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Artificial Intelligence and Human Creativity: A Collaborative or Inhibitory Relationship

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Abstract

Something strange happens when machines start painting, diagnosing, teaching. A look through over 120 academic papers from 2010 to 2025 shows AI slipping into creative spaces once thought safe from code. Refik Anadol turns city noise into swirling visuals, while Hugh Herr builds legs that move like living limbs, each motion shaped by algorithms. Then there's the fake Rembrandt, painted by software studying centuries of brushwork. These examples sit uneasily. Tools speed things up, open doors for amateurs, stretch what feels possible. Yet hands grow idle, thinking grows thin, questions about who made what linger without answers. Creativity gains reach but loses grip. Machines help until they are needed. Moments of invention now carry invisible strings. Surprise appears where logic ends. Not every leap forward lands softly. Picture this: creativity grows when people guide AI with care, yet shrinks if they hand over control without question. What matters most sits quietly beneath the surface - knowing where AI's limits begin, staying involved every step, thinking deeply about each choice made.

Implications for practice or policy:

Start with hands-on drawing before any software enters the room. When sketching becomes routine, then bring in digital helpers. Creativity first, machines later. A blank page teaches more than a screen ever could. Only after ideas flow freely should code-assisted tools appear. Skills grow from struggle, not shortcuts. Let pencils wear down before pixels arrive.

Clear rules around artificial intelligence help organizations guide staff on skills plus moral choices. When workplaces lay out expectations, people learn how machines work while understanding right from wrong. Training becomes meaningful once values shape each step forward. Rules aren't just about code - they reflect judgment woven into daily tasks. Decisions gain clarity when boundaries exist from the start.

Starting fresh each time, creators might lean on artificial intelligence to spark ideas or wander through options - yet they still hold control when choosing what stays. A tool appears here not as a leader but a helper, one that offers paths without deciding which path wins. Even with machines chiming in, judgment remains human-shaped, guided by instinct more than code. Decisions land where they always have: in hands trained by experience, not algorithms.

Who gets credit when AI helps make something? Rules are unclear now. A fresh look at ownership feels overdue. Creators need clear lines on who owns what. Right now it is messy. When machines help write, draw, or compose, someone must define control. Laws haven't kept up. Clarity would help everyone move forward without confusion. Fairness depends on smart updates to old systems.

True understanding should shape how we judge work, not just what machines produce. Ways of checking progress need to shift, focusing on original thought rather than copied answers. Real effort deserves recognition, so methods must change to see who truly learns. Instead of accepting quick results, tests might look deeper into how ideas form. Learning grows differently in people, which means scoring shouldn't follow a single path.

Keywords: *artificial intelligence, creativity, education, human–AI collaboration, cognitive skills, qualitative meta-synthesis*

Introduction

Poetry rolls off machines like morning thoughts. Scoring tunes? Computers do that too. Sketching structures lands on screens without human hands touching pens. Even wild

guesses in science now come from code, not just lab coats. A future dreamed up in old novels quietly settled into daily work. Smarts used to belong to minds alone - now circuits learn, weigh choices, think. The real puzzle isn't if gadgets make art anymore. It's how we feel when something else does what we thought only we could.

One view sees things bright. AI acts like a helper, reaching further than we could before. Another feels cautious. It looks at machines as opponents pushing creators aside, lowering value too. Reality twists differently each time. Sometimes teamwork shows up. Other times tension creeps in. The path shifts based on choices made, hands involved, directions taken.

Somewhere in the middle of these extremes sits this paper's stance. When handled with care and clear boundaries, artificial intelligence opens new doors for imagination - yet when leaned on too heavily, it often dulls original thinking. What really shapes the outcome isn't the tool, but how people treat it: as a partner or a substitute. Decisions like that come from individuals, teachers, and organizations, never from code alone.

Methodology

Looking into existing public sources made up the core of this work, so there was no need for fresh data collection involving people. Because of that setup, getting ethical clearance wasn't necessary.

