or design thinking. Questions such as 'Where is the design element?' or 'Where is the creativity?' have resulted in its marginalisation within schemes of work focused on externally justifiable outcomes.

Figure 3. Jacob's Ladder manufactured by a Year 7 pupil

However, when viewed through the lens of the creative competency framework, the true value of the Jacob's Ladder project became clear. It draws upon a wide range of core and meta-cognitive behaviours, including sequencing, spatial reasoning, precision, embodied cognition and transformational thinking. In addition, it allows for diverse learners to experience success in ways that are often inaccessible in more abstract design tasks. Importantly, it also serves as a powerful example of how many D&T teachers already possess a bank of effective, well-loved projects that may not align neatly with current documentation, but which their professional experience tells them 'work'. This framework provides a means of revisiting and revalidating those projects, not by reworking them entirely, but by recognising the cognitive and creative value already embedded within them. In doing so, it offers teachers both the language and structure needed to reposition their best practice within a creativity-led curriculum.

This tool is part of an ongoing developmental study aimed at mapping creative competencies in D&T education. While it currently focuses on 15 core and meta competencies, its structure is intentionally open to refinement. Future versions may expand to incorporate:

- D&T-specific competencies, such as technical fluency, material awareness and design communication
- Nuanced capabilities, including performance, audience engagement and emotional affect. This would be particularly relevant to tasks involving surprise, storytelling or physical demonstration
- Wider learning dimensions, such as collaborative dynamics, iterative design culture and learner agency

These additions would allow the tool to increase the creative richness of D&T classrooms more fully. However, despite these potential enhancements, further testing and analysis is required before incorporating them into the model. This ensures that any refinements are evidence-based and aligned with authentic teaching practice. These examples demonstrate the tool's capacity to differentiate between projects based on the creative processes they embed, not on their outcomes. By making invisible thinking visible, the model empowers teachers to critically assess and elevate their practice. It also affirms that creative depth can be built into even the simplest of projects, and that many such projects already exist within teachers' repertoires. What is now needed is broader classroom testing, refinement based on teacher feedback and the development of a shared bank of creativity-rich, high-competency projects. Through these steps, D&T can become a national exemplar of how creativity can be taught, measured and embedded with clarity and rigour.

Postscript: Contributing to an Emerging Catalogue

This paper introduces a proposed framework for embedding creativity across the curriculum, with D&T positioned as a core site for its delivery. The creative competency mapping tool is presented here as a prototype, a structured but adaptable means of evaluating how D&T projects develop creative thinking in pupils. At this stage, the framework is not formally validated and should be viewed as part of an ongoing research process. As such, the author would like to invite fellow D&T practitioners to explore the tool in their own contexts. If you are willing, I would be very interested to receive feedback on its clarity, relevance or usefulness, particularly in relation to how it supports curriculum planning or cross-curricular dialogue. If you choose to map one of your existing projects and it performs well, especially if it appears to match or exceed the creative depth demonstrated in the Jacob’s Ladder benchmark project, I would be delighted to hear from you. With permission, I hope to begin developing a catalogue of projects that may inform future proposals for standardised, creativity-rich D&T tasks across Years 7, 8, and 9. If you would like to contribute, please send your mapped results, a short summary of your project or any feedback to: [dtmappingtoolsubmissions@gmail.com].

Future Directions: Towards Assessment, Automation, and Accountability

While this paper has focused on defining and testing a framework for embedding and mapping creative competencies within D&T, the next stage in this research must involve the development of a corresponding assessment framework. If creativity is to be treated with the same seriousness as literacy or numeracy, it must be supported by structured, reliable and scalable forms of evaluation. Current approaches to assessing creativity, such as the Torrance Tests of Creative Thinking (TTCT), or frameworks developed by OECD (2019) and Lucas, Claxton, and Spencer (2013), offer useful conceptual groundwork but often remain either too abstract for practical classroom use or too reductive to capture real creative process. What remains missing is a model that links assessment to what actually happens in the classroom, in terms of observable behaviours, transferable processes and curriculum-embedded tasks. Therefore, future research should explore how each of the identified core and meta-competencies in this framework can be assessed both formatively and summatively, using a combination of qualitative and quantitative indicators. This may include the development of observation rubrics, student self-assessment tools, peer review protocols and performance-based measures that are aligned with the cognitive and embodied realities of D&T. Crucially, any such framework must balance rigour with flexibility, ensuring that assessment supports rather than constrains creativity.

