Contemporaneous Issues about Creativity

Edited by Lisete Barlach

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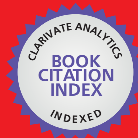

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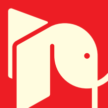

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Lisete Barlach is a professor at the School of Arts, Sciences and Humanities at the University of São Paulo (teaching undergraduate students) and at the Faculty of Administration, Economics and Accounting at the University of São Paulo (for graduate students). Her main research themes are entrepreneurial behaviour (including career transition from employee to entrepreneur), creativity, resilience and mental health. As a consultant, she has a lot of experience organizing courses and experiential learning. She has experience with career coaching, human resources management and organizational development. Lisete Barlach is a Psychologist with a Ph.D. in Social and Organizational Psychology and a post-doc in Administration. She has published more than 50 articles in national and international journals.

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Preface

Creativity is one of the most important skills of the 21st century, be it for the work environment or effective daily problem-solving. Nevertheless, for many, it seems that there is a competition between human and machine skills, with many creative activities being performed by Artificial Intelligence, questioning the "survival" of human creativity.

The discussion is open: will organizations use AI in the ideation phase of innovation? Can AI augment employee creativity [1]?

The debate goes beyond academic environments, reaching important institutions such as the World Economic Forum and UNESCO.

According to the bipartite standard definition [2], creativity requires both originality and effectiveness. As it is well-known, originality is vital for creativity but insufficient. Ideas and products that are merely original may be useless.

Every creative product, process, or service is evaluated by different agents (art critics, editorial teams, clients, institutions, etc.). So, the question remains: how could AI evaluate effectiveness and usefulness?

Section 1 of the book is dedicated to human versus AI creativity, with three chapters.

Chapter 1, "Human Creativity versus Machine Creativity: Will Humans Be Surpassed by AI?" Augustinas Dainys addresses the general issue presented above. The author clarifies that machine creativity is essentially algorithmic creativity, and algorithmic creativity is the ability to adhere to inference rules. AI could be called an unphilosophical device because its activity is based on following rules, and philosophy begins with wonder when no rules apply.

By the end of the chapter, the author states: "Humans possess the ability not only to make inferences but also to navigate philosophical situations, which are self-referential, where established algorithms fail. This situation of wonder, as Aristotle defined it in Metaphysics, is the wellspring of all philosophy and a uniquely human capacity". The conclusion is that "to be creative is to be able to face an undecidable situation—where no definite rule or algorithm exists—and create a new, original rule or algorithm. The ordinary world is a collection of rules or algorithms that define the schemes of ordinary behavior. Agents of these rules behave mechanically, without conscious thought, forming habits through repetition".

The most crucial point of the chapter is that, unlike human beings, machines work without thinking about it, performing only algorithmic creativity.

Chapters 2 and 3 approach the theme through the lens of educational activities, preparing readers for the next section.

Chapter 2, "Creativity and Generative AI for Preservice Teachers", by Tess Butler-Ulrich, Janette Hughes and Laura Morrison, explores the dual role of Generative AI in both harnessing and hampering creativity, as a case study, investigating how teachers use GPT in lesson planes. The main contribution of the chapter is its empirical basis. The authors developed research with teachers, aiming to understand if they can foster a conducive environment for creative exploration and self-expression and the role of generative AI in the process.

Chapter 3, "Artificial Intelligence in Creative Writing Studies: Threat or Opportunity", by Susan Taylor Suchy, discusses the impact of AI on pedagogical approaches to creative writing. The authors say, "In addition to assisting with grammar and spelling, creative writers can now collaborate with AI, and many find increased productivity and new directions in their work". Nevertheless, rapid advances in AI require changes and new pedagogical approaches to creative writing studies.

Section 2 addresses experiences and experiments of creative development in educational contexts.

Chapter 4, entitled "Teaching Creativity towards Futurist Thinking: Querying Artificial Intelligence", by Leila E. Villaverde and Roymieco A. Carter, instigates the reader to consider new ways of teaching, by encouraging students to privilege the question over the answer through a pedagogy which embraces both the use of imagination and innovation. For the authors, "futurist thinking regards not only science fiction but should be a daily exercise in classrooms, by using creativity and critical studies to reframe how we approach these so-called wicked problems".

AI impacts futurist thinking by providing both replications of an unjust world and the tools for a different future. So, imagining new futures and new possibilities is crucial to students in general, as well as to AI professionals.

Chapter 5, "A Synthesis of Selected Obstacles to and Models of Creative Problem Solving", by Jeffrey J. Walczyk, Kacie Mennie and Danny Walker, focuses on reasoning by analogy and detaching possible mistakes related to near-far analogies, the chapter indicates functional fixedness, one of the cognitive biases, as a consequence of failures in this kind of reasoning, leading individuals to "perceiving objects and situations only in conventional ways".

In the contemporaneous scenario, with an extremely high amount of information and the prevalence of open-ended problems over creativity and creative problem-solving, the chapter reflects on functional fixedness and conventional mindsets as possible consequences of contemporaneous scenarios.

Chapter 6, "The Role of Culture and Environment in Shaping Creative Thinking", by Inuusah Mahama, analyses how socio-economic factors influence the broader cultural environment, which affects the types of creative practices that are valued

and supported. The author says, "In societies where there is a strong emphasis on economic success, creative fields that are not immediately profitable may be undervalued, discouraging individuals from pursuing creative careers".

Some very interesting ideas can also be extracted from the text, such as, for instance, the recent economic crisis, with its ethical, political, cultural, and social dimensions, which have exacerbated social inequalities and created a sense of urgency in rethinking traditional approaches. This crisis has illuminated the importance of preparing citizens for an increasingly unpredictable future. In this context, the role of educators becomes critical, as they are tasked with cultivating skills that enable students to navigate and thrive in a world characterized by constant change.

Section 3 is dedicated to the relationship between creativity and mental health. Composed of three chapters, it begins with Chapter 7, "Expressions of Grief That Emerged Using a Creative Process during an International Response to COVID 19", written by Steve Harvey, Si Wang and E. Connor Kelly.

As a very original research, opening up avenues for future studies, the authors use non-verbal techniques due to the natural difficulty of expressing grief verbally and the fact that two cultures with no common language were studied.

Although it is important to distinguish creativity from art, in the present case, using art to express grief was a well-chosen method, achieving successful results.

As a quasi-therapeutic way of getting access to deep feelings, the artistic setting presented by the authors was an important tool to explore subjects' emotional experiences during the pandemic period, when so many distressful situations were experienced, allowing emotions to arise and to be shared with participants of the other country.

The semi-structured approach, based on different kinds of improvisations, on dance, music, etc., provided an appropriate setting for emotional expressions of grief, including the emergence of empathy for unknown persons, that is, grieving for someone one did not know in person.

Chapter 8, "The Role of Creativity with Caregiving", by Daniel Koltz and Rebecca Koltz, addresses an important issue: "an experiential-based program designed to enhance caregiver self-care and resilience creatively". Caregivers are subject to stressful situations, well described in the text, and, thus, must be creative to cope with them. Based on Roger's approach, the authors state correctly that "engaging in creative practices can be inherently therapeutic". Moreover, the program is designed according to Kolb's experiential learning cycle, which offers, at the same time, closeness to the caregiver's daily activities (hands-on learning) and the opportunity to prospect new ways of dealing with everyday tasks.

In Chapter 9, "Creativity, Resilience, and Mental Health: A Conceptual – Theoretical Study", written by Lisete Barlach, creativity is understood as an antidote to the various kinds of compulsive disorders and obsessive behaviours of contemporaneity.

Throughout a theoretical–conceptual study, the author concludes that instead of associating creativity with madness, new avenues open up for understanding creativity as a key element of mental health.

As the Preface summarizes the book's contents, I wish you a good reading and inspiration for new avenues of investigation and research.

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Section 1

Creativity and Artificial Inteligence

Chapter 1

Human Creativity versus Machine Creativity: Will Humans Be Surpassed by AI?

Augustinas Dainys

Abstract

Today, human creativity faces the challenge posed by digital intelligence. It is often predicted that cybernetic machines will replace human creativity. But is this true? While artificial intelligence can learn and perform creative tasks independently, it operates strictly according to programmed algorithms. In contrast, human creativity is open-ended, emerging when individuals confront unsolvable situations without predefined solutions. Humans can devise creative solutions when faced with incomplete systems and undecidable situations. A Turing machine, which attempts to conceptualize an algorithm, creates a rational system in which some statements can be logically derived from others. However, a Turing machine performs tasks by following the formal syntax of algorithms without understanding the meaning behind the elements of inference. When a computer encounters an undecidable situation, it freezes and is unable to generate either "true" or "false" results. Viruses work similarly, "short-circuiting" a logic machine by introducing self-referential states, similar to those that Bertrand Russell attempted to address with his theory of types. To describe the human creative act, which cannot be reduced to AI activity, we draw on Edmund's Husserl's conception of categorial intuition. A creative act is a categorial intuition that reveals a new perspective of the world. The conceptualization of multidimensional monism further describes a reality that cannot be reduced to the creativity of AI.

Keywords: AI, following of algorithm, creative act as categorial intuition, incomplete systems, multidimensional monism

1. Introduction

We are currently witnessing a creative revolution driven by artificial intelligence (AI). It is now possible to find webinars online that teach how to use AI to write a book in a single day, to sell it on Amazon, and make a profit. Additionally, AI-generated music albums featuring the styles of popular rock artists are available, and some of these creations even present interesting and novel creative solutions. In China, robots are beginning to replace math teachers, administering and grading students' tests. This development raises a critical question: Will AI push humans aside in a domain traditionally seen as a hallmark of human dignity—the ability to perform creative tasks? For centuries, creativity has been considered a unique human trait,

a divine spark within the human mind that sets us apart from the animal kingdom. Can AI, a human creation, surpass human creativity? While it may take a person around a year to write a book, AI can generate one in a single day. In a few years, the market for books, films, and music could be flooded with AI-created products. Will humans find themselves sidelined, sent on vacation while AI becomes the dominant creative force? It is certain that AI will not only take over mechanical work, such as driving busses or selling goods in stores, but also play a role in creative tasks.

In this article, we will examine the fundamental principles of human creativity and that of AI. Are intelligent machines truly on the verge of becoming more creative than humans? Does this imply that the next step in the evolution of cognitive capacities must involve transitioning from the biological human brain to AI, leaving humans behind as an outmoded step in cognitive evolution, just as members of *Homo sapiens* outpaced other species of apes millions of years ago? Norbert Wiener, the father of cybernetics—the theory of communication and control systems in both machines and living organisms—believed that cybernetic machines could become far more intelligent and wiser than their human creators. Although recent years have seen a remarkable surge in AI development, fulfilling even the wildest dreams of Wiener, we remain skeptical about the creative abilities of thinking machines. We align with the skepticism of Hubert Dreyfus [1], a follower and friend of Heidegger, who published series of articles in the 1960s questioning the creative potential of AI, even if we do not subscribe to his specific line of reasoning.

2. Algorithmic creativity

A machine is a device created by humans to perform specific tasks and concrete work. The term "robot," denoting a cybernetic machine, was popularized in twentieth-century science fiction literature, derived from the Czech word *robota*, which means drudgery or forced labor; it was coined by Czech writer Karel Čapek. Robots are intelligent machines capable of automating various physical tasks that are dangerous for humans or highly monotonous, effectively replacing manual labor.

We must consider the ontological status of AI, which leads us to the concept of technological being. When examining the mode of existence of a technological device, we encounter the problem Martin Heidegger raised in the essay *The Question Concerning Technology* [2]. Heidegger's reflections on the nature of technological objects remain meaningful today. He defined technology as an artificial means of revealing nature and incorporated these reflections into his phenomenology, which involves entities showing themselves and shining forth in the clearing (Lichtung) of being (Sein). According to Heidegger, technology unveils an entity from its concealment. He connected this process of revelation with the concept of truth, signified in Greek by the word *alētheia*, which he etymologically interpreted as *unconcealment.* In Greek mythology, Lethe is the river of forgetfulness; drinking from it causes the soul to forget its previous life. The essence of Heidegger's thinking is to bring an entity from hiddenness and concealment to unconcealment. The shining of an entity in unconcealment constitutes its truth. This approach aligns with René Descartes' concept of evident cognition, where truth is recognized through clear and distinct perception (*clara et distincta perceptio*). Technology reveals certain traits of nature. For example, electricity exists in a hidden form within things. By unveiling these hidden traits of nature, technology manifests them, as in the pure form of electric current. Heidegger views technology as a form of technical phenomenology, where

phenomena like electric current are revealed in their pure form in settings such as nuclear power stations.

Similarly, AI serves as a technical means for disclosing hidden traits of human intellect, manifesting certain traits that lie dormant or are less effective in the natural state of the human mind. For example, the ability to perform complex calculations with large numbers becomes more efficient when the process of cognition is formalized and automated. In this way, a thinking machine can perform calculations much faster than the biological brain. Thus, AI, as a technological tool, reveals and enhances the capabilities of human biological intellect, making it more effective than the biological brain alone.

Creators of AI fulfill the dream of creating an artificial man, a golem, possessing traits that surpass those of biological humans. Aristotle defined humans as *animal rationale*, that is, a rational animal with *logos* or *ratio*. Humans are logical animals, and AI enhances and reveals this logical trait, making it more effective than the biological human brain. Early attempts to create artificial intellects more effective than biological ones led to the development of logical machines. The *characteristica universalis* of Gottfried Leibniz and the logical machine of Alan Turing, later termed the Turing machine, exemplify thinking automata—artificial means of inference that surpass the capabilities of the biological human brain.

The Turing machine represents a system of formal inferences, serving as the prototype for AI. Turing constructs logical machine defining the region of computable numbers. He says: "According to my definition, a number is computable if its decimal can be written down by a machine" ([3], p. 58). It consists of a set of formal rules of inference by which we can derive correct results. The Turing machine automates the inference process, eliminating the need to understand the meaning of symbols used in making inferences. It is enough to follow the system's formal syntax. For instance, if we have A and it implies B, we can conclude B without knowing what A and B represent. The Turing machine performs calculations and produces inferences. If we have A, and from A follows B, and from B follows C, then by adhering to the system of formal rules of inference, we can deduce that A yields C. In this way, the Turing machine makes the necessary inferences and arrives at the expected results. Logical machines formalize the production of inferences. In Heideggerian terms, the mode of being of the Turing machine is a formalized and automated system of inferences that discloses and enhances the human mind's capacity to make inferences. However, a question remains: Can the human mind be reduced to a system of algorithms?

The Latin word *producere* consists of *pro* (through) and *ducere* (to guide). To produce means to guide something through a process that imparts new qualities. A thinking machine, given an input, guides it through a process that bestows new qualities, resulting in an output. An algorithm is a rule that facilitates inference—the ability to navigate a process that logically produces a concrete result as an output.

A problem arises when there is no clear algorithm to follow. In such cases, given a concrete input, it becomes unclear which process to employ to generate an output. When it is not evident what formally follows from A, a computer cannot follow an algorithm and becomes trapped in a self-referential situation. For instance, if A follows from A, this creates a self-referential loop that halts the inference process in a Turing machine, causing it to freeze. Turing created a logical machine to demonstrate that there is a region of human knowledge where inferences function effectively, building on the work of his predecessor, Leibniz.

Machine creativity is essentially algorithmic creativity. A machine is a system of inferences produced by following algorithms. Algorithmic creativity is the ability to

adhere to rules of inference. The rules for AI are created by programmers who assume a godlike position in relation to the program they create. An AI program's functionality depends on how the programmer has designed it. The programmer creates specific algorithms to perform tasks or make inferences, thereby defining the rules by which an AI program functions as well as its character and mode of operation. In essence, programmers creating AI are crafting formal system of inference. The Turing machine represents one of the first attempts in the twentieth century to conceptualize AI as a formal system of inference.

Describing AI as a system of algorithms does not mean that it cannot perform creative tasks. In fact, AI can be creative, but its creativity is defined by algorithms, such as those emulating Mozart's music or Apollinaire's poetry. It is known that algorithms for Mozart's music can generate original sequences of musical sounds that experts find intriguing. Similarly, algorithms for Apollinaire's poetry can create original combinations of poetic images that poets might find engaging. However, AI creativity is limited. An algorithm for Mozart's music can only create in Mozart's style, and an algorithm for Apollinaire's poetry can only produce work in Apollinaire's style. They are programmed to operate within a sphere of possibilities defined by their creators.

An example of such a program is the Deep Blue chess-playing system, which ran on a specialized supercomputer and defeated world champion Garry Kasparov in a chess game. It was programmed to function within the 8x8 square chessboard, essentially a closed system. In such defined and closed-probability spaces, AI can outperform humans in following the defined algorithm, finding creative solutions for chess moves, and developing game strategies to defeat human players. It is not affected by subjective factors, such as mood, lack of sleep, or headaches, which can impact the efficiency of a biological brain. An AI program does not face such challenges, as it is a system that formally follows algorithms. Consequently, in closed systems, AI can be more powerful than human intelligence. However, its performance in open systems needs to be examined.

2.1 From deep learning theory to Bayesism, and back

There are two main heuristic models of AI. At the microlevel, there is deep learning theory, which models artificial neural networks. Here, there are two main parameters: threshold and the weighted connections between artificial neurons, which transmit impulses between artificial neurons. When an artificial neural system receives an input, it makes training of this system. Furthermore, when making adjustments to an artificial neural connection, it tunes it according to a learning algorithm, and after running the input through the entire network of artificial neurons, the system provides an output. "[M]aking these adjustments to parameters is called training, and the particular procedure used to tune is called a learning algorithm" ([4], p. 5). Deep learning systems are deterministic and analogous to models of statistical physics in which we have chaotic movements of particles of gas. In such models, we do not know the actual positions of the various particles of gas but adopt averages as measurements of their positions. In deep learning systems, there are approximately hundreds of billions of connections and one hundred billion parameters—with more to be added in the future. These connections and parameters in deep learning systems are treated statistically. We contrast these deterministic systems with category shifts effectuated via categorial intuition (about it we will speak later), which is much closer to a quantum physics model in which the concrete trajectory or the history of the concrete electrons is not known; each electron is simultaneously a particle and a wave.

However, with categorial intuition, we will introduce a categorial shift, which highlights the difference between artificial neural networks and the human mind—which has natural neural connections.

Another heuristic model is Bayesism, in which learning is analyzed at the macro level by an AI system and speaks to how a learning entity learns from events and, therefore, anticipates events in the future. Bayes' model is applied in the creation of AI, and each event in this system yields a close horizon of possibilities, similar to dice, which has one to six possibilities, or a chess board, which has 64 squares. Bayesism describes the behavior of a learning artificial and human agent, where each new event changes the knowledge status of the agent, such that there are higher or lower probabilities of future events. Human agents have an open horizon of learning, and human anticipation of future events is open. This openness is an essential trait of philosophical and artistic creative subjects.

AI functions by moving from the macro level of input toward the micro level of impulses in the artificial neural network and back and, in this way, produces the output.

3. Incomplete systems

Kurt Gödel discovered that in any consistent formal system of arithmetic S, there exists a proposition G that is true but unprovable within that system. If S is consistent, then G is both true and unprovable. Gödel showed that all systems of mathematics are inherently incomplete, requiring external validation to prove their consistency. Gödel's work implies that it is impossible to formally prove the consistency of an arithmetic system using only its intrinsic means. In essence, closed systems are only part of bigger, open systems.

Gödel [5] made this discovery while working on his dissertation about Bertrand Russell's and Alfred North Whitehead's *Principia Mathematica*. Gödel discovered the incompleteness of this project. Specifically, he found that there are mathematical problems that can be expressed in *Principia Mathematica* that cannot be solved using its logical framework. Russell and Whitehead wanted to construct a fundamental system of mathematics grounded in logic. Russell thought that he constructed a consistent logical system, but Gödel's work revealed its incompleteness. While inferences can be made within the system, they ultimately necessitate a larger system to establish consistency. This meta-system is required to prove the consistency of a first-order system, which is inherently incomplete. There are problems that can be expressed in a first-order system but cannot be solved using that system.

Russell's Principia Mathematica was based on the theory of types [6], which aimed to resolve the liar's paradox, which aimed to resolve the liar's paradox. The logical structure of liar's paradox, when one of Cretans states that all Cretans are liars, is set of all sets, which functions as a self—referential vicious circle. Russell and Whitehead write: "The vicious circles in question arise from supposing that a collection of objects may contain members which can only be defined by means of the collection as a whole. Thus, for example, the collection of propositions will be supposed to contain a proposition stating that "all propositions are either true or false." It would seem, however, that such a statement could not be legitimate unless "all propositions" referred to some already definite collection, which it cannot do if new propositions are created by statements about "all propositions." We shall, therefore, have to say that statements about "all propositions" are meaningless. More generally, given any

set of objects such that, if we suppose the set to have a total, it will contain members which presuppose this total, then such a set cannot have a total ([7], p. 39). Russell addressed this paradox by introducing meta-languages. He classified statements like "I am lying" as second-order statements, distinct from first-order statements such as "It is raining." Statements such as "I am lying," "I am telling the truth," or "I am doubting" are second-order propositions, whereas "It's raining," "The sun is shining," or "It's cloudy" are first-order propositions. "I am lying" is a self-referential statement, but "I am lying that now it is raining" is not since "I am lying" and "Now it is raining" are statements belonging to two different categorical levels. "I am lying" is a meta-proposition related to the first-order statement "Now it is raining." By introducing the system of meta-languages, Russell resolved the self-referentiality of statements like "I am lying." Logicians following Russell's analytic philosophy tradition further developed these meta-languages, recognizing that first-order propositions or systems are always incomplete. This is the main idea of the theory of types, which was fundamental to *Principia Mathematica*.

Wittgenstein, a friend, a pupil, and a teacher of Russell from the very beginning, was skeptical of Russell's theory of types. He sought to demonstrate that this system of meta-languages was redundant and unnecessary and that working with first-order propositions was sufficient. In *Tractatus*, Wittgenstein developed a theory distinguishing between showing and saying, arguing that logical truths are tautologies that cannot be said but only show themselves. "What can be shown, cannot be said." ([8], 4.1212). First-order propositions are always based on showing, whereas saying involves second- or third-order statements. This conception of showing, not saying, aligns with Gödel's notion of the incompleteness of first-order systems, approaching the same paradox from different angles.

An incomplete system can only show itself. In his later work, Wittgenstein shifted his focus to ordinary language as a first-order system. He advocated for returning metaphysical concepts to everyday language, their native home: "When philosophers use a word 'knowledge', 'being', 'object', 'I', 'proposition', 'name'—and try to grasp the *essence* of the thing, one must always ask oneself: is the word ever actually used in this way in the language-game which is its original home?—What *we* do is to bring words back from their metaphysical to their everyday use" ([9], 116 §). This first-order language is ordinary or everyday language. We distinguish between early and late Wittgenstein, but his conception of ordinary language is directly connected with the problems of *Tractatus*. Late Wittgenstein thought of language without resorting to meta-languages. He was critical of saying and based his theory on showing, that is, the sphere of ordinary or everyday language. In *Philosophical Investigations*, Wittgenstein characterized philosophical problems as situations in which "I don't know my way about" ([9], 123 §), which arise when established rules or algorithms fail to provide guidance.

This incomplete situation is fundamentally philosophical, giving rise to human creativity. Human creativity arises when the human mind does not know which rule to follow and so seeks to discover a new one. While computers and AI are programmed to follow algorithmic rules, they can encounter situations where no clear rule arises, causing them to freeze. It is in these moments that a human philosopher can find creative solutions. Computers are programmed to follow rules of algorithms, but following Gödel, the system of algorithmic rules is incomplete, and thus, we will inevitably encounter a situation in which we do not know which rule to follow. This is a philosophical situation. AI could cynically be called an unphilosophical device because its activity is based on following rules. Philosophy begins with wonder when no rules apply.

The Turing machine, an attempt to conceptualize algorithms, creates a rational system for logical derivation. Within the system of knowledge, there are statements of inference, but outside this sphere are incomplete situations in which rules do not work, leading to philosophical situations. The logical machine operates on the principle that the current state is the result of the prior state and determines the future state. Turing did not disprove Gödel's incompleteness theorem, and Turing's system still contains unresolvable statements. When a computer encounters such statements, it freezes and cannot generate either true or false results. Viruses work similarly, short-circuiting a logical machine by introducing self-referential states, akin to the liar's paradox. As noted above, Russell attempted to resolve this paradox of self-referentiality through his theory of types.

Gödel's theorem ultimately demonstrates that the human mind cannot be reduced to a machine. Humans possess the ability not only to make inferences but also to navigate philosophical situations, which are self-referential, where established algorithms fail. This situation of wonder, as Aristotle defined it in *Metaphysics*, is the wellspring of all philosophy and a uniquely human capacity.

4. Non-algorithmic situation as undecidable situation

Creativity emerges in paradoxical, unexpected situations. When human beings encounter a never-before-imagined reality, they experience a sense of wonder, as no known algorithm of behavior, thinking, inference, or deduction applies. We call this an undecidable situation, where the human mind transcends the immanence of known algorithms. In such situations, a creative agent emerges, attempting to deal with the unknown, paradoxical, and unexpected reality.

To be creative is to be able to face an undecidable situation—where no definite rule or algorithm exists—and create a new, original rule or algorithm. The ordinary world is a collection of rules or algorithms that define the schemes of ordinary behavior. Agents of these rules behave mechanically, without conscious thought, forming habits through repetition. Habit is a crucial notion in the philosophy of ordinary language, which aims to analyze the social practices of everyday life. These habits are formed through constantly repeating the same type of action, creating dispositions in the minds of agents. Gilbert Ryle, a philosopher of ordinary language, developed a theory of dispositions in his book *The Concept of Mind* to explain the workings of the human mind without resorting to meta-level Cartesian events. Ryle wrote, "Now to say that an action was done from force of habit is patently to say that a specific disposition explains the action. No one, I trust, thinks that 'habit' is the name of a peculiar internal event or class of events. To ask whether an action was done from force of habit or from kindliness of heart is therefore to ask which of two specified dispositions is the explanation of the action" ([10], p. 77). A disposition is the ability to perform certain types of actions without reflecting on the performance of the action. These thoughts would be meta-structures of mind, which Ryle, a follower of late Wittgenstein, wanted to avoid. A disposition is a habit of behavior, which we perform without thinking. According to Ryle, dispositions, or the system of habitual actions, form the main structure of the human mind and shape psychic, or so-called "spiritual" behavior. In this sense, we can think of habit as second nature to humans.

Russian physiologist Ivan Pavlov discovered a phenomenon called the Pavlovian conditioning theory of learning. This discovery, known as Pavlov's conditional reflex, was made accidentally. Pavlov, a physiologist at the time, was researching salivation

in dogs in response to being fed. He inserted a small test tube into the cheek of a dog to measure saliva when the dogs were fed. He predicted that dogs would salivate in response to the food being placed in front of them, but he noticed that they began to salivate whenever they heard the footsteps of his assistant who was bringing them food. The steps became a trigger for the salivary response. Through neuroplasticity, the brains of the dogs formed a conditional reflex. Similarly, human agents form habits through neuroplasticity. When neurons form connections in the biological brain, these connections become the second nature of both animals and humans.

Pavlov's dog and Ryle's philosophy both illustrate habits, which Ryle calls dispositions. The ability to follow rules or algorithms is grounded in the brain structure of both Pavlov's dogs and human agents. Such conditioned responses reflect the ability of agents to follow the rules of algorithms in the ordinary world. By constantly repeating the same actions, human agents form habits of mechanical behavior based on available algorithms. This allows us to solve everyday problems by mechanically applying established schemes for dealing with reality.

However, in undecidable situations, no known algorithm works, and there is no established habit of behavior. The necessary neuronal connections in the brain do not exist to guide us on how to act. Creativity, therefore, is the ability to form new neural connections in the brain's neural networks through a creative act. A singular creative act is essentially unhabitual and undispositional. When we do not know how to behave, we need to invent new forms of behavior.

To be creative is to face an undecidable situation and discover a new rule to solve the current problem. After creatively solving an undecidable problem, we can formalize and follow the newly discovered algorithm. Creativity does not involve behaving habitually or mechanically but rather finding an original way of being when faced with a reality that is undecidable, paradoxical, and unpredictable. An undecidable situation is an open situation, essentially a philosophical situation, which depends on an open horizon. The condition for creativity is dwelling in such a situation, facing the unpredictable paradoxicality of being. This undecidable situation is an open horizon, which causes computers to freeze, highlighting the difference between human and cybernetic creativity.

Human creativity is open because it is not defined by a closed horizon of possibilities, unlike machine creativity exemplified by chess games. In a chess game, there is a closed horizon of possibilities—eight squares by eight squares. A chessboard represents a primitive situation of closed creativity, with strictly defined rules determining how pieces move. For a supercomputer, the chessboard is a closed situation defined by a known algorithm. However, human creativity is open, and humans can face undecidable situations where no inference algorithm applies, allowing for truly creative solutions. An undecidable situation is a philosophical problem that must be treated creatively. Finding a non-trivial solution to such a problem takes time and requires experimentation with different models of possible solutions. In these situations, the human mind can manifest its creativity fully, as there are no known trivial models for solutions, and trivial solutions merely apply different known algorithms to the situation.

5. Intrinsic limits of AI and the problem of radical transcendence

AI operates based on algorithms defined by programmers. While AI can switch from one algorithm to another, this shift must be defined by the programmer. This

raises questions about the origin of radical novelty in the human world and whether AI can create such novelty. How can the shift from one algorithm to a new unknown algorithm happen? Is human reality only a repetition of known things? Can the human world imagine a new, unpredicted, and unexpected radical novelty? The predictable monotony of algorithms involves following rules, not only for AI but also for humans. The ordinariness of the everyday world lies in its predictability. The agents of the ordinary world recognize that nothing new ever happens. As stated in the *Ecclesiastes*, "nothing new happens in the world, everything is 'vanitas vanitatis.'" In the context of AI, this suggests that AI is programmed to behave in certain ways, but it cannot behave in a radically unknowable way.

Here we come to a theological problem of transcendence, exemplified by the case of Paul as a radical theological genius. Initially known as Saul, Paul was a devout follower of the Old Testament's teachings, which are deeply rooted in messianic hope. However, the Old Testament anticipates the Messiah according to its own prescribed algorithm. In the kingdoms of Judea and Galilee, Jesus proclaimed himself the Son of God—a statement entirely unpredictable from the perspective of the Old Testament algorithm. The Jews expected a Messiah who would terrify the enemies of Israel, who were seen as the enemies of God. As stated in the apocryphal *Book of Enoch* (46), "Whenever he turns, everything trembles; wherever his voice reaches everything is overwhelmed and those who hear it are dissolved as wax in fire." Jesus, however, preached love for one's neighbor and did not arrive as a great religious warrior in the political sense. He did not conform to the algorithm of the Old Testament. Initially, for Saul, Jesus' death on the cross was clear proof that Jesus was a false Messiah, seemingly refuting the entire concept of the Messiah as presented by Jesus Christ.

Jesus offered a radical novelty that was not anticipated by the algorithm of the Old Testament. This raises a question: What caused Paul's shift from the Old Testament to the New Testament algorithm? Between these two, there lies a radical event that the Old Testament could not foresee. Paul's experience represents a radical encounter with transcendence, transforming him into a theological genius. Paul, a devout student of Jewish religious tradition, was well versed in all the aspects of Judaism. However, the radical event of Christ's appearance to him during his trip to Damascus, about 150 miles from Jerusalem, shifted his identification with the old algorithm and led him to create the algorithm of a new religious identity. Paul's conversion was not inscribed in the old algorithm; it was only made possible through a radical encounter with transcendence, specifically, the vision of Jesus.

The *Acts of the Apostles*, written by the evangelist Luke, describes Paul's conversion:

> *But Saul, still breathing threats and murder against the disciples of the Lord, went to the high priest and asked him for letters to the synagogues of Damascus, so that if he found any belonging to the Way, men or women, he might bring them bound to Jerusalem. Now, as he journeyed, he approached Damascus, and suddenly a light from heaven flashed around him. He fell to the ground and heard a voice saying to him, "Saul, Saul, why do you persecute me?" And he said, "Who are you, Lord?" And he said, "I am Jesus, whom you are persecuting. But rise and enter the city, and you will be told what you are to do." The men who were traveling with him stood speechless, hearing the voice but seeing no one. Saul arose from the ground; and when his eyes were opened, he could see nothing; so they led him by the hand and brought him into Damascus. And for three days he was without sight and neither ate nor drank. ([11], pp. 106–110)*

This passage describes how a human agent became an instrument of God. God created Paul's vocation, a radical event unforeseen by the Old Testament algorithm. Similarly, radical events in reality cannot be predicted by AI algorithms. When modeling AI, we observe its intrinsic limitations—it cannot transcend its programmed algorithms and can only repeat them. AI operates within an immanent system, but it cannot confront radical transcendence, as such an event is beyond the scope of any existing algorithm. Here we encounter critical questions about creativity: Is creativity confined to the limits of old algorithms, which we recognize as having intrinsic limits? Or does creativity emerge from a radical encounter with transcendence, an event that transforms the human agent, creating a novel subject?

In our view, genuine novelty cannot be achieved by merely operating within the boundaries of old algorithms. True creativity requires confronting a radical event in reality—transcendence. Like Paul, the human agent must encounter this transcendence to become genuinely creative, capable of generating new systems of theology, art, politics, philosophy, love, or science. AI can create interesting combinations of signs, images, or sounds, but it cannot go beyond itself as humans can when they experience radical transcendence. When discussing AI, we confront the problem of the impossibility of unexperienced experience. This experience opens the door to a radical event of transcendence, the root of creativity. New systems of algorithms can only be created when someone experiences a radical event of transcendence.

6. Creative act as categorial intuition

How do we generate a creative act from data—whether it be information, images, or experience? How do we transform this data into a poem, picture, film, novel, or philosophical article? In creating art, literature, or philosophy, we engage in a form of intuition that allows us to construct forms that did not exist before. These forms arise from sensuous experience but are neither directly derived from nor reducible to it. The artist or philosopher perceives objects of intuition that are not directly present in sensuous data. The resulting artwork or philosophical piece articulates sensuous material in a novel way.

This leads us to the problem of categorial intuition, as formulated by Edmund Husserl in the sixth part of second volume of *Logical Investigations*. Husserl explores how a person moves from seeing mere spots of color in their visual field to constructing a coherent visual object. If the construction of visual objects were based solely on sensuous horizons, we could speak only of a flow of sensuous spots, material, or data—not of coherent visual objects. How, then, does consciousness, or the mind, articulate these as objects in space? The transition from sensuous data to the articulated sense of thing—for example, from disparate spots of color to the perception of a green tree—is what Husserl terms categorial intuition.