Looking through past research, a scan covered articles from 2010 to 2025 across education, psychology, computing, and artistic fields. Sourced via ERIC, PsycINFO, IEEE Xplore, the ACM library, plus the Arts & Humanities index, findings emerged using keywords like "artificial intelligence," "creativity," "teaching," alongside "teamwork." Studies chosen often showed real data - experiments, thorough summaries, or combined results focusing on how AI shifts inventive thinking. Over 120 references shaped the outcome, leaning more heavily on newer pieces because recent tech changes matter most here (Xiao & Watson, 2019).

One example comes from visual art, where an artist worked alongside machine learning tools to generate new forms. Another case sits in biomedical engineering, a space not usually linked with creativity, yet showing clear inventive output through joint human-algorithm efforts. A third explores fine art practices using AI as a partner, revealing

shifts in how work gets made. Each was picked because they differ strongly from one another, offer transparent processes, and show results you can actually see. Together, these stories add weight - something abstract reasoning tends to lack.

Looking at how people talk about AI and making art. Our study dug into what artists say, articles about tech, plus papers on teaching rules. Ideas came out step by step, built from real examples. These patterns were later checked alongside known frameworks, following methods from Braun and Clarke in 2021.

Looking at things differently helps. One view comes from how thinking spreads across people and tools, as Hutchins explained back in 1995. Another angle uses Boden's way of sorting kinds of new ideas, laid out in 2004. Then there is Glăveanu's take on creativity shaped by culture and society, shared in 2020. Seeing results through these different frames makes the outcomes more believable. When multiple views point similar ways, trust grows.

Though it can't prove AI directly shapes creativity, another look at design still adds value. Fast changes mean today's tools might differ tomorrow; that pace leaves little room to capture fresh methods with hard data. Still - by weaving together different accounts - a clearer picture emerges. Not perfect, yet steady enough to explore something tangled.

Literature Review: The Changing Place of AI in Creative Work

Decades passed before machines began shaping art in any real way. Back in the seventies and eighties, rigid code limited programs to shuffling preset forms - truly new ideas stayed out of reach (Boden, 2004). By the nineties, brain-inspired models got better at spotting sequences, yet still needed people guiding each move (Wang, 2020).

Something shifted around the middle of the 2010s. Not long after, generative adversarial networks started gaining attention - two systems improving one another until outputs became hard to tell apart from human-made ones. Meanwhile, transformers quietly reshaped what machines could do with words, pictures, images. Fluency emerged where there had mostly been stiffness before (Elgammal et al., 2017). Machines stopped seeming only capable of sorting data. Instead, they began making things - writing stories, drawing scenes, composing tunes. This wasn't just mimicry anymore. With large language models entering the scene, capabilities

deepened fast. Take GPT-4 - it handles phrasing, nuance, even structure in ways few expected (Brown et al., 2020; OpenAI, 2023). Image generators followed close behind. Outputs from tools like DALL-E 3 or Midjourney V6 carry a distinct imprint, almost as if guided by taste (OpenAI, 2024; Midjourney, 2024). Speed plays a role, yes - but so does spotting connections humans might overlook. For Gervas and León (2023), this marks a quiet turning point: not using AI merely to assist, but letting it shape outcomes alongside people

Still, real-world evidence tells a messier story than flashy demos imply. While studies confirm boosts in speed and word count, true originality wobbles - shifting with task type, field, and how much control people keep (Wang et al., 2022). When tested head-on, top-tier minds beat current systems on freeform idea challenges, even if typical users fall short (Koivesto, 2023). Progress isn't marching steadily toward robot inventors; it's reshaping who does which parts of creating - a shift shaped by choices in setup and practice. That turns the key issue for teachers and professionals away from robotic authorship, steering it instead toward when engagement lifts work - or drags it down.

Conceptual Framework

Key terms

Creativity shows up when someone comes out with thoughts, answers, or ways of expressing things that feel fresh yet matter in a given situation - this idea fits how art, science, companies, and daily life tackle challenges, just like Runco and Jaeger described back in 2012: newness tied to real worth. Systems called artificial intelligence handle jobs usually needing people's smarts, mostly now by using machine learning, where doing better over time happens from seeing more data instead of being told every step directly, according to Kaplan and Haenlein's work in 2019. As for machine learning, it takes different shapes - one kind learns from tagged samples, another finds hidden patterns without labels, while a third adjusts based on rewards after repeated attempts, something Brynjolfsson and McAfee pointed out in 2017.