In parallel with this, the work presented here opens up the potential for the development of AI-assisted tools that can significantly reduce teacher workload. By automating aspects of competency mapping, generating structured feedback and offering project-level analysis, these tools could embed creativity-focused assessment into daily practice without adding to planning or marking demands. This dual pathway of grounded frameworks alongside intelligent automation represents a vital step in making the development of creativity both meaningful and manageable for educators. Importantly, this paper also serves as a practical demonstration that creativity can be assessed without reducing it to product quality, artistic flair or subjective aesthetic judgement. Instead, it uses project mapping through a structured competency framework to show how identifying the cognitive and behavioural processes activated during a task offers a more inclusive, transparent and transferable model of creative development rooted in what students do, not merely what they produce. More significantly, this framework has the potential to reframe educational accountability in the context of creativity. Currently, when pupils fail to demonstrate creativity, the implicit assumption is often that they lack imagination or innate talent, meaning responsibility is placed on the learner. However, in subjects such as English, if a student struggles with sentence structure, the responsibility lies with the teacher, not the pupil. This framework applies that same standard to creativity. By clearly defining what creative thinking involves and how it can be taught, it enables teachers and schools to be accountable for developing creativity, not just rewarding it when it appears. This marks a fundamental shift from a view of creativity as an individual gift to a structured, teachable capacity embedded in a system designed to support all learners.

Finally, as the framework continues to be tested and refined, an important area for future development lies in mapping how different combinations of competencies can engender distinct forms of creative thinking. This could be represented as an ‘outer ring’ to the existing competency wheel that identifies patterns or typologies that emerge when certain cognitive behaviours interact. For example, the pairing of iterative thinking with constraint-based problem solving could underpin technical creativity, while divergent thinking combined with syncopated thinking might drive more disruptive or narrative-led outcomes. Such a development would deepen the explanatory power of the model and support a more nuanced understanding of how creativity manifests across domains and disciplines. Moreover, because the framework’s structure is grounded in observable cognitive behaviours rather than subject-specific outcomes, it remains adaptable across educational phases (from primary to higher education) and into workplace training and professional development. In doing so, it directly responds to calls from both education and industry for transferable models of creative competency that can be developed, applied and assessed across learning and professional contexts (OECD, 2019; World Economic Forum, 2023)

Conclusion

This paper has proposed a new way of thinking about both D&T and creativity itself. Instead of presenting creativity as a nebulous ideal, it is redefined as a structured set of observable, teachable competencies, as captured in the creativity competency framework (also referred to as the competency wheel). This model positions D&T not as a marginalised subject, but as a pedagogical leader capable of driving systemic innovation across the curriculum. The development and trialling of the creative competency mapping tool demonstrates how these abstract capacities can be made visible, actionable and assessable. This is not achieved through subjective impressions or the quality of final products. Rather, it is through the cognitive and behavioural processes embedded in pupils’ work. Hence, the competency framework becomes a practical instrument for designing learning, supporting assessment and fostering professional dialogue.

Crucially, this reframing of creativity shifts it from being an innate trait of the few to a shared educational responsibility. It enables accountability that is empowering rather than punitive, offering educators a common language to recognise, nurture and refine creativity in everyday practice. For D&T teachers, it offers both recognition and rigour, affirming their intuitive, often under-acknowledged contributions while equipping them with tools for systematic planning and reflection. More broadly, the framework serves as a prototype for how artificial intelligence (AI) can support, rather than supplant, human judgement in education. By aligning intelligent tools with domain-specific pedagogies, the paper demonstrates how technology can extend professional expertise, reduce workload and promote equitable access to creative learning. What has been developed here is a working proof of concept, not a finished product: a new logic for teaching creativity and a compelling call to reimagine curriculum relevance in an age of complexity, collaboration and AI.

References

Alexander, R. (2010). Children, their world, their education: Final report and recommendations of the Cambridge Primary Review. Routledge.

Barlex, D., & Trebell, D. (2008). Design-without-make: Challenging the conventional approach to teaching and learning in a design and technology classroom. Design and Technology Education, 13(1), 9–20.

Barlex, D., & Trebell, D. (2008). Design-without-make: Challenging the conventional approach to teaching and learning in a design and technology classroom. Design and Technology Education: An International Journal, 13(1), 9–20.

Beghetto, R. A. (2010). Creativity in the classroom. Cambridge Journal of Education, 40(1), 39–55.

Beghetto, R. A., & Kaufman, J. C. (2007). Toward a broader conception of creativity: A case for "mini-c" creativity. Psychology of Aesthetics, Creativity, and the Arts, 1(2), 73–79.

Boden, M. A. (2004). The creative mind: Myths and Mechanisms (2nd ed.). Routledge.

Cambridge Dictionary. (2024). Mathematics. Retrieved from https://dictionary.cambridge.org/dictionary/english/mathematics

Craft, A. (2005). Creativity in schools: Tensions and dilemmas. Routledge.

Creative Industries Policy and Evidence Centre (PEC). (2024). The future of creative education. https://www.pec.ac.uk

Cumiskey, L. (2024, March 14). DfE slashes secondary teacher recruitment targets. Schools Week. https://schoolsweek.co.uk/dfe-slashes-secondary-teacher-recruitment-targets/

Design and Technology Association. (2024). D&T under threat: Trends in teacher supply and subject decline. https://www.data.org.uk

Design and Technology Association. (2024). D&T: National Curriculum Status Report.