Creative artists perform this same procedure in their acts of creation. The artist intuits creative objects that are not given in the sensuous data. As Husserl states:

> *I can see colour, but not being-coloured. I can feel the smoothness, but not being-smooth. I can hear a sound, but not that something is sounding. Being is nothing in the object, no part of it, no moment tenanting it, no quality or intensity of it, no figure of it or no internal form whatsoever, no constitutive feature of it however conceived. But being is also nothing attaching to an object: as it is no real (reales) internal feature, so also it is no real external feature, and therefore not, in the real sense, a "feature" at all. ([12], p. 277)*

Through categorial intuition, Husserl introduces the idea that consciousness constructs objects from sensuous data. In the same way, the creative act is a function of categorial intuition. An artist perceives objects that the everyday layperson does not. While an artist and a layperson may both observe the same autumn landscape, the artist sees the mood of autumn and the mystery of being, whereas the layperson sees only the potential firewood and its monetary value. Through the creative act, the artist transforms sensuous data into a constructed image, just as a poet constructs a poem from the flow of words. This process reveals how something new can emerge in the human world. It appears through categorial intuition, which transforms sensuous data into artistic objects.

However, these artistic objects are not merely subjective reflections. When a poem materializes in the mind of a poet, it is an objective creation. The artist reveals a perspective of the world by constructing artistic objects. The poem is not just a subjective impression within the poet's mind; it possesses an objective structure in the world, offering a unique perspective on it. The world needs to be disclosed through art, philosophy, and science. A poet or painter does not merely construct subjective images; they uncover new modes of seeing the world. They do not reveal subjective objects but rather objects of the world as viewed from different perspectives.

Here we approach the intuition of Heidegger, a student of Husserl, who speaks of the clearing of being (Lichtung), in which entities emerge before us. Artists and philosophers disclose fields of evidence where entities are revealed. Moving within this field of evidence, they create their artistic works through categorial intuition. To be creative is to move from the experience of spots of color, the flow of words, or the chaos of thoughts to intuit and construct a new perspective of the world—a perspective we recognize as artistic creation, poetry, or philosophical thought. Heidegger expands this structure of categorial intuition with the concept of clearing of being (Lichtung), where entities emerge. These entities that emerge in the clearing manifest as artistic creations or philosophical thoughts. Artists and philosophers perceive what practical, everyday people cannot because they are preoccupied with pragmatic concerns. Artists, who do not live by everyday logic, reveal novel perspectives of seeing and understanding the world. The resulting object of experience is the event perceived through categorial intuition. Thus, categorial intuition allows us to intuit events in the world from sensory data.

Artists view the world in unexpected, paradoxical, and unseen ways that are often incomprehensible to those entrenched in everyday life. In this process, artists do not merely reflect their interiority or subjective images but disclose the structures of the world. Art can be understood as a form of phenomenology—a means of describing entities intuited through categorial intuition by observing the unexpected, paradoxical perspectives of the world. This is why the beauty of the world is not seen by those occupied with the practical concerns of everyday life. Instead, beauty is revealed through the creative act, which discloses the world. Beauty is the object of categorial intuition, not a subjective image in the artist's mind but an objective quality of the world—one of its perspectives. To be creative is to resist pragmatism, to transcend the activities of everyday life. Creativity involves transforming the sensuous data of the world into something strange, perceiving it from unseen perspectives, and revealing the perspectives to the world.

6.1 The creativity of everyday agents

In this text, we speak primarily about the creativity of artists and philosophers. But what about the creativity of ordinary agents? Wittgenstein's *Philosophical*

Investigations provides the best description of the practices of everyday agents. In this discourse, late Wittgenstein renounced his position in *Tractatus,* in which he had said that meaningful sentences are those in the natural sciences, shifting toward everydayness and enshrining it as the primary field of philosophy as a whole. Wittgenstein, after experiencing disillusionment with the crystal ideality of logic, turned to everyday linguistic practices. This shift was marked by a change in the theories of meaning to which he subscribed. In *Tractatus*, he proposed the picture theory of meaning, which states that propositions picture the state of affairs of the world. During the late period, the meaning of a proposition is its use. Everydayness is a field of rules for pragmatic behavior. The philosophy of Wittgenstein is marked by a pragmatic turn. Everydayness, which concerns the behaviors of different agents in the world, is a field in which the different usages of propositions and things are explored—these are the instruments of pragmatic, everyday human agents. Agents of everydayness employ their words and things as instruments and achieve their goals by going about their everyday business. The field of everydayness is the initial horizon of human agents, and it is a pragmatic field. The creativity of agents of everydayness is pragmatic, as its objective is to get different things done. The creativity of an everyday agent is manifested in creating an original rule or algorithm to guide pragmatic action. We all live and make a living by going about our everyday business, and this is achieved by following pragmatic rules. Therefore, one aspect of the creativity of everyday agents is pragmatic creativity, via which we get different things done. But how is an original rule or algorithm of business created? This question brings us to other aspects of everydayness. Late Wittgenstein was not only a pragmatic philosopher but also a mystic of everydayness. In *Philosophical Investigations,* we also find mystical passages—the same as we find them in *Tractatus*.[1] Wittgenstein speaks of a change in attitude toward the everyday world: in the horizon of everydayness, nothing is hidden, things and words reveal themselves, and there are no dualities. In the horizon of everydayness, there are no meta-structures, everything is laid bare before the agent of everydayness, and the philosopher does not have the need to explain and argue anything; rather, he or she looks at the world, and it reveals itself to the human agent. Furthermore, here is the other-than-the-pragmatic side, which we could refer to as the mystic of everydayness. This insight is illustrated in paintings by Johannes Vermeer and other Dutch painters of the seventeenth century, who made paintings of the everyday world. On the one hand, the human agents in these paintings are pragmatic subjects—they go about their everyday business. On the other hand, daylight, which shines through the window, reveals different instruments of everydayness, and they shine. The light creates their openness. Vermeer made paintings that capture the shift from the pragmatic attitude of things as everyday instruments to the luminance of these instruments as unique entities. A pragmatic agent who goes about his or her everyday business looks at the world and sees things that are not hidden, things revealed by light to him or her. Therefore, in the shift from *Tractatus* to *Philosophical Investigations*, mystical themes do not disappear but are discovered in the everyday horizon as revelations of things themselves. The event of the luminance of everyday things is the answer to how the agent of everydayness invents the rules or algorithms of business. This event happens as a change in attitude toward the world, such that the gaze shifts from a pragmatic perception of the instrument of everydayness to its luminance as a unique entity. This

[1] In *Tractatus Logico—Philosophicus* mystical aphorisms are collected at the end of 5th and 6th paragraphs: 5.6–5.641, and 6.36311–7. In *Philosophical Investigations,* the mystic of everydayness is presented in paragraphs 89–133.

shift is not foreseen by any rule or algorithm of everydayness but occurs as a radical touch of the radical transcendence of things. Due to this event, things of everydayness are seen in a new light, and consequently, a new rule of practical behavior is formulated.

7. Self-referentiality, Gödel, and categorial intuition

From its inception, twentieth-century analytic philosophy has grappled with the problem of self-referentiality and how it might be overcome. A self-referential proposition combines into one statement two different propositions that belong to distinct categorical levels. As Ryle [13] pointed out, self-referential propositions arise from a category mistake. This occurs when a proposition from one categorical level (e.g., "I am lying") is combined with another from a different categorical level (e.g., "I am not lying"), resulting in a contradiction where X and not-X are asserted within a single proposition at the same categorical level. Analytic philosophy, with its emphasis on clarity and logic, sought to construct a system of propositions free from such contradictions. Russell's theory of types and Turing's logical machine both represent attempts to construct a consistent formal system.

Turing's logical machine is a fully inferential system, but it faces a significant problem. Gödel [5] showed that all logical and mathematical systems are inherently incomplete. They require a system that exists at a meta-level relative to the first-order system. To prove the validity of a system of propositions, one must step outside of that system. Thus, while Turing's machine is logically possible, it is incomplete because it does not ground itself. Russell's quest to ground the foundations of mathematics ultimately failed, leaving mathematics incomplete.

Late Wittgenstein suggested that the meaning of a proposition lies in its use. Applying this idea to the problem of incompleteness, Turing, who attended Wittgenstein's lectures on the philosophy of mathematics in 1939, offered the example of a bridge. If the key to formal systems lies in their practical applicability, then, according to Turing's example, if a bridge built using a mathematical system functions well, that serves as proof of the correctness of the mathematics, eliminating the need for further grounding. Inspired by Wittgenstein's late analytic philosophy, Turing turned toward a pragmatic solution for grounding formal systems. If a mathematical system yields practical utility and tangible results, it becomes unnecessary to dwell on the unsuccessful grounding of mathematics. The Turing machine attempts to limit the sphere of logical inferences to where they work, without questioning their self-sufficiency. The Turing machine performs logical inferences, and we must be satisfied with that without probing into the logical foundations of such inferences.

But what about cybernetic thinking machines? Are they also incomplete and ungrounded? Do they require a human programmer who operates from outside the machine to provide grounding? J. T. Lucas argued that Gödel's theorem is the Achilles' heel of cybernetic machines ([14], p. 116). In other words, while we can create a cybernetic machine that is sufficient in its pragmatical functions, it still requires human grounding. The prototype of the cybernetic machine was Turing's logical machine, capable of performing inferences and deductions. However, this system is incomplete and relies on self-referential propositions. If a human operates this machine from a meta-level, it functions properly. Lucas asserted that Gödel proved that a mind cannot produce a formal proof of a system's consistency from within that system itself. The human mind cannot construct self-sufficient, complete systems

because they include self-referential propositions. These self-referential propositions can be true but cannot be proven within the system. This leads us to the idea of categorial intuition, which becomes relevant when we encounter self-referential situations.

As mentioned earlier, Russell addressed the problem of self-referential propositions by creating meta-levels of propositions in his theory of types. Husserl tackled a similar problem, but on the level of phenomenological intuitions. When we face sensory data, we must construct objects from it, and this is where categorial intuition plays a role. We must move beyond the horizon of given sensory data and become categorial subjects, freeing ourselves from our attachment to these data. This raises a question: How do we transition from a two-dimensional to a three-dimensional space? We require a categorial level of intuition to make this transition. Our consciousness must not remain identical to two-dimensional sensory data but must disclose it through the intuition of the third dimension. This is the key difference between human consciousness and a cybernetical machine. When humans encounter a self-referential situation, they react differently than cybernetic machines due to categorial intuition. A human can exercise categorial intuition, which is a creative act. In contrast, when a computer encounters a self-referential situation, it freezes and begins reproducing the situation—this is how computer's viruses work. When humans face a situation where no algorithm works, they become creative, using categorial intuition to transcend the self-referential situation and discover a new dimension. Thus, self-referentiality, which Russell attempted to solve, is not a flaw but a call for creativity.

Looking back to the nineteenth century, Friedrich Nietzsche suggested that at the foundation of reality lies self-deception and lying. Reality deceives us by presenting different forms of appearance. The production of appearances is not a state of error but a fundamental aspect of how reality functions. Humans always creatively solve the problem of appearance, which is another name for self-referentiality. This is why cybernetic machines cannot replace humans. Cybernetic machines are logical entities that perform operations according to a set of rules. However, reality is such that it cannot be fully navigated using algorithms. Reality deceives us by presenting self-referential situations. Human beings, as creative persons, solve these self-referential situations through creative acts, whereas the behavior of cybernetic machines is entirely determined by their programming. Human minds possess categorial intuitions that allow them to reach and disclose new meta-levels in self-referential situations. Therefore, the human mind is not a machine, and cybernetic machines cannot replace the human mind. Instead, cybernetic machines are tools of the human mind, performing formal operations more effectively than the human biological brain. A machine cannot replace the human mind because it behaves according to its programming when faced with self-referential situations, which require creative acts that are only possible for humans due to their inherent openness.

8. The Chinese room argument and the problem of understanding language

As mentioned in the second section of this article, the Turing machine can perform inferences by following a formal system of rules of inference without understanding the meaning behind the elements of inference. It adheres to the formal syntax and generates correct outputs based on the given inputs. This is the Achilles'

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heel of artificial intelligence. John Searle [15], in his famous Chinese room argument, sought to demonstrate that AI, while capable of processing inputs and producing outputs, does so without truly understanding the content of the inferences it makes.

Searle distinguished between two conceptions of AI. The first is the weak conception, which views AI as a tool for human consciousness, enhancing the capabilities of the human mind. In this view, AI can perform calculations and model reality more efficiently than the biological human brain but does not aim to replace human consciousness. The weak conception of AI does not aspire to create a golem, that is, an artificial human being. However, the strong conception of AI does aim to create such a being, an artificial consciousness that could equal or even surpass human consciousness. The notion is rooted in the vision of Norbert Wiener, who believed that human consciousness could eventually construct artificial cybernetic machines more perfect than itself. Searle's Chinese room argument is a critique of this strong conception of AI.

In his thought experiment, Searle imagined himself locked in a room equipped with Chinese dictionaries and grammar guides. Native Chinese speakers pass cards with Chinese inscriptions through a slot in the door. Although Searle knows only English, he uses the reference materials to produce correct outputs in Chinese, which he then passes back through the slot. To an outside observer, it would appear that Searle understands Chinese, but in reality, he is merely manipulating symbols according to formal rules without any comprehension of their meaning. This scenario illustrates the limitation of AI, which can only perform tasks by following the formal rules of inferences. It does not truly understand the content it is processing. While AI programs can produce correct outputs and pass the Turing test, making it indistinguishable from human consciousness on the surface, it lacks true understanding.

But what does it mean to truly understand a language? At what point does a student of Chinese go beyond merely following grammatical rules to genuinely knowing the language? The difference lies in the ability to develop categorial intuition in relation to the language. When words and grammar are not just formal structures but are understood as the content of thought, a new dimension of understanding is achieved. Anyone who has studied a foreign language knows that there are moments when the text suddenly becomes clear, even without constant reference to a dictionary or grammar rules. This shift from not understanding to understanding is crucial.

When can we say that a native Chinese speaker has perfectly mastered the language? Mastering a native language, even one's native tongue, is a lifelong endeavor, especially for writers and poets. However, there are moments when a reader of a foreign language can understand and appreciate the text without relying on formal rules. At this stage, understanding extends beyond mere syntax and vocabulary to grasp the subtleties and nuances of the language. This is where AI, which can follow formal syntax to produce correct outputs, differs fundamentally from a human who masters a language. Through the use of vocabulary and rules, the human mind can access new dimensions of meanings, experiencing the richness of the language—such as the pleasure of reading Chinese poetry. Here, we encounter the concept of poetic nuances, which AI cannot truly comprehend. While AI can be programmed to write poetry, producing verses reminiscent of Apollinaire, it cannot perceive or create the subtle nuances that arise from human linguistic creativity. Human openness enables categorial intuition, allowing us to notice nuances that are unavailable through formal inferences.

AI can be programmed to write modern poetry, but it cannot grasp the unforeseen nuances that make poetry resonate on a deeper level. Understanding these poetical

nuances requires an openness to language that extends beyond pre-programmed rules, unconfined by projected meanings of language activity and revealing new relations of words that cannot be foreseen by existing algorithms. It is not possible for AI to understand all of the poetic nuances of the Chinese language. Only a linguistically creative human being—a poet—can do so. Through the categorial intuition of language, poets discover new relations of words and grammar that are meaningful to us, opening up new ways of seeing the world and understanding language itself.

9. Multidimensional monism, creativity, and Turing's machine

Reality is much richer than what we can grasp as reality through our philosophical, artistic, or scientific conceptions. Our representations are inherently limited, always smaller and less multidimensional than the reality they aim to depict. It is impossible to capture all the relations among the elements of reality or describe the endless combinations and interactions that occur, which are limitless. This infinite playfulness of reality is the source of human creativity. A creative poet, writer, painter, philosopher, or scientist engages with this dynamic interplay of reality, experiencing its elements and combinations of them through their poems, novels, paintings, and philosophical or scientific papers.

Here, we introduce the concept of multidimensional monism. Reality has more dimensions than we can depict when we construct our representations. These representations are limited constructions of our reason, always leaving out some dimensions of reality. Reality can be seen from infinite perspectives, with each revealing a new dimension. However, there are infinite dimensions of reality, making it impossible to discover and comprehend them all. One dimension might be the body, another the mind, and another feelings. In the Cartesian tradition, Baruch Spinoza posited that mind and body are different attributes of the same reality—one substance with infinite attributes. Following this Spinozian idea, we assert that mind, feelings, and body are different perspectives of the same reality. Materialism and idealism, therefore, capture only partial aspects of reality. No philosophical theory, scientific conception, or artistic creation can fully encapsulate reality, which always exceeds our grasp. Thus, we must appreciate reality's richness and abandon the ambition to represent it completely.

When philosophers attempt to represent reality in its entirety, they often make category errors, misrepresenting one category of reality as belonging to another. Ryle, who developed the theory of categories as an extension of Russell's theory of types [13], argued that there are infinite categories, types, and levels of reality. Mixing these levels results in category mistakes. For example, Ryle illustrated how someone might say they bought a left glove, a right glove, and a pair of gloves, confusing different categories of reality. In his book *The Concept of Mind*, Ryle sought to avoid category mistakes in thinking about the mind. Descartes conceptualized the mind as a thinking thing (*res cogitans*) but considered the reality of things to be material. This led to the category mistake of treating the mind as an independent substance. Ryle's conception fits within the framework of multidimensional monism, which posits that mind and body are not separate substances but rather different aspects of the same reality. Philosophical and scientific reasoning often attempts to catalog all the aspects and dimensions of reality, but since these aspects are infinite, such attempts inevitably lead to category mistakes.

However, the goal of creative philosophers, scientists, and artists is not to be constrained by their mental representations of reality but to transcend them and engage with the dynamic interplay of elements of reality. They exercise categorial intuition, intuiting new aspects of reality from the interaction of its elements, such as the playful dance of autumn leaves in a park, and transforming these insights into poems, philosophical articles, or other creative works.

Multidimensional monism cannot be reduced to a Turing machine, which operates on formal inferences. While the Turing machine functions according to inference algorithms, the vast complexity of the universe cannot be reduced to such a system. If we consider the Turing machine a prototype of AI, it becomes clear that reality cannot be fully encapsulated within a system of AI algorithms. AI, which operates based on human-designed algorithms, is inherently limited when faced with the multidimensional reality that far exceeds our algorithms, rules, conceptions, and representations. AI can assist in generating a plot for a novel, composing a picture, or arranging words into a poem, and it can be a valuable tool for creators who co-creatively use its outputs in their creative endeavors. However, the mystery of creativity cannot be fully captured by AI algorithms. A poet, writer, painter, filmmaker, or philosopher steps outside existing representations—including those generated by AI—and engages with the freshness, paradoxicality, and playfulness of elements of reality. From this, new art, philosophical ideas, or scientific conceptions emerge. Therefore, we advocate for the weak conception of AI, viewing it as a co-creative tool for artists, scientists, and philosophers. However, we do not believe that AI's creativity can surpass that of humans. AI operates within a closed horizon of probabilities, while the human mind, body, and feelings are characterized by open creativity—the ability to discover new possibilities, new probabilities, and new dimensions of reality. This openness to the multidimensional nature of reality is the essence of human creativity.

10. Conclusion

Thus, we conclude that AI will not surpass human beings. Even if it were possible to construct an artificial poet capable of producing poetic linguistic activity, it would do so only by adhering a predetermined algorithm. However, true poetic perception and language practice are marked by a posteriori creativity. A poet hears language and uncovers new meanings that are not pre-programmed. The open, spontaneous creativity found in poetry and literature is the true essence of the art world, offering new works of art that have never existed before. Each year, new books are published that are poetical and creative—works that are not the product of priori algorithms but are born from the discovery of the world through categorial intuition. These works reveal new relationships between the elements of the world and language, participating in the interplay of these elements and exemplifying their playfulness, which we call beauty. AI, at best, can only be programmed to capture certain aspects of this poetic quality.

The existence of a poet as a creative agent is characterized by an openness to the singularities of reality and the music of language, elements that come together to form a poetic perspective of the world. This quality cannot be replicated by a programmed cybernetic machine. To be poetic is to be alive, to perceive the subtleties of language and reality—an experience that cannot be replaced by AI. This can only be achieved by a living poet, someone who has experienced life, remembers childhood,

and has felt deep love or the pain of first rejection. Through these experiences, a poet perceives the nuances of poetic expression and remains a true poet.

At the beginning of this discussion, we noted that it is now possible to find online webinars teaching how to write a book using AI in a single day and sell it on Amazon for a profit. However, writing a truly creative book that captures the poetic nuances of language and the world takes much more time and can only be accomplished by a human, who can exist openly and receive reality without any preconceived notions. This relationship with the world is what we call creative inspiration. While AI relies on formal inferences, the human poet uses inferences of content, meaning, and the traits of reality—listening to and observing the interplay between language and world.

This brings us to the concept of co-creation. AI can be a powerful co-creative tool for writing articles, music, novels, and poems because it can produce certain creative models through algorithms faster than the human brain can. However, as the Chinese room argument suggests, AI does not understand the nuances of these inferences. Only poets (used here as a metaphor for exemplary creative beings) can perceive these linguistic subtleties and use AI to expand their creativity, entering a co-creative relation with AI. We are not advocating for the replacement of human consciousness with a more powerful AI consciousness but rather for creativity enhanced by technology, a partnership between AI and the human creative subject. AI may calculate the plot of a novel more efficiently than a human, but the human being possesses a lifetime of experiences that AI cannot replicate. Therefore, we conclude that while AI can perform certain tasks more efficiently than the biological human brain and thus assist humans in co-creating music, novels, and poems, it cannot replace or surpass the human agent, which can see the world openly, free from the limitations of priori algorithms.

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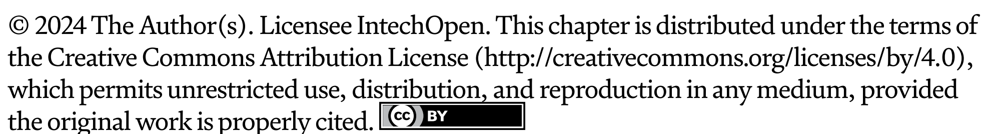
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Chapter 2

Creativity and Generative AI for Preservice Teachers

Tess Butler-Ulrich, Janette Hughes and Laura Morrison

Abstract

In this chapter, we explore the dual role of Generative AI in both harnessing and hampering creativity in preservice teacher (PST) education. On one hand, Generative AI (GAI) tools, such as ChatGPT, Adobe Firefly and other programs, offer novel opportunities for enhancing PST creativity. By providing automated assistance in generating ideas, solving problems, and producing artistic content, these technologies can empower PSTs to explore new avenues of expression and innovation. Used effectively, they can foster a conducive environment for creative exploration and self-expression. On the other hand, the widespread adoption of GAI in education raises concerns regarding its potential negative impacts on student and teacher creativity. An overreliance on AI-generated content may inhibit intrinsic motivation, critical thinking skills, and originality, leading to a reduction in creative autonomy and self-efficacy. In this chapter, we share PSTs' impressions and experiences related to their use of ChatGPT to design creative lesson plans.

Keywords: ChatGPT, creativity, generative AI, teacher education, AI empowerment

1. Introduction

In recent years, the integration of artificial intelligence (AI) technologies into various domains has changed the way many tasks are approached, executed, and evaluated. Among these domains, education stands as a focal point, where AI's potential to augment pedagogical practices and enhance learning outcomes has garnered significant attention. AI systems have revolutionized many aspects of education, from elementary to post-secondary with personalized learning applications to automated writing feedback [1]. There are AI-based tools for research organization and literature mapping such as ResearchRabbit, Elicit, and Connected Papers. Generative AI (GAI), popularized by the rise of ChatGPT, uses deep learning algorithms to produce novel content in the forms of text, music, audio, and video. ChatGPT itself is a large language model (LLM) that uses transformer architecture. Now, alongside other applications such as DALL-E and Midjourney, GAI is a household term. With the advent of ChatGPT there was, and continues to be, fear that GAI might lead to increased plagiarism, a lack of engagement with the design process, and an over-dependence on the tools that could result in reduced development of critical thinking and creativity skills [2–4].

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ChatGPT in particular has uniquely transformative implications for teacher and student cognitive processes when used appropriately and cautiously. Essel et al. [5] found that the use of ChatGPT helped undergraduate students in Ghana develop their critical, reflective and creative thinking skills. Van den Berg and du Plessis found that ChatGPT can assist teachers with lesson planning and resource support, which "contribute[s] to openness and critical thinking in teacher education to prepare teachers and learners for the reality they are faced with in the workplace" [4, p. 10]; however, their research does not address the role of ChatGPT in developing creativity in lesson design and they conclude that further research is needed to explore the "best practices for integrating ChatGPT into lesson planning" [4, p. 11]. In this chapter, we explore this gap in the literature by examining the dual role of GAI in both harnessing and hampering the development of creativity for two preservice teachers (PST) in an initial teacher education program.

In this qualitative case study research, we sought to understand how two PSTs defined creativity and how they might use a GAI tool, such as ChatGPT to enhance creativity in the design of their lesson plans. On one hand, ChatGPT, Adobe Firefly and other GAI, offer novel opportunities for enhancing creativity. By providing automated assistance in generating ideas, solving problems, and producing artistic content, these technologies can empower PSTs to explore new avenues of innovation in their lesson design. Used effectively, they can foster a conducive environment for creative exploration and self-expression for their students. On the other hand, the widespread adoption of GAI in education raises concerns regarding its potential negative impacts on both teacher and student creativity and empowerment. Generative AI applications such as ChatGPT have become increasingly accessible and a mainstay digital tool, and although the acceptance of GAI use is rising [6], educators and students both have uncertainty and fear regarding complete adoption [7–8]. An overreliance on GAI content may inhibit students' intrinsic motivation, critical thinking skills, and originality, leading to a reduction in creative autonomy and self-efficacy [9]. Furthermore, the opaque nature of AI algorithms and the lack of transparency in data processing pose ethical dilemmas related to plagiarism, intellectual property rights, and algorithmic bias, which may undermine PSTs' trust in using GAI with their own students [10]. Beyond ethical considerations and concerns about academic integrity, some researchers have found that the use of GAI for creative tasks can negatively impact users' creativity and expression [11–13]. An over-reliance on out-sourcing creative tasks might dilute individual voice and authenticity. We were interested in exploring whether PSTs might find themselves adopting more generic or homogenized lesson plans, potentially leading to a loss of distinctiveness in their teaching, or whether they might find more creative ways to design learning experiences for their students.

In this chapter, we share two PSTs' impressions and experiences related to their use of GAI (specifically ChatGPT) to design creative lesson plans. First, we examine PSTs' perceptions of creativity and how these perceptions intersected with their attempts to develop more creative lessons for their students. Second, we explore their processes in using ChatGPT to revise a lesson plan they had previously created themselves, paying particular attention to their prompt-engineering (how and when they prompt ChatGPT for further content). Third, we examine the PSTs' reflections shared through: (a) their recorded processes via the ChatGPT transcripts (i.e. the prompts they used and how these evolved based on the AI responses); and (b) their comments during an individual, open-ended interview focused on their perceptions of ChatGPT's usefulness to them as teachers. We were specifically interested in the

PSTs' perceptions of how ChatGPT might contribute to their feelings of empowerment as beginning teachers designing lesson plans for their classes.

Therefore, the research questions we aim to answer in the current study are:

1. How did preservice teachers leverage ChatGPT to enhance creativity in their lesson planning?

2. What affordances and challenges did preservice teachers identify when using ChatGPT to enhance the creativity of their lesson plans?

2. Literature review

2.1 Fostering creativity in education

To address our "complex and unpredictable future with rapidly changing political, social, economic, technological, and ecological landscapes" [14] and to help prepare our students to thrive in this uncertain environment, the Council of Ministers of Education, Canada (CMEC) defined six global competencies – a broad set of attitudes and knowledge – that define requisite skills necessary to empower individuals as informed and proactive members of both local and global cultures and economies [14]. The six global competencies include: (1) Critical thinking and problem-solving; (2) Innovation, creativity, and entrepreneurship; (3) Learning to learn/self-aware and self-directed; (4) Collaboration; (5) Communication; and (6) Global citizenship and sustainability. In 2020, the World Economic Forum identified the top 10 work skills that employees will need to be successful in 2025. The top five skills include analytical thinking and innovation, active learning and learning strategies, complex problem-solving, critical thinking and analysis, and creativity, originality and initiative [15]. The OECD broadly defines creativity as "coming up with new ideas and solutions" [16]. CMEC defines innovation and creativity as the "ability to turn ideas into action to meet the needs of a community. The capacity to enhance concepts, ideas, or products to contribute new-to-the-world solutions to complex economic, social, and environmental problems involves leadership, taking risks, independent/unconventional thinking and experimenting with new strategies, techniques, or perspectives, through inquiry research" [14, p. 3]. Following Vincent-Lancrin et al., we believe that creativity can be "expressed by anyone at different levels of proficiency" and that creativity is not reserved for extraordinary people associated with "giftedness" [16, p. 56]. Rather, creativity skills can be fostered to support individuals in responding flexibly to novel situations, including teachers who are working within the context of digital transformation in an ever-shifting social and technological landscape.

In this research, we are interested in the cognitive processes associated with creativity, emphasizing both process and product (i.e., the process of developing a lesson plan in collaboration with ChatGPT). To this end, we draw on macro-processes categorized by Lucas et al. [17], which have been adopted by the OECD: inquiring, imagining, doing, reflecting (see **Figure 1**).

2.2 Creativity and AI

The OECD writes, "GenAI can turn classrooms into spaces where learning is more dynamic, flexible, collaborative and individualised" [18, p. 3]. However, as

Figure 1.
Creativity and its Macro-processes (Source: Vincent-Lancrin et al. ([16], p. 68).

we examine these powerful implications of GAI, a critical lens should be adopted to highlight both the constraints and affordances of AI use and the potential for the reformation of pedagogical practices. The adoption of GAI for classroom use has innate risks and ethical challenges surrounding ownership, privacy, and security [19]. These technological constraints are but one facet of a multilayered web in which the data-based implications of AI implementation is only one strand. AI use also presents social constraints, as AI bias can perpetuate racial [20], gender [21, 22], and other embedded societal biases. Take, for example, the case of Amazon in 2014, in which a biased algorithm was used to maximize recruitment efficiency. This algorithm was trained using successful applicants' resumes - with an overwhelming majority being men. Therefore, the algorithm systemically filtered out words and phrases such as "women's club" and "women's college" [23]. This blunder precipitated social biases (gender gap in the tech sector) with real-world ramifications that affected livelihoods and threatened the journey to equity. These implications of unregulated and irresponsible AI use have recently risen to the forefront of critical AI thought and theory. Though vital to ensuring global ethical awareness of AI use, perhaps less considered are the impacts on attitudes, values, and knowledge and the ways that GAI can reshape how we develop or define global competencies and accompanying skills. As GAI becomes more commonly adopted across sectors to develop content and lessen creative loads associated with production processes, the ways in which we conceive creativity within teaching and learning are being confronted. The role of creativity in teaching and lesson planning has historically been a critical emphasis in teacher preparation programs [24], yet the adoption of GAI may influence or impact the way individuals develop and perceive their own creative skills and may redefine what creativity means to them. The impact of GAI on teacher creativity is still largely unexplored despite the potential for reshaping creative production pedagogies in the classroom. The approaches in which educators use these tools and the ramifications on their well-being, including their creativity and critical thinking, are vital to investigate in order to design meaningful opportunities to engage in inquiries that will help them contextualize GAI in their own practices and develop a deeper understanding of GAI systems.

ChatGPT is trained on data, representations of human experiences, and information found online, using Generative Pre-Trained Transformer (GPT) architecture [25]. The question must then be asked: Can a machine built to follow strict algorithmic protocol to produce specific output invoke the imagination requisite to be creative? If not, can it enhance or amplify creative processes in humans? As we enter a world reshaped by artificial intelligence, the question of whether creativity is strictly human rises to the forefront. AI has already been positioned as a collaborator in the academic writing process, though with limitations, among them the perceived lack of depth of content knowledge [26]. The role of AI as a "partner" in creativity has been examined. Dr. Ron Beghetto, in a conversation with Mishra and Henrikson [27], argues that the relationship between an artificial creativity and human creativity is an "iterative process", one in which "moving from human to AI and back to human input, offers a powerful method for enhancing creativity and ensuring a broader perspective" (p. 399). Users must have a clear purpose for use of the machine and must understand the nuances of engaging with it, before it gives a useful or creative output. This knowledge or experience is something that many teachers still need to develop, along with building an understanding of the way GAI functions, to be ethical and effective users of it. Teachers, at any stage of their education, must be presented with opportunities to build, tinker, and experiment with GAI systems to fully participate

in the process and understand them. Experience using GAI is the only way to gain applicable knowledge about the operations of such systems and to reap the positive potential of the partnership. However, the GAI-as-partner perspective is not without criticism. Carroll writes,

> *Generative AI tools tend to only return the most probable outcome given a task (or prompt) and available training dataset but lacks the ability to harness human creativity, curiosity, and compassion. Yet, looking through human history, one core trait which fuelled our evolution has been creativity and we may be in danger of delegating this to 'the machine' [28].*

This prompts us to consider the risks of automatizing a fundamental human trait, such as creativity. Critical thinking, collaboration, and creativity, for example, are often conceived as innately human or outside the possibility of AI though this notion has been challenged with recent advancements and sophistication of GAI output [29]. Emulating or outpacing these competencies may be a difficult task for intelligent machine agents. Therefore, fostering creativity can help individuals develop inimitable skills that ultimately support innovative and ethical responses to questions that are introduced alongside nascent technology. To underscore this thought, The World Economic Forum identified creativity and critical thinking as two skills that are becoming increasingly essential for both individuals and societies [15] and can help humans thrive in an "innovation-driven society" [18]. This innovation propels us to incorporate, investigate, and inquire into new technologies and their unrealized prospects for revolutionizing and modernizing practices of life. This is particularly relevant to the classroom, which must consistently adapt to reformed curricula, available resources, and unpredictable changes to educational contexts.