Reading the human–AI relationship

Thinking isn't just inside your head - it spreads out into objects, places, because people rely on them. From this angle, artificial intelligence works alongside thought instead of replacing it. What exactly does AI bring? Boden's framework from 2004 helps lay that out

•Combinational creativity - joining familiar ideas in unfamiliar ways;Now think about exploring ideas while staying within set limits. Picture discovering unseen options under familiar rules. Imagine working inside boundaries yet uncovering fresh paths. See what happens when structure guides surprise. Watch how constraints open doors you didn't expect

•Transformational creativity - changing the rules of the framework itself.Altogether, these perspectives shape how we look at what comes next. When applied to today's setups, Boden's groupings make things clearer. Machines handle mix-and-match and search-style creation well - stirring together known elements or racing through preset options - yet fall short when it comes to redefining entire fields, a task that still leans on people to set direction and purpose. The idea of shared thinking shows why the useful examples ahead blend roles instead of replacing them; invention flows between individual, device, and setting, meaning cutting out the person doesn't just shift labor - it alters the nature of the outcome.

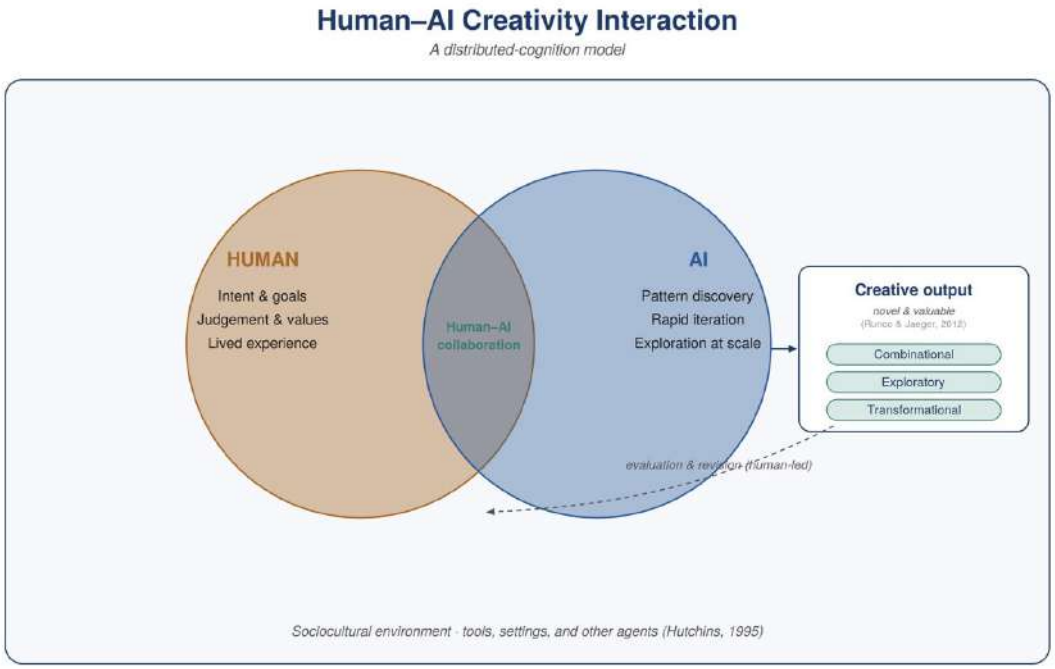

Figure 1. Conceptual model of human–AI creativity interaction. [Insert figure.]