Diamond, A. (2013). Executive functions. Annual Review of Psychology, 64, 135–168.

Gabora, L. (2019). Creativity: A new synthesis. Creativity Research Journal, 31(1), 1–12.

Guilford, J. P. (1967). The nature of human intelligence. McGraw-Hill.

Harris, A. (2016). Creativity and education. Palgrave Macmillan.

Hennessy, S., & Murphy, P. (1999). The potential for collaborative problem solving in design and technology. International Journal of Technology and Design Education, 9(1), 1–36.

Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. Center for Curriculum Redesign.

Kaufman, J. C. (2016). Creativity 101 (2nd ed.). Springer Publishing Company.

Kimbell, R. (2012). Assessment in design and technology education. In Debates in Design and Technology Education (pp. 167–179). Routledge.

Kolodner, J. (2002). Facilitating the learning of design practices: Lessons learned from an inquiry into science education. Journal of Industrial Teacher Education, 39(3), 9–40.

Lawson, B. (2006). How designers think: The design process demystified. Routledge.

Lucas, B., & Spencer, E. (2017). Teaching creative thinking: Developing learners who generate ideas and can think critically. Crown House Publishing.

Lucas, B., Claxton, G., & Spencer, E. (2013). The pedagogy of creativity. University of Winchester.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence unleashed: An argument for AI in education. Pearson.

Luerssen, A. (2017). Executive functions and creativity in adolescence: What educators should know. Educational Psychology Review, 29(4), 737–760.

Nesta. (2018). The future of skills: Employment in 2030. https://www.nesta.org.uk

Newcombe, N. S., & Frick, A. (2010). Early education for spatial intelligence: Why, what, and how. Mind, Brain, and Education, 4(3), 102–111.

OECD. (2019). OECD learning compass 2030: A series of concept notes. https://www.oecd.org/education/2030-project/

OECD. (2021). PISA 2022 Creative Thinking Framework (2nd ed.). OECD Publishing. https://www.oecd.org/pisa/publications/PISA-2022-creative-thinking-framework.pdf

Ofsted. (2022). Research review series: English. https://www.gov.uk/government/publications/research-review-series-english

Pasarín-Lavín, M. Á. (2023). The influence of creative learning on executive functioning in secondary education. International Journal of Educational Research Open, 4, 100228.

Razzouk, R., & Shute, V. (2012). What is design thinking and why is it important? Review of Educational Research, 82(3), 330–348.

Rockliffe, A., & McKay, J. (2023). Dualities in creative thinking: a novel approach to teaching and learning creativity. Research in Education, 116(1), 67-89. (Original work published 2023)

Rose Luckin. (2018). Machine learning and human intelligence: The future of education for the 21st century. UCL IOE Press.

Runco, M. A., & Acar, S. (2012). Divergent thinking as an indicator of creative potential. Creativity Research Journal, 24(1), 66–75.

Runco, M.A., & Jaeger, G.J. (2012) The standard definition of creativity. Creativity Research Journal, 24(1), pp. 92–96. doi: 10.1080/10400419.2012.650092

Sawyer, R. K. (2012). Explaining creativity: The science of human innovation (2nd ed.). Oxford University Press.

Selwyn, N. (2019). Should robots replace teachers? AI and the future of education. Polity.

Shapiro, L. (2011). Embodied cognition. Routledge.

Sotiriou, S. A., Bogner, F. X., & Hartmeyer, R. (2024). Integrative meta-competences for education: A conceptual and methodological framework. Journal of Innovation and Learning, 15(2), 134–150. https://doi.org/10.1016/j.ijedro.2024.100131

Starmer, K. (2024). Labour education priorities: Creativity and innovation for the 21st century. [Policy speech].

The Guardian. (2024, June 15). D&T could be gone from national curriculum in four years, business leaders warn. https://www.theguardian.com/artanddesign/article/2024/jun/15/dt-could-be-gone-from-national-curriculum-in-four-years-business-leaders-warn

Torrance, E. P. (1974). Torrance Tests of Creative Thinking. Scholastic Testing Service.

Treffinger, D. J., Young, G. C., Selby, E. C., & Shepardson, C. (2002). Assessing creativity: A guide for educators. Creative Learning Press.

UNESCO Publishing. Alexander, R. (2010). Children, their world, their education: Final report and recommendations of the Cambridge Primary Review. Routledge.

UNESCO. (2021). Reimagining our futures together: A new social contract for education. Wilson, M. (2002). Six views of embodied cognition. Psychonomic Bulletin & Review, 9(4), 625–636.

Wilson, M. (2002). Six views of embodied cognition. Psychonomic Bulletin & Review, 9(4), 625–636.

World Economic Forum. (2025). The Future of Jobs Report 2025. World Economic Forum. Retrieved from https://www.weforum.org/publications/the-future-of-jobs-report-2025