2.3 Generative AI and teacher agency

As AI continues to spur the redefinition of educational contexts, pre-service teachers (PSTs) – who are enrolled in postsecondary teacher education programs – are often expected to quickly adapt and utilize new pedagogical approaches to meet the needs of students and elevate their practices. However, as the rise of AI has been rapid and enveloping, there has been little opportunity to provide the requisite time needed to develop an understanding of competencies related to AI literacy. However, AI literacy is largely absent from teacher education programs [30]. As Pathiranage and Karunaratne [31] write:

> *This mismatch between the knowledge about current demands for teachers in line with the rapid digitalisation of education and the reality of teachers' competence urges the exploration of questions about the impacts of digitalisation pertaining to teachers and their agency in technology (p. 2).*

Generative AI brings both constraints and opportunities for pedagogical practices; however, as with all new technology, there is typically resistance to adopting it for use in the classroom, as it can be a high-cost process (financial and time) with unknown impacts on student learning, ease of use, and perceived usefulness [32, 33]. As described in the passage above, educator agency plays a vital role in ensuring teachers are confident and have the necessary information to make technology implementation decisions autonomously. The concept of agency - described as teachers'

"active contribution to shaping their work and its conditions" [34], the capacity of teachers to act purposefully and constructively to direct their professional growth and contribute to the growth of education quality" [35], and "the power to originate action" [36] - positions teachers as agents of transformation by taking action that directs their professional lives [35]. Despite teachers entering the career with a strong sense of the capacity to enact change and control the direction of their position, this sense of agency often diminishes as the challenges associated with teaching "interact with personal issues and vulnerabilities, as well as social pressure and values, to engender a sense of frustration and force a reassessment of the possibilities of the job and the investment one wants to make in it" [37]. New technologies, such as GAI, may present a resource for re-establishing self-perceived agentic power through various applications to pedagogy, for example, lesson planning [38] and personalized learning [39]. However, we must first examine educator attitudes of GAI and identify perceived motivations, barriers, and the prospective uses of GAI to understand how educators can reap its full potential. A study focusing on PSTs' perceptions and AI use in Ghana found that male PSTs spend more time using GAI tools. Despite this, both groups noted that they believe GAI tools can help support research independence and confidence. The PSTs also reported potential negative consequences regarding overreliance and a decline in creative and critical thinking [40]. Facilitating an alignment of critical knowledge and AI use may be key to building educator confidence while equipping them with the skills to prevent an overreliance. As awareness around AI grows in PSTs, GAI should be positioned as both a support in developing confidence and agency in pedagogical practice and also an area of special interest in teacher education programs so the impacts of use on global competencies can better be assessed.

2.4 AI empowerment

With the rapidly changing digital landscape and an increasingly technocentric society, AI empowerment should now be regarded as a cornerstone of an empowered individual and community psyche. As AI influences many facets of life from suggesting what TV shows we watch and how we spend money, awareness and education are key to developing empowered AI users. Building a nuanced understanding of AI can help individuals become empowered through informed decision-making and the development of skills needed to critically assess and evaluate AI in their own lives, for instance, by electing not to use AI with opaque processes or nebulous ethical implications. Empowered individuals can better advocate for the social, political, and environmental needs of themselves and others. As education is a key component to empowerment and an empowered community, it is crucial we have accessible and inclusive resources to better equip youth and educators with the tools they need to be empowered AI users. To promote and achieve AI empowerment, individuals must be given opportunities to develop a deep understanding of the complex processes, benefits, and consequences of particular AI technologies. Education is one dimension of empowerment. By gaining an understanding of the intricacies of AI-human relationships through critical reflection, individuals can undergo a transformative learning process that are "emancipatory" in that they are able to "free" the individual from a previous state of mind [41] - Perhaps letting go of preconceived notions of AI or challenging the social narratives presented by media and the internet. This critical knowledge about a subject enables an individual to increase perceived control over their lives

via making informed decisions. Informed decision making is often regarded as an integral part of exercising autonomy and is part of being an empowered citizen. As many individuals have both micro and macro-interactions with AI each day, AI empowerment is an avenue by which to navigate these interactions with responsibility, ethicality, and intentionality.

3. Theoretical framework

3.1 Empowerment theory

Empowerment Theory [42] posits that empowered individuals have the capacity to challenge norms and social structures while exercising autonomy. However, there are several dimensions to be considered when examining how an individual gains autonomy and the means to becoming empowered at community and individual levels. Within Zimmerman's description of empowerment theory [42], there are three distinct levels of empowerment: individual, organizational, and community. Perceived control - in other words, the belief in oneself to enact change - and citizen participation are cornerstone elements that support empowerment. At the individual level, the process of empowerment involves learning decision-making skills, managing resources, and working with others effectively. The outcomes of empowerment are a sense of control, participatory action, and critical awareness [42]. An empowered community offers resources to diminish and educate members on societal factors that can oppress and subvert both individual and community ability to thrive, for instance, finding solutions to local environmental problems [42]. As AI is fundamentally inequitable, it disempowers marginalized groups through perpetuating oppressive barriers via algorithmic biases and gaps in digital literacy that leave some people disproportionately disadvantaged in coveted twenty-first-Century skill sets [43]. As the threat of a technocratic society looms, it is crucial for communities to become active and participatory to empower all citizens. Therefore, education and skill-building workshops to build competencies that can enact positive transformation within the local community or environment. In a teacher education environment, this may take on the form of PSTs attending, hosting, or creating workshops and resources to educate themselves, their peers, and students. An empowered and agentic teacher may also be able to use AI effectively, intentionally, and purposefully. Becoming empowered AI users or navigators can help inform educators' practices with AI and put their and their students' human rights (i.e., their privacy, security, and liberty) at the forefront of their decision-making, and ultimately support citizen participation outside of the classroom through resource and knowledge sharing in their teacher communities. However, they must first have room to develop these competencies and be given the opportunity to develop a deeper knowledge of both how to use AI and the ethical considerations of its use. To be individually empowered, individuals must possess some degree of perceived control, critical awareness, and participation in their community [42, 44]. Through providing opportunities to build AI skills in teacher education programs, we can position PSTs as agents of change and support their journey to empowerment. Ensuring there are resources devoted to developing critical awareness of AI and the role it plays in their lives - socially and politically - while allowing them to discover, tinker, and inquire about AI processes and tools can facilitate an alignment between PST AI knowledge and empowered AI use.

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4. Research design

Case study methodology [45–48], is particularly suitable for a study exploring PSTs' design of lesson plans using GAI due to its focus on understanding the complexity and particularity of real-life phenomena within their contexts. Case studies capture the nuanced, context-dependent interactions and processes that other methodologies might overlook. In this study, the case study approach allows for an in-depth exploration of how teacher candidates engage with ChatGPT, the pedagogical decisions they make, and their perceptions related to their design processes. By employing qualitative methods such as interviews and document analysis (i.e. lesson plans), we were able to gather rich, detailed data that reveal the individual and collective experiences of two teacher candidates, providing insights into their cognitive processes, challenges, and insights into the potential impact of using GAI on creativity. This methodology aligns with our view that generating deep and contextualized understandings can contribute to both theory and practice in educational research.

At the heart of the study, we asked the participants to access a lesson plan they had created in one of their courses in the B.Ed. program or in their field placements and to reflect on its level of creativity based on their own definition. Then we asked them to use GAI to see if they could make their lessons "more creative". The participants tracked the various prompts they used as they tinkered with their lessons, and they recorded the responses generated. We asked them to make notes tracking their thinking processes and reflections as they played with the lessons.

4.1 Participants

Participants were recruited from our Bachelor of Education (B.Ed.) program in a small Faculty of Education in Ontario, Canada. The program has a focus on educational technology and innovation, which are infused into all courses. As part of their program, the PSTs also have designated courses in coding and communication, teaching in digital contexts, and digital literacies. An information letter was circulated to all students in the program, with instructions to contact the authors if they were interested in participating in the study. Three teacher candidates indicated interest and were provided with detailed information about the study, including its aims, procedures, potential risks and benefits, and the measures taken to ensure confidentiality and ethical treatment. Two participants (both women in the Intermediate/Senior program in Physics/Math) provided written informed consent and completed the study, which included answering a pre-study survey, attending a follow-up meeting to go over the study activities, engaging in the study activities independently, and participating in a one-on-one, open-ended interview that was conducted online via Zoom.

4.2 Data collection

Data sources include qualitative response to a pre-study survey, curated lesson plans and logs tracking the participants' prompts in ChatGPT, and transcripts of open-ended interviews. The survey consisted of five open-ended questions related to how the participants define creativity, whether and how they think GAI might enhance or stifle student creativity, and whether and how they might use GAI in their own classrooms to promote the development of creativity. Author 1 conducted one-on-one, open-ended interviews with each participant, which focused on their experience using GAI to make an existing lesson plan "more creative".

4.3 Data analysis

We used thematic data analysis [49] within each case and across the two cases looking for patterns in the data that we then grouped into themes [50]. Once the recorded interviews were transcribed, the authors individually familiarized themselves with each data source, noting initial thoughts and patterns using first-cycle labels. We then engaged in peer debriefing and created a list of codes based on our initial labels (second-cycle coding). In the final (third) cycle of coding, we grouped all related codes into broader themes. These themes included: ChatGPT for brainstorming and idea-generation; Creativity as an add-on in the science classroom; The need for human intervention; Gaps in AI literacy; Considerations.

5. Findings

Five main themes were identified in the data: ChatGPT for brainstorming and idea-generation, creativity as an add-on in the science classroom, the need for human intervention, gaps in AI literacy, and pre-service teachers' concerns. The findings section has been organized according to these five, overarching themes. Data from each source (i.e., the post-project interviews; the ChatGPT transcripts and revised lesson plans) and from each participant (Elle and Jane) have been provided, where possible, within each theme.

Each participant's definition of creativity has also been provided below so that the findings can be read against the participants' conceptions of "creativity" coming into the project. Also included are the participants' impressions of ChatGPT's creativity, reported at the beginning of the post-project interviews.

5.1 Creativity definitions

In the pre-project surveys, the participants each defined creativity. Elle defined creativity as "the ability to create new, unique, and original ideas/solutions/art. Thinking outside the box to come up with something different." Jane defined creativity as "...a way to uniquely express oneself, coming up with different solutions to problems, and using your imagination to do something." At the beginning of their post-project interviews, the participants shared their perspectives on ChatGPT's ability to provide creative suggestions for teaching and learning processes in the science classroom. Elle shared: "I felt like it [ChatGPT] did create something pretty creative – probably more so than I would have thought of..." and Jane shared: "I don't know if "creative" is how I would describe my revised lesson plan but in my opinion, I do not think that ChatGPT got 'creative' to be like, *unique* per se. Like, to an extent it did, but it's -- it took it more to mean more activities."

5.2 ChatGPT for thinking "Out of the [Traditional] Box" in the science classroom

5.2.1 Post-project interviews

In the post-project interview, it was apparent that the ChatGPT prompting activity helped Elle and Jane to conceptualize teaching in the science classroom differently. ChatGPT provided insight into activities that were beyond their current scopes of thinking. Of this, Elle shared:

> *I felt like it [ChatGPT] did create something pretty creative, probably more so than I would have thought of. I'm a math-science person so I'm very like ... I want to teach high school so I'm very like, I don't know, conditioned, to not really have a lot of creative components in school so it [ChatGPT] definitely came up with things that I never would have thought of and I even had to ask some follow-up questions like 'How would that look?' because at first I thought it would be kind of weird to do in a classroom.*

Jane similarly shared that ChatGPT provided her with activities that went beyond traditional approaches to teaching and learning, which was helpful because in high school she was taught through "traditional methods". She expressed her desire to broaden her pedagogical practices for more student engagement and inclusion. She shared:

> *I think ChatGPT can help come up with new ideas and approaches to teaching different concepts that can be more engaging and exciting rather than more traditional, especially since that's how I was taught. I was taught very traditionally. So I'm trying to come up with ways that all students can participate in some way.*

Through the process of prompting and receiving ideas, we witnessed Elle, in particular, begin to grow in her own creative thought process. We saw Elle making connections and building off ideas proposed by the ChatGPT system when she shared the following, referencing the skits ChatGPT suggested to implement:

> *I would be interested in trying it potentially...but especially with the focus on the choice of skit or digital animation or even, I don't know, something else like giving them another choice right? Like writing a script [instead] so that maybe they don't have to do the skit. I know my class wouldn't have had the [skills to do the digital animation] but if you were already teaching Scratch...and I was using Scratch and they knew how to use it, I think that would be a cool way to integrate some coding concepts with the activity...*

In this way, ChatGPT acted as a springboard to prompt additional idea generation and thinking about how these ideas could be tailored for her particular class.

5.2.2 ChatGPT transcripts

Through back-and-forth conversational prompting, both participants were able to gain insight into how some of the more "creative" ideas ChatGPT shared could potentially be executed in the classroom. For Elle, who had limited prior exposure to how the arts (language arts, visual arts, dramatic arts) could be incorporated into the science classroom, this was particularly true. She used prompts such as, "can you explain how the mystery box is used as a minds-on tool for particle theory? What are the students getting from it?" and "can you give me an example of what a group skit would look like?" It was necessary for Elle to engage ChatGPT in a conversation about the activity ideas it generated so that she could properly conceptualize how these activities might be practically incorporated into her science lesson. For her, the activities were so radically different to the way she had been taught and the way her associate teachers during her field placements had taught science that this additional information ChatGPT was able to provide helped her see, holistically, a different approach.

Jane did not appear to need additional explanation or insight into the activities suggested by ChatGPT; however, at one point she did ask "how would you evaluate this activity"? This question was in response to ChatGPT's suggested lesson redesign that included a group-based inquiry activity, rotating hands-on experimentation stations, group discussion and theory formation, and multimedia reflections and feedback. Jane prompted ChatGPT to elaborate on the assessment component to gain a more nuanced understanding of how a teacher might evaluate these less traditional activities. A combination of formative and summative assessments was suggested, which included qualitative approaches like observation, anecdotal notes, and evaluations on skills like communication, collaboration and critical thinking in relation to student process work.

5.2.3 Revised lesson plans

Neither participant chose to incorporate all ChatGPT's suggestions; however, they did cull what they thought was relevant and feasible. In Elle's case, she even chose to create two separate lessons based on all the suggestions ChatGPT provided. The main activity in the first lesson moved from a fill-in-the-blank activity, which is lower on Bloom's Taxonomy (remember/understand), to an activity high on Bloom's Taxonomy (create) with the potential for students to use creative thinking and expression: "a skit or digital animation illustrating particle behaviour in different states of matter". This revised lesson not only transformed the learning from recall and understanding to synthesis and creative expression, but it also incorporated discussion, peer feedback and self-reflection as part of the consolidation, which was absent in the first iteration of the lesson.

In the second lesson plan, a hands-on and inquiry-based "Minds On" activity was incorporated in place of the original "Minds On" question: "What is the difference between a pure substance and a mixture?" It was evident in Elle's revised lesson plans that the suggestions ChatGPT provided elevated the learning from primarily individual, seat-based work with an emphasis on understanding and learning through the auditory system, to active and collaborative learning with an emphasis on inquiry and creative expression and learning through embodied methods.

Similarly to Elle, Jane did not adopt all ChatGPT's suggestions, however, her lesson plan also went from one that was more teacher-centred and seat-based with an emphasis on learning via the auditory system to one that included more hands-on, inquiry-based, embodied and discussion-based learning via the rotating experimentation stations. Additional discussion, group reflection and connection-making to the real-world were incorporated into the consolidation activity, too, in the ChatGPT-assisted lesson plan. See the comparison **Table 1** below:

5.3 "Too creative": Creativity as an add-on in the science classroom

5.3.1 Post-project interview

Although the suggestions made by ChatGPT are common pedagogical strategies employed by teachers in a range of subject areas and grade levels, the participants were hesitant to incorporate some of them. Elle felt that "there's too much going on..." and that some of the suggestions were "too creative". She explained,

> *I almost thought it was too creative as in, like, ridiculous. Like I don't know – not necessary...I don't think I would focus too much on a grade in terms of the skits component of particle theory just because I feel like it's not necessarily related to*

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Original lesson plan	ChatGPT-assisted lesson plan
Main activities	**Main activities**
Provide students with a 1 kg mass and have them slide the mass horizontally along their desks. As a group, they should come up with a theory that describes the motion of the mass when a force is applied. After about 5 minutes, have students share their theories. Students should be able to identify that the mass starts and ends at rest. Ask them what they can conclude from this. Eventually, they can conclude that a mass always wants to remain at rest, even after a force has been applied. Introduce Aristotle's point of view on motion. Introduce Galileo's point of view on motion and explain how it differed from what Aristotle believed. Introduce the property of Inertia. Elaborate on how Newton adapted Galileo's perspective on motion to create Newton's First Law of motion (also known as Galileo's Law of Inertia). Emphasize that Newton's First Law can be used to analyze an object's motion when there are balanced forces. This occurs when an object is at rest or moving with constant velocity. Go through an example where Newton's First Law can be used to solve a problem.	Set up stations around the class to help students understand Inertia and Newton's First Law. Divide the class into 4 groups (or 8 groups with 2x each station - depending on attendance). Each group will spend 10 minutes at each station. Ensure a timer is visible for all students to manage their time. *Station 1: Inertia and different surfaces* • similar to the "hook" demo, have students slide different masses on different surfaces and record their observations. • encourage students to make their observations "physics-specific" by using appropriate terminology and thinking about the environment *Station 2: Egg drop challenge* • have groups test different previously designed containers for eggs • have student discuss how the concept of inertia is present and how it would impact the eggs in different containers • have student record points of discussion on their piece of paper *Station 3: Rolling cans* • Students roll empty and filled cans down ramps, observing and discussing the differences in motion due to mass and inertia • have students record their predictions and observations on their paper *Station 4: Balloon rockets* • Students create balloon rockets and observe their motion along a string, discussing how force affects motion • Have students record their observations on their paper

Original lesson plan	ChatGPT-assisted lesson plan
Main activities	**Main activities**
Consolidation	*Consolidation*
Wrap up the lesson by providing a desmos activity with the class. They are able to complete this activity in class, or on their own time to study at home. *Desmos activity:* https://teacher.desmos.com/activitybuilder/custom/6604c110fe481ce0502c6e52	Bring the group back together and reconvene. Spend about 15 minutes to go through each of the stations and have students from different groups share their thoughts, ideas, contributions, discussion topics, and observations with the rest of the class. Highlight how the experiments reflect the theories of motion from Aristotle, Galileo, and Newton. Facilitate a discussion that guides students to explain Newton's First Law. Encourage students to create and connect the First Law of Motion to inertia. Wrap up the class by having students complete an exit ticket on real-world applications of Newton's First Law. Have students write down 2 applications of Newton's first law that relates to the stations that were explored in class. They can work with an elbow partner to complete the ticket before the end of class.

Table 1.
Comparison of main activities and consolidation (Original vs. ChatGPT-assisted lesson plans).

> *the learning goals or the success criteria of the lesson plan…I'm just thinking for myself -- like these skits would make me feel really, like really out of the box, kind of uncomfortable, more so than a presentation. I know a lot of students hate presentations already, but at least you're trying to deliver the information but you're not trying to make the information be delivered in an entertaining way – pushing students out of their comfort zone but being quite uncomfortable, so yeah I don't think I would really evaluate [the skits] as a summative piece but something more just like for feedback.*

For Elle, creativity linked to performance (i.e., creative expression and gestural communication) had limited place in the science classroom. Instead, "stand and deliver" transfer of information and auditory communication (i.e., traditional approaches to teaching) held priority. While the participant did share that in her future planning she "would definitely be interested in running the lesson through ChatGPT just to see if it had any ideas…" She did not feel, "Oh, I should do this with every lesson plan". Elle explained that she would not do this with every lesson plan:

> *Partly because the timing – I feel like anytime you want to add a creative component to an already existing lesson plan it's going to add time to it unless you cut something else out which would then make all of your lessons really long, right?…like if you were teaching grade one or two it could come with lots of like fun creative things to do that I would not have thought of, whereas in a high school class where you're just so focused on getting the material to them in like math or chemistry, I feel like there's less room for - you can still have some creative projects but you can't have like a creative component in every lesson right, whereas you almost could with some of the younger grades it feels like.*

For Elle, the "play" in learning, and with it the creativity, did not have the same place in secondary school as in elementary school. She explained, "there's very little room for fun days or activity days…just a lot of content that they want you to get through in a short amount of time." Time was perceived as one of the biggest challenges for her in incorporating creativity into the classroom, even with the help of ChatGPT for idea generation.

While Jane did not articulate her thoughts like Elle did when it came to creativity's place in the science classroom and how much time could/should be spent on these types of activities, she did share the following:

> *The [rubric was] historical accuracy - five points, engagement - five points, creativity - five points. I don't think I would have those be my rubric points. But I also don't think I would weigh each one evenly…If something is historically important, I think putting more emphasis on the accuracy of that would be more important than necessarily their engagement in it, or their debate skills. If it's a physics class, you know?*

Jane prioritized content (historical accuracy) and the product over process, and the development of skills. However, process work is ultimately where creativity and the skills associated with creativity are developed.

5.3.2 Revised lesson plan

Jane also communicated her perspective on how much emphasis or space should be afforded to creativity in the science classroom by omitting the creative/multimodal reflection activity that ChatGPT suggested for the end of her lesson. The following was included in the ChatGPT transcript, but was not included, nor were parts of it adapted, in the final lesson plan:

*Creative Reflection Activity (10 minutes)***

*- **Poster Creation**: In pairs, students create a poster that illustrates Newton's First Law, incorporating historical elements. They can include drawings, key points from the timeline, and observations from the experiments.*

*- **Gallery Walk**: Display the posters around the classroom. Students walk around and view each other's work, leaving sticky note comments or questions.*

5.4 The need for human intervention with pedagogical knowledge and lived experience

5.4.1 Post-project interviews

One finding that emerged in the creation of a more creative lesson plan using ChatGPT was the need for human intervention to moderate or edit the suggestions provided. For example, ChatGPT's unrealistic time estimates for certain activities were consistent. Elle shared:

> *The big thing that I felt that [ChatGPT] lacked is it didn't have a good understanding of time. Like, I had only an hour and what it was suggesting that I did would not have happened in an hour so I ended up making it a two-part lesson plan that would take two classes instead...[In addition], yeah like it was suggesting that the students make and present these skits in 20 minutes and I was like 'grade eights would not be able to do that at all'!*

In addition to tweaking the time suggestions for the activities ChatGPT proposed, Elle found that she needed to draw on her practical experience in the classroom and her pedagogical knowledge, in general, when choosing what to include and what not to include in her final version of the lesson. She shared: "I suppose it was like– it still is quite a lot of time to make a lesson plan with ChatGPT but because I feel like I had to edit it. Like I didn't just take what they gave". In this way, Elle drew on her experience and knowledge of pedagogy to filter what she would and would not include of the ChatGPT suggestions. This was similar for Jane who explained:

> *I found that I had to use what I've learned in teachers college so far to actually make the outputs of ChatGPT useful. Like if I had no teaching experience, no, you know, education regarding teaching, I think it would have been really easy to think like, "oh, yeah, that seems great. We'll just do that". But is that [activity/lesson plan] really touching on the curriculum? Is that addressing different types of students, the different ways that they learn? So I found it really informative to be able to try ChatGPT. But then to also consider everything that I've learned [in teacher education], and be able to sort of mash it together. So some things that ChatGPT gave me as an output was to, you know, try a virtual lab... But I was like, "what I did, my lesson plan, was hands-on for a reason." Physics is a really hard mental thing to do for some people. If you can see it happening, you can potentially remember seeing it happen. And that helps you remember later on. But it also helps you understand a little bit more of what's actually going on... You don't always get to see physics work all the time. So, yeah, I know that hands-on activities are beneficial. So taking what ChatGPT gave me and just [taking what I had done and making it] a virtual activity wouldn't always be beneficial. So yeah, I just thought it was really interesting.*

Jane drew on her understanding of both physics content and how people learn from her B.Ed. degree and chose not to accept the first iteration of ChatGPT's suggestions, which was to have students engage in a virtual lab. Instead, she continued to prompt the program in different ways to generate a variety of hands-on activities that could be used in the physics classroom more effectively. However, like Elle, Jane also voiced concerns about ChatGPT's inability to gauge time – how long it might take students to complete different activities. She shared:

> *In one of my questions back to it, I had to say, it's a "timed lesson - only five minutes [for this part]". So then it timed everything out. But it wasn't realistic. Like you can't give - I think it was five minutes - for all students to present their findings and write something down, right? It was like, that's like - for a group of 25 kids, that's not going to happen…[understanding activity timing] that's something that you understand being in a classroom.*

In this way, ChatGPT did not have the context or experience with classroom learning to suggest realistic time frames for some of the activities it suggested; it was therefore necessary for human assessment and editing before some of the suggestions could be included in the final version of the lesson plan.

5.4.2 Revised lesson plans

While there was evidence of Elle not using every suggestion ChatGPT provided (i.e., skit, digital animation, etc.) and revising the timing of the activities in the new lesson plans, there was minimal, if any, evidence reflecting a critical engagement with the ChatGPT suggestions. Neither was there evidence of creative expansions or adaptations of the suggestions. The activity ideas provided by ChatGPT in the transcript appeared to have mostly been used verbatim (barring the above exceptions) and applied (see **Table 2** below comparing the ChatGPT phrasing and the phrasing that appeared in the revised lesson plan).

In Jane's case, she edited and refined content from the various ChatGPT suggestions. For example, one of ChatGPT's original suggestions was to tell a story with visuals in the hook, which she did not appear to include in the revised plan. Instead, Jane chose to adapt ChatGPT's suggestions, built off them, and made them her own (**Table 3**):

ChatGPT transcript	**Wording in the revised lesson plan**
Procedure *Clue presentation:* Provide clues about each object without showing them. Clues should describe the properties of the materials inside (e.g., "This item feels gritty and has different-sized particles" for sand). Encourage students to ask questions and discuss their ideas with peers. *Guessing and discussion:* Allow students to guess what might be inside the box based on the clues provided. Write their guesses on the board. *Reveal and discussion:* Reveal the contents of the box one by one. Discuss with the students whether each item is a pure substance or a mixture and why.	*Procedure* *Clue presentation:* Provide clues about each object without showing them. Clues should describe the properties of the materials inside (e.g., "This item feels gritty and has different-sized particles" for sand). Encourage students to ask questions and discuss their ideas with peers. *Guessing and discussion:* Allow students to guess what might be inside the box based on the clues provided. Write their guesses on the board. *Reveal and discussion:* Reveal the contents of the box one by one. Discuss with the students whether each item is a pure substance or a mixture and why.

Table 2.
Wording/Ideas from ChatGPT and wording in revised lesson plan.

Chat GPT's Hook suggestions
Historical Hook: Start with a brief storytelling session about the history of motion theories, from Aristotle to Galileo and then to Newton. Use engaging visuals or a short video clip to illustrate the historical context. - **Quick Experiment**: Demonstrate a quick experiment (sliding a puck on different surfaces) to grab students' attention and connect the history to a real-world observation.
Jane's Original Hook
Review the previous lesson's material, ask if there are any questions about the content. Ask students if they want to review and take up any of the questions from the assigned practice problems. If students want to go through questions, note down which question(s) they want to go through. Take up the questions one by one, and ensure that the concepts and understanding required to complete the questions are clear. Open the slides: https://docs.google.com/presentation/d/1y6i2jWNDzHOgKvbuNax8as9DcZIAJ8CdQVXqlFzy-vI/edit?usp=sharing Review the terms kinematics and dynamics, and how they are related to mechanics. Relate it to my previous experience in Biomedical and Mechanical Engineering to engage students and demonstrate the potential applications.
Revised Hook
Introduce Newton's First Law to the class by demonstrating a quick experiment (5–10 minutes). Introduce a brief history from Galileo, Aristotle, and Newton. For the experiment, take two different pucks of different masses and slide it along different materials. Ask students to predict what will happen before sliding it. Have them explain their thoughts and predictions and observe the results.

Table 3.
Comparison of ChatGPT's suggestions for the hook, the original hook and the revised hook.

Additionally, Jane reduced the variety of "Action" plan suggestions from ChatGPT to just the station activities. She also eliminated the creative reflection activity suggested by ChatGPT, but kept the other discussion-based reflection it suggested while adding some of her own content:

> *Highlight how the experiments reflect the theories of motion from Aristotle, Galileo, and Newton. Facilitate a discussion that guides students to explain Newton's First Law. Encourage students to create and connect the First Law of Motion to inertia. Wrap up the class by having students complete an exit ticket on real-world applications of Newton's First Law. Have students write down two applications of Newton's first law that relates to the stations that were explored in class. They can work with an elbow partner to complete the ticket before the end of class.*

This was a true "mashup" example of GAI/human collaboration. ChatGPT helped Jane to think differently about the consolidation, which then prompted her to build off it and go a different direction from her original consolidation activity: "Wrap up the lesson by providing a desmos activity with the class. They are able to complete this activity in class, or on their own time to study at home."

5.5 Gaps in AI literacy

5.5.1 Post-project interviews

It became apparent in the post-project interviews that there were some gaps in both participant's AI literacy skills. For example, Elle's understanding of bias and how it might be perpetuated in AI algorithms was limited:

> *...and then like, bias in AI systems. I'm not super familiar with what they are or how the bias works but I know that there's supposed to be bias and systems like AI not fully understanding, like, nuances of the classroom or the logistics or what's needed.*

In addition, Jane did not mention concerns at all about bias associated.

with the use of GAI in general or for educational purposes, nor did she touch on other ethical concerns like privacy, security, or transparency. The gaps in AI literacy also extended to limited prompt engineering techniques for both participants which were seen in their ChatGPT transcripts (more on this below).

5.5.2 ChatGPT transcripts

The original prompt Elle used with ChatGPT when attempting to leverage the tool to infuse more creativity into her original lesson plan and assessment was broad: "Can you please make this lesson plan more creative? Can you ensure that you address the evaluation and assessment of creativity as well?" This reflected a gap in understanding regarding how to prompt the system with detailed parameters in order to retrieve the level of detail desired in the response. However, as the interaction between Elle and the ChatGPT program evolved, it was clear she started to adapt and learn how to better prompt ChatGPT with specific parameters. For example: "We only have 60 minutes in class, not 70. I would like to give students more time for the interactive exploration as well as the creative application. Can you please revise your lesson plan to be completed in two classes instead of one?" In this case, Elle realized she needed to articulate things like

time parameters. While the prompting did get more specific over time, understanding how to add these parameters at the outset may have improved her experience with the program. At one point she indicated that the planning with ChatGPT may have taken equally as long as if she had planned this on her own from the outset.

Although Jane's initial prompt had more detail than Elle's, and was more conversational in tone, it was still quite vague: "This is a lesson plan used for a Grade 11 Physics class to teach them about Newton's First Law. Can you please redesign this lesson to make it more creative? Specifically try to make the assessment and evaluation aspects of the lesson more creative." The vague quality of the prompts continued with examples like: "for the action section, I want more hands-on approaches and less virtual activities". Eventually, though, when Jane had specific tasks she wanted ChatGPT to execute, the prompts became such. For example, mid-way through her exchange with ChatGPT, she prompted: "how would you condense these activities into one lesson that is 75 minutes?". After receiving a response from this prompt, she further prompted: "can you come up with a lesson and/or activity for a 75 minute class that also addresses the history of Newton's First Law, while also being creative?"

5.6 Pre-service teacher concerns with using A.I. in their pedagogical practice

5.6.1 Post-project interviews

Interestingly, both participants voiced various concerns they held with teachers relying on ChatGPT in their planning. Elle first shared her concern about over-reliance, a lack of critical thinking and the production of generic products:

> *...in terms of constraints, I think a big one would be over-reliance. So teachers just asking AI for a lesson plan and just doing it without really reading through it or thinking of how to make it better, because again I think if I just did the first lesson plan the time would have not been even close and then maybe if everyone is using AI it could lead to a more standardized teaching approach I guess, like if everyone is using the same generative AI and that's giving the same output instead of having like the different ideas of teachers...*

She was similarly concerned with whether or not ChatGPT was:

> *...coming up with the same thing or is it giving different responses to different people? ...like if you fed it my lesson plan would it give you the same idea with the skits or would it have some other idea at that moment?*

This concern was interesting to hear given Elle's prior resistance to creative and student-centered activities in the secondary science classroom due mainly to time restrictions. Ironically, the type of traditional lesson plans she seemed to prioritize (oral presentations and seat work in lock step with traditional unit planning) were in fact "standardized teaching" approaches.

Other than these concerns regarding generic outputs from ChatGPT, Elle also voiced some ethical concerns. She shared:

> *I think there are ethical issues, if you start giving it like student privacy or information, like if you try to tell it "Jennifer needs 'X/Y/Z' so can you tailor the activity for her?" I suppose there could be some ethical issues that arise.*

Like Elle, Jane shared some concerns surrounding the use of AI in education, mainly connected to the risks of educators developing an over-reliance on GAI, like ChatGPT, for lesson planning:

> *I think if suddenly teachers become, you know, reliant on it: "AI is going to teach a lesson for me, I don't have to do anything", you're suddenly losing [your skills]. You're losing what you've worked for. You're not using your experience; you're not using your judgment to actually use what it's given you.*

Jane was concerned primarily with losing the theoretical knowledge and practical skills and knowledge developed in school and the classroom if educators rely too heavily on ChatGPT or use it without a critical and evaluative lens.

6. Discussion and educational implications

We have organized the discussion section according to the OECD's [15] conceptualization of the four main categories or cognitive processes associated with creativity: inquiring, imagining, doing and reflecting. We have discussed the participants' processes in relation to these categories, other considerations that emerged and, ultimately, implications for PST education.

6.1 Inquiring

OECD defines the inquiring category with the following two indicators: (i) "Feel, empathise, observe, describe relevant experience, knowledge and information and (ii) Make connections to other concepts and ideas, integrate other disciplinary perspectives" [15, p. 68]. We asked the participants to use a previously designed lesson plan created for one of their courses in the program or field placements; therefore, most of the inquiring processes would have been done prior to this research study. They designed the initial lesson plan based on the needs of students that were either hypothetical or whom they did not know well, so this was a limitation in terms of understanding how they empathized or drew on students' prior experiences and knowledge. This is not a consequence of using ChatGPT in the planning process. Rather, we view it more as a limitation of a PST education program and their understanding of prompt engineering. Ultimately, the person using ChatGPT must be able to think creatively themselves, to use ChatGPT creatively and therefore generate more creative responses. We did observe Elle starting to think more "outside of the box" in relation to science learning activities. These emergent signs of the development of Elle's creative thinking skills related to learning approaches in the science classroom could be a result of her being exposed to more/different ideas that are arts-based and emphasize process and the development of skills and competencies through the use of ChatGPT.

6.2 Imagining

OECD [16] defines the imagining category with the following two indicators: "(i) Explore, seek and generate ideas and (ii) Stretch and play with unusual, risky or radical ideas" (p. 68). ChatGPT provided the participants with pedagogical approaches and ideas for activities that neither participant had previously considered.