AI across five domains

Now showing up in classrooms, hospitals, labs, offices, and studios, artificial intelligence brings gains that often come with matching setbacks. Because smart programs help students generate ideas, get responses fast, and learn at their own pace, some learners lean too hard on them - skipping deep thought or copying outputs instead of creating. Tools meant to fix grammar might clean up sentences well, yet slowly push different voices into similar styles without meaning to. Even when machines spot health issues sooner and lighten workloads for doctors, they may dull hands-on skills and leave confusion about who answers for mistakes. While software speeds up medicine creation by testing virtual compounds, it could sideline human hunches and chance discoveries that once led to breakthroughs. Finding hidden links in massive data sets becomes easier, also making people trust results more than they should - sometimes missing messy truths outside digital models. Customer bots respond quick, ads target better, still many feel watched, reduced to profiles, subtly guided without knowing why. Art tools for pictures, sound, and moving images open up new styles while making creation easier technically - yet stir debates about who owns what, what counts as new, and what good work means. This balance shifts across fields, shown in Table 1 (Henriksen & Mishra, 2023; Wang et al., 2022; Luckin et al., 2022).

Table 1. Positive and negative impacts of AI applications across five domains.

Domain	AI Tool / Application	Positive Impacts	Negative Impacts
Education	ChatGPT	Brainstorming, personalised feedback, exploration of writing styles	Over-reliance, bypassing understanding, plagiarism concerns
Education	Grammarly	Technical writing improvement, professional polishing	Homogenised writing styles, weaker grasp of grammar rules
Education	AI tutoring systems	Personalised learning, targeted practice	Fewer chances for independent problem-solving
Healthcare	Medical imaging	Earlier detection, greater	Possible deskilling of

Domain	AI Tool / Application	Positive Impacts	Negative Impacts
		accuracy, time savings for clinicians	radiologists, accountability for AI error
Healthcare	Drug discovery	Accelerated development pipeline	Reduced role for intuition and serendipity
Research	Data analysis	Pattern discovery in large datasets, new findings	Over-trust in AI output, less critical evaluation
Research	Scientific simulation	Study of phenomena hard to examine directly	Simulations simplify reality and may miss real-world complexity
Business	Chatbots	Higher satisfaction, frees staff for complex issues	Impersonal experience if poorly designed
Business	Marketing analytics	More effective campaigns, higher sales	Privacy concerns, potentially manipulative tactics
Business	Fraud detection	Stronger protection, safer transactions	False positives causing unnecessary stress
Arts	Midjourney, DALL-E	New visual styles; images hard to make by hand	Ownership and copyright disputes, devaluation of craft
Arts	MusicGen	Experimentation with new sounds, faster output	Questions of originality, homogenised styles
Arts	AI video editing	Rapid editing without years of training	Decline of traditional editing technique

Case Studies: AI as Creative Partner

Case A: Refik Anadol and media architecture

From air currents to color fields, Anadol shapes invisible forces through machine learning. Over two years, sensors around Istanbul captured wind, heat, moisture - one reading every ten seconds, totaling millions (Anadol, 2019). Hidden rhythms emerged only after a specially built

algorithm combed through those sequences. Machines spotted what minds might overlook. Choices about flow, shade, motion came solely from the artist. What lit up on a massive screen was neither pure data nor mere intuition. Light stretched twenty-eight feet wide because vision guided computation. It shows up like a mirror to his thinking - this machine uncovers shapes inside numbers most people would miss... Then he turns those rhythms into something you can feel (Elgammal et al., 2017, p. 8). Seen at MoMA and later at the Centre Pompidou (MoMA, 2022; Centre Pompidou, 2021), the piece never stopped shifting, always listening, feeding off signals in real time. That loop - between creator, code, space, and viewer - only clicks because math stitches it together (Anadol, 2024; Sedition, 2024).

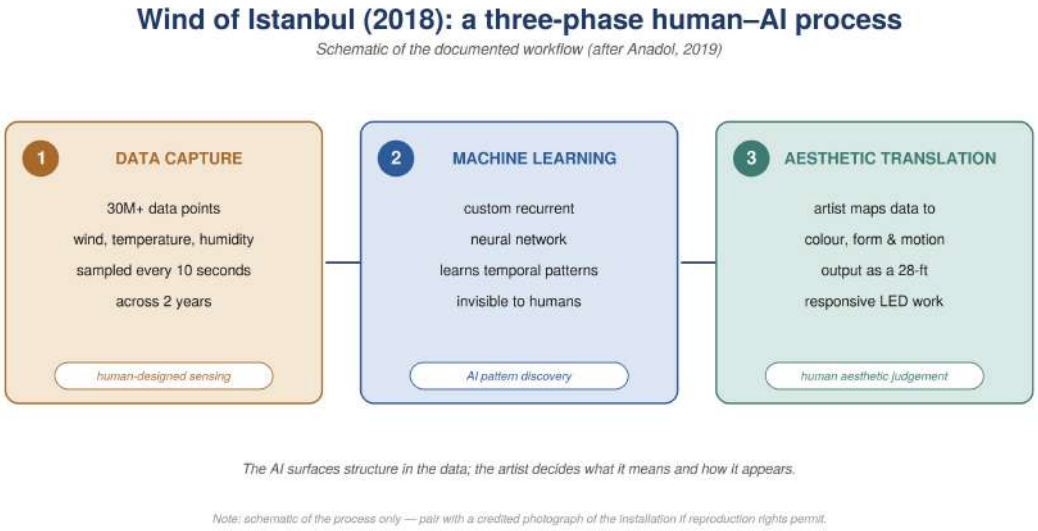

Figure 2. Refik Anadol's Wind of Istanbul installation: the large-scale LED display. [Insert figure.]

Case B: Hugh Herr and bionic limbs

Though missing both legs, Herr runs a lab at MIT focused on body-machine connections. Machines learn how people move by studying detailed measurements from healthy limbs. Instead of copying past examples, smart software invents new ways to walk based on physics rules. Sensors feed live info, letting artificial systems adjust motion on the fly. One surprising twist - answers emerge not from stored patterns but through trial shaped by science. People still guide the process, setting limits, offering

intuition, making choices about right and wrong. Computers handle endless tests, ranking possibilities fast. Yet where things go next - the sense of purpose, the idea of better - is decided elsewhere. Not in code. In thought. Human judgment steers even when machines lead the search. Progress spreads across minds and circuits alike. Direction matters more than speed. Thinking shapes outcome far beyond calculation. Insight stays rooted where it began.

Case C: The Next Rembrandt

This time, artificial intelligence helped craft an original piece styled like Rembrandt. Instead of guessing, researchers scanned 346 artworks, extracting details on face shapes, shadows, strokes - right down to individual pixels (Mensink & van Gemert, 2019). From that data, they shaped custom code meant to mimic his habits. Yet machines didn't decide alone; experts in old masters and material chemistry stayed close, guiding choices and weighing outcomes. Step by step, through nearly two years, a digital image took form - one built from 168,263 painted pieces, totaling well over 148 million dots - and later emerged as a physical bust via 3D printing. Some saw it as skillful mimicry missing the soul of a true Rembrandt. Others viewed it as something original standing on its own. Jonathan Jones put it well in 2021 - while the piece does not substitute real human creation, it throws that very quality into sharp relief by comparison (p. 27).

One after another, these stories paint cooperation in shades, not just one rigid form. Not quite invention but something looser happens when Anadol lets machines stretch his vision before stepping in to guide it. Then there is Herr, whose digital setups suggest moves never seen during learning, nudging things into new territory. The Next Rembrandt, despite flashy tools, sticks mostly to stitching old strokes back together, tightly watched by people every step. Still, choices about what works or matters come down to humans each time. Look closer and you see meaning forms where minds meet wires, neither side doing it solo.

Analysis and Discussion: AI and Student Creative Development

When it comes to shaping tomorrow's creators, schools and colleges play a key role - so how AI shapes learners matters deeply, yet findings so far bring little comfort.

It happens again and again. Thinking deeply gets harder once students turn to AI instead of wrestling with questions on their own - according to Zhang et al. (2024), those who later tried writing alone showed 23% weaker analysis. When fast replies take over, real problem-solving fades; it's the messy effort that builds strong learning, something Dweck (2023) ties closely to creative sparks and grit. Fresh ideas shrink too, since AI draws only from what already exists - Henriksen et al. (2023) tracked design students for two years, noticing steady drops in uniqueness if they skipped guided reflection. When answers come too soon, real grasp remains thin. Skills listed here link to risks from depending too much on quick fixes - alongside habits that protect depth (Wadinambiarachchi et al., 2024; Koivisto, 2023; Bloom, 1956).