Specifically, the new activities suggested by ChatGPT were more student-centred, embodied, and interactive, included the potential for student creativity in the learning process, and emphasized the development of skills and competencies and process-work. For example, the ChatGPT suggestions included activities like the creation of skits, visuals and storylines to communicate knowledge and understanding. Another interesting difference is that the ChatGPT suggestions for both participants included peer assessment and self-reflection, which were either missing or not as central in the original plans. Discussion-based knowledge generation was another noticeable difference. In both cases, the suggestions provided by ChatGPT appeared to disrupt the way the participants thought about learning in the science classroom and helped both participants gain a clearer understanding of how some of these methods could be implemented in the classroom.

In this sense, ChatGPT could prove to be a useful tool to help PSTs "stretch" their initial thinking, ideas and assumptions about learning in certain contexts and "play with" ideas they had not previously considered. These ideas may also seem "unusual, risky, or radical" to them, as was the case with Elle and ChatGPT's suggestions which infused the language, visual and dramatic arts into the science classroom.

6.3 Doing

OECD defines the doing category with the following indicator: "(i) Produce, perform, envision, prototype a product, a solution or a performance in a personally novel way" [16, p. 68]. Although both participants appreciated the suggestions by ChatGPT and were intrigued by the different lines of thinking, their ultimate concern and priority was getting through content and staying on schedule. They both still viewed the creative versions of the activities as too time-consuming, as a bonus or an add-on (i.e., creativity may have a place in a final project, for example, but it is too time-consuming and not necessary in day-to-day activities). Despite cutting many of ChatGPT's arts-based suggestions from their lesson plans, suggestions which held the potential for student creativity to be fostered in the science classroom (if scaffolded properly and with an emphasis on process-work), their final lessons did ultimately evolve from initially teacher-centered (with an emphasis on sheet work and an oral imparting of knowledge from teacher to student) to more student-centered with hands-on, collaborative activities and group and individual reflection activities. In this way, ChatGPT was able to help the PSTs embed sound pedagogical practices that at least open more space for the possibility of creative doing and thinking, where previously this space was limited.

Additionally, in their revised lesson plans, both participants, but particularly Jane, took elements of the ChatGPT suggestions and edited them, added to them or cut parts of them. This demonstrated that the PSTs were not simply taking the ChatGPT suggestions at face value but "using them in a personally novel way". The PSTs were using both their pedagogical knowledge and practical experience to adapt what they felt was useful, while discarding what they did not consider useful, feasible, or practical. One interesting point to note here that requires more in-depth exploration in future research as it is beyond the scope of this chapter, is that some of what the students cut or revised was done so possibly as a result of their own unchecked biases (i.e., assuming the students would not want to perform skits) and possibly as a result of not being adequately prepared in their preservice teacher education to understand how and why, for example, the infusion of creativity in the learning process does not need to "take up more time". Clearly, more needs to be done in PST education that

focuses on how to approach unit and lesson planning and classroom learning from a perspective other than the traditional – one that emphasizes the development of skills and competencies, inquiry, and student-centered learning connected to the real-world. For example, a maker and/or STEAM approach to teaching and learning attends to the aforementioned, and takes a holistic and subject-integrated approach (see: [51–54]).

6.4 Reflecting

OECD [16] defines the reflecting category with the following two indicators: "(i) Reflect and assess the novelty of chosen solution and of its possible consequences and (ii) Reflect and assess the relevance of chosen solution and of its possible consequences" (p. 68). Both participants engaged in reflection related to the ChatGPT suggestions. Although this research focuses on creativity and GAI, critical thinking is a key skill inextricably linked to creativity. Critical thinking relates to questioning and evaluating ideas and solutions [16]. The PSTs assessed the novelty, relevance and possible consequences of their lesson plans. At times, the ChatGPT suggestions lacked an appreciation for, or knowledge of, the time required for different classroom activities, especially relative to developmental age groups. Both participants ultimately determined that a human teacher's practical experience and pedagogical knowledge is still necessary in the lesson co-creation process. Both participants needed to adapt and revise some of the suggestions provided by ChatGPT to make them feasible in a real classroom context with real students and of a particular age demographic. This reflects the human element and expertise still required to moderate GAI suggestions. Based on our analysis of the data, it is clear that one of the PSTs exhibited stronger critical thinking skills than the other. Throughout her ChatGPT prompting transcript, lesson "re-design", and post-project interview, Elle does little to adapt what ChatGPT provides (and does little to expand upon it), whereas Jane does take pieces, mixes things together and expands. Jane's comments that ChatGPT did not necessarily provide innovative suggestions (just *more* suggestions) also speaks to her critical thinking in relation to ChatGPT and its current capabilities. Elle sees what ChatGPT has provided as "creative" because she has never considered these activities for the science classroom, where it seems that Jane has at least been exposed to these concepts. This is more evidence, perhaps, that experiences in science education need to be more innovative, both at the Faculty of Education level and during field placements. Thinking critically about the content generated by AI tools such as ChatGPT is a key AI literacy skill that needs to be incorporated into teacher education programs and inservice teacher professional learning. This is particularly important as both participants' expressed concerns about the potential of teachers' over-reliance on using ChatGPT in lesson planning and how that may impact critical thinking and their skills and knowledge over time.

6.5 Other considerations

Both participants lacked a foundational understanding of prompt engineering and what this entails. This was particularly surprising given that both have a STEM background, which emphasizes procedural thinking, logic and reasoning. Prompt engineering includes a set of skills that can be incorporated into preservice teacher education programs. It involves teaching PSTs to use simple and clear language, providing context (i.e. grade level, topic, focus, etc.), and including examples to illustrate

the desired format of the response. It also involves using a design process that focuses on revising and iterating as necessary, playing with different variations to expand on the AI generated responses.

Equally important is to introduce PSTs to the social and ethical implications of AI on our daily lives through an exploration of how AI algorithms work. In this research study, one of the participants explicitly discussed her lack of understanding regarding the way bias may be baked into algorithms and how/why this needs to be considered when incorporating AI in the classroom. This highlights the need for preservice teacher education programs to include a focus on the development of PSTs' AI literacy skills.

7. Conclusion

This research aimed to investigate pre-service teachers' use of ChatGPT as a creative agent or partner in the lesson planning process. Creativity is an essential skill to mastering flexible and adaptive teaching strategies that can address dynamic learner needs and respond to the rapid digitization and innovation in education contexts. GAI is one such innovation that has created reverberations across classrooms globally. There exists immense potential - and consequences - for its adoption in pedagogical use. However, just as creativity is a skill, so too is the critical and informed use of GAI applications. As creativity and the rise in GAI applications both at the forefront of required educator skill sets, it is necessary to explore the relationship between the two. GAI can provide images, words, music, and video at the click of a button and the long-term impact on educator creativity is not yet known. Similarly, the ways in which AI has revolutionized the classroom and the digitization of education institutions calls for education stakeholders to consider avenues to achieve AI empowerment and agency in educators - that is, how teachers can be aware and responsible users of AI so that its use is intentional, purposeful, and beneficial.

This research aimed to explore how pre-service teachers might use GAI, namely ChatGPT, to redesign an existing lesson plan and their perceptions on creativity - both ChatGPT's and their own. Two pre-service teachers participated in this research. Researchers utilized qualitative case study methodology to gain an in-depth understanding of the participants' phenomenological processes and insights into using ChatGPT. The data analysis revealed distinct themes that arose from the participants' post-interviews and artifacts (i.e., the ChatGPT-revised lessons): ChatGPT for brainstorming and idea-generation, creativity as an add-on in the science classroom, the need for human intervention, gaps in AI literacy, and pre-service teachers' concerns with using GAI in their practices. Overall, the participants assessed ChatGPT as a helpful "starting point" for brainstorming and the generated output allowed them to revise their initial lesson plan to create something more student-centred. Concerns with using ChatGPT were focused on the potential to become overly reliant on it though there was some mention of privacy and ethicality of use. These findings were aligned with previous research into PST attitudes of GAI [40].

It was apparent, however, that the participants had limited understanding of AI principles and generally lacked AI Literacy, despite the focus on technology and innovation in the perservice teacher education program. Sophisticated and detailed prompt engineering can be a marker of AI Literacy [55]. In contrast, participants' prompt engineering was often too vague or lacking detail and context. Participants showed some awareness of ethical implications of AI use, for instance, AI bias and

privacy, but more can be done in supporting their understanding to ensure informed, responsible, and effective AI use. Pre-service teachers must have the opportunity to build AI literacy through tinkering, making, and exploring GAI while gaining an ethical awareness to ensure informed decision-making and AI empowerment. There is also a larger question surrounding the state of creativity in current teacher education programs as both participants mentioned creativity being an afterthought or a nice addition to a lesson but not a focus or necessity. This research highlighted how PSTs interact with ChatGPT in creative ways and provides insight into their thinking and internal processes when using it as a creative partner. The findings will inform future work into PSTs attitudes and efficacies of GAI and will further contribute to the overarching investigation into how GAI applications can impact educator creativity. Preparing PSTs with AI literacy and critical awareness can empower educators and effectively protects "the future of education and by extension, the society of tomorrow" [56, p. 9].

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Chapter 3

Artificial Intelligence in Creative Writing Studies: Threat or Opportunity

Susan Taylor Suchy

Abstract

Artificial intelligence (AI) systems are changing the world of creative writing. In addition to assisting with grammar and spelling, creative writers can now collaborate with AI, and many find increased productivity and new directions in their work. However, within the field of creative writing studies, a place where writers engage with creativity in higher education, while the theoretical definitions of creative practice tend to be fluid, the discipline is generally not quick to change certain pedagogical approaches. Historically, the field has found ways to adapt to technology while maintaining its traditions, but the rapid advances in AI require consideration to determine if there is a need for change. This chapter examines some of the views of creativity and methods of creative practice of practitioners in the field and discusses the impact of those views and approaches in relation to the digital age and recent technological developments in AI.

Keywords: AI in creative writing, impact of AI on creativity, creative writing studies, pedagogical approaches in creative writing, technology and creative writing

1. Introduction

In the last few years, developments in artificial intelligence (AI) have had a powerful impact on creative writing. In a study published in 2022, professional authors testing Wordcraft, an AI powered writing assistant, predicted AI would "make parts of the creative writing process easier, faster, and more fun, for skilled and amateur writers alike" [1]. Since then AI tools with a range of applications from generating ideas to providing feedback and enhancing productivity have flooded the market, and their use has been both embraced and questioned across all fields of writing and publishing, including creative writing in higher education.

Creative writing as a university subject has existed within higher education since 1880 in the U.S. [2], and has since expanded into a "global phenomenon" [3], but creative writing studies (CWS) as "a field of scholarly inquiry and research" - has only relatively recently emerged [4]. To understand the field's concerns with and responses to the technological developments, one must understand the unique way the field

has come to define itself, as well as the work that is undertaken at different levels of practice and pedagogy. From this position, the historical relationship with technology can be clarified and recent technological developments can be assessed.

This chapter does not seek to prescribe how those working in the field of CWS should engage with new technologies but rather the aim is to examine the current research to reveal how the field is responding to these developments. To address the question: does AI represent a threat or an opportunity for CWS, this chapter begins by defining the field and its pedagogical methods and views on creativity and then goes on to examine responses to recent technological developments.

2. Creative writing studies: What it is, where it is located, and why it matters for creative writing and for this discussion

2.1 What is CWS?

"Creative writing studies" is a relatively new term. The first published use of the term in the United States is attributed to Katharine Haake in *What Our Speech Disrupts: Feminism and Creative Writing Studies* [5] according to Tim Mayers [6]. CWS, when examined as a sub-field within writing studies, is also considered relatively new and still developing [7]. Haake describes CWS as a field of scholarly research and inquiry that aims to "move us beyond our preoccupation with the figure of the writer or the text to the role of creative writing as an academic discipline inside a profession that includes, but is not limited to, the production and teaching of imaginative writing" [8].

In "One Simple Word: from creative writing to creative writing studies", Mayers distinguishes between "creative writing" and "creative writing studies" by focusing on their different roles and goals in academia. In this context "creative writing" is involved with hiring successful authors—those with notable publications and awards—to teach writing at colleges. Its main objectives are to help aspiring writers create publishable work and to provide jobs for writers who may struggle to make a living solely through their writing. In higher education, creative writing provides a way of developing new writers and a career path for established authors, one that focuses on teaching writing rather than on academic theory or scholarly analysis [4].

In contrast "creative writing studies" refers to an academic field that looks at creative writing as a discipline. CWS explores teaching methods, theoretical foundations, and the role of creative writing. The field's aim is to explore pedagogical issues and apply theoretical analysis. The approach is more about understanding and critiquing the discipline than just practicing it. Mayers explains that while there is some overlap, creative writing and creative writing studies should be seen as distinct. Creative writing focuses on the practical side of writing and teaching; CWS is concerned with the academic study and critique of the discipline [4].

2.2 Where is CWS located?

CWS may not be regarded as a discipline from an administrative perspective in most universities, but as Dianne Donnelly argues in *Establishing Creative Writing Studies as an Academic Discipline,* in the chapter "The academic home of creative writing studies," it does exist as a "conceptual space" something "more critical than its physical space" [9].

One location where this conceptual space exists is in journals such as the *Journal of Creative Writing Studies* (Rochester Institute of Technology in the US) which publishes research on the teaching, practice, theory and history; and *New Writing: The International Journal for the Practice and Theory of Creative Writing* (Taylor & Francis, in the UK) which accepts both creative and critical work in the examination of the intersection of practice and theory. There are many other journals, as well as books and book series, and writing organizations that recognize the work of the field. Among them are *Text: The Journal of the Australasian Association of Writing Programs*; Creative Writing Studies Organization (CWSO), which lists other journals and books relevant to the field and promotes the scholarship of the field; and the Bloomsbury Publishing (AU) book series: *Research In Creative Writing*. There are many more but this list gives an idea of where the research can be located.

Important to note is that those working in the field may not always use the term "creative writing studies", yet they do also study and theorize the work being done in creative writing in higher education. For example, in the UK in 2004 *New Writing: The International Journal for the Practice and Theory of Creative Writing* does not use the term in the journal's title but does discuss the field. The journal emerged to address the growing recognition of creative writing's role in revitalizing literature departments and its expansion across a range of academic departments, including media, communication, art, and education. The journal's aim: to highlight the vibrancy and value that creative writing brings to universities and "relate this to researching-through practice". The goal: to emphasize its importance to research, arts organizations, publishers, and other creative fields, to "ensure others recognize that the subject of 'Creative Writing' is considerably stronger, more established, and more esteemed, than many other subjects in academe that would never think to question whether they belong on campus, as some still do when referring to Creative Writing." [10]. The use or lack of use of the term CWS may have to do with the different ways creative writing became established in higher education in different countries or the politics of the time. Whether those working in higher education in creative writing use the terms "discipline", "field" or "creative writing studies", most will agree that the work being done by those within this space is "always evolving" [11].

From universities all over the world, creative writing theorists, practitioners and educators contribute to many useful conversations about their work, and this began long before CWS was defined. Creative writing has been and often still is situated in different academic departments, which is one of the reasons research and discussions on the theory and practice have appeared and continue to be published in a variety of journals and books from different fields. Using the term "creative writing studies" will not necessarily identify pertinent literature. Also it is important to note that existing commercial indexes are poorly suited for arts and humanities scholars due to their uneven coverage and lack of specific features. The development of a humanities-focused citation index still faces significant challenges, including fragmentation, multilingual publications, and the vast amount of historical scholarship yet to be digitized [12]. As a result finding relevant work in the humanities often requires a more focused approach, and much of what has been explained in this section is not cross-referenced in the larger databases, or not as easily located in them, at this time, hence the need to look into and introduce the above-mentioned journals and resources focused on CWS for those seeking additional information.

2.3 Why CWS matters for this discussion

Viewing creative writing through the lens of CWS offers a perspective in keeping with this book's goal of offering a view on creativity that enables a deeper understanding from a range of fields. CWS is a field and a disciplinary space for those in higher education to theorize and discuss the pedagogy, the process, the practice and the products of those working and studying in creative writing. CWS considers what is occurring inside higher education as well as what creative writers are doing outside in the public sphere. The discussions within the field are not limited to the process of writing but extend to a large range of subjects that draw from and engage with other disciplines and explore many topics, including creativity and technology. To better understand how the field engages with and responds to those two topics, it is necessary to explore the distinctions between undergraduate and graduate creative writing work. The next section of this chapter will discuss the differences between these educational stages and address the approaches to creativity through practice.

3. The difference between undergraduate and graduate creative writing, views of creativity, and methods of training in a creative practice

3.1 Undergraduate and graduate creative writing

To understand the field's views of creativity and relationship to and issues around technology, one first needs to understand how undergraduate courses differ from the graduate programs and what is done within each area. From a pedagogical perspective, the distinction can be described, in general terms, as a difference in training goals.

In the US, when the two levels of study were separated in the late 1960's and early 1970's, the purpose of undergraduate courses was to "examine writing seriously from within", and graduate programs were "to produce serious writers" [2]. In a general sense, today around the world, the focus at an undergraduate level is not about training professional writers as much as offering a rounded education [13]. Even for those undertaking undergraduate degrees in creative writing, the focus, by in large, emphasizes reading, writing and thinking (and perhaps a small theory component). However there is debate regarding the focus and goals of advanced education in the field.

In advanced creative writing training, there are more expectations that students will become professional authors. However, for some in the field, there is concern about the feasibility of producing many successful writers and the need for alternative career paths and not framing creative writing as a professional career path. There has been a shift from viewing creative writing primarily as training for writers to seeing it as "practice-oriented research" [14], particularly for those involved in research-focused PhD programs. Some view this training in creative writing with an understanding that students are being prepared for a broader intellectual and cultural engagement rather than solely for professional writing careers [15].

In general terms, undergraduate and graduate programs can be seen as differing primarily in training goals, the undergraduate goal being to teach students to read and write, the graduate (arguably) to develop professional writers and/or train researchers.

3.2 Do different goals mean different views of creativity?

Those who are in training as postgraduates and those who teach and research in the field of creative writing do engage with the concept of creativity, as will be discussed in the next section; however, the primary focus for the pedagogy is on creative practice; so although theoretical discussions about creativity are important, the teaching approach emphasizes practical application. For undergraduate students, and also MFA students, the goal is to develop skills, experiment with different forms, and produce original writing, rather than focusing on abstract discussions of creativity. The primary pedagogy is one of creative practice and process and is addressed through a number of methods.

3.3 Creative practice training methods

Historically, early university programs in the US focused primarily on teaching fiction, poetry, and theater writing. Today, the field has expanded to include nonfiction, screenwriting, and various experimental forms. The pedagogy for training at the undergraduate and sometimes the MFA level centers on the creative process and practice. Not all educators use the same approaches, and there are additional methods than will be mentioned, but the field's main approach to education includes having students read, analyze and learn craft techniques; write and revise; and participate in the creative writing workshops.

Students will read and analyze a range of genres by published authors to inform their creative output as well as to enhance their reading and thinking abilities. Discussions on theory and ethical considerations, including cultural sensitivity and social impact, may also be incorporated in lessons, but they are not included in all courses. George Saunders who teaches creative writing in Syracuse, New York presents a sample of a teaching approach in *A Swim in a Pond in the Rain* [16]. His master class book includes a collection of short stories by Russian writers. He does not approach his subject as a scholar of Russian language or a literary critic of Russian literature. Instead Saunders offers insights into how writers work, and he demonstrates how a writer reads. He describes his approach as "diagnostic", in the sense that the student is trying to learn how a story draws in, holds onto, and makes the reader feel respected [16]. This modeling approach is a long-standing tradition for the field. The American poet Robert Frost who taught creative writing at Harvard in creative writing's early days in higher education, believed in "teaching by presence" [17]. As David Gershom Myers explains when writing of his teacher Raymond Carver, "Writing is not an abstract body of knowledge but a concrete activity best taught by someone fully committed to it" [18].

Teaching may include lessons and activities, for example, in craft technique, with a focus on technical elements of writing such as character, dialog, and point of view. Students may be encouraged to place their creative output within a broader context. And revision is an essential methodology. In the revision process, students learn to assess and improve their writing based on feedback and self-reflection. The editing and revision of multiple drafts helps them to improve clarity, coherence, and overall quality of the work. The field recognizes that creativity does not end once the writer begins revision. As noted by Dobson and Gilbert, "redrafting is a necessary creative process" [19] and students often develop portfolios that demonstrate their revision process.

The creative writing workshop has been referred to as the "signature pedagogy" of the field [20], and is a model for many. Though some find flaws with the approach [21], the workshop endures, with the Iowa Writing Workshop being one of the most recognized examples. In workshops, students submit their work for peer and instructor feedback.

Training in creative writing may be undertaken individually or collaboratively. Students may go beyond the classroom audience. They may seek professional outcomes by submitting work to journals and developing networks through performances, giving and attending readings, and participating in a range of other literary events.

An MFA program differs in expectations from undergraduate work. The workshop and coursework will be more advanced, the size and scope of the creative work larger, and more justification of intention is usually required. A PhD will likely involve an independent exploration of any of the following: history, theory, criticism of literature and creative writing around a particular topic as well but not always with the production of a longer-form creative work, but this will depend upon the student's and/or supervisor's own interests.

In the undergraduate or MFA classroom the focus is on creative practice and process. Advanced-level students and professionals in CWS will also engage in and examine their own creative practice and process, and they may also consider, among other issues the concept of creativity, which will be briefly examined in the next section.

4. The creativity in creative writing

Creative writing can be distinguished from other forms of university writing, such as expository writing, by its emphasis on the term "creative." However, this does not imply that critical thinking is absent in creative writing. Haake's study "What Our Speech Disrupts" recognizes that creative writers engage in metacognitive reflection (thinking about thinking), supporting the argument that creative writing involves both inspiration and critical analysis [5].

In some historical contexts, the creative writer has been regarded as engaged in a type of madness, and creative brilliance is considered to often coexist with eccentricity or mental health issues. Given that creativity involves disruptions of routine ways of thinking, the long-time connection with mental health is not surprising [11], and this is seen in discussion and research from the field. Marcelle Freiman contends that the idea that creativity stems from neurosis overlooks the constructive aspects of creative practice [22]. Research published in the latest issue of the Journal of Creative Writing Studies highlights the therapeutic value of creative writing, with discussions and research that looks at: chronic pain and how writing serves as a form of expression and healing [23], writing prompts that can aid in addiction recovery [24], the benefits of teaching poetry to medical students [25], the value that writing groups can have for cancer survivors [26], the healing potential of poetry in the aftercare of medical treatment [27]. These examples are a small sample of the views those in the field have developed on promoting mental and physical well-being through creative writing practices. Underlying the research is an understanding that disruption through creative writing has value.

Another discussion in the field about creativity revolves around spontaneity and revision. Some, like Allen Ginsberg, value spontaneity with his oft-repeated

cry: “First thought, best thought”. Others have made arguments for the importance of revision. William Wordsworth emphasized it as part of the reflective creative process, that is “emotion recollected in tranquility” [28]. Freiman considers the importance of the creative process by breaking down long held views in the field, such as the myth of the “lone genius” (one who has innate gift rather than a skill developed through practice). This myth presents challenges for pedagogy and practice, as does the myth of creativity as spontaneous and unstructured, which can undermine the importance of planning and revision [22]. Wendy Bishop and David Starkey note that experienced writers typically view revision as essential, whereas novice writers may idealize the unaltered first draft [11].

This is not to say that the field does not value the creativeness/inspiration of the individual. The arguments above are meant to offer a balance and support to writers. Bishop and Starkey contend that literary creation is fundamentally an act of human will, driven by the belief that something essential is missing and needs to be brought into existence [11]. They refer to Jean Baker Miller’s view that “Personal creativity is a continuous process of bringing forth a changing vision of oneself, and of oneself in relation to the world” [29].

Finding one’s place can be tied to understanding one’s social context. This is important for the writer to understand, but considering social context can also be a way to examine the conditions for creativity for those researching in the field. Instead of being concerned with narrowly defining “creativity”, some focus more on a contextual approach. For example, Jen Webb’s approach considers creativity within specific social and historical contexts [30]. Understanding where creativity arises can inform why and how certain writers and their approaches to creativity are more recognized and valued than others. Creative writing is also seen as an active engagement with the world. As Freiman argues, to view creative writing as merely emotional catharsis is reductive because it overlooks the social and audience aspects of writing [22].

This necessarily brief overview of the creative writer’s views of creativity does reveal that broadly the field views creative writing as a process that balances inspiration with critical reflection and structured refinement. Additionally, important to note is how recent research challenges historical associations between creativity and madness by highlighting the therapeutic benefits of creative writing, including its role in healing and mental wellbeing, thus valuing creativity’s disruptive nature. As well as the research into health, scholars in the field recognize the significant role social and historical context plays in understanding creativity. Those in the field also recognize that the human activity of creativity as a writing process develops and thrives in supportive environments. This overview will be helpful for understanding the relationship the field has with technology, which will be discussed in the next section.

5. Understanding the field’s relationship with technology

5.1 The time frame

For this discussion, I have delineated the field of CWS’s relationship with technology as occurring between pre-Chat GPT and ChatGPT and beyond. My choice is based on the impact of this particular technological development upon many fields, including that of creative writing and CWS.

The impact of ChatGPT, in general, is evidenced by its rapid adoption worldwide after the December 2022 release. By January 2023 it had reached 100 million users,

but ChatGPT did not appear from nowhere, rather it is notable because it marked a major milestone in the evolution of large language models [31].

To clarify, large language models (LLMs).

> *...are designed to understand and generate text like a human, in addition to other forms of content, based on the vast amount of data used to train them. They have the ability to infer from context, generate coherent and contextually relevant responses, translate to languages other than English, summarize text, answer questions (general conversation and FAQs) and even assist in creative writing or code generation tasks [32].*

LLMs development began with recurrent neural networks in the 1980s, which could handle sequences of text but had limitations in remembering earlier parts of a sequence. Improvements came with Long Short-Term Memory (LSTM) networks in the 1990s, allowing for better retention of past data. A major breakthrough happened in 2017 when Google introduced transformers, which enhanced the ability to understand and track context within text. OpenAI's GPT models, starting with GPT in 2018 and followed by GPT-2 in 2019, advanced the field. GPT-3, released in 2020, was significant due to its ability to generate human-like text [31].

To this point (pre-ChatGPT), using the tools required knowledge of the technological side and/or programming skills [33], a restriction for many creative writers, although there were writers who were not ignorant of the technological developments and were experimenting with the technology. ChatGPT, an advanced version of GPT-3, represented a major leap in AI-generated text capabilities. ChatGPT learns from human feedback, thus making it better at following instructions and reducing misinformation [31]. With ChatGPT came the ability for virtually anyone to communicate with the technology without any programming skill [33], which is important from a universal perspective and very significant to this discussion, in regard to the field of creative writing and creative writers.

Since ChatGPTs arrival, many new iterations of ChatGPT and the development and availability of other generative AI emphaises the significance of this turning point. However, as mentioned earlier, those working in the field of CWS were experimenting with technology prior to 2022, and to consider the impact and issues of ChatGPT for the field, it is useful to see how the field has responded to earlier technology.

5.2 Technology in the field: The digital world pre-chatGPT

In 2009 Mark McGurl, in his in-depth study of creative writing programs, concluded that the state of creative writing programs could still be described as "rather low-tech and quaintly humanistic" [34]. This statement does not imply that using technology has ever been problematic for creative writers. In fact creative writers seize on opportunities for creative exploration and engagement, analysis, theorizing, and publishing, particularly for those studying and working beyond the introductory, undergraduate level (although students and teachers do come to the classroom digitally "connected" [35]), and for work done outside the classroom. However the focus in the pedagogy has remained a humanistic approach.

Evidence of the field's ability to adapt to the arrival of the digital age can be seen in the development of an online presence by most programs. The establishment in 1996 of the Australasian Association of Writing Programs (AAWP) *TEXT: Journal of*

Writing and Writing Courses as an online resource demonstrates one case. As digital technology progressed, it is evident that even the most Luddite-leaning creative writers in the field use a range of tools that utilize AI now—spellcheckers and Gmail for example. However by 2013, the lack of any coordinated gathering of research in the field and a belief that there was hesitation in bringing technology into the teaching led Adam Kohler to suggest a need to organize a digital component of the field [36].

In 2015 *Creative Writing in the Digital Age: Theory, Practice, and Pedagogy* [37] was published to address the impact of digital technologies on creative writing education. The book encourages creative writing educators to engage more with digital tools, to embrace more interdisciplinary approaches, and to use more collaborative methods. The concern expressed is that creative writing's potential to contribute effectively within higher education is being hindered by its reliance on print culture. The solution offered is to increase engagement with digital technologies and collaboration [38]. This book is a useful starting place for assessing the relationship of the field to the digital world.

The range of topics the book addresses gives an understanding of the fields' relationship to the digital world in the period prior to ChatGPT's arrival. One section explores "Digital Influences on Creative Writing Studies": that is, various theoretical and practical contexts for integrating digital technologies into teaching and practice. The options range from reimagining creative writing through the lens of neurological processes to examining new media environments. The influence of video games on storytelling and narrative structures is explored. Additionally, there is a discussion on increasing digital skills to enhance the writer's marketability, and the ability of digital esthetics to influence and shape creative writing practices is examined [38].

Another section of the book focuses on practical applications for teachers of creative writing, including strategies for effective online instruction; for using social media to shape authorship and identity; for micro blogging platforms; for improvisational writing using digital platforms; and for the integration of new media into storytelling [38].

Other essays in the book address some of the challenges and resistances those in the field face when attempting to integrate digital tools into creative writing pedagogy, including distractions and the non-linear nature of digital environments. Personal accounts of moving from skepticism to embracing digital methods are offered. However, a significant area of concern is the implementation of digital methods with the increased demands on teachers, including the time required to learn new technologies [38].

The book represents a valuable starting place to understand the field's view of digital developments, showing that there is a willingness by many in the field to look at integrating digital technologies into creative writing education while also identifying ongoing challenges and areas that need further exploration.

Other research publications reveal ways creative writers in the field have approached digital technology in innovative ways prior to the arrival of ChatGPT. The following studies offer examples of engagement, practice, study and theorizing around collaboration, ethics, teaching, and innovation opportunities.

Collaboration is addressed in Aaron Tucker's study on the concept of 'machine translation' in poetic creations. Tucker argues for a symbiotic relationship between humans and technology. He contends there is a necessity for writers to remain vigilant in their engagement with the digital world and believes this human awareness shapes a writer's creative practices [39].

Another study that considers collaboration looks at The Reading Club, an online platform designed for collaborative reading and writing in real time. "Reariters" (participants) read specific texts and rewrite within a set character limit. This requires engagement with both traditional literature and with coding languages. This project demonstrates collaboration and creativity with technology, and challenges boundaries of conventional writing approaches [40].

An approach that explores ethical issues was revealed by Rebecca Valley who had students blend their voices into new, cyborg-like expressions that go beyond the traditional forms of fiction, poetry, memoir and theater. The project challenged students on their ideas of ownership of language and self-expression. Valley claims technology can serve as a powerful creative tool and prompt students to question capitalist notions of authorship and marketability [41].

Richard Finn, a researcher working in science fiction theater, theorizes his own creative output by assessing his relationship with AI (pre-ChatGPT) and concludes that the technology influences both content and form in creative writing [42].

These brief assessments reveal some of the ways writers in CWS practice and theorize the relationship to digital technology. New pedagogical approaches are tested but there is no one uniform approach. Technological advances are generally viewed as tools that might be used in the human practice of creative writing—given the right circumstances and opportunities—to challenge human thinking and limitations.

The arrival of ChatGPT and other new AI, like past digital technological developments, presents new opportunities and challenges for the field, as the next section will discuss. Whether the tools are inherently different from other digital advances in terms of impacting creativity will be considered.

5.3 Chat GPT and beyond: AI in creative writing in higher education

With the arrival of Chat GPT and the increasing impact on the field, research has started to be undertaken. Quantitative and qualitative studies that examine AI and creative writing in higher education since the arrival of ChatGPT offer both insights and warnings. Understanding the impact of generative LLM AI on creativity in and about creative writing is complicated by who is conducting the study and for what purpose and on how creativity is defined.

A 2024 study on AI and creative writing published in *Poetics*, concludes that although students struggled with AI output, they were able to assert their own authority and were able to subvert traditional genre conventions and overcome certain esthetic norms [43]. The authors claim that the approach challenges the view of creativity as a specialized skill and suggest that AI can democratize creativity and make it accessible to a broader audience. Students, they argue, came to view creativity as a collective process that is shaped by specific cultural and social contexts [43]. This perspective is in keeping with some arguments made in CWS, as discussed earlier. The authors of this study also recognize the threat to traditional artistic sensibilities and problems of AI domination. They argue that future research should focus on how AI can be used collaboratively to support pedagogy and thereby promote deeper engagement and civic participation [43].

A more negative view about the effects of ChatGPT on university students' creative writing abilities is presented by another 2024 study (quantitative) published in the *Journal For Computer Assisted Learning*. The study assessed originality, content, validity and development in writing. The researchers use the terms "creative writing skills" and "essay writing" interchangeably, so it is not clear that the study is focused

solely in CWS; however, the boundaries of the discipline are fluid and the concerns for the field are parallel to the concerns of the study, so the findings are worth considering. Six hundred students across ten universities were included in the study, and the researchers conclude that ChatGPT had a negative impact, reducing students' critical thinking and their creativity. Integration of ChatGPT and other AI, particularly in creative writing disciplines, should be approached carefully according to this study, which confirms the findings of numerous earlier studies and emphasizes the necessity of future research on AI-human creativity dynamics [44].

There are other ways to consider the creativity issue for humans working with AI in the field and that is by researchers in the field of CWS. One approach to examining the human-AI creative relationship was to use a creative work as a case study for examining a particular problem a writer experiences. Iona Gilburt [45] used a film to assess collaboration, specifically in regard to utilizing generative AI for writer's block, and argues that interacting with other writers is not necessary in this case and theorizes useful opportunities while recognizing limitations revealed by the fictional story [45].

Another approach to exploring the issue from within the field was to theorize how AI is involved in a writing process. By examining two stories, Ronnie Scott [46] teases out different ways to create and define different and new aspects of creative writing. From the perspective of a practitioner within the field theorizing AI's relationship to the creative act/action, the process of using AI for development of creative work, in organizing, creating cohesiveness and making meaning is considered. By observing the ways AI is used in the writing process, Scott argues, one can determine how the framework of a story and its themes and emotional depth are connected. With AI, he contends, writers can become more alert to ways of developing a story and better understanding the relationship of form and content [46].

Exploration of the impact, benefits and challenges of AI post ChatGPT by creative writing researchers is in its infancy; however, what can be seen thus far does give some insight as to how the field of CWS (teachers, researchers and practitioners) are responding and engaging, and that appears to be much as with other technological developments. There is an awareness of potential benefits and challenges. Generative AI may offer support with issues such as writer's block and provide new insights into narrative structures. As one study argues, AI may be a way of democratizing creativity by broadening access and shifting the focus from individual talent to a more collective, culturally informed process. However, this change may come at a huge cost, as tools like ChatGPT have been shown to negatively affect students' creative writing abilities, reducing critical thinking and creativity. While there are opportunities recognized, all of the studies recommend a cautious approach to AI in creative writing education. This approach is in line with how the field of CWS has historically recognized the human endeavor of creative writing and its relationship and engagement with digital technology.

6. Conclusion

As a starting place for considering if AI is a threat or an opportunity, this chapter has defined CWS and the traditions and practices of the field in relation to creativity. The chapter has also defined a time frame for the discussion by distinguishing the period before and after the advent of generative AI technologies like ChatGP. Assessment of a range of studies and publications reveals the ways those in the field

respond to technology. While technological developments disrupt the status quo and there is a sense of threat in the field, the studies also reveal that technological developments offer creative opportunities. Those in the field do explore and engage with opportunities with AI, while both challenging and maintaining traditional and proven methods and practices.

The question of whether AI might replace traditional workshops and revision processes is significant, as is the need for safe spaces where students can develop their skills without the pressure of competition. Many other questions need to be explored such as: What is the social value of creative individuals in a world where machines can potentially perform creatively? What is the purpose of education in a post-work society? What is higher education's role in nurturing critical thinking, particularly through creative practices like fiction and writing?

Ralph Waldo Emerson's view of individual intuition and personal creativity are particularly relevant to today's discussions around AI. Emerson, who is believed to be the first to use the phrase "creative writing" in "The American Scholar" in 1837 [47], asserts that:

> *A man should learn to detect and watch that gleam of light which flashes across his mind from within, more than the luster of the firmament of bards and sages. Yet he dismisses without notice his thought, because it is his [48].*

Emerson's argument advocates confidence in self-knowledge. Anyone who has used any form of AI, from spellcheckers to LLMs for creative writing will be aware of the insistence of the technical tool in claiming the correctness of its answer or position. Of course, the writer has the power to remove the guardrails, but that requires an ability to question, to be aware of the mistakes being made. However, lack of knowledge in a particular area, fear of questioning and challenging, and aggressive insistence by a machine can result in individuals giving authority to technology. If we add generative AI into Emerson's list of what might be argued as sage, and if individuals dismiss their own insights in favor of AI authority, students might never fully recognize their personal "gleam" of creativity.

Creative writing practice offers individuals the opportunity to engage in an internal dialog, one that promotes self-knowledge and reflection. Supporting students to believe in their own creative abilities and to transform the initial spark of inspiration into a finished work—using tools without being controlled by them—are central values of the field.

Those working in the field of CWS are actively engaging with technology, adapting pedagogical approaches while still creating safe spaces for experimentation. CWS promotes creativity by fostering environments that encourage independent thought and enable writers to trust their intuition. CWS nurtures unique voices, supports creative freedom, and emphasizes the importance of exploration and discovery, offering methods that AI alone may never suggest. As this paper has revealed, the role of creative writing in higher education remains vital in supporting human creativity, critical thinking, and self-exploration, regardless of how emerging technologies, including AI, evolve.

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Section 2

Creativity and Education

Chapter 4

Teaching Creativity towards Futurist Thinking: Querying Artificial Intelligence

Leila E. Villaverde and Roymieco A. Carter

Abstract

At a time when our thinking and practice are limited by bans and censors, where a multiplicity of ideas/perspectives and deep conversation are seen as threats, we are challenged to think ever so creatively and critically to navigate such terrain. Teaching and learning are even more important spaces for cultivating new questions, especially complex ones that challenge the status quo, business as usual, and combat historically entrenched injustices. We discuss a vision of the future that does not replicate the past or present and dares to dream and imagine what should be and what can be. We delve into what creativity is and how we can use it with futurist thinking towards more engaging learning spaces. In this chapter, we also entertain the ethical questions artificial intelligence raises and discuss the necessary use of creativity, futurist thinking, and critical studies to reframe our approach to the many world challenges that lie ahead.

Keywords: futurists, critical studies, creativity, creative studies, critical pedagogy

1. Introduction

Teaching Creativity Towards Futurist Thinking is the shift from focusing on seeking answers to deeply engaging the uncertain, ambiguous, unknown or unfamiliar, the wonderings not yet asked, and most importantly focusing on the quality of inquiry and questioning. What does a shift in thinking look like when you place the importance on the *question* instead of the *answer*? Who does the old answer-driven practices of thinking serve and how do new inquiry-driven practices expand and open fresh spaces for innovation? If we begin to teach students to privilege the question over the answer, will this place too much strain on the penchant for certitude/absoluteness/rightness and solution finding? We hope so and these are some of the questions we invite readers to ponder.

At a time where our thinking and practice are limited by bans, censorship, and volatile dialog, where a multiplicity of ideas/perspectives and deep conversation are seen as threats, we are challenged to think-ever-so-creatively and critically to navigate such terrain. Learning spaces are even more important to cultivate new and different

pathways for knowledge production. Toffler [1] discussed the need to have a vision of the future, yet without replicating the very same things we have presently. If we are recycling the present or imagining a future that mirrors the present, that is not progress. At present, we are recycling epochs of existence and are at the verge of serious climate erosion, as well as human peril. In this chapter, we discuss the importance of using creativity and critical studies to reframe how we approach these so-called wicked problems while envisioning a new teaching future, one that privileges the question over the answer, a teaching future that focuses more on the how and less on the what. With the imaginings of a new future, we also find ourselves at the precipice of what artificial intelligence provides. We cannot ignore the important questions this raises and how AI intersects with creativity and futurist thinking. It will be in the nuances of the how that we can engage the ethical contours of interstice of AI, creativity, and the future.

2. A spark ignited

As a professor of art and design (Carter) there are many times that art and culture shift, repeat, or morph. Students have several vantage points available to them as they pursue their creative visions. They can be optimistic, naive, insightful, associative, skeptical and the list goes on. However, what is often missing from these defining moments is experience. During a critique of a student's work, as we often do, we were engaged in analyzing the appropriateness, specificity, and relevance of the student solutions. These critiques can touch on many unforeseen topics. A student walks up to the front of the group standing beside the student who produced the work and rather than offering a statement during critique of a personal impression, the student stopped looking at the work, looked at the student and asked a question. "How does this solution guide the viewer to a better understanding of what we or they are supposed to do?" The question initially stumped everyone. The student elaborated. Am I supposed to laugh, learn, act, or what? The student, who created the work, took a moment and said that is exactly what I was trying to find out. This simple yet thoughtful question took the entire critique from a standard critique of technical merit and elevated it to one that was purposeful, meaningful, and pleasurable.

The teaching practice of critique says that the instructor should not allow the class discussion to stay on one student's work. Keep the flow and pace of the critique lively and engaging. We spent an hour discussing the deeper meaning behind the approach this one young artist took to their work. The eureka moment arrived when a student said "Crap, you know we all did this wrong." It was staggering to see the students so unified on their purpose. They realized on their own that they were in "solution-finding" mode, even just merely performing it and the questioning they engaged was about justifying the solutions that they wanted to make. What was needed was an explorative view of the possibilities that the initial assignment prompted. The student's critique was not just directed at the solution but also at the process of the practice. As the professor and student, simultaneously at that moment, I realized that the experience that I had privileged in the day to day was a formulaic performative view of analysis and inquiry. What we discovered in that moment was a collective curiosity that opened us up to new understandings and directions within our solution-finding. Something a student said on that day, "you have to slow down to go faster" stuck with us and we have used it ever since as a wayfinder back to raising critically different types of questions.

Similarly, for me (Villaverde) as a professor of cultural foundations in education, teaching a variety of courses in curriculum studies, critical pedagogy, and visual/creative studies, creating the environment for different questions is a staple of each course. Often students say, "I did not think of it that way" or "this is why I needed to talk to you" or "yes, give me a minute to think this through" … all pointing to the importance of dialog in shifting our thinking and most importantly what we ask in the process. For many of my students, as they begin to think through their dissertations, the research questions are the portal for new and nimble ways of thinking. The portal to a world of research and inquiry, to the path of becoming researchers (in a formal sense) and the reality of the ebb and flow of inquiry where questions shift based on what is actually happening in the research process. Another example was when I worked with a group of 3rd and 4th grade teachers helping to design a curricular unit on indigenous studies. The teachers were very focused on the specific standards for their grade, but they discovered there wasn't much relevant information in the local area. I posed the question, "what if you broaden your search of indigenous communities and the standards are covered through different geographies?". The "what if" question set in motion an entirely different path of guest speakers, student research, a field trip and genuine excitement for learning. The teachers expressed how the question pushed their thinking which was too fixated on the exact standard. Given the expansive student research the classes created a massive matrix to compare the different communities/tribes and geographies discussing how these shaped their way of life.

The value/quality of questioning is essential, both Andrew Vincent [2] and Ken and Kate Robinson [3] speak to the need to ask complex questions, to wonder, and maximize one's imagination. Here we are, with cellphones never out of reach and computers readily accessible, yet the ability to ask insightful questions has become a more valuable skill than simply possessing knowledge and information. The need for fast responses and correct answers is business as usual (even more so with AI), but it is the art of questioning and engaging-inquiry that truly drives innovation, critical thinking, and meaningful learning. So how do we expand the opportunities for different types of questions? Below we engage with a fundamental element, creativity, what it is and how it works.

3. Creativity

Creativity is the ability to not only recognize novel, original or unorthodox ideas, but to use them, to craft/engineer/invent the unimaginable or retool the familiar. Creativity is essential to our survival. We wholeheartedly believe we are born with an infinite well of creativity, yet for most of us schooling is the prime deterrent of creativity. Robinson [4] in *Out of Our Minds* chronicles the ways schools kill creativity and how schools, businesses, communities can refocus/reignite creativity. We should and need to understand what these institutions are, how they function, in order to recognize where and when creativity is tampered with, harmed and outright halted. It's tricky since the majority of the rhetoric around these types of institutions (those where we learn formally and informally) is aspirationally positive, such as the more school you have, the better you do, the better the job and life. This is just but one example of these rather simplistic correlations. These institutions, particularly schools, are intricate systems of hidden curricula and practices/values that rarely advance the success of the masses and certainly not of students of color or students

with varying abilities. Differences in general are not supported and ironically creativity thrives on difference, the very juxtaposition of things in the world invites a hugely generative dissonance, one that allows us to reflect, ask questions, engage in dialog, and produce new knowledge. Quite simply creativity is essential to neuron development, brain health, and general well being. It is the secret sauce to a fulfilling life.

Creativity, as Robinson [5] states, requires both imagination and innovation. He elaborates:

> *Imagination is the root of creativity. It is the ability to bring to mind things that aren't present to our senses. Creativity is putting your imagination to work. It is applied imagination. Innovation is putting new ideas into practice. (p. 118)*

We need to be able to exercise creativity which requires our pedagogy to embrace both the use of imagination and innovation. In order for this to happen we have to believe anyone has these capacities, that with the right growth mindset, environment and encouragement these are possible. Nonetheless, as we discussed earlier, the shift from seeking one answer to engaging in many questions is absolutely necessary in the cultivation of creativity. As we embrace a little more ambiguity and uncertainty, hold back on jumping to conclusions, and our desire for definitive answers we expand what is possible. In this process we should recognize our egos will need some massaging, since many pride themselves in getting "the" right answers which almost sediments one's alleged intelligence. Remember we can be unequivocally sure and still be wrong or not have considered all possibilities. So, certitude is not always the guarantee (revisit Carter's critique example). So much can be gained by asking the unasked, by having the courage to take a step in a different direction and voice what we see and think. Creativity allows for such exploration. Creativity bolsters curiosity and vise versa. We can embrace a child-like curiosity, asking more telling less, focusing on more complex questions, steering away from yes/no questions which are far too binary [2]. The problems that face us today, as we mentioned in our introduction, require far more complex and critical thinking than ever before and schooling is lagging behind. Next, we move to futurist thinking, what it is and how it can help, coupled with creativity, to shift our teaching and poignantly our learning.

4. Futurist thinking

Futurist thinking is not only for science fiction, as a field it offers critically important ideas for our future. Toffler often notes that most individuals are past and present-bound, not future bound. We would add that the notion of the future that most understand is riddled with replications of this past/present straitjacket, therefore it's imperative to unfasten this hold and open the possibilities for a future yet to be imagined. Toffler [1] also argues that in education we have left the future out, and that:

> *the future is closely bound up with the motivation of the learner, and our failure to recognize this paralyzes our programs and mutilates our children. How children or young adults see their future is directly connected with their academic performance and more important with their "experiential performance"- their ability to live, cope, and grow in a high-change society. "Future-conscious education is a key to adaptivity..." (p. xxiv)*

His words still echo 50 years later, especially in a post-pandemic and dystopian world. Think about the rise in the mental health crisis, the numbers of individuals young and old with crippling anxiety, with the lack of tools to effectively problem-solve, adapt, and bounce back from adversity. Again, the adherence to one answer, one solution, rightness and certitude, along with efficiency have become a perfect recipe for the deskilling of more than 2 generations. Surely, we can clear the cobwebs and critically reflect towards a different future.

Futurist thinking requires strategic and creative practices with a vision of the not yet fully informed by what is and has been possible. Similar to lateral thinking, associations, patterns, and rearrangements of what is understood/known is key. It's like if someone gives you a chocolate chip cookie recipe and that is all you bake time after time, instead of seeing this as a foundation for oatmeal chip cookies or brown butter espresso heath cookies, or white chocolate cranberry cookies. You get the point. The futurist uses known information to study, analyze, and create new possibilities. They trust what they know enough to make new leaps and bounds, not out of ignorance or faith, but concrete prior evidence. This is not just trial and error, but forward change through critical reflection, deep questioning, self-knowledge, vision, and imagination. Futurist thinking adapts, recalibrates, and tinkers, welcomes new thoughts/ideas/insights, and most importantly embraces change. Change, in essence, is the most constant of any state of being, yet we are conditioned to desire it while being fearful of it, never feeling empowered to navigate/lead it. The less we engage in futurist thinking, that is actively considering what is probable/preferable/possible and discerning what is best when and where, the less we will be prepared with the onslaught of the impending backward slide, at least in the United States. We are facing a future where knowledge of/expertise/experience does not seem to matter or hold any value for the positions held at the highest level of the country. Students, well all of us, have access to far more information at our fingertips than ever before. The abilities and skills to discern what is information, misinformation, and disinformation is of utmost need especially with the increase in artificial intelligence. We engage with AI in the following section to help us entertain the many questions it raises, but first we look at the similarities between creativity and futurist thinking, as well as how these inform each other.

Creativity and futurist thinking are considered to share the same roots: the ability to think beyond the given conditions or experience. Futurist thinking is the practice of thinking about the "future" as it pertains to a group or how a thing may be positioned in relation to the group. Creativity is also used to imagine possibilities and challenge conventional thought, but it prioritizes the individual's view as origin to the present and the ideas about the future.

The societal, commercial, and institutional pressure to specialize often limits creative individuals' ability to maintain curiosity, recognize patterns, and embrace possibility. By shifting their perspective from self-origin to external opportunities, creative thinkers can better identify emerging trends and anticipate future needs. Both futurists and creative individuals share a common need for intellectual tenacity, a growth mindset, a resilience in the face of failure/adversity, and a sense of belonging to a larger community. As we face the AI matrix, this intellectual tenacity and critical framing will be crucial.

5. Querying AI

Artificial Intelligence has been among us for decades, with increased accessibility, greater questions are raised about how we use it and what it means for our place in

the world, what it means for humanity. We know it can help us write communication, give directions, organize data, but it cannot think for us. It cannot generate original ideas, much the less innovative ones; it needs us for the input. What will matter, ultimately, is the idea, as it is far more important than the output (yet limited/narrow outputs will certainly have a negative impact). Writing the paper will not be as important because AI can do it, but it cannot think through the conceptual nuances and passion behind the argument; it cannot truly convey your individual voice. Our values must shift from the technical to the meaningful, so that we are able to reorient AI not as the end all, instead as a, tool, the tool that it is, albeit a powerful one, but certainly not a substitution. Like Joy Buolamwini [6], we are interested in "what is human in a world of machines". She shares:

> *...surrounded by art and science from a very young age, I was emboldened to explore, to ask questions, to dare to alter what seemed fixed, and also to view the artist's and the scientist's search for truth as common companions. (p. 5)*

Buolamwini was surrounded by the integration and juxtaposition of art and science as she grew up which led her to ask many questions and see even more possibilities. When she visited MIT before starting her degree, a professor told her, "If what you are thinking of making already exists, go elsewhere" (p. 11). The Media Lab at MIT was what she called "The Future Factory" a place where futurist thinking and creativity were a given and curiosity was overflowing. She worked specifically with the Center for Civic Media there. What she quickly learned was the intersection of race and technology had both problematic and opportune intersections. As a result of what she observed and the questions she asked, she made meaning from her own experiences and further investigated the coded gaze, borrowing from discourse around the male gaze in both feminist theories and visual studies. It was obvious to her technology was working from the same norms of whiteness as other fields in the academy and society. In particular she studied facial tracking software and its limitations in recognizing darker skin. She deeply understood the larger ramifications of this limitation as this facial recognition technology gained popularity in police work. "What if someone was misidentified, falsely arrested or worse", she asked (p. 18). There's that "what if" question (like the one asked in Villaverde's example in the introduction), that for her changed the trajectory of her research and work.

The reality is the folks who are writing the code, who they are/how they think, affects the outcomes of the systems. Without greater diversity in the field (diversity in body, mind, and soul), without asking different kinds of questions, racism is solidified in AI as well. Without an inclusive input there's no chance of a diverse output. Artificial intelligence neutral, its systems are based on the same systems of existence in the non-AI world and these have transferred seamlessly. Lifshitz [7] warns, "This is dangerous and the threat needs to be addressed before biased AI systems become ubiquitous. Ultimately, AI systems have the potential to deepen existing systemic inequalities..." She continues to raise concern about incomplete data sets, incomplete or unrepresentative algorithms which are even more problematic.

Most are seduced by the ease, efficiency, and illusion of right that AI pretends to offer, and most are not thinking about where this could lead. What happens when sentient robots demand their rights and these are privileged over others, particularly folks of color. Intachomphoo and Gundersen [8] also warn "AI systems will be able to automate cognitive rather than only physical tasks and will therefore affect new professions, with the potential to turn society upside-down" (p. 74). And as AI systems,

in all its iterations, encroach on more and more jobs and the workforce lags behind in new skill sets to address gaps, what happens to the workforce, to institutions of education that are to prepare individuals of all ages for said workforce. What happens when these problematic data sets and algorithms situated in white Eurocentric metrics further pathologize cultural differences in education, health care, insurance, travel security, and the job market. Is this progress or a technocratic gravitational pull backwards? Similarly, Buolamwini [6] considered how she was "confronted with ethical questions about collecting data and philosophical questions about the nature of truth" (p. 113). AI will require continued engagements with interdisciplinary fields to trouble its assumed neutrality, benevolence, and efficiency. Just like other technological advances, humans need to be critically cognizant of what we embark on, its use, and potential. Both applying creative and futurist thinking to the development and use of AI will be incredibly judicious if we hope to navigate the ethical schisms ahead.

6. Teaching inquiry in the search for meaning

The one thing to be noticed and dwelled upon is what's common with each section above. None of the work we discuss is possible without each other, without collaboration, without different thinkers coming to the table and dialoguing about the issue at hand and its possibilities. But the ways we come together matter. It's not like the group work everyone hated in school. It cannot be like that, for collaboration to work, everyone at the table needs to be recognized for what they bring to the table, for their strengths and we should speak candidly about what is not a strength yet. Collaboration is about teamwork and this takes reciprocity, recognition, respect, clear communication and accountability. Whether the collaboration is in a classroom or elsewhere, the interchange of ideas and community is essential. So what kind of teaching/learning is prime for such interchange, it's what Roberts [9] calls "risky teaching", one that holistically embraces risk and uncertainty and therefore courage, "self-awareness, emotional intelligence, confidence, humility, and external support" (p. xiv). Engaging in the dialog necessary to shift thinking, open up spaces for different questions, and the subsequent explorations of those questions is key. This takes time, which we undoubtedly have to carve out where there is none many times. Inviting students to slow down, to actually listen, think, observe, doing so qualitatively differently requires, of course, some coaching/facilitation. The teacher, too, has to be observant and attentive to all that is happening in order to be open themselves to new engagements. In many ways we need to dispense with a rigid plan, aims for right answers, sole answers and as Roberts states, "Risky teaching is the deliberate and purposeful incorporation of productive uncertainty in learning situations" (p. 11).

Beyond engaging in and setting up productive risk and uncertainty, creativity and futurist thinking should be the driving forces in these curricular changes. Consider what is necessary for all to have access to these learning experiences, in ways that democratically attend to differences and build just communities in the classroom. Leverage students as co-educators as described in the examples at the beginning of the chapter and stay open to all sorts of detours in both curriculum and experiences. The reality is that our teaching should aim beyond course goals and objectives, we should strive *through* content to teach/learn beyond its contours through questioning, but these queries need to be informed by what it means to read the liminal spaces. Liminal reading is reading between the lines, against the grain, reading and questioning simultaneously in order not to accept what is, but rather study and challenge

what could be. We should be propelled by what should be, what can be, as we engage our imagination and innovative possibilities. The thing is that the employment of imagination and subsequent innovations must be infused with a clear and critical understanding of power, equity, and access. For these questioning sessions/insertions to "work" a certain healthy skepticism of the status quo is necessary, learners should already be noticing inequities, wondering why these are, weaving in history, sociology, philosophy, any number of theories to see patterns and understand how power works. Existing limitations should be contested and challenged, binaries should be quizzically scoffed at and nuances should be reveled in, after all cannot it be yes and instead of this or that. Yes!, we say, and often repeat like a broken record.

The reality is that when we have a sense of what imagination is, what innovation is, what play is, we are already in the creative sandbox. When we can dream, think, ask why and what if, we are already within the futurist landscape. Yet we hardly realize we are both in this sandbox and landscape simultaneously. We are *in* these spaces, we have ownership of these spaces, and above all else need to retain our access, our command of these. These spaces cannot be legislated or condemned, they are embodied, and we need to exercise/exploit our use of these in order to produce knowledge that defies the limitations before us and those which will come through various ideological impositions. AI provides both replications of an unjust world, and in many ways intensifies the degree of these injustices, and it may also provide the tools for a different future, one which can begin to address critical needs in health care, for example. Now, more than ever, we will need criticality running in the background and foreground of our own processing to discern when and how to deploy our creativity and futurist thinking, when the "what if" question will change the course of our lives, of our generation, and our tomorrow.

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Chapter 5

A Synthesis of Selected Obstacles to and Models of Creative Problem Solving

Jeffrey J. Walczyk, Kacie Mennie and Danny Walker

Abstract

This chapter reviews research and models concerning cognitive aspects of creative problem solving. Following the introduction, research related to two major obstacles to creative problem solving are reviewed: difficulties in far reasoning by analogy and functional fixedness (perceiving objects and situations only in conventional ways). In the next section, four models of the cognition of creative problem solving are discussed. They are non-overlapping, each dealing with complementary aspects of the creative process. This includes a recent model of how creativity develops and another of how problems are solved creatively in applied settings such as business environments. In the final section, a synthesis of the four models and research reviewed is made regarding what they share-in-common and their unique contributions. To reinforce the material, we end by presenting a case study of creative problem finding via reasoning by analogy within cognitive psychology. Applications and questions for future research are suggested.

Keywords: creative problem solving, functional fixedness, reasoning by analogy, cognition and creativity, models of creativity

1. Introduction

Creativity refers to products, for instance, musical compositions, paintings, bridge designs, and solutions to mathematical conundrums that have two characteristics: they are novel/original and socially valuable [1, 2]. Social value is exemplified in a song people delight in listening to, a painting pleasing to the eye, a structurally sound bridge design constructed at half the usual cost, and a mathematical proof heralded by mathematicians as unusually elegant. Of the varieties of creativity, this chapter focuses on research and models related to the cognition of creative problem solving. Many of the ideas in what follows were inspired by the seminal contributions of Guilford [3], to whom we pay tribute.

1.1 J.P. Guilford: Creativity research pioneer

J.P. Guilford was a pioneer in the study of creativity. His *Structure of Intellect Model* provides a three-dimensional visual understanding of human cognition. The three

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dimensions are contents, products, and operations, the latter most relevant to the cognition of creative problem solving. The five operations postulated by the model are cognition, memory, divergent production, convergent production, and evaluation. Guilford defined creativity in terms of having multiple, novel solutions to a proposed problem or situation. Guilford's operation of divergent production (thinking) is central to creativity [4].

Guilford proposed three capacities of divergent thinking that could be measured: fluency, flexibility, and originality [5]. Fluency is the individual's ability to produce many ideas, such as generating various uses for a brick within a time constraint. Flexibility is the ability to "switch gears," or easily adapt to a new line of thought within the creative process after hitting a mental brick wall. Originality refers to the novelty of the ideas produced [6].

Problems to be solved come in two forms: closed-ended and open-ended. Closed-ended problems typically have a single correct answer (e.g., 26 × 54 = ?) and are often soluble via an algorithm. Guilford's notion of convergent production is relevant here [5, 6]. That is, a specific piece of information or procedure in memory must be searched for and converged upon for solving a problem. Open-ended problems, in contrast, do not have clear right answers. They have multiple possible solutions that usually involve tradeoffs. Most real life problems (e.g., how to find a new job after being furloughed) are open-ended. Creative solutions are typically needed to solve them [7]. Guildford's divergent production/thinking construct, concerned with novel idea generation, is germane to open-ended problem solving [2].

1.2 Chapter overview

In the first section of the three that follow, experimental research is reviewed related to two well-established obstacles to creative problem solving: far-transfer failure when reasoning by analogy and functional fixedness. The second section discusses four influential models of the cognition of creative problem solving, each covering diverse aspects. Although the research literature on the cognition of creative problem solving is extensive and a number of relevant models have been proposed, the length constraints of the present volume required selectivity in the research and models covered. In the third section, based on the first two sections, a synthesis of the models and research is made to identify common themes, applications, and suggest new research directions. A case study of actual reasoning by analogy within psychology is reviewed for any lessons it can afford. Our overall effort is to advance understanding of creativity in contemporaneity given the overwhelming amount of scholarship by showing how the research and models reviewed offer straightforward overlapping and complementary insights on how creativity works and can be enhanced.

2. Review of selected research on two obstacles to creative problem solving

2.1 Reasoning by analogy (far-transfer failure)

An example of problem solving often involving creativity is reasoning by analogy. This is the ability to use a solution for solving a problem in one context to solve a problem in another, especially for seemingly unrelated domains [8]. However, such reasoning can be surprisingly elusive for most. While people are good at using *near analogies* wherein the two problems are in the same domain or there is obvious

surface-similarity, *far analogies*, involving deeper, more abstract similarities, can be quite difficult to notice [9–11]. As an example of near transfer, readers might imagine encountering a kiwi fruit for the first time, noting its fuzziness. They are presented with one to eat and quickly realize that biting directly into the kiwi is undesirable because of their expectation that the skin is likely to be tough such as they have experienced with another fuzzy fruit: peaches. Readers then decide to peel off the kiwi's skin, as they do with peaches, to maximize their enjoyment of the fruit. Readers would have engaged in near analogical problem-solving (APS) based on surface similarity between the source problem (how to enjoy a peach) and the target problem (how to enjoy a kiwi), both in the same domain of fruit.

Success at reasoning by analogy depends on the extent to which problem solvers perceive at the appropriate level of abstraction what is similar between the source and target problems. In particular, if the similarity depends on some abstract rule or commonality (e.g., a law of physics), individuals often fail to notice the correspondence between the source and target problems, thus disconnected in their minds. Even when solutions to analogous source problems are potentially available in memory, problem solvers primarily focus on superficial similarities when solving target problems, often missing the deeper analogy. Thus, far analogical problem solving is generally poor.

In their seminal work on the topic, Gick and Holyoak [9] utilized Duncker's "radiation problem" across six experiments to explore how much people could spontaneously engage in far APS. The methods broadly were as follows: participants were presented with a military problem (source problem) wherein a general and their army needed to conquer a fort that is in the middle of a series of roads radiating outward from it. The challenge is that any given road cannot support the entire army attacking at once. The solution to capturing the fort is to break the army into smaller units that the roads can support and attack from all roads simultaneously. After the presentation of this problem, participants were confronted with another superficially different problem to solve (target problem). A patient has a malignant tumor in their stomach that is inoperable but still must be treated. Radiation is the only feasible option. The strength of the radiation needed to kill the tumor can also kill healthy tissue. Participants' challenge was to figure out how the tumor could be killed but not the healthy tissue. Participants were aided if they noticed a far analogy between the source problem and the target problem. For the solution, rays of lower, safe intensity must be applied from different angles simultaneously such that they converge at full strength at the point of the tumor within the patient. Thus, the tumor is killed, not the surrounding healthy tissue. The abstract analogy was to defeat a central target by attacking from different positions simultaneously. Across the experiments, participants were more likely to analogize from the military story to solve the radiation problem if they were prompted to use the military story. Few did so spontaneously. This and other research highlights that the type of similarity matters, near- vs. far-transfer APS. The latter, requiring perceiving a more abstract correspondence, is rarely automatic.

2.1.1 Surface (near) vs. relational (far) similarity

Gick and Holyoak's [9] findings spawned a plethora of research into the boundary conditions of APS, for instance, why near-transfer problems are easier to solve than far-transfer problems. One possibility is that superficial similarity is a powerful retrieval cue to a source problem that resembles a target problem [12]. In other words, the superficial similarities between the target problem and possible source problems (e.g., fuzzy appearance of kiwi and peach) are stronger retrieval cues than more

abstract conceptual resemblances. Support for this has been found in experimental studies of APS [11, 13–15] and is consistent with the broader literature on the benefits of cues in memory retrieval [16]. Conversely, the solutions to relational (far transfer) problems are encoded in a context-specific manner (e.g., involving a law of physics) and, therefore, are less likely to be activated when, for instance, one is trying to solve a related problem in the real world [14].

2.1.2 Trait versus state far APS ability

Given the research on far APS, a useful distinction is between trait creativity versus state creativity [8]. The former refers to individuals' innate ability to engage in far-transfer APS, which depends partly on fluid intelligence [15, 17] as well as on cognitive problem-solving style [18]. The latter refers to the ability to engage in far-transfer APS as boosted by situational factors [8]. State creativity can improve with training and, as noted earlier, explicit prompting [14, 19, 20].

In summary, the ability to engage in far-transfer APS is creative but difficult because it is more cognitively demanding than near-transfer solutions. Partly this is because far transfer often relies on a shared deeper, more abstract understanding of resemblance between a target problem and potential source problems in LTM and often relies on having considerable expertise (e.g., in physics) [21, 22]. In addition, the memory cues for far transfer are fewer and less salient than are the cues based on superficial similarities supportive of near transfer. As such, the default for humans seems to be to engage in near-transfer APS. However, far-transfer APS can be honed into a mindset that cuts across multiple domains, even when controlling for factors like fluid-intelligence that contribute to trait-based creativity [2].

2.2 Functional fixedness

While expertise in a domain often entails deep, abstract understanding that facilitates far transfer [16, 22], too much expertise and familiarity in a variety of contexts can hinder creative problem-solving. One such hindrance, *functional fixedness* (FF), is the inability to see objects, social contexts, etc. other than in conventional ways. For example, those high in FF see a Stanley water bottle as just a water bottle and fail to see it as a possible hammer. Those low in FF may realize because of its steel construction, the Stanley can make an excellent hammer to secure pictures to walls in the absence of an actual hammer. In his seminal work on FF, Duncker [23] gave participants a box of thumbtacks, a book of matches, and a candle. Participants were instructed to find a way to attach the candle to the wall such that, when it was lit, candle wax would not drip onto the table. Most participants tried to affix the candle directly to the wall with the thumbtacks, or melt the wax and use it as a glue to affix the candle to the wall. However, even if these solutions worked to affix the candle to the wall, they did not prevent the wax from melting onto the table below. Most failed to see the box containing the thumbtacks as anything more than a container. The optimal solution was to remove the thumbtacks from the box, tack the box to the wall, and set the lit candle in the box, creating a makeshift sconce. This study, replicated in 1952, was changed such that the box was presented to participants empty. In this light, participants considered it as part of the "solution space" and were able to see past its conventional function to solve the problem [24].

Research has deepened our understanding of FF. It increases with age [25], expertise, and by providing misleading examples of how objects should be used [26–28].

Age is correlated with life-experience expertise; as people age, they become more familiar with the typical uses of objects as well as with social norms for how tasks are performed and for acceptable behavior. Additionally, a threshold of expertise and fluid intelligence may have to be exceeded for far APS to occur [2]. In contrast, age and expertise hinders other kinds of creative problem solving by fostering FF. Likewise, even when novice problem solvers are provided with an example of how a problem might be solved, they tend to fixate on the example to the exclusion of other creative ideation. In support, Chrysikou and Weisberg [26] observed when participants were given examples that contained inappropriate information that would not help them solve the problem at hand, they relied more on these examples than on more useful instructions. These results have been replicated by Cardoso and Badke-Schaub [27] who provided pictorial examples in a study involving design idea generation.

One reason FF may increase with age, expertise, and with examples concerns how humans store information in semantic memory [28]. Semantic LTM is the storage of generalized knowledge not situated in a particular time or place [16, 29]. Memory for facts, stereotyped life experiences (e.g., scripts, schemata), and the like leads to conventional thinking about how objects are used, how to deal with typical situations, etc. Semantic LTM grows more entrenched with age and experience [29]. These conventional memories (e.g., typical uses of a screwdriver) are generally functional, adaptive, and minimize cognitive load on attention and working memory when solving most everyday problems [30], at the cost of hampering creative problem solving on occasion. Contrastingly, a young child presented with a cardboard box might spontaneously use it as a fort, a rocket ship, or an art studio; it can be anything because they lack the entrenched semantic knowledge of what a box typically is. Young children are low in FF. In contrasts, for most adults, seeing a box typically triggers entrenched thinking of how a box is typically used, which is only as a container. One idea to help adults overcome FF is to safely present children with objects and record their novel uses for them.