Table 2. Cognitive skills, risks of over-reliance on AI, and balanced approaches.

Skill	Description	Risk of Over-reliance on AI	Recommended Balanced Approach
Critical thinking	Analysing, evaluating, forming judgements	Weaker analysis when AI supplies ready answers	Use AI to surface perspectives, then evaluate independently
Problem-solving	Resolving complex challenges	Reduced capacity to work through problems alone	Attempt unaided first, then consult AI for guidance
Originality	Generating novel ideas and approaches	Ideas become derivative of AI output	Limit AI to initial brainstorming; develop ideas yourself
Learning persistence	Willingness to struggle with hard concepts	Lower tolerance for cognitive challenge	Set AI-free periods that require persistence
Information literacy	Finding, evaluating and using information	Weaker judgement of source credibility	Teach students to appraise AI-generated information
Written	Clear, effective written	Possible atrophy of writing	Balance AI assistance with

Skill	Description	Risk of Over-reliance on AI	Recommended Balanced Approach
expression	communication	skill	independent composition
Metacognition	Awareness of one's own thinking	Less insight into one's cognitive processes	Require reflection comparing student and AI reasoning

Caution fits better than panic here. Depending on the subject and activity, results shift - some come from setups where AI gets pulled away too fast, instead of testing steady support over time. Concerns around tech in class aren't new; people once feared distractions and reliance even before tools like this existed, yet those issues tended to fade through smart setup and shared habits, not outright bans (Selwyn & Aagaard, 2021). Still, two ways these changes play out should stand out. What sticks in memory often grows from effortful work, yet slick responses sidestep that process by feeling too right to question. A smooth reply slips past doubt even when it shouldn't, especially during lessons meant to sharpen judgment. Relying on instant answers weakens the mental grip built through wrestling ideas alone. Not using tools helps less than shaping how they're used. Design matters more than denial.

Toward responsible use

What helps most isn't banning tools but choosing the right order and structure. Once students handle a task alone, then turning to AI makes sense - this way learning grows instead of being replaced. Teachers might ask pupils to test what AI produces by comparing answers elsewhere, spotting slanted views, challenging weak logic - doing so sharpens both topic grasp and tech awareness together. Work must still carry personal thought, a clear signature style, while letting AI nudge just the starting phase. Moral issues need space in lessons: cheating rules, hidden leanings in data, who owns information, how credit gets given, plus deciding moments when using AI fits at all.

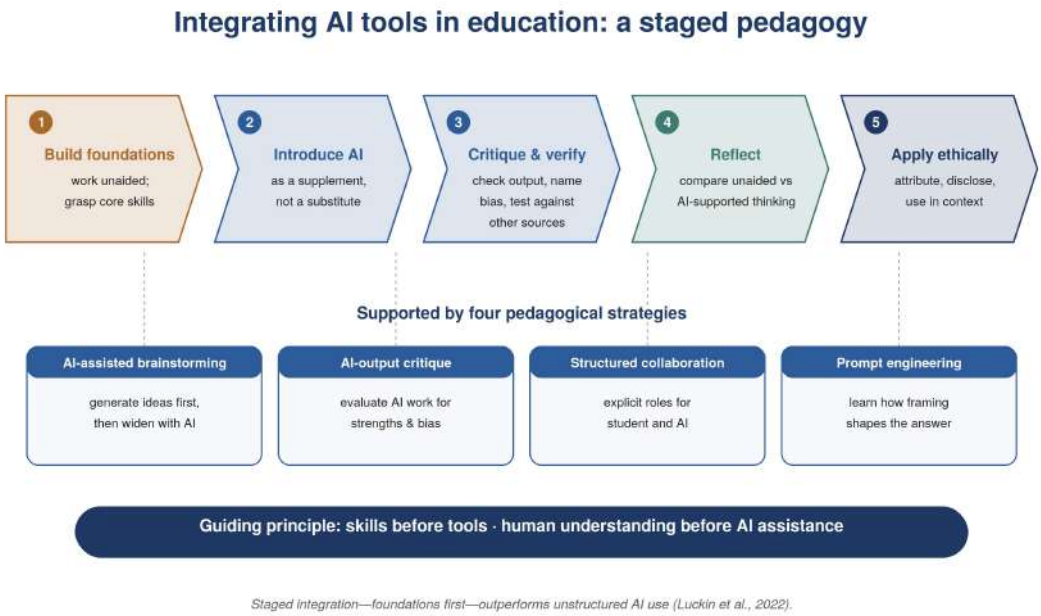

Figure 3. Framework for integrating AI tools in educational settings. [Insert figure.]