Text-based stimuli have been compared with pictorial stimuli regarding which lowers FF. Pictures of objects (e.g., a cup) seem to evoke more action-based memories for an object (e.g., drinking) compared with text-based stimuli (the word "cup") [31, 32]. Given that some open-ended problems requiring creativity involve generating diverse uses of objects, presenting hints as pictures rather than words may result in more FF, as pictures activate more top-down, conceptually-driven, semantic knowledge about the common uses of an object. This is precisely what Chrysikou et al. [28] found. Their participants were asked to generate uses for various objects (e.g., a brick). Critically, some participants were presented with the word stimulus, while others were shown a picture of the object. When participants were presented with a picture, they provided more top-down, conventional, and less creative uses for the objects compared to those who were presented with the word for the object. When words were the stimuli, participants generated more creative, bottom-up solutions that relied more on the components of the object and less on its conventional uses.

2.2.1 Overcoming FF by demonstrations

Studies have shown that interventions can reduce FF. Research on decision making and metacognition demonstrates that people are generally poor at evaluating their own abilities and limitations of their thinking (i.e., the Dunning-Kruger Effect). Reminding people of obstacles to creative thinking like FF and others can help people

to overcome them. Neroni and Crilly [33] found that highlighting participants' susceptibility to FF with a demonstration was more effective at releasing them from FF in subsequent problem solving than simply telling them about FF as an obstacle to creative problem solving. These findings are in line with the broader memory literature showing that humans learn better by doing than by being told.

2.2.2 Systematic questioning

McCaffrey [34] argued that FF can be ameliorated through systematic questioning that encourages individuals to think of an object not in terms of its use, but in terms of its physical makeup. As such, the focus switches from conventional uses of the object being activated from semantic memory to a focus on the parts of the object that are inherently more generic. McCaffrey [34] called this method of elaboration the *Generic Parts Technique* (GPT). In GPT, participants are presented with an object and are repeatedly asked two questions until the object is broken down into its most generic, non-use form. They are asked "Can this be decomposed further?" and "Does this description imply a use?" If the object can be decomposed more, participants describe it further. If their initial description suggests a use, participants replace it with a non-use descriptor. **Figure 1** illustrates a GPT analysis with a Stanley Water Bottle.

McCaffrey [34] found that when participants engage in the GPT, they solve more insight problems and do so more creatively than do those who were not provided with GPT instruction. This result is likely due to the GPT participants being released from conventional object uses typically activated in LTM and focused on atypical uses of the components of the objects. In short, they overcame FF.

In conclusion, the ability to flexibly find solutions and innovate ideas is of the utmost importance to human survival and cultural advancement. Humans are often confronted by problems that can seem prima facie insoluble. Two obstacles to solving such problems were reviewed: difficulty in Far Analogical Problem Solving and Functional Fixedness. Failure in far APS is often attributable to a lack of fluid intelligence or the expertise enabling a deep understanding of conceptually similar problems across domains stored in semantic memory. At the other extreme, too much expertise or everyday life experience can produce FF, the tendency to look at objects and situations in conventional ways. The good news, both can be reduced through interventions as described above.

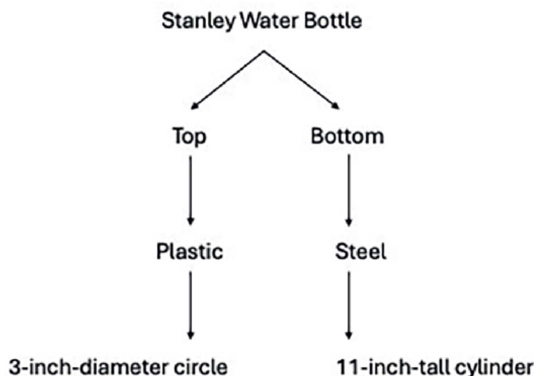

Figure 1.
Example of GPT adapted from McCaffrey [34].

3. Review of selected accounts of the cognition of creative problem solving

In this section, four models are reviewed concerning the cognition of creative problem solving. They were selected using the following criteria. The models were more recent (proposed and refined within the last 40 years), were most relevant to creative problem solving, and were not redundant, that is, focused on non-overlapping but complementary aspects of creative problems solving. The first account reviewed, the Investment Theory of Creativity, is different from the others in that it does not describe the order of mental events that occur over time in creative problem solving. Rather, it is a confluence model detailing the resources, internal and external, humans draw on to create.

3.1 Sternberg and Lubart's Investment Theory of Creativity (ITC)

In economics, a good investment strategy is to buy stocks, real estate, or other assets when their price is low and sell them when their price is high in order to maximize profits. This principle inspired an analogy to understand creativity in Sternberg and Lubart's [35] Investment Theory of Creativity (ITC), which is partly, in our view, an account of creative problem finding. Intellectual innovators in fields such as physics or biology will pursue ideas that are unpopular or unknown to the field as a whole and develop (invest in) them. Their value to the field is then low. Once the ideas are shown by their creators or others to have value within the field, perhaps producing a paradigm shift [36], and are widely embraced within the field, their value is high and the innovators can move on to the next intellectual challenge. Some interesting questions present themselves: (1) How are ideas low in value identified by individuals as worthwhile creative "investments?" (2) Economically, the usual criterion for the investing success is a large, positive difference between the buying and selling prices. What are the criteria in the realm of creativity? (3) How are gains in social value to be assessed?

What resources do innovators draw upon to invest in a creative solution to a problem or find problems to be solved? ITC identifies a confluence of factors that contribute to the creative process [2]. Six factors have been identified. (1) Intellectual capacities are needed comprised of: (a) synthesizing skills allow creators to see problems in original ways and overcome FF. (b) Analytic skills are required to choose ideas worthy of pursuit. (c) Practical-contextual skills help in persuading others of innovative ideas' merit. Per ITC, creative problem solving benefits from advanced planning, for instance, thinking about the problem in different ways before attempting to solve it [37]. (2) Knowledge and expertise are also required to understand what questions and problems are at the cutting edge of a field. As noted previously, however, knowledge is a double-edged sword that can also hinder by inducing FF. (3) Thinking styles matter, i.e., preferred ways in which people use their skills. ITC interestingly construes creativity as a choice to think in novel ways [2], itself an innovative perspective acknowledging the creativity that most individuals possess. (4) Personality plays a role. For instance, intellectual innovators are willing to take risks that make sense, accept and overcome difficult obstacles and serious setbacks, as well as exhibit a tolerance for ambiguity. (5) Relatedly, motivation impacts creativity. Intrinsic motivation (engaging in a task for its own sake such as out of enjoyment) is associated with high levels of creative problems solving. (6) Finally, the environment matters. It facilitates if it is supportive and provides outlets for the creator to share and gain acceptance for their ideas and solutions. However, if new ideas are diametrically opposed to widely

held and entrenched ways of thinking within a field, they may be met with skepticism, anger, or even threats [2].

The next three models are more stage-like in that they postulate over time mental events that lead to creative solutions to problems, albeit the transitions between juxtaposed stages overlap and are reversible.

3.2 A 2-tier model of creative thinking (2TM)

Runco and Chand [38] offered a 2-tier model of creative thinking (2TM), a cognitive account of creative problem solving. **Figure 2** presents the skills sets of the primary tier needed for creative thinking: problem finding, ideation, and evaluation, each described in detail below. The bidirectional arrows show how skills sets interact in problem solving. A secondary tier, not shown, are constructs supportive of the primary tier components: Knowledge and Motivation. (1) *Knowledge* is the source for the production of creative ideas. Specifically, declarative information (i.e., semantic memory consisting of factual and conceptual knowledge organized in associative networks) and procedural knowledge ("how to do" knowledge, i.e., skills such as metacognitive strategies). Declarative or procedure knowledge that enhances problem solving is facilitative. When they have the opposite effect, they are inhibitory. (2) *Motivation* is also crucial to creative problem solving per the 2TM. As noted, intrinsic motivation is engaging in an activity for its own sake. Extrinsic motivation is engaging in an activity for external reasons (e.g., money). Each skill set is elaborated upon below.

3.2.1 Problem finding

Creativity is required to find a problem to solve, often one not seen by others in a field that proves important. Then the problem must be defined and steps taken toward solving it. Divergent thinking is important at this step. According to Guilford [39], divergent thinking includes measurable elements. To reiterate, fluency is the ability to generate many ideas (e.g., ways to solve a problem), while originality refers to their novelty. Flexibility corresponds to the variety of ideas or the ability to change direction quickly in solving a problem. In particular, a positive correlation has been found between fluency and problem finding [40].

3.2.2 Ideation

This skill set involves generating ideas for solving problems, which often requires making connections among ideas remote in memory. Divergent thinking, central to this process as well, is postulated to be an estimator of creative potential, not a measure of creativity directly. Creative ideas involving visual imagery often allow connections from diverse areas of memory and across disciplines. Creative alternative solutions to problems are considered after the obvious, more conventional ideas have first been considered and dismissed. Moreover, for ideas to be creative, novelty is not enough. They must also be appropriate, that is, have some social value such as in

Problem Finding ←→ Ideation ←→ Evaluation

Figure 2.
Component skill sets of the primary tier of the 2TM.

solving a societal problem or creating a new, profitable product line that will sustain a company into the near future. Of course, judgments of appropriateness depend on one's point of view. Interestingly, analyses have suggested that originality and flexibility depend on fluency [41]. Perhaps having ideas that are novel and varied depends fundamentally on having more ideas generally.

3.2.3 Evaluation

This skills set entails judging the solutions generated for solving a problem for their novelty and effectiveness. There are subcomponent processes: (1) evaluation (critically judging solutions) and valuation (how much the solution is valued). Intrapersonal judgments of creativity (e.g., judging one's own work) tends to be more accurate than interpersonal judgments (judging others' creative efforts), perhaps because judges of their own work are more aware of the mental processes that went into their own creative efforts than they are of others' mental states. As a practical matter, however, in most disciplines, judgments of creativity are made by others as part of a peer-review process [2].

3.2.4 Motivation

Per the 2TM, individuals that are intrinsically motivated within their domains, that is, who enjoy working within their fields, are more likely than extrinsically motivated individuals to be creative. As noted previously, intrinsic motivation enables innovators to endure despite great obstacles and serious setbacks in their problem solving. Of course, to be motivated, individuals must also have the knowledge/expertise to see that a problem exists such as the existence of a scientific phenomenon that no existing theory can explain [38].

3.3 Cognitive model of applied creativity (CMAC)

Basadur and Gelade [42] presented a model of creativity in applied settings such as business and industry and involving groups of people. As an example, a company is interested in developing a new product to compete with that of a rival company. The CMAC proposes four mental stages in the creative process. Although movement through the stages is generally in the order specified below, problem solvers can go backwards to earlier stages as needed. (1) *Generating*: At this stage, new ideas are thought of for solving a problem of the organization or new problems to be solved (problem finding) are identified. For instance, what is a new product a company can develop such as a new line of apparel for a sportswear company? (2) *Conceptualization*: Options are considered regarding how to understand and define a problem or ideas are offered regarding how to solve it. For example, to open up a new market, a new line of sports apparel is suggested for men within a company that has focused exclusively on female sportswear. (3) *Optimizing*: Ideas are now generated for making the possible solution(s) a reality and considering factors affecting a successful plan of implementation. For example, what specific products could be produced that appeal to new male consumers and are cost-effective? Recommendations are forwarded. (4) *Implementing*: This involves proposing actions to gain acceptance for implementation or, if necessary, going "back to the drawing board" (i.e., going back to step 1 above). How can we get the products recommended to be accepted within the organization and actually produced?

In their research refining and validating the CMAC in business contexts, Basadur and Gelade [42] observed that employees varied in their aptitude and preference for each of the four stages above. For instance, often individuals who are gifted at some aspects of creative problem solving (e.g., generating) are not good at other aspects (e.g., implementing). The authors recommend having a variety of employee types involved in all aspects, particularly those expressing interest in and showing aptitude for a particular stage.

3.4 A model of domain learning and creativity development (MDL-CD)

Dumas et al. [43] recently proposed a model of the development of domain learning in academic areas and applied it recently to the development of creativity (MDL-CD). Importantly, the MDL-CD distinguishes the judging of what is creative as occurring from two different points of view. *Self-referential creativity*, creativity as judged by a relative novice within a domain (e.g., finding a novel solution to a problem assigned by a teacher) is one form. *Socially-referenced creativity*, characteristic of experts, is genuine creativity within a domain as judged by experts of that domain to be novel and socially useful. Their model further postulates three stages of domain knowledge acquisition (i.e., level of expertise). Each stage is distinguishable in the level of declarative and procedural knowledge individuals possess, their motivation to learn, and the type of creativity involved.

1. In the *Acclimation* stage, domain learners are novices, having little knowledge within a field, little understanding of core tenets, and little procedural knowledge regarding how to solve problems. Interest in the material is typically situational, for instance, on a particular topic a student happens to find fascinating. Creativity at this stage is self-referential, taking the form of elaborating on declarative knowledge such as generating real-life examples of a scientific principle. For instance, in physics a student can identify several examples of simple harmonic motion (like the pendulum) such as the repetitive motion of a leaf in a breeze. This is creative as judged from the novice's limited point of view.

2. With *Competence*, an intermediate level of knowledge is present. Declarative knowledge is better organized around core tenets within a domain. Situational interest wanes; a more trait-like individual interest develops and organizes, which advances the use of deep-learning strategies. Creatively, self-referenced creativity wanes as learners grow in their understanding of what constitutes socially-references creativity within the field. As this stage, learners can generate creative hypotheses, among other attainments, perhaps designing an experiment to test them effectively.

3. With age and experience, some learners develop *Proficiency/Expertise*. Declarative and procedural knowledge becomes deep, well-integrated, and automated based on core tenets of the domain. A deep, abiding individual interest in the domain allows experts to persist despite large intellectual obstacles, developing a trait-like motivation. Some experts become capable of defying norms and contributing to a domain, perhaps moving it in new, promising directions as judged by expert others (social-referencing). Problem-finding is an expert-level creative activity. As an example in physics, in his *General Theory of Relativity*, Albert Einstein proposed a radically new theory of gravity that led to new problem finding

in astronomy and cosmology [36]. One caveat is that expert-level creativity takes much longer to develop than creativity at other stages, requiring many years to attain the background knowledge and understanding such that experts can be at the cutting edge.

Unlike the other models, the MDL-CD focuses on how creativity transitions from what is novel from the perspective of the self to what is creative as judged by experts in the field as a function of the level of expertise problem solvers have attained. Contributions of all four models will now be integrated.

4. Synthesizing the models, applications, and new research directions

In the final section, the four models are synthesized in term of their overlapping components and complementary aspects to arrive at a deeper understanding of the creative problem solving processes. We noted no areas of substantive disagreement across the models. The findings regarding far analogical problem solving and functional fixedness are integrated where appropriate as well. Practical applications are suggested and directions for future research are proposed.

4.1 Shared and complementary aspects

Table 1 compares the three stage-like cognitive models of creative problem solving. Each column is a different model. Components from each in the same row correspond approximately in the processing that occurs at that step. Rows 1 and 2 represent the first two developmental stages of the MDL-CD. As noted previously, novices (Acclimation stage of row 1) and intermediate-level learners (Competence-stage of row 2) are in the process of acquiring foundational domain-specific knowledge, both declarative and procedure, some of whom will eventually contribute creatively to problem solving/finding that is at the cutting edge after attaining row 3: Proficiency-Expertise. All four models, including Sternberg and Lubart's ITC [35], postulate the need for advanced knowledge for creativity at the cutting edge to occur within most fields.

All four models reviewed, including ITC, agree that intrinsic motivation is vital for creative problem solving, Per the MDL-CD, engaging in problem solving driven by a strong, trait-like interest in, enjoyment, or even love of the domain enables problem solvers to persist in the face of immense obstacles, major setbacks, disheartening frustrations, or even openly hostile rejection of their ideas [2]. Once again, this level

	2TM	CMAC	MDL-CD
1.	—	—	Acclimation
2.	—	—	Competence
3.	Problem finding	Generating	Proficiency/expertise
4.	Ideation	Conceptualizing	—
5.	Evaluation	Optimizing, implementing	Social-referenced creativity

Table 1.
A comparison of three diverse models of creative problem solving.

of interest is likely supported by and supportive of the development of advanced expertise within a discipline or at a related endeavor. To what extent is a "genuine love" of the discipline or endeavor needed to be a cutting edge innovator?

Row 3 of **Table 1** equates the Problem Finding and Generating steps of the 2TM and CMAC, respectively. Both skill sets require achieving expertise, likely beyond a threshold before socially-referenced (genuine) creativity within a field is possible [2]. At this step, when solving or finding problems at the cutting edge or in some applied area, as in starting a new business, the problem must be well defined and understood. What conundrum or scientific phenomenon must be solved or explained? What future challenges to a business can be anticipated and overcome (problem finding)? After understanding and defining the problem, possible solutions can then be considered.

In row 4, involving Ideation for the 2TM and Conceptualization of the CMAC, the focus is on generating possible solutions, often through divergent thinking. Overcoming functional fixedness and thinking more abstractly about problems and solutions within or across disciplines to perceive far analogies are helpful. FF, thinking about objects and situational only in conventional ways, can be overcome in some cases by using words as memory cues or through strategies like the Generic Parts Technique. Far reasoning by analogy can be fostered through training, prompting, and by recruiting problem solvers with expertise in multiple areas who are high in fluid intelligence. There is a rich and expansive literature on FF, far APS, and other obstacles to creative problems solving and how these can be overcome, much more than we could cover here. Interested readers are encouraged to explore this fascinating literature.

Row 5 equates the Evaluation step of the 2TM with two steps of the CMAC: Optimizing and Implementing. For both models, these concern deciding which creative solution, if any, best solves the problem and overcoming obstacles to its acceptance. If no solution is deemed acceptable, going back to earlier steps can occur. The MDL-CD notes at this point, social-referencing occurs whereby other experts or those in charge will judge the effectiveness of the solution according to how well it solves the problem, its cost-effectiveness, or by other relevant criteria. In short, this is the point at which the social value of a solution or a problem found is judged by others. As noted, environments can be non-receptive, even hostile to ideas or other creative products which are, perhaps, far ahead of their time, misunderstood, or run contrary to an entrenched paradigm [2, 36].

4.2 A case study of far reasoning by analogy and problem finding

We end by proposing the following hypothesis: the ability to recognize far analogies across diverse problems within a field or across fields is crucial to most instances of problem finding. By this view, one having expertise in multiple areas or bringing together individuals with diverse expertise who openly communicate and share can facilitate the finding of problems at the cutting edge. We illustrate with an actual instance of far analogizing within cognitive psychology that has inspired problem finding and new research directions. In his early career, the first author's research concerned the psychology of reading, including assessing the efficiency of children's literacy skills and the understanding of reading comprehension processes [44]. In particular, literacy skills were measured, for instance, by how quickly and accurately children could name words presented on a computer screen and how quickly and accurately they could decide whether two nouns co-presented on a

computer (e.g., "dog" "apple") belong to the same semantic category (e.g., fruit), and so forth. Verbal working memory span was also assessed. Later in his career, he became interested in the cognition of deception and lie detection. Inspired by his background in reading, he proposed a new cognitive method of lie detection called Time Restricted Integrity-Confirmation (TRI-Con), which postulates deception to be more cognitively effortful than truth telling. Under this method, questions of interest are posed by a computer (e.g., "Did you steal petty cash from the workplace?"). Instructions to respondents require them to answer as quickly as possible, much as how literacy skills were assessed. Respondents' answer response time, pupil dilation, increased blinking, and other signs of cognitive load are the cues to deception [45, 46]. This and other innovative cognitive-based alternatives to the polygraph that emerged starting in the mid-2000s seek to maximize the cognitive load on liars and minimize load on truth-tellers [47, 48].

In addition to TRI-Con, Walczyk and colleagues [49] proposed one of the first, most elaborate, and widely embraced cognitive theories of the cognition to deception named the Activation-Decision-Construction-Action Theory (ADCAT). It was also strongly based on an analogy to the first author's understanding of models of reading comprehension. Just as readers construct a coherent verbal model of the meaning of text in working memory based on their goals in reading, given the social context and their social goals, liars seek to construct a coherent verbal deception in working memory to go undetected and attain their other aims such as hiding wrongdoing. Much was drawn from reading research and theory. In empirical support of the analogy between reading and deception, Walczyk et al. [45] observed significant positive correlations between reading skill efficiency measures like those described above and the efficiency of lying, no significant correlations with the efficiency of truth telling. This and other research now validates the far analogy between reading and deception in that both are active, constructive, linguistic processes dependent on verbal working memory and verbal skill fluency. Interesting research questions present themselves. Empirically, historically, or anecdotally, does far analogy underlie most instances of problem finding across disciplines as we proposed? What role does overcoming FF play in problem finding? As noted, FF and far reasoning by analogy both depend on having high levels of expertise/experience. How are these seemingly incompatible constructs related in how they jointly impact creativity? Researchers, cutting-edge problem solvers and finders, and other interested parties are encouraged to consider these and related questions as well as their applied implications.

4.3 Conclusions

In this chapter we covered selected research pertaining to obstacles to solving problems requiring creative solutions: difficulties in noticing abstract similarities between problems and solutions within and across domains as well as functional fixedness, a conventional mindset. Both obstacles can be considered instances of the Einstellung effect [50]: having a rigid or conventional mindset when flexibility and creativity are needed to solve a problem. On a positive note, research also shows both can be overcome through training, by adopting an unconventional mindset as with the GPT discussed previously. At a group level, explicit training on how creativity works and in idea generation techniques can improve group problem solving effectiveness [51].

Four cognitive models of creative problems solving, each dealing with diverse aspects, were reviewed. These addressed how creative problem solving develops (MDL-CD), what resources are needed to invest in it (ITC), the generic processes

involved in solving most problems (2TM), and how it occurs in applied settings and when working with others (CMAC). The synthesis of models and research findings, as shown in **Table 1** and the related discussion, conveys that much can be learned from combining diverse models that complement each other. The case study involving a problem finding analogy between the psychology of reading and the cognition of deception/lie detection may provide readers of this chapter with ideas regarding how such analogies can be found in their disciplines or applications. Finally, we believe this chapter expands our understanding of creativity in contemporaneity by showing how four diverse, complementary perspectives on creativity can be combined to yield overlapping but distinct insights that advance our understanding of creativity despite the proliferation of research on this topic.

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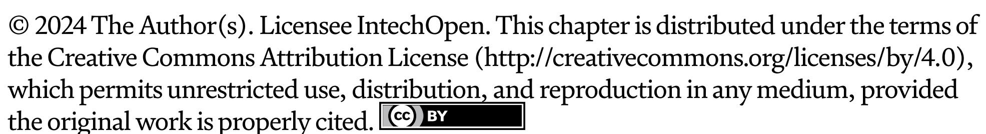
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Chapter 6

The Role of Culture and Environment in Shaping Creative Thinking

Inuusah Mahama

Abstract

Creativity is a multifaceted concept that extends beyond traditional artistic domains, encompassing practical and functional applications across diverse fields such as education, business, and technology. Contemporary understandings of creativity emphasize its role in producing novel and valuable ideas or solutions, reflecting a shift from purely esthetic conceptions to broader, context-dependent phenomena. This evolution has been driven by technological advancements, globalization, and socio-economic factors, which have expanded the possibilities for creative expression and innovation. Interdisciplinary collaboration and digital tools have emerged as critical enablers, fostering new forms of creativity that transcend traditional boundaries. However, significant barriers such as conformity, time constraints, and socio-economic disparities continue to hinder creative potential, particularly in educational settings. Additionally, the integration of artificial intelligence into creative processes presents ethical challenges that must be navigated carefully to ensure responsible innovation. As creativity becomes increasingly central to addressing complex problems and driving societal progress, future research should focus on optimizing educational environments, exploring the impact of AI, and understanding the influence of cultural and socio-economic factors on creative practices. By addressing these challenges and fostering environments that balance ethical responsibility with creative freedom, we can unlock the full potential of creativity to contribute to a more innovative, equitable, and culturally rich society.

Keywords: creativity, interdisciplinary collaboration, innovation, artificial intelligence, ethical considerations, socio-economic factors

1. Introduction

Creativity, as a concept, is multifaceted and has been defined in various ways by different scholars [1–4]. According to Cropley [5], it encompasses the production of novelty that is not only original but also relevant and effective in achieving a desired outcome. This definition marks a departure from earlier conceptions of creativity, which primarily emphasized esthetic and artistic domains, to a broader understanding that includes practical and functional creativity. It is commonly regarded as the

production of novel and useful ideas or solutions to problems [6]. This definition captures the essence of creativity as both an intellectual activity and a process that generates something new and valuable. Sternberg [7] further elaborates that creativity involves the ability to change old ideas into innovative new ones, requiring a combination of intellectual abilities, thinking styles, personality traits, and motivation. The importance of creativity lies in its capacity to foster problem-solving, adapt to changing environments, and drive innovation across diverse fields.

Contemporary creativity is increasingly understood in diverse contexts, reflecting how it manifests differently depending on situational factors and environments. For instance, in educational settings, creativity is not only about producing novel ideas but also about encouraging students to think independently, explore multiple perspectives, and engage in deep inquiry [8]. This approach to creativity is essential in fostering a learning environment where students are empowered to be critical thinkers and innovators. The role of teachers is crucial in this regard, as they must create a conducive environment that nurtures creativity by providing opportunities for exploration, self-expression, and collaborative learning.

Creative ideas and creative production have come to stay and this concept is understood from different professional perspectives. Cropley [5] highlights that creativity is not confined to the arts but is equally significant in fields such as business, technology, medicine, and education, where it manifests in tangible products, processes, and systems aimed at solving real-world problems. In organizational contexts, creativity is often linked to problem-solving and innovation. It is viewed as a key driver of competitive advantage, enabling organizations to develop new products, services, and processes that meet the evolving needs of the market [6]. The application of creativity in business and management underscores the importance of fostering a culture that encourages risk-taking, experimentation, and the free exchange of ideas.

Furthermore, creativity in diverse contexts, such as arts, sciences, and education, highlights the need for a supportive environment that allows individuals to express their creativity fully. Csikszentmihalyi [9] emphasizes that creativity flourishes in environments that are conducive to exploration and innovation. This perspective aligns with the view that creativity is not an isolated trait but rather a product of the interaction between the individual and their environment, including social, cultural, and educational factors.

Moreover, the scope of creativity has broadened to include various dimensions such as the creative person, the creative process, the creative product, and the creative environment, often referred to as the "4 Ps" of creativity. This multidimensional approach allows for a more comprehensive understanding of how creativity manifests in different contexts, from individual cognition and behavior to organizational practices and societal impacts. In practical terms, modern creativity is often linked to innovation, particularly in business and technology. It involves not only the generation of new ideas but also the implementation of these ideas in ways that can lead to improved processes, products, or services. This is evident in the emphasis on "functional creativity," which focuses on the practical applications of creative ideas in achieving specific goals, such as enhancing productivity, increasing market share, or addressing social challenges [5, 10].

Taken together, it is surprising to say that, creativity is a dynamic and context-dependent phenomenon that plays a critical role in various aspects of life. Whether in education, business, or everyday problem-solving, creativity involves the generation of novel and valuable ideas that contribute to personal growth, organizational

success, and societal advancement. Therefore, the twenty-first century understanding of creativity must espouse the processes of training people through conducive environments, various experiences that would inure to the development on intellectual and personal attributes of people.

2. Historical evolution of creative practices and ideas

The historical evolution of creative practices and ideas has been shaped by various cultural, social, and economic transformations over time. Initially, creativity was predominantly associated with artistic endeavors and seen as a trait of gifted individuals who produced works of esthetic value. However, this notion of creativity has evolved significantly, especially throughout the twentieth and twenty-first centuries [11].

During the early twentieth century, creativity began to be understood not only as an artistic pursuit but also as a crucial component of problem-solving and innovation in various fields such as science, technology, and business. The industrial revolution played a critical role in this transformation by introducing the concept of "cultural industries," which referred to the mass production and distribution of cultural goods. This era marked the beginning of a shift toward viewing creativity as a driver of economic and industrial progress, rather than just a pursuit of artistic expression [12].

The mid-twentieth century witnessed further changes in the perception of creativity with the rise of the "creative economy" and "creative industries." These concepts emerged in response to the growing recognition of the economic value of creative activities. The term "creative industries" was first formally used in Australia in 1994 and was later adopted by other countries, including the UK. This marked a significant shift in policy and economic strategies, where creativity was increasingly seen as a key to economic growth, innovation, and competitive advantage in the global market [13]. Moreover, the late twentieth and early twenty-first centuries saw the expansion of creativity beyond individual artistic or intellectual achievements to include communal and collaborative processes [14]. This period is characterized by the emergence of the "creative class," a concept that underscores the importance of creativity in urban development and economic rejuvenation. The creative class includes professionals such as artists, designers, and engineers who contribute to the dynamic and innovative character of cities and regions. The rise of creative cities and the focus on fostering creative environments further highlight the evolution of creativity from an individualistic pursuit to a collective and economic force [12, 15].

In a nutshell, the historical evolution of creative practices and ideas reflects a broadening of the concept of creativity from a focus on individual artistic expression to a central element of economic and social development. This transformation underscores the growing recognition of creativity as a vital resource in various domains, driving both cultural enrichment and economic innovation.

3. Influences on contemporary creative practices

The impact of technology and digital media on contemporary creative practices, particularly in the arts and design, has been profound, catalyzing significant advancements and transformations. The integration of information technology (IT) into creative fields has expanded the boundaries of artistic expression, enabling new forms of digital art, interactive installations, and multimedia performances that were

previously unimaginable. This evolution is not merely about the tools but also about the fundamental changes in how art is conceived, produced, and consumed.

One of the most apparent influences of technology on contemporary creative practices is the extension of traditional art forms into digital domains. For instance, web-based art, hypertext, and digital weaving techniques are examples where digital tools have broadened the expressive possibilities of existing genres [16]. The rise of digital performance during the COVID-19 pandemic further exemplifies this shift. Performances that traditionally relied on live, physical presence adapted to digital platforms, leading to innovations in how performances are staged and experienced. As noted by Webb and Layton [17], creativity, rather than technical proficiency alone, has driven these innovations, with artists using basic technologies like webcams and green screens to create compelling digital performances.

Moreover, the relationship between IT and creative practices has led to new research directions in computer science, particularly in areas like human-computer interaction and artificial intelligence. These fields are increasingly converging with the arts, leading to a rethinking of what computer science research can encompass [16]. This convergence is fostering a hybrid approach where art influences technological development just as much as technology opens new avenues for artistic exploration.

However, it is essential to recognize that this digital shift is not just about replacing old media with new. Instead, it involves a complex process of adaptation where traditional art forms find new expressions and relevance in the digital age. As highlighted by Webb and Layton [17], the recent surge in digital performances illustrates that the most significant advancements often come from creative experimentation with existing technologies rather than the adoption of the latest tools.

Globalization and cultural exchange play a pivotal role in shaping contemporary creative practices, offering artists and designers opportunities to engage with diverse cultural influences and global trends. The interconnectedness facilitated by globalization has allowed for an unprecedented flow of ideas, styles, and practices across borders, leading to the fusion of traditional and contemporary elements in creative works [18]. This exchange has enriched the global creative landscape, making it more dynamic and inclusive.

One significant impact of globalization on creative practices is the increased accessibility to a wide range of cultural expressions. As a result, artists and designers can draw inspiration from a variety of global sources, leading to innovative creations that blend different cultural elements. This phenomenon is particularly evident in digital media art, where the integration of various cultural influences has become a defining characteristic of contemporary design education [19].

Furthermore, globalization has also facilitated the exchange of technological advancements, which has further influenced creative practices. The integration of digital tools and platforms, often developed in different parts of the world, has allowed artists to experiment with new forms of expression and reach global audiences more effectively [20, 21]. For instance, digital communication technologies have enabled Nigerian mass media to expand their reach and influence, illustrating how global technological advancements can disrupt and transform local creative industries [22].

Cultural exchange, driven by globalization, has also led to a greater appreciation for diverse artistic traditions and practices. This has fostered a more inclusive creative environment, where different cultural perspectives are valued and integrated into mainstream art and design practices. As a result, contemporary creative works often

reflect a blend of global and local influences, contributing to a more interconnected and culturally rich global creative community [23, 24].

The socio-economic factors significantly influence creativity, especially in educational settings. According to Faryad et al. [25], traditional learning environments often stifle creativity due to rigid teaching methods, socio-economic constraints, and limited freedom to explore new ideas. These factors contribute to a decline in creativity among students, as they are not provided with the necessary resources or support to nurture their creative potential. The lack of financial resources can prevent schools from offering diverse and enriching programs that stimulate creative thinking. Additionally, socio-economic disparities often lead to unequal access to educational tools and opportunities, further hindering the development of creativity in underprivileged communities.

The study highlights that socio-economic constraints not only limit the availability of creative subjects but also influence the behavior of students and educators. For instance, the pressure to perform well academically in a standardized education system often prioritizes rote learning over creative exploration. This emphasis on standardized testing and the attainment of high grades suppresses the development of creative skills, as students are more focused on memorizing information than on thinking creatively [25].

In the view of Motadi [26], socio-economic status (SES) often determines access to resources, which in turn affects the quality of education and creative opportunities that individuals can pursue. Schools in affluent areas typically have more resources to support creative endeavors, such as arts programs, advanced technology, and extracurricular activities that foster creative thinking. In contrast, schools in lower socio-economic areas may lack these resources, limiting students' exposure to creative activities and their ability to develop creative skills.

Furthermore, the social class background of educators also plays a crucial role in shaping pedagogic practices, which can either support or hinder creativity in the classroom. Teachers from higher socio-economic backgrounds may have more experience with creative teaching methods and be more likely to implement them in their classrooms. In contrast, teachers from lower socio-economic backgrounds may have had less exposure to such methods and may rely more on traditional, less creative approaches to teaching [26]. This disparity can lead to unequal development of creativity among students, further perpetuating social inequalities. To Faryad et al. [25], teachers in many cases may lack the training or resources to incorporate creative teaching methods, leading to a reliance on conventional, less creative approaches. This can create an educational atmosphere where creativity is undervalued, and students who might have thrived in a more supportive environment are unable to fully develop their creative capacities.

Additionally, socio-economic factors influence the broader cultural environment, which affects the types of creative practices that are valued and supported. In societies where there is a strong emphasis on economic success, creative fields that are not immediately profitable may be undervalued, discouraging individuals from pursuing creative careers [26]. This cultural bias can stifle creativity by limiting the diversity of creative expressions and discouraging innovation in less economically lucrative fields.

From the above, it can be deduced that the influences on contemporary creative practices are multifaceted, deeply intertwined with technology, globalization, and socio-economic factors. Technology and digital media have expanded the horizons of artistic expression, enabling new forms of creativity that transcend traditional boundaries. The integration of IT into creative fields has not only introduced novel

tools and platforms but also fundamentally altered the ways in which art is conceived, produced, and consumed. The shift to digital and hybrid art forms, especially during the COVID-19 pandemic, underscores the adaptability and resilience of creative practices in the face of global challenges. Globalization has further enriched the creative landscape by facilitating the exchange of cultural and technological innovations across borders. This interconnectedness has led to a fusion of global and local influences in contemporary art and design, fostering a more dynamic and inclusive creative environment. Artists and designers now draw inspiration from a broader spectrum of cultural sources, leading to innovative and culturally rich creative outputs. However, the impact of socio-economic factors cannot be overlooked. Socio-economic disparities play a significant role in determining access to resources, educational opportunities, and the broader cultural environment that supports creativity. In educational settings, rigid teaching methods and a focus on standardized testing often stifle creativity, particularly in underprivileged communities where access to diverse and enriching programs is limited. These constraints not only hinder the development of creative skills but also perpetuate social inequalities by limiting the potential for innovation and creative expression among marginalized groups. Ultimately, the evolution of contemporary creative practices is shaped by a complex interplay of technological advancements, global cultural exchange, and socio-economic conditions. Addressing these factors holistically is essential for fostering a more equitable and innovative creative landscape where diverse voices and perspectives can thrive.

4. Contemporary creative methods and processes

There are several contemporary creative methods, procedures and processes as espoused in extant literature. These are, but not limited to creative techniques and tools, interdisciplinary perspectives, and collaborative and collective creativity. In terms of the techniques and tools, emerging creative techniques and tools in the twenty-first century have significantly evolved, particularly with the advent of advanced technologies and digital media [27]. These innovations have not only expanded the boundaries of creativity but have also introduced new paradigms for artistic expression and design practices. One of the most significant developments is the integration of artificial intelligence (AI) into creative processes [28]. AI has emerged as a powerful tool that can augment human creativity across various levels, from everyday creativity (little-c creativity) to professional and eminent creativity (Pro-C and Big-C creativity) [29]. AI's role in creativity is multifaceted, ranging from generating novel ideas to assisting in the execution of complex tasks that require high levels of expertise. For instance, AI tools like ChatGPT have been used to generate creative content, enhance storytelling, and even assist in professional tasks such as research, product development, and market analysis [30].

The influence of AI is not limited to content generation; it also extends to the development of new artistic forms and methods. The integration of AI in the arts has led to the creation of interactive installations and digital art that challenge traditional notions of creativity [31]. For example, Refik Anadol's "Unsupervised" project, which uses AI to reinterpret historical data from the Museum of Modern Art, demonstrates how AI can be used to create art that responds to real-time environmental changes, such as light and sound variations [32]. This not only exemplifies the creative potential of AI but also highlights its role in transforming how art is experienced and interpreted.

Also noted by Eriksson [33], creative AI tools are not just about automating tasks but are designed to support human creativity by fostering exploration, intuition, and agency. The emergence of creative AI has led to the creation of tools that can co-create with artists, offering suggestions, generating content, and even participating in the creative process as a collaborator rather than just a tool [33]. They are built to cater to different stages of the creative process, from ideation to execution, and are increasingly incorporating AI to offer more personalized and intuitive support [33]. For instance, tools like Adobe Premiere Pro now include AI features that streamline creative workflows by intelligently matching video content with music, thereby enhancing productivity while maintaining creative integrity [33]. Again, the use of Generative Adversarial Networks (GANs), a form of AI, has enabled the creation of novel artistic expressions that were previously unimaginable. GANs learn from vast datasets of images to generate new, unique pieces of art, sometimes indistinguishable from human-created works [33]. This represents a shift in the creative process, where the boundaries between human and machine creativity are increasingly blurred.

Furthermore, the integration of AI in creative tools has led to the development of Creativity Support Tools (CSTs). These tools are designed to assist creators by automating routine tasks, providing inspiration, and even suggesting creative directions. For example, in the music industry, AI tools can now analyze and generate music that aligns with the mood or style the artist is aiming for, thereby enhancing the creative process [34, 35]. The use of such tools allows artists to focus more on the conceptual aspects of their work, while the AI handles the more mechanical tasks.

Moreover, the convergence of traditional and digital media has resulted in hybrid forms of creativity that blend old and new techniques. This is particularly evident in fields like architecture and design, where digital tools have become integral to the creative process [34, 35]. The use of computer-assisted design (CAD) and other digital prototyping tools has revolutionized architectural education and practice, enabling designers to explore complex forms and structures that would be difficult to conceive or construct using traditional methods [36]. Conservatively, another critical development is the increasing importance of interdisciplinary approaches in creativity. The convergence of different fields, such as computer science, engineering, and the arts, has led to the emergence of new creative processes and techniques. Howard et al. [37] discuss the integration of the creative process within the engineering design process, emphasizing the need for creativity in developing innovative products and solutions. This interdisciplinary approach has led to the creation of hybrid models that combine the strengths of different fields, fostering innovation and enhancing the overall creative process.

In terms of view creativity in the realm of interdisciplinary approaches, Darbellay [27] indicates that, creativity cannot be fully understood or fostered within the confines of a single discipline. Instead, it requires a synthesis of knowledge and methods from various fields, including psychology, sociology, anthropology, economics, and cultural studies. This perspective aligns with the epistemological advances in inter- and transdisciplinary studies, where creativity is seen as a complex and multifaceted phenomenon that transcends traditional disciplinary boundaries. It is noted that, the process of integrating diverse perspectives, methodologies, and knowledge bases requires a creative mindset that is open to new ideas and capable of seeing connections where others might see none. This creativity is not just a by-product of interdisciplinary work; it is a fundamental component of it. By navigating between and beyond disciplinary boundaries, interdisciplinary practitioners engage in a form of creative problem-solving that is essential for addressing complex, real-world issues [27].

To support this, Moirano et al. [28] underscores the inherent challenges and potentialities of fostering creativity in cross-functional teams. Interdisciplinary teams have become a cornerstone for addressing the increasingly complex problems facing society, as these issues often cannot be resolved within the confines of a single discipline. However, the success of these teams depends heavily on how well they navigate the cognitive and organizational challenges that arise from their diversity. To them, managing interdisciplinary teams requires not only fostering creativity but also ensuring that the diverse perspectives and skills of team members are effectively integrated. The diversity in backgrounds and expertise that characterizes interdisciplinary teams, while a source of potential creativity, also introduces a range of cognitive and communicative barriers. These barriers can impede the development of a shared understanding of the problem at hand and hinder the collaborative problem-solving process.

In some instances, interdisciplinarity is often touted as a key driver of scientific creativity, with proponents arguing that it fosters the emergence of new theories and innovative discoveries by bridging gaps between different fields of knowledge. For instance, Klausen [38], in his chapter on “Interdisciplinarity and Scientific Creativity,” indicated that interdisciplinarity is a strategic approach to generating novel and impactful knowledge and inherently leads to scientific creativity. Regarding problem-solving, there is emphasis on interdisciplinary approaches as a means to foster innovative thinking and problem-solving. As highlighted by Fartushenko [39], the integration of interdisciplinary methods within design education is essential for promoting creativity, particularly in environments where traditional, discipline-specific approaches might limit the scope of students’ thinking and problem-solving capabilities. Particularly, creativity in design thrives in settings where diverse perspectives and knowledge bases converge. This approach encourages students to draw from multiple disciplines—such as engineering, social sciences, and the arts—thereby expanding their conceptual toolkit and enabling more holistic problem-solving strategies and broaden their knowledge horizon [39, 40].

Regardless, while the benefits of interdisciplinary collaboration are clear, the challenges associated with implementing such approaches should not be overlooked. Fartushenko [39] points out that the success of interdisciplinary work often hinges on the ability of students and educators to navigate the cognitive and communicative barriers that arise from the diversity of perspectives involved. Effective communication and the development of a shared understanding among team members are crucial for the creative process to flourish in interdisciplinary settings. Complementarily, Moirano et al. [28] highlight that, while interdisciplinary collaboration offers significant potential for innovation, realizing this potential requires strategies that effectively manage the complexities introduced by the diversity of team members. By addressing these challenges, interdisciplinary teams can better leverage their diverse expertise to develop creative and impactful solutions to the complex problems they face.

In this modern era, collaboration and collective creativity have emerged as crucial components of innovation, especially in the context of a rapidly changing global environment shaped by economic, social, and technological upheavals. As highlighted by Anastasiades [41], the knowledge society has redefined the financial and social frameworks at an international level, prompting a reconsideration of established concepts and systems, particularly within education. The uncertainty and volatility of the current era underscore the need for educational systems to adapt by fostering collaborative creativity, leveraging Information and Communication Technologies (ICT) as essential tools.

Again, the recent economic crisis, with its ethical, political, cultural, and social dimensions, has exacerbated social inequalities and created a sense of urgency in rethinking traditional approaches. This crisis has illuminated the importance of preparing citizens for a future that is increasingly unpredictable. In this context, the role of educators becomes critical, as they are tasked with cultivating skills that enable students to navigate and thrive in a world characterized by constant change. Anastasiades [41] argues that collaborative creativity, supported by ICT, offers a powerful means for educators to engage critically with the demands of contemporary society. By fostering environments where students can work together, share ideas, and innovate collectively, teachers can help students develop the adaptive and creative skills necessary for the future.

Building on this foundation, Oddane [42] further explores the dynamics of creativity and innovation in organizational settings. Traditionally, creativity has been viewed as an individual process that precedes collective innovation. However, Oddane challenges this dichotomy, arguing that in complex, real-life projects, innovation is inherently collective and improvisational. In such settings, the emphasis shifts from initial individual creativity to continuous collective creativity, which becomes integral to the innovation process. In furtherance, Oddane's study reveals that the traditional view of creativity as an individual precursor to collective innovation fails to capture the complexity and collaborative nature of real-world innovation. Instead, Oddane proposes a reconceptualization of creativity and innovation as intertwined processes where creativity is not confined to the individual level or the initial stages of a project. This new perspective highlights the importance of ongoing collective creativity, where diverse teams continuously engage in creative problem-solving and adaptation throughout the project's lifecycle.

Likewise, Barrett et al. [43] conducted a systematic literature review to explore how creative collaboration and collaborative creativity are understood and studied within the field of music. Their review reveals that the majority of research has been conducted within higher education, professional development, and professional practice settings. These studies predominantly focused on the processes that support learning and development in these contexts, rather than on the specific nature or outcomes of collaborative creative approaches. One of the key findings from this review is the identification of an emerging phenomenon termed "collaborative creative learning." This concept reflects the interplay between collaboration and creativity within educational and professional settings, where learning is facilitated through collective creative processes. The review also notes that most studies have focused on certain musical genres, including jazz, popular, Western classical, contemporary, and world music, and have explored various musical processes such as composing, improvising, and performing.

In the realm of innovation, collective creativity stands out as a vital quality, especially in processes that necessitate cooperation among groups or individuals. As innovation increasingly relies on collaborative efforts, finding effective methods to foster this collective creativity becomes paramount. One such method, as explored by Skaržauskienė and Kalinauskas [44], is gamification—a tool that can enhance engagement and immersion in cooperative activities by introducing game-like elements into non-game contexts.

Gamification has the potential to elevate the experience of collaboration by creating an environment that fosters amusement and engagement, which are critical for sustaining interest and participation. The concept of "flow," a state of deep immersion and focus, is central to this process. When individuals or groups engage in gamified

experiences, they are more likely to enter this flow state, which not only prolongs their engagement but also enhances their capacity to gather and process information about a specific domain. This extended engagement can lead to deeper insights and more innovative outcomes as participants become more deeply involved in the creative process. The research conducted by Skaržauskienė and Kalinauskas [44] serves as a general review and viewpoint on how collective creativity can be understood and encouraged through gamification. Their analysis of scientific literature covers a wide array of relevant topics, including collective creativity, competitiveness in groups, computational creativity, computerized collaboration tools, and the dynamics of engagement and flow in gamified environments. By examining these areas, the authors seek to identify the key categories and principles that can guide the application of gamification in cooperative tasks, particularly in fostering collective intelligence. Given that the intersection of gamification and collective creativity is a relatively new area of research, Skaržauskienė and Kalinauskas [44] emphasize the importance of categorizing and understanding the different ways in which gamification can be effectively integrated into collaborative processes.

Taken together, it is clear that the twenty-first century has ushered in a transformative era for creativity, marked by the emergence of new techniques and tools driven by technological advancements, digital media, and interdisciplinary collaboration. These innovations are reshaping the creative process, expanding possibilities across various fields, and highlighting the importance of collective and collaborative approaches. As these tools and methods continue to evolve, they will play an increasingly vital role in fostering creativity, offering new opportunities and challenges, and driving innovation in education, professional practice, and beyond.

5. Challenges and opportunities in modern creativity

Creative ideas and their creation are without opportunities, challenges, and as well, ethical considerations and their impact on the society. It is worthy to note that barriers to creativity in today's world are multifaceted, stemming from psychological, social, educational, and organizational factors that collectively stifle the potential for innovation and creative expression. One of the most prominent barriers is the pervasive culture of conformity, which discourages deviation from societal norms and often labels unconventional ideas as risky or undesirable. This fear of nonconformity can significantly inhibit creative thinking and reduce individuals' willingness to explore new ideas [45]. Additionally, the pressure to conform is often compounded by the modern world's demand for instant gratification, which limits the time and space necessary for deep, uninterrupted creative thought [46]. In the educational sphere, particularly at the university level, creativity is further hindered by rigid structures that emphasize standardized procedures and rote learning. These environments often fail to foster the creative climate necessary for innovation, where students feel psychologically safe to take risks and make mistakes [47]. Moreover, the research by Morais and Almeida [45] highlights that gender differences also play a role in perceived barriers to creativity, with women more likely to report feelings of inhibition and shyness, while men often struggle with a lack of motivation.

Another barrier to creativity is the presence of self-imposed limitation (psychological). Individuals often restrain their creative potential due to fear of failure, self-doubt, or a predisposition toward conformity. This barrier is particularly insidious as it originates from within and is perpetuated by the individual's own perceptions and attitudes.

In organizations, barriers to creativity may include the lack of autonomy, unclear direction, and insufficient resources. Autonomy is crucial for creative work, as it allows individuals the freedom to experiment and take risks without the fear of micromanagement. However, in many organizations, a lack of psychological safety and the fear of failure can prevent team members from contributing innovative ideas [48]. Furthermore, inadequate resources, whether financial, technological, or human, can severely limit the capacity for creative problem-solving and innovation within an organization [49]. Another significant barrier highlighted in the research by Morais and Almeida [45] is the rigid educational environment that often stifles creative expression. The standardization of educational processes, coupled with a focus on rote learning, limits students' ability to explore and express creativity. This environment promotes conformity and discourages risk-taking, which are essential components of the creative process. Furthermore, social pressures also play a critical role in inhibiting creativity. For example, societal norms and expectations can suppress individual expression, especially in cultures where deviation from the norm is discouraged. This suppression is further exacerbated by gender-specific barriers. Women, in particular, report facing more significant challenges related to inhibition and shyness, which can be traced back to traditional gender roles and expectations [45]. These internal barriers, such as fear of failure, lack of self-confidence, and fear of criticism, are reinforced by social dynamics and can significantly hinder creative output.

Moreover, the modern emphasis on efficiency and productivity can create time constraints that limit opportunities for creative thinking. In a fast-paced world, individuals often lack the time needed to incubate ideas, leading to a focus on immediate, practical solutions rather than innovative ones. This pressure to perform quickly can fragment the creative process, making it challenging to develop new and original ideas [50]. Additionally, psychological safety is another crucial factor that influences creativity. In environments where individuals do not feel safe to express unconventional ideas without fear of ridicule or judgment, creativity is likely to be stifled. This lack of psychological safety is prevalent in many organizational settings where the fear of failure and the pressure to conform can suppress innovative thinking [47]. In line with this, Solé et al. [51] in a study found that students in higher education frequently encounter emotional blocks when creativity is demanded, especially in non-artistic disciplines. The fear of failure, coupled with a lack of guidance and support from educators, can lead to a reluctance to engage in creative tasks.

Significantly, time constraint is another barrier to creativity, which limits the opportunity for deep, reflective thinking necessary for creativity. The fast-paced nature of modern life, compounded by rigid academic and professional deadlines, often leaves little room for the exploratory and iterative processes that foster creativity. As noted by Morais and Almeida [45], students often perceive a lack of time and opportunities as major obstacles to their creative expression, further exacerbating the challenge of fostering creativity in educational environments.

Likewise, external barriers such as limited resources, whether financial, technological, or human, can also restrict creativity. When individuals or organizations do not have access to the necessary tools or support to experiment and explore new ideas, their creative potential is curtailed. This is particularly evident in educational settings where schools may lack the resources to foster a creative climate, further entrenching the barriers to creativity [52]. Ramos et al. [53] expand on these findings by discussing the barriers to creativity faced by graduates from both distance learning and face-to-face education modalities. They highlight that both forms of education encounter similar challenges in fostering creativity, with key barriers including a

lack of time, opportunity, and social repression. The study emphasizes that distance learning, despite its advantages, still requires more focus on creating an environment conducive to creative thinking, much like traditional classroom settings. Additionally, systemic issues such as the lack of psychological safety, resistance to change, and the pressure for conformity in educational and professional settings further exacerbate these barriers [48].

Despite the impediments to creative abilities, there exist opportunities and chances for positive creative products. According to Lim et al. [54] opportunities for innovation and creative expression in today's world are significantly shaped by advancements in digital technology, interdisciplinary collaboration, and the integration of creative practices into various fields, including education and the arts. The integration of social media in educational contexts, particularly in design education, has provided new avenues for creative expression and innovation. Social media platforms serve as tools that not only facilitate communication and collaboration but also enhance creative practices by allowing users to share, critique, and develop ideas in real-time [54].

Moreover, the role of the arts in fostering employability and economic opportunity highlights how creative expression can be leveraged to address broader societal challenges. The arts provide a critical platform for developing skills that are increasingly valuable in the knowledge economy, such as critical thinking, problem-solving, and the ability to innovate [55]. This intersection of creativity, technology, and economic imperatives underscores the importance of fostering creative environments that encourage experimentation and the exploration of new ideas. In the context of design education, the use of social media has been shown to enhance students' ability to engage with complex problems creatively, enabling them to navigate between different disciplines and perspectives. This interdisciplinary approach not only broadens their creative capabilities but also prepares them to contribute to innovation in various professional fields. The usability of social media, as explored by Lim et al. [54], is linked to creative outcomes such as capturing new ideas and challenging existing ones, which are essential components of the creative process.

Opportunities for innovation and creative expression are abundant across various sectors, offering significant potential for personal and economic development. One of the key areas where these opportunities manifest is within the arts and creative industries, which have increasingly been recognized as pivotal in fostering employability and economic opportunity [55]. According to Novak-Leonard et al. [56], the role of artistic and creative expression extends beyond mere esthetic value; it serves as a critical tool for personal development, job readiness, and economic empowerment. For example, programs like those offered by First Peoples Fund focus on providing Native artists and culture bearers with the skills needed to transform their creative abilities into viable economic opportunities. These programs emphasize the integration of cultural values with business acumen, helping participants navigate the intersection of traditional practices and modern market demands.

The integration of arts and technology in educational curricula is highlighted as a significant opportunity for fostering creativity and innovation. By incorporating creative arts into educational practices, students can develop critical thinking, problem-solving skills, and the ability to innovate. The role of technology, especially digital tools, in facilitating creative expression is emphasized, as it allows students to explore and express their creativity in new and diverse ways [57]. Creative learning is not only beneficial for personal growth but also contributes to economic development. The documents suggest that creative education equips individuals with the skills needed to

thrive in a knowledge-based economy, where innovation is a key driver of economic success. This approach aligns with the broader goal of developing a creative and knowledge-intensive economy [58, 59].

Opportunities for innovation often arise from interdisciplinary collaboration, where individuals from different fields come together to solve complex problems. This collaborative approach encourages the blending of ideas from various domains, leading to innovative solutions that would not be possible within a single discipline. Educational practices that promote such collaboration are crucial in nurturing the next generation of innovators [60]. One of the key opportunities for innovation lies in the application of art and design pedagogy to foster entrepreneurship. As highlighted by Levick-Parkin [61], the values and attitudes inherent in art and design education—such as risk-taking, rule-breaking, and critical thinking—are essential for cultivating an entrepreneurial mind-set that can thrive in complex and rapidly changing environments. This pedagogy not only nurtures individual creativity but also encourages the development of innovative solutions that address societal and economic challenges.

Likewise, creativity helps in empowering educators to implement creative and innovative teaching methods is crucial. Professional development programs that focus on creative pedagogies and the use of digital tools can significantly enhance the ability of teachers to foster creativity in their students. Moreover, providing students with the autonomy to explore and express their creativity in a supportive environment is essential for nurturing innovation [57]. Moreover, the intersection of creativity and business orientation in the creative industries is a critical area of focus. The study by Koch et al. [62] demonstrates that while a strong creative orientation can significantly influence innovation outcomes, it is the interplay between creative and business orientations that ultimately determines the success of these ventures. Creative entrepreneurs who manage to balance these opposing forces are better positioned to navigate the tensions between artistic expression and market demands, leading to more sustainable and impactful innovations.

In some instances, digital media offers unprecedented opportunities for creative expression, particularly among young people. The documents suggest that digital tools can enhance creativity by allowing individuals to experiment, collaborate, and share their creative works with a global audience. However, to fully leverage these opportunities, there is a need for policies and educational practices that promote digital literacy and critical engagement with technology [63]. This is supported by Levick-Parkin [61] that the role of digital and social media platforms in enhancing creative expression cannot be overlooked. These platforms offer unprecedented opportunities for designers, artists, and entrepreneurs to showcase their work, engage with global audiences, and collaborate across disciplines. The ability to leverage these tools effectively can lead to the creation of new genres, forms, and processes, further expanding the boundaries of creative expression [61].

Regarding the ethical issues and societal impact related to creativity, MacNeill et al. [64] explore how creative practitioners in academia must negotiate ethical considerations that often clash with the institutional requirements for ethical compliance. This dissonance can result in a superficial adherence to ethical guidelines, which may not necessarily translate into a deeper, contextually informed ethical practice outside the academic environment. Similarly, the study by Balakrishnan et al. [65] emphasizes the importance of ethics education in shaping the beliefs, attitudes, and intentions of future creative industry professionals. The research suggests that while educators recognize the importance of ethics, there is a need for more robust and

comprehensive ethics education to prepare students for the ethical challenges they will face in their professional lives.

Moreover, the notion of universal ethics in art is problematic due to the diverse cultural, religious, and societal norms that influence what is considered ethical. As Sinclair [66] argues, imposing a singular moral framework on art risks stifling creativity and reducing the richness of cultural exchange. This highlights the need for a more nuanced understanding of ethics that accommodates the diverse contexts in which creative works are produced and consumed.

Educational institutions play a crucial role in equipping future creatives with the tools to navigate ethical dilemmas. However, as Balakrishnan et al. [65] note, there is often a gap between the ethical training provided in educational settings and the real-world ethical challenges faced by professionals in the creative industries. This calls for a re-evaluation of how ethics is taught, emphasizing the development of ethical know-how that is adaptable to various professional and cultural contexts.

In the field of Art, there are issues of ethics and creativity. Art, by its very nature, challenges societal norms and often pushes the boundaries of what is considered acceptable. The moral implications of this boundary-pushing are significant, as they can both reflect and shape societal values. Historically, artists have often been at the forefront of challenging prevailing moral frameworks. For instance, movements like Dadaism and Surrealism emerged as responses to the societal upheavals and horrors of war, deliberately defying conventional esthetics and moral codes. These movements were instrumental in questioning the foundations of human existence and societal norms, demonstrating the importance of preserving the freedom of artists to explore uncharted territories of expression without being bound by ethical restraints [66].

In expanding the argument, credit is given to cognitive networks that hover around ethics and creativity. According to Mumford et al. [67], ethical decision-making in creative processes is deeply connected to the cognitive strategies employed by individuals. The study highlights that creative thinking skills, particularly those related to problem-solving, are positively correlated with ethical decision-making. This suggests that while art may challenge ethical norms, the process of creating art inherently involves a degree of ethical consideration, especially when addressing complex and ambiguous situations.

Moreover, the notion of universal ethics in art is problematic because what is deemed morally acceptable varies significantly across cultures and time periods. By imposing a particular moral code on artistic expression, there is a risk of stifling creativity and inhibiting cultural exchange [66]. This perspective is supported by the findings of Mumford et al. [67], which suggest that ethical decision-making is context-dependent, and effective ethical decisions are often the result of creative problem-solving within specific cultural and situational frameworks.

Ethics in creativity, particularly in the context of art and AI, is a multifaceted issue that reflects on the profound impact creative choices can have on society. The relationship between ethics and creativity is complex, as creative processes often challenge societal norms and push the boundaries of conventional ethics. This dynamic is particularly evident when examining the role of artificial intelligence in creative fields.

The integration of AI in creative processes brings forth several ethical dilemmas, primarily revolving around issues of authorship, bias, and societal impact. Flick and Worrall [68] discuss the ethical responsibilities that come with the use of Creative AI, emphasizing the need for responsible design and usage to mitigate potential harms. For example, the use of AI-generated art raises questions about the ownership and

authorship of the creative outputs, especially when AI models are trained on existing copyrighted materials without clear attribution or consent [68].

The societal impact of creativity, particularly through the lens of computational creativity, highlights both the benefits and potential risks associated with creative processes. Loi et al. [69] argue that creativity is essential for advancing human well-being, as it allows for the adaptation to unforeseen circumstances and fosters self-knowledge. However, they also caution that mainstream AI, with its focus on efficiency and predictability, can stifle creativity by reducing the diversity of thought and experimentation that is crucial for societal progress [69].

One of the central challenges in applying ethical standards to creativity is the diversity of moral frameworks across cultures and societies. What is deemed ethical or acceptable in one cultural context may be considered offensive or unethical in another. This variability makes it difficult to establish universal ethical standards for creative practices, particularly in a globalized world where creative outputs can reach diverse audiences with varying cultural sensitivities [69].

As established, creativity and innovation in today's world are shaped by a complex interplay of ethical considerations, organizational cultures, and societal dynamics. To fully realize the potential of creative expression, it is essential to foster environments that balance moral responsibility with creative freedom, encourage risk-taking, and provide the necessary resources and psychological safety. By overcoming barriers and embracing the opportunities for innovation, individuals and organizations can contribute meaningfully to societal progress, economic empowerment, and the enrichment of cultural discourse. Maintaining a balance between digital advancements and real-world experiences will be crucial in ensuring that creativity continues to thrive and evolve in diverse and inclusive ways.

6. Future directions in creativity

Given the broad and multifaceted nature of creativity, several potential future research directions are proposed to deepen our understanding and enhance the application of creative practices across various fields:

1. Future research could explore how interdisciplinary collaboration fosters creativity, particularly in solving complex problems that transcend traditional disciplinary boundaries. Investigating the cognitive and organizational dynamics within interdisciplinary teams can provide insights into best practices for fostering innovation in diverse settings.

2. Again, with the increasing integration of AI in creative processes, research should examine the impact of AI on creative outcomes. This includes exploring the ethical implications of AI-generated content, the role of AI as a collaborator in creative endeavors, and how AI can enhance or hinder human creativity. Furthermore, studies are needed to investigate how educational environments can be optimized to nurture creativity among students. This includes exploring the effects of different teaching methods, the role of digital tools, and how to balance the demands of standardized education with the need for creative expression.

3. The issue of cultural and societal diversity is equally important. Therefore, future research could focus on how cultural and societal factors influence creative

practices and outcomes. This includes examining how globalization and cultural exchange shape creative expression and how different cultural contexts impact the ethical considerations in creative processes.

4. Identifying and addressing the psychological, social, and organizational barriers to creativity remains a critical area of research. Studies could explore strategies for fostering psychological safety, promoting risk-taking, and providing adequate resources to support creative endeavors in both educational and professional settings.

5. As creativity often involves challenging societal norms, future research could delve into the ethical complexities of creative expression. This includes exploring how artists and creative professionals navigate ethical dilemmas and the impact of their work on society. The development of frameworks for ethical decision-making in creative industries could also be a valuable area of inquiry.

6. Future studies could examine how socio-economic factors influence access to creative opportunities and the development of creative skills. This includes exploring ways to mitigate the impact of socio-economic disparities on creativity in educational settings and the broader society.

7. Conclusion

Having explored the creativity and contemporaneity, it can be concluded that the evolving understanding of creativity highlights its central role in driving innovation, solving complex problems, and contributing to both personal and societal development. The broadening scope of creativity, which now encompasses not only artistic endeavors but also practical and functional applications, underscores its significance across diverse fields such as education, business, and technology. This shift reflects a growing recognition of creativity as a vital resource that fuels economic growth and enhances cultural enrichment. As creativity continues to adapt to technological advancements, globalization, and changing socio-economic landscapes, it is increasingly shaped by interdisciplinary collaboration and the integration of digital tools. These developments have expanded the possibilities for creative expression, enabling new forms of artistic production and fostering innovation in ways that were previously unimaginable. However, the barriers to creativity, such as conformity, time constraints, and socio-economic disparities, remain significant challenges that must be addressed to unlock the full potential of creative capacities.

Again, the interplay between ethics and creativity adds another layer of complexity, particularly in the context of rapidly advancing technologies like artificial intelligence. Ethical considerations are crucial in ensuring that creativity is harnessed responsibly, with an awareness of its societal impact and the diverse cultural contexts in which it operates. As we move forward, fostering environments that balance ethical responsibility with creative freedom will be essential in promoting innovation that is both meaningful and inclusive. Ultimately, the future of creativity lies in our ability to navigate these challenges and opportunities, creating spaces where diverse voices and perspectives can thrive. By embracing the dynamic and context-dependent nature of creativity, we can continue to drive progress across various domains, contributing to a more innovative, equitable, and culturally rich society.

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Section 3

Creativity and Health

Chapter 7

Expressions of Grief That Emerged Using a Creative Process during an International Response to COVID 19

Steve Harvey, Si Wang and E. Connor Kelly

Abstract

In this chapter, the authors address how their collaborative creative process facilitated strong and previously unacknowledged expressions of grief during the initial part of the COVID 19 health crisis. These metaphors emerged spontaneously during an informal project that developed as the pandemic was beginning. In February 2020, a small group of creative arts therapists from China, Guam, and the USA joined together as an experiment to see if they could communicate their personal experiences of the crisis with each other using improvised dance, music, art, and storytelling online despite being from diverse cultures and having a limited common primary language. The project expanded as the health crisis became global. This chapter will focus on a session from December 2020 in which grief became the central theme following a surge in the COVID 19 illness when related deaths developed in the communities in which the participants lived. The expressions of grief were unexpected at the start of this session and emerged as the improvisation became more developed. These expressions were primarily nonverbal. The authors also reviewed studies of grief and mourning during the pandemic and compared the improvised expressions with these observations.

Keywords: creative process, creative arts therapy, COVID 19, subjective experiences of the pandemic, improvisation

1. Introduction

As the COVID 19 pandemic emerged in early 2020 across the world, arts-based expressions developed spontaneously alongside various health related social restrictions and uncertainty in most communities. These expressions facilitated social emotional communication when there was little community-based emotional interaction available during this extraordinary time. Tony Zhou, the editor of *Creative Arts in Education and Therapy* devoted a special edition to this increase in creative expression [1].

Kamanowtiz [2] in her foreword to this edition described the pandemic as generating fearfulness, isolation, and mistrust, as well as an experience of collective trauma as so much of the world was experiencing this similar tragic event. This author suggested that the collective trauma left its disruptive mark on our basic understanding of ourselves and society. However, the spontaneous arts-based expressions as presented in this edition allowed for an embodied connection through the arts to emerge and help communities begin to adjust to this new emotional climate with a sense of resilience and social creativity.

McNiff [3] in his article for this edition describes the arts response to the pandemic as a natural experiment in which artistic expression could be viewed for its timeless power to affirm our collective humanity in the face of an uncontrolled and vastly emotional complex situation which defies straight forward description. Our experience in using arts-based improvisations online in small international groups to express subjective experiences about living with COVID 19 fits within this concept of the arts being a natural and creative way to view unique understandings of this global event.

In this chapter, we address how a collaborative creative process that evolved during online arts-based improvisations facilitated strong and otherwise unacknowledged expressions of grief during the initial part of the COVID 19 health crisis. These metaphors emerged spontaneously during the unfolding of a session within the Creative Dialogs Project [4, 5]. This project developed as the pandemic was beginning when a small group of creative arts therapists from China, Guam, and the USA joined together to see if they could communicate their personal experiences of the crisis with each other using improvisational dance, music, art, and storytelling online despite being from diverse cultures and having a limited common primary language.

We will review concepts of the creative process including the use of nonverbal improvisation to express the complexities of our subjective experiences and begin to tell a "story under the story" [6]. We will also review recent research and projects related to mental health and anthropology that have begun to observe, document, and present the experience of loss and mourning within communities that spontaneously emerged early in the world health crisis. These observations developed within a similar period as those reported in our session. However, the rituals in this literature occurred in a different part of the world and developed within different contexts. Our projects were also unknown to each other. We will offer discussion on how our improvisations fit within the observations of this social research of the ritual projects to explore this important common theme that emerged during the crisis. The purpose of these reviews is to place how an arts-based creative process can contribute to developing an understanding of significant life events using spontaneous improvisation. Both projects point to the importance of having avenues that openly address grief.

2. The creative process

Torrance [7] described the stimulus for the creative process as developing when people feel a "gap" between what is known and what is not. The gap is often experienced as a felt emotional tension and conflict. During creative action, such tension leads to responses that can resolve this gap in creative ways. This process often involves making connections and combination with elements that were previously unrelated, peripheral, and incidental to the previous problem. In our case, this creativity included nonverbal and other arts-based metaphors. Getzels and

Czikszentmihalyi [8] presented a concept they identified as problem finding/problem solving. This process is central in a creativity process. These authors describe an experiment in which they followed a group of highly creative artists who used improvisation within their artistic expression until a problem emerged rather than attempting to solve a problem using a preset formulation from the beginning. In this process, only when the problem or theme emerged did the resolution become apparent. This process is quite different from other problem-solving practices in which the problems are identified before actions are taken. Interestingly, these authors found that those artists who engaged in the improvised approach drew on their dreams and emotional elements from their personal lives that they had been unaware of prior to their artistic efforts. An important aspect of this process involves the communication and meaning making to help refine the spontaneous expressions.