Some classroom strategies bring this idea to life. Students start by coming up with thoughts on their own, after that they turn to AI to explore more possibilities and examine differences with care. Instead of accepting responses at face value, they look closely at what artificial intelligence produces, checking for strong points, weak spots, and hidden leanings. When working together in clear frameworks, each person has a defined part - one might build the main case and organize it, while the machine helps locate sources or adjust wording. Trying out different ways to shape questions shows them how small changes affect answers, also reveals when technology falls short.

Educational Implications

Attribution and authorship

When it comes to giving credit for work made with help from AI, things get tricky. A common stance sees artificial intelligence as just another instrument, much like pen or paintbrush - in such cases, all recognition goes to the person using it. Sometimes though, people argue the machine does more than assist, contributing in ways that deserve mention alongside the creator. Others insist real authorship needs intent, something tools do not possess, which means only

humans involved at some level should be named - whether they used the system, built it, or provided what it learned from. Now it's clearer what counts under the law. The U.S. Copyright Office said so in 2023 - creations made only by artificial intelligence won't get copyright. However, if a person shapes the outcome using AI tools, then those parts they make stay protected. Rules draw lines at who actually makes choices. What matters most? Human effort shows up in the details where people guide the result.

Still, no matter the system in place, people remain at the heart of things - goals come from them, so do raw materials, evaluations, choices on changes or removals. Because of this shift, organizations now document roles more precisely: tasks done without machine help, those shaped by humans then polished by machines, ones started by machines but adjusted by people, even projects mostly built by algorithms yet guided by human oversight (International Center for Academic Integrity, 2023).

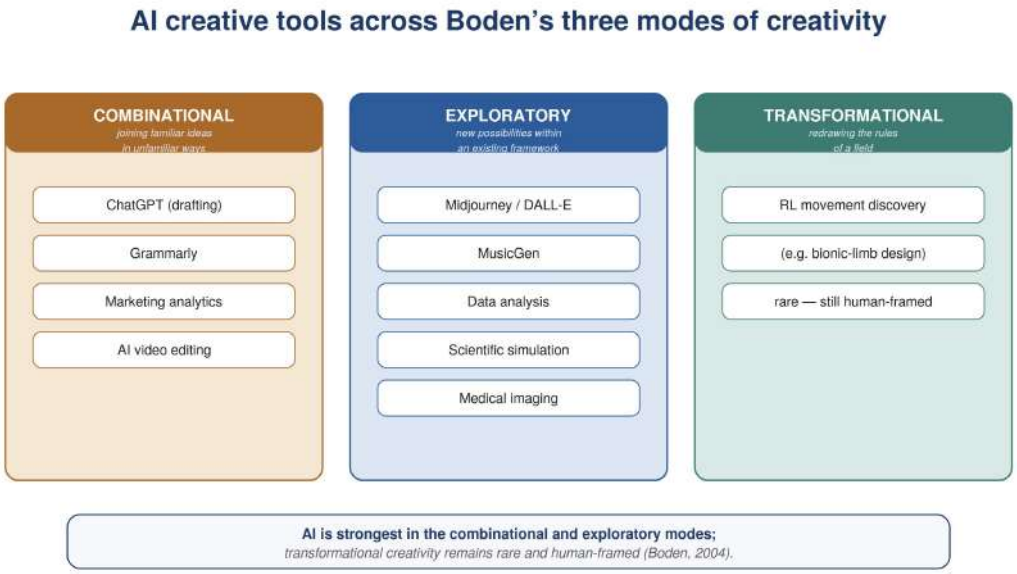

Figure 4. AI creative-tools visualisation. [Insert figure.]

An integrative framework

One study shows step-by-step learning works better when basics come before tech. Only after mastering essential thinking and making abilities does AI enter the picture. Pupils examine how they solve problems alone versus with machine help, revealing shifts in thought patterns.

Instead of guessing norms, they learn honesty in credit, openness in methods, and judgment about suitable usage. Working through these layers lets them grow alongside tools instead of being replaced by them.

Step by step, evaluation must change too. When students bring work made at home using tools built fast and wide, proof of real understanding leans into how they worked - early attempts, writing done during class time, spoken explanations, notes showing when and why AI played a role - making grades reflect thought behind it more than just the finished piece. This shift lets skill with AI count within grading instead of shaking its trust.

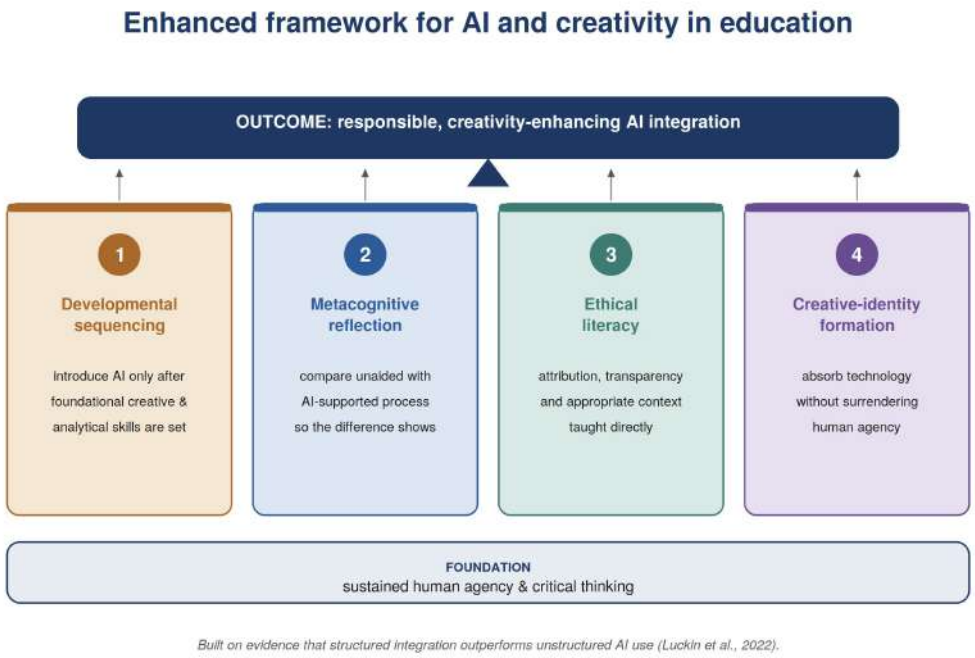

Figure 5. Enhanced educational framework for AI and creativity. [Insert figure.]

Conclusion

Out here, AI pushes and pulls on how people make things. Sometimes it stretches imagination, finds new paths, solves tough puzzles - other times it slips into shortcuts that weaken judgment and slow learning. Staying sharp means using it alongside thought, not instead of it.

Here come five promises. One, tap into what AI might do - examples like Anadol's art pieces or Herr's artificial limbs reveal just how much it widens what people are able to

achieve. Not only that, but also watch out for growing too reliant, losing hands-on abilities, slipping on moral standards; studies in schools prove thoughtless use actually weakens the strengths learning is meant to grow. Another point: place real emphasis on nurturing people, putting sharp judgment, creative fixes, and fresh ideas up front, making sure basic know-how comes first, well before handing over any tech. When it comes to AI, fairness matters - treat its use with care around bias, who owns data, and personal limits while laws slowly catch up. Later on down the line, make sure learners aren't just skilled at using tech but also aware of how deeply it shapes lives.

One day closer might be shaped by teamwork instead of races to win. With thoughtful handling, artificial intelligence expands human making - yet it stays grounded when people stay involved. Creativity itself could shift, especially since original ideas aren't ours alone anymore; this back-and-forth with smart tools might uncover forms of expression still unseen.

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