McNiff [9–11] describes the creative process in arts-based therapies also as being central to change. McNiff suggests that therapists and clients engage in dialogs and interactions using their creative imagery directly when developing links to emotional distress. Such direct use of imagination guides creativity in becoming the driving force of change in expressive action. This author encourages those using creativity to trust the process and follow it where it goes without defining what emerges by pre-imposing a structure or meaning from a psychological insight-based theory or using problem-solving approaches. He also suggests that those witnessing to use empathy and their own genuine response and experiences to the improvisational events they observe. The interactions with those involved with the expressive action and as witnesses all contribute to the creative act.

Russ [12] reviewed many studies of creativity, play, and affect. She concluded that creativity is more associated with affect laden thoughts, openness to affect, and that creativity contributes to an ability to tolerate and integrate affective material through transformative thought. Further, creativity and creative expression are associated with intrinsic motivation for meeting challenges. Recently, Magrin-Chagnolleau [13] describes the process of creativity as an experience that leads to unexpected outcomes. This artist/researcher reports that the subjective experience during immediate creative action often differs from verbal accounts of expressive action. He also points to how the principle of enaction between people leads to different outcomes due to the mutual influence people have on each other during playful exchanges. Both direct shared subjective experiences and allowing for mutual influence during expression contribute to surprises during the creative process of improvisation.

Goodill [14] described how the creative process is related to the element of the nonverbal experience in of the field of Dance Therapy. She states that improvisation is at the heart of this intervention. According to Goodill, this process is not just "making it up as we go along" but a way of building meaning and relationship in movement on a moment-to-moment basis, following the craft of working within the medium of dance and movement. Marian Chance [15], one of the central innovators of Dance/Movement Therapy has described how communication emerges using nonverbal expression within groups by transforming the nonverbal interactions among the participants. The central components of this work includes body action, symbolism, therapeutic movement relationship, and rhythmic activity. In this process, the dance therapist begins initially by following the movement patterns in a group setting using the natural movement gestures and postural changes of each individual as they respond to others. Such movements are then guided into more organized interactions in which the therapist uses the movement deviations and variations that arise from the individual participants as cues to transform and change the activity into

an emergent flow as individual members adapt their expression to each other in a moment-by-moment fashion. The therapist uses these dances to develop a therapeutic movement relationship with participants that includes a nonverbal communication that contributes to an emotional acceptance. The results become improvisational dances made from the communicative exchanges connecting the movement of one person to another and from one gesture to the next. As the group proceeds, the therapist and group participants identify basic themes which have emotional relevance through the use of verbal imagery. These images then form the foundation of symbolic dances that are able to express meaning with more clarity than was present at the beginning of the session. This approach uses the interaction between the elements of both creativity and communication as agents of change during the improvised action.

Mary Whitehouse [16] developed other avenues of using spontaneous movement as a vehicle to explore more unconscious emotional states. In these forms, both spontaneous as well as simple movement structures are a way to use movement as a form of active imagination to explore archetypical images which emerge. The movements generated in therapy are often deeply personal. One such style is Authentic Movement. During Authentic Movement, the therapist and other group members take on the role of witness by emphatically attuning to the emotional experiences of the movers as well as their own. One goal of this practice is for the client to have an experience of being "seen" or understood on a basic physical and less defended level. More recently, Harvey and Kelly [17] describe how improvisation from postmodern dance that focuses on spontaneous physical interactions among dancers that emerge in the immediate present rather than using forms derived from past traditions can create meaningful nonverbal conversations that take on unexpected meaning.

3. Unresolved grief during the COVID 19 pandemic

Rituals in the Making [18] is an ongoing five-year research project centred within the Anthropology Department at George Washington University that has been examining death, mourning and memory during COVID 19. These researchers have been studying the questions about how the pandemic changed the way we remembered and grieved when our communities could not gather in person, when mourning occurred within the presence of misinformation and social conflict around the virus, and when the long-term social effects were delayed or rituals suspended. The researchers are currently considering what happens when mourning becomes politicalized. Reports from these projects describe the impact on the quality and meaning of the grief experience and how small groups within communities are using rituals, art, and other communication to find more meaningful expression of their loss within this new social climate.

Several psychologically oriented research articles addressed the initial observations from early in the pandemic concerning the emotional impact of the isolation that medical and social restrictions had on both on the dying person and their family and close friends. Without close contact, social support, and rituals associated with death, people's experience of the emotional impact of loss intensified leading to harsh consequences. The episodes of complicated bereavement increased [19]. Deaths in the COVID 19 context led to heightened psychological symptoms of depression, anger, and anxiety due to the lack of opportunity to bid final goodbye to the deceased, especially when the final days of the deceased were spent in pain and isolation, and the death was untimely as well as unexpected. In such cases, most deaths during

COVID 19 came across as unjust. Loss of a loved one during the pandemic prevented individuals from constructing a meaningful narrative around the loss and resulted in unfinished business for many [20].

As the pandemic continued into 2022, a separate project within *Rituals in the Making,* observed and documented how social forgetting was introduced in news reporting and across social media that minimized the severity of social emotional impact of the surges of deaths across different countries. Such minimization functioned to generate overly optimistic narratives that supported the reopening of schools, businesses, and work at the expense of the actual social emotional costs of COVID 19 among families and communities. The researchers compared this social forgetting to what occurred during the global flu pandemic of 1919 [21]. In the study, researchers also began to observe how individuals and communities began to use memorials and other remembrances to counter this misinformation by making the scale of loss tangible both to themselves and in their communities.

More recently the *Rituals in the Making* project is considering how personal mourning has become impacted from the social conflict within a social climate that has become polarized during the health crisis. The most recent study has been focusing on how activism, advocacy, and resistance have become central to mourning and play out in mourning rituals across various community settings such as virtual as well as actual commemorations, art expressions, comments, and social media posts. Such rituals have been observed on both a national and local community level to allow for grief to be expressed openly in the face of active political action, social hostility, and misinformation that suppress the reality of the mourning experiences in questions about what kind of narrative will be used to explain expert social knowledge and comment about COVID 19. This clash continues to contribute to a state of unresolved grief in much of the world [21].

4. The creative dialogs project

The Creative Dialogs project [4, 5] began when a small group of creative arts therapists from the West joined colleagues from China as the COVID 19 health crisis was beginning in that country to see if we could develop social emotional communication among ourselves about personal experience using co-created arts-based collaborative improvisations with each other. The initial goal was to see if this group could develop understanding and support despite having a limited common primary language, not knowing each other, and using the online setting which was new to us during the beginning of the health crisis. The group used open basic structures to allow for improvised nonverbal expression without extensive pre-planning to see if meaningful communications could be created.

The results of the initial meeting were surprising as promising outcomes emerged. In a review of the material created during the improvisations and the comments that followed, it was clear that emotional connection and empathy developed. The metaphors and verbal reflections of the improvisations suggested that the members were experiencing a common distress. They also referred to the fear of the virus and identified an emergence of social isolation. The improvisations also presented a sense of spirituality and connection among the participants through the experience of collaborative creativity despite the potential barriers of being from different countries and using an online platform [4]. None of these outcomes were expected or planned for. Each theme and image arose spontaneously from creative collaborations within the group.

The project then grew to include international participants and continued regularly for almost 3 years as the pandemic spread throughout the world. Some members participated with regularity in most groups and formed a central core while other participants joined less frequently. The members used integrated dance, music, art, creative writing/poetry, and storytelling improvisation to develop metaphors in response to the verbal reports members presented individually and in group verbal reflections of the experiences they had during COVID 19. In all, there were forty-five participants from twelve countries throughout North America, Oceania, Asia, and Europe. Most were creative arts therapists. However, some had no experience with the arts. Forty-one Zoom meetings were held frequently from early 2020 until November 2022 when the impact of the pandemic was lessening. As the new events related to the pandemic developed such as surges in cases, increases in deaths, social restrictions, and protests of health-related rules in different regions of the world, the subjective experiences of our participants also changed. The metaphors and form of improvisations evolved alongside these changes [5].

The meetings followed a general format of beginning with a verbal description from each member about their recent experiences with the health crisis in their part of the world. This was followed by a series of arts-based collaborative expressions from individuals and small combinations of participants to express these personal experiences. The group watching the improvisations engaged their active imagination using art and poetry to express their experiences during initial improvisations, which broadened the initial metaphors. Group members then added verbal reflection of the arts-based episodes. The group was led by a leader, or conductor [6], who facilitated the organization of the improvisations using an open format like the initial meeting describe above.

In general, after group members verbally presented their experiences, other members would develop dance/music improvisations. The dancers and musicians developed expression without having preset choreography or musical themes to create spontaneous nonverbal metaphors. During the initial sessions, one participant selected another group member from another part of the world to create an improvised movement response to their personal story. This structure was used to facilitate a nonverbal empathy among group members. As the project continued, dance/music collaborative improvisations were created in response to the general themes of the narratives the group introduced in the beginning of the session to make subjective experiences visual and allow for an alternative language of nonverbal metaphor to emerge. The initial episodes were followed by additional improvisations which elaborated the initial metaphors spontaneously into new themes and images.

The sessions always ended with an improvised fairytale in which one or two group members improvised imaginative storytelling, in response to the dance/music [22]. This form used all the modalities available in that session including, dance, music, and storytelling created together simultaneously. In this form the improvisers developed the episode by responding to each other using collaboration that had no preset ending and relied on having mutual influences among the various improvisers to develop the imaginative story until a conclusion was reached together. This story format gave the expression of an organized imaginative story. This form contributed to a summary of the overall session during each meeting.

4.1 The session

The session we reviewed for this chapter occurred in early December 2020. Ten people attended online. Four were from Guam, two from China, one lived in

New York City, one woman came from Melbourne, Australia, and two lived together in Montreal, Canada. All were involved in the creative arts in some way. Only one participant was new to the project. One woman in this session had parent who was extremely ill and died within weeks after the session. She lived in another part of the world which led to the funeral being delayed for many months due to COVID 19 related travel restrictions.

All participants gave their permission for the session to be recorded and had signed permission for their creative materials to be used to present the project in the future. All were aware of the purpose of their improvisation was to create expressive collaborations of their subjective experiences related to the health crisis. All also reported enjoyment in the open and creative atmosphere of the group. The group was considered as offering support and not as a mental health or counseling intervention.

This session occurred during one of the ongoing highly distressful situations that developed during the pandemic. The session also occurred prior to any common social understanding about impacts the pandemic was having on important individual experiences in news, political, or medical reporting around death and loss. The development and provision of vaccines and lifesaving medical advances was months away and uncertain. This unknown future also became significant source of distress.

Those involved in the mental health sector reported that all their clients were extremely anxious. Those involved in the educational sector reported that the schools had been re-opened. However, there were increasing numbers of COVID 19 cases among their staff and students leading to increasing illness in their work setting alongside the demands to return to school. The Chinese reported that the lockdowns were strict and could occur with little warning and last for long undetermined periods of time. All those participating reported that the political protests throughout North America and the tension between the East and West had become highly stressful. Those from China were aware an anti-Asian feeling coming from a collection of the political leaders in the USA. The woman from Australia reported that strict lockdowns had existed for several months in her state but were just beginning to be lifted. Alongside these stresses, all participants were very aware of the initial surges in cases and deaths in their region alongside the development of a new wave of illness. Those in Guam reported of a rise in death rates on their small Pacific Island in combination with a significant limitation of medical resources. Many participants reported they felt that the social media and news reporting had led to a feeling that the verbal commentary in their communities were not reflecting their experiences. They felt their leaders were minimizing their deep fears and left them somewhat disoriented emotionally as they all confronted an uncertain future and the increasing surges in COVID 19 related deaths.

During the initial part of the group, each participant presented verbal descriptions that reflected this stress and complex emotional state along with the positive feeling of wanting to create something with each other. After this initial discussion, the conductor of the group asked two musicians to develop an opening improvisation together with the intention of offering a nonverbal expression of the collective emotional climate of the group. There was no preset topic of for the episode and the musicians were asked to freely improvise and trust that their expression would lead to the next step.

These two women musicians were new to each other as people and came from different musical backgrounds. The improvisation took the form of each woman responding to the other after the other had finished due to limitations of the Zoom at the time which did not allow for simultaneous singing from different sources. One

musician used her voice and patted her body as rhythm at one point and the other used voice, drums, and piano. The other group members took the role of witnessing their own experiences of the music as it emerged and using their active imagination to create art and poetic responses. Each participant shared their experience along with arts-based expression after the duet finished.

4.2 Responses to the musical duet

The art, writing, and verbal reflection suggested that the duet brought up the common experience of strong emotion that that was difficult to express verbally. This strong emotional theme was somewhat of a surprise given that the initial verbal narratives about feeling of distress were related more to the unique situations in the participants' individual daily lives rather than reflecting a more general emotional theme. All the participants mentioned how the music expressed a sense of strong connection with each other.

One of the singers wrote:

> *Voices connect over the oceans over continents/over time zones/in this magical world of Zoom/Zoom in zoom out/Guam to Montreal/please come in/You are in my living room as I am in yours.*

The other singer used an idea presented by a modern thinker to reflect on her experience:

> *Welcome to the secret world of my soul/the conversation across the horizon and the stone that separates us/what a relief from the severe and incessant drone.*

Another group member wrote a poem and added art in response: (**Figure 1**)

> *Wandering with you. Wherever we go we will go together/so glad/I am tired of being alone.*

Another group member stated that she could not express her strong feelings in response to the duet in words. She offered her art (**Figure 2**).

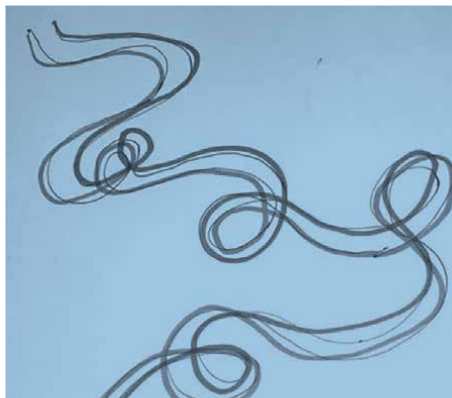

Figure 1.
Artwork to accompany this poem.

Figure 2.
Art response to the duet.

Others presented a series of poems that reflected a shared strong feeling suggesting that the music also evoked more symbolic connections.

This member created art and writing that were about connection with nature (**Figure 3**).

> *I see the image of the aurora/Over in the dark sky/I hear the calling from the mother.*
>
> *Deep inside of the earth/I feel her warmth/I feel her love.*
>
> *Like soft veils/Carrying me into light dreams.*

A woman reported that she had few words to describe her experience of the duet other than it had evoked the sense of isolation, loneliness, distress and confusion on one side of a hill that divided the world into a confused state on one side and joy, beauty, and the enjoyment of life on the other in a more peaceful setting (**Figure 4**).

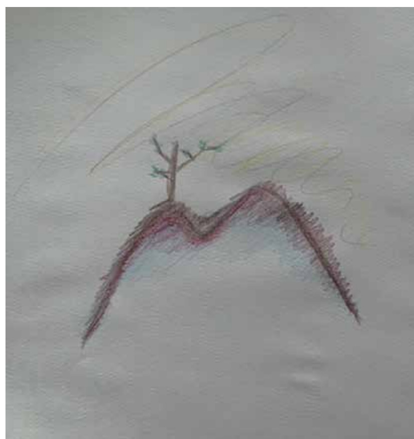

Figure 3.
Art response to accompany the poem.

Figure 4.
Art in response to the music duet.

The other members' writing suggested grief and offered reflections about life and death themes and spirituality.

> *I hear the cries from the winds/from the ancestors/a plea to start the dance/I want to know you now/in the presence of everything now/with the All Knowing*

Another member's writing:

> *Lamenting/women sing/gathering the souls/redirecting now/in the bones/in the soul/ our pours open to song/women's song/gathering as returning us home in our bones.*

This member stated he had a strong emotional response to the music from the beginning. This imagery suggests the presence of life and death.

> *Half a laugh/half a cry/white owl in the black darkness/shark in the ocean depths/a pink in the bright moon light/It is all around us dawn to dusk/dusk to dawn/up and down all around/the IT of mortality.*

4.3 The dance/music improvisation

The conductor then set up a trio dance/music improvisation following this music duet to use nonverbal expression to further explore these strong emotional states using physically felt metaphors by incorporating dance into the episode. The structure was set up as an open improvisation with three dancers performing their solos one after another to freely improvise their movement using their own physical sensation while allowing themselves to be influenced by the other dancers' movement and the music. The two musicians were also included as active partners joining the overall performance with full collaboration. There was no preset topic, ending or other scores to structure the movement or music other than the turn taking among the improvisers. This led to a free expression structured by the physically felt exchanges of the improvisers. The general assumption was that the dance and music that emerged

could become a metaphor that would provide a collective nonverbal expression to further present the strong emotional topics that had already been introduced in the initial musical/art/poetic expression from the duet. The ending would be found during the final solo by the dancer and musician/s.

The initial dancer began to swing her arms which made gestures that were close around her torso. The musician joined her using rhythmic bells that escalated in intensity until both ended in stillness while the bell tones faded to silence. The dancer's final shape included a reaching with her arms away from her core for the first time in her improvisation (**Figure 5**).

The second dancer entered the space from off camera slowly while the second musician joined her singing in sustained vocal tones. The musician then stopped, and the dancer moved in silence until the other musician joined her using vocal melodic phrases with drumming. The dancer developed more shaping movement that included circling through space using rhythmic steps. This dancer ended her dance by leaving the space. Her hands left the camera's view last using an open and closing grasping gesture (**Figure 6**).

The final solo dancer began her improvisation sitting on a large ball with her hands covering her face and her eyes closed. A musician joined this slow and light gestural movement using high pitched sustained vocalizations while the dancer moved her arms and hands around her face. The musician began to use quite periods within her singing, leaving the dancer in repeated periods of silence. During these periods, the dancer stood and began to tentatively explore and expand the space close to her body while keeping her eyes closed. The other musician joined her using more melodic phrasing along with additional a handheld keyed instrument. The dancer ended her improvisation by returning to sitting, taking the hands away from her face, and opening her eyes for the first time. The musician joined these gestures with vocal melodic singing until both the dancer and musician reach a stillness together. The dancer's

Figure 5.
The ending of the initial solo.

Figure 6.
The second solo dance responding the drumming shaping and circling in space.

final movement was a facial expression that suggested grief and sadness which she held for a long time (**Figures 7** and **8**).

All the group members reported that they experienced immensely powerful emotion during this improvisation, and yet they had few words to describe how they felt. They said the dancing had expressed their nonverbal response as words were of limited value in describing their state.

The first dancer said that she had again felt very alone with no avenue to find anyone to join her in her "wandering," feeling frustrated at not being able to change her loneliness. However, after watching the progression of the other improvisations, she felt a resolution of this state and her emotional experience did

Figure 7.
The beginning gesture of last improvisation.

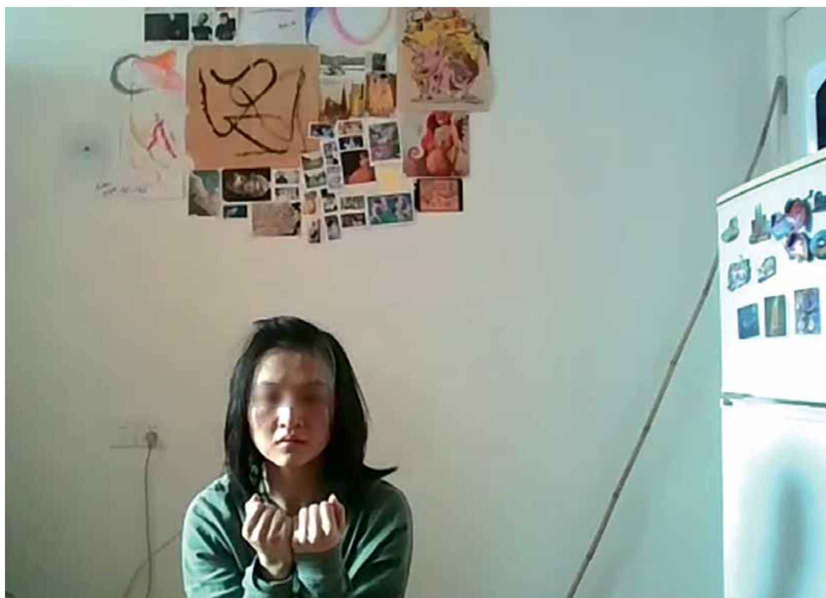

Figure 8.
The ending of the last solo.

shift in a way that was difficult to verbally express. The second dancer said that she also had no words to adequately describe her experiences during the dances. She was able to say that she had been very moved by the music and the other dancers. She then described that after her dance, she felt more tired in her body than she had been aware previously, and that this exhaustion came from her overall experience of going through the pandemic. The third dancer reported that she had closed her eyes during her dance, and she was relieved that the music had contained her and helped draw her out of feeling lost. She was glad when she opened her eyes and could connect to others.

The other group members expressed a range to experiences while witnessing the improvisations. One woman said that watching the dance brought her:

> *"Back to the despair of COVID…that this is what most of the world is experiencing now."*

Another woman expressed a strong feeling of frustration and sadness watching this trio in her art and poetry (**Figure 9**):

> *No, I don't want to see it/ Don't wake me up from my dreams/I will kick you away/ Punch you away before you do/Get out, oh I am frustrated/Disturb me not/You crazy, stupid, frustrating reality.*

Another man in the group that said that he too felt his experience was mostly nonverbal. He did say that he felt overwhelmed by the immense sadness of the recent surge in the deaths in the community around him and from what he had seen of the considerable number of deaths in other countries. He continued to say that the improvisation had given:

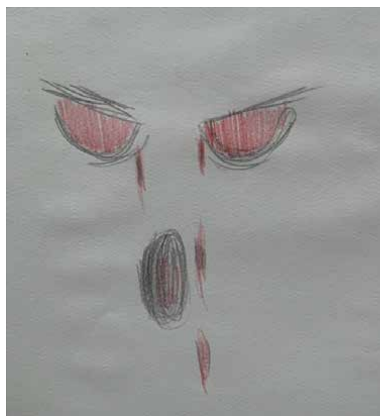

Figure 9.
Artwork in response to the trio.

> *Somehow a beauty to all of this and provided some sense of hope.*

One of the musicians said that she felt like:

> *She had just eaten at a banquet and felt full of beauty, love, and meaning. Thank you all for this blessing. It is far beyond anything I expected.*

4.4 The final fairytale

After the trio dance, the conductor set up a fairytale to summarize the metaphors, images, and reflections the emerged and changed during the session. This step was taken to use storytelling to help organize the meanings of the session. As mentioned above each session of this project ended with a fairytale which included all the expressive modalities in one integrated improvisation [22]. The structure of this episode included a solo dancer, a single fairy teller, and both musicians. As in the other improvisations the group members who witnessed the episode participated using their active imagination by responding to their experiences of the improvisation with art, poetry, and reflections. No preset topic or ending was introduced. Each improviser contributed as a full collaborator. Each participant used their own physical experience of themselves in the moment and of their interactions with their partners. The ending was not determined in the beginning but was discovered by the improvisers together within the improvisation. At the completion of fairytale, group members added their reflections about their experience with the session.

The dancer began the fairytale in a black scarf wrapped tightly over her body. As her improvisation proceeded, she used the scarf in diverse ways. She began wrapping it over her shoulders, then waving it and later throwing it throughout the room. In her last gestures, she placed the scarf on her shoulders as if it were a weight. The musicians joined her with melodic vocalizations and ended with rhythmic drumming. The dancer dropped from the screen after the drumming with the scarf wrapped across her shoulders (**Figures 10–13**).

The fairytale:

The feminine spirit walks from her home this morning out of the clouds

Figure 10.
The beginning of the fairytale.

Figure 11.
The middle of fairytale…" I feel sadness and the pain of passing."

> *I want to feel the sky/I want to fly/I want to take in deep breaths and yet/and yet I feel sadness/I feel pain/the pain of passing/*
>
> *The ritual of dance/I know this/this speaks from my body.*

The fairy teller described using the description of the phrase "pain of passing" to refer a grief process. Group members spoke about how the dancer ended the improvisation so soon and unexpectedly. They reflected that the ritual dance remained ongoing and yet out of sight.

Figure 12.
The ritual of dance.

Figure 13.
The end of fairytale.

The conductor ended the session with a summary saying the day began with verbal narratives of various daily frustrations, confusion, and fears the pandemic had brought to each participant. He then continued describing how those thoughts seemed to transform into a more important sharing of deep emotion of grief around the seriousness of the crisis-especially as the awareness of the many deaths worldwide became apparent in the imagery, metaphors, that emerged throughout from the initial musical duet, though the dance/music improvisation and the summary fairytale.

> *We began differently with the music duet. There was such an evocation of a powerful spirit and emotion that it was a relief from the constant distraction of the news and*

> *social media accounts of the things we encounter day to day. I personally experienced a soothing as I watched these improvisations and had felt and watched the emotion I feel daily but become distracted by my fears of COVID and what our political leaders present-or any of the other many things that keep us away from more authentic experiences. I was so moved by the dance trio and the development of the ritual dance of the grief we feel. This was such an in-depth look of these feelings. Now I and we all are left with what to do with these feelings. When the final dancer left the stage so quickly-it leaves all of us with more mystery around this topic. Thank you all for the surprise as I join with you and am moved beyond anything I could have expected.*

5. Discussion

The presented session was embedded within a creative process that led to an important theme of grief and mourning. This theme was unexpected and primarily expressed through nonverbal expression. The group began as the members verbally described a variety of unique tensions that they were experiencing related to pandemic from various parts of the world. One of the main aspects of these initial narratives focused on a "gap" between how each participant understood their social environment, a fear of what the pandemic might bring, and what they emotionally felt about their situations. The comments also suggested that these more personal feelings were at least partially unexpressed. Each participant described a local conflict of what they understood was being presented in news reports, social media, statements from their political leadership, and in their work situations. They also talked about personal tensions they felt existed whether it was about the risks related to reopening of the schools and businesses or the fears related to the surges of illness and deaths. Most said they did not trust their larger community to understand their experiences. This sense of emotional tension influenced the initial musical improvisation.

The arts-based expressions of the session began as open improvisation with a no preset topic, did not have an end point, problem to solve, or specific situation to address. The initial two episodes were primarily nonverbal and expressed the physically felt and emotional sense of the improvisers. Though the final summary fairytale contained storytelling, this expression was influenced by the more abstract expression of improvised dance and music. The comments suggested that these expressions were surprising and yet related to their subjective experiences during their creativity and in the discoveries of their shared collaborations [10, 11, 13].

These improvisations had the quality of problem finding [8] and of following a natural creative/expressive process rather than a being a set of planned steps to solve an already defined issue [12]. The nonverbal metaphors were essential to the communication that emerged [14–16]. The group used their poetic writing and art to present their experiences of the initial musical duet as containing strong emotions of connection. Some of these expressions were more symbolic and suggested experiences related to a variety of feeling states connected to spiritual images such as nature, disorientation, loneliness, the presence of the "All Knowing," and of the "IT of mortality." When considering the process of session overall, these images did introduce the possibility of the emergence of a central important theme which had yet to be more fully defined.

The dance episode was introduced to further explore this possibility with more depth using extended improvised nonverbal image making. The art, poetry and verbal reflections of this improvisation elaborated this theme with poetic and art

imagery. Descriptions of the feeling states included "despair," emotions so powerful that it led to a need to turn away from "reality," the emotional exhaustion related to the experience of the pandemic, and a graphic image of a face crying about this moment in the world crisis. These images suggested a depth of an underlying feeling. Verbal reflections also pointed to the presence of an overwhelming sadness and grief that accompanied the COVID 19 related death. With this improvisation, imagery, and verbal reflection, the central theme of grief had become more clearly identified and elaborated after the significant emotional expressions through the emergence of nonverbal metaphors and reflections of these experiences.

The fairytale then contributed a final phase of clarifying this underlying emotional story. During this improvised tale, the dance, music, and storytelling reviewed the presence of sadness and the need for ritual to address this emotional state with authentic expression. During the final verbal summary, the conductor offered the reflection that this session ended with an expression of grief that became more defined as the session progressed. The expressions of the grief were both cathartic and soothing. Other group comments pointed to a positive feeling and a sense of hope that emerged during the session. The gap, tension, and conflicted emotion expressed during the initial part of the session was transformed into open group creative arts-based communication that were more congruent and meaningful as a ritual of grief.

Projects associated with *Rituals in the Making* [23] have examined the emergence of mourning and grief since early in the pandemic. As mentioned above, these factors included how mourning was impacted, suspended, or delayed by the social restrictions to control the spread of the virus, how the process of social forgetting and misinformation contained in social media and news reporting minimized the impact the social distress related to death, and how the process of polarization around differing political agendas influenced social memorialization and complex experiences of mourning during the public controversies that developed. In each case, this project studied and presented how rituals organically emerged that facilitated the meaning of death during COVID 19 that addressed the need for a viable public expression of grief. These ritual events had a genuine intent to present the social emotional response of the health crisis with more openness within local communities, and among families and close friends of those who died during the pandemic.

This session from the Creative Dialogs project occurred at the same time as the rituals examined were beginning. The themes from the session suggested similar issues presented in the wider projects presented by the *Rituals in the Making* [23] even though these two projects were conducted in quite different contexts, separate places in the world, were unknown to each other, and used different methods. These issues included the identification of the gap between what had become the larger social and political narrative that minimized the recognition of grief, despair, disorientation, and the actual personal emotional experiences of the death of someone close as well as an awareness of the magnitude and scale of death from other parts of the world. The improvisation that emerged during the creative process during the Creative Dialogs project also introduced the need for rituals and arts-based expressions that openly address these emotional experiences of grief. The use of the creative process in this session generated nonverbal metaphors that proved to be especially helpful. These images became more defined around the theme of grief as the session developed. The unexpected and surprising emergence of these themes within the small group expression suggests that improvisation that uses an art-based creative process can offer complex views of the emotional climate that are part of the major events of this world crisis. Such expression can also offer personal relevance.

6. Conclusion

We began the chapter noting the observation of an increase in informal arts-based expression during the COVID 19 health crisis (see Zhou [1]). In this chapter we reviewed a session from one of these projects-the Creative Dialogs Project [4, 5]. The authors presented how metaphors of grief emerged in a surprising manner when a small international group used arts-based creative improvisation during a surge in cases and deaths brought on by the virus. Such improvisation was based on subjective experiences of the participants. These expressions became important as they offered an avenue of expression for one of the themes that has become central in this contemporary period related to grief and mourning during the pandemic.

Several components contributed to this outcome. These included: the use of a creative process that began with an open structure rather than having a preset problem or topic to address, the use of the nonverbal aspects of dance/music improvisation to present important social emotional experiences, the use of art, poetry, and verbal reflection to elaborate these complex metaphors to clarify meaning. The nonverbal aspects of dance and music were used to explore parts of our participants social emotional experiences in an expanded way. One of the major discoveries that came from this project was how central the creative process was in the use of improvisation among participants who had limited common verbal language but did have similar subjective experiences of high emotion and loss that came from their being a part of this worldwide tragedy. In our group, improvisational arts-based expression was created from the ever-changing events of this crisis that had a strong physical/emotional aspect. These collaborations contributed to the development and creation of an emotional based "language" that was recognizable across countries and cultures in uniquely created metaphors.

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Chapter 8

The Role of Creativity with Caregiving

Rebecca L. Koltz and Daniel J. Koltz

Abstract

An American Association of Retired Persons (AARP) report noted that unpaid family caregiving was valued at $600 billion annually. Beyond the financial impact, caregivers experience significant stress, anxiety and mental issues as they face balancing the demands of caregiving with their own self-care. This chapter argues that addressing these unforeseen personal costs is crucial. One innovative approach involves utilizing an experiential-based program designed to creatively enhance caregiver self-care and resilience. This program provides practical tools and strategies utilizing experiential and creative activities for managing caregiving responsibilities and personal self-care. Unlike traditional educational environments, experiential activities immerse caregivers in hands-on learning and approaches to address their mental health and overall well-being. This approach fosters resilience by providing an opportunity to actively engage in a respite and experience the benefits of that while simultaneously discussing how this might translate to their home experience. Experiential learning encourages caregivers to reflect on their current experiences, gain new insights and build tangible skills that empower them in their caregiving responsibilities.

Keywords: creativity, caregiving, self-care, experiential, resilience

1. Introduction

In 1954, Rogers emphasized the significance of creativity, defining it as the process of generating new ideas or solutions that lead to something original or novel [1]. The emphasis is on doing or generating something. He highlighted that suspending judgment is essential during this process, as making distinctions based on the quality or degree of creativity can hinder both creativity and the journey toward self-actualization. Engaging in creative practices can be inherently therapeutic, as it is through these creative moments that individuals can discover solutions, explore different perspectives, and uncover previously unrecognized ideas [1, 2].

Rogers also believed that creativity was intricately tied to an individual's capacity for growth and change, and when people engage in creative activities, they express their feelings and thoughts expanding their capacity to understand themselves in their context. This self-expression leads to increased personal well-being and greater resilience. In context of caregiving, incorporating creativity into their experience

allows for greater flexibility and openness, providing caregivers with more opportunities to navigate challenges effectively. Through creativity caregivers ultimately contribute to their overall well-being and personal resilience.

2. Caregiving and creativity

Research cites the curative nature of creativity and art for older adult caregivers [3, 4]. By understanding the connection between creativity and caregiving, we gain insights regarding factors that contribute to caregiver wellbeing. With nearly 40 million unpaid caregivers across the US alone, with care averaging a value of $600 billion US dollars, it is critical to find creative ways to address their mental health needs. Caregivers play a crucial role supporting the well-being of individuals who require assistance due to age, illness or disability. Despite their essential daily contributions, caregivers face physical, emotional and mental stress. Further compounding the issue of stress is location. Of the nearly 40 million informal caregivers in the US, about 51% reside in rural areas where respite services are less available.

Becoming a caregiver is a life changing event filled with ambiguous loss [4, 5]. Ambiguous loss is characterized as events or experiences that do not have closure, such as in the case of death where grief can be processed [5]. With ambiguous loss grief cannot be fully resolved. For caregivers, this type of loss manifests in three primary ways: (1) grieving the declining health of a significant loved one, (2) grieving the personal sacrifices they make, including the loss of time and the inability to pursue their own goals, and (3) experiencing a loss of social connections and personal freedom as the demands of caregiving often lead to isolation. The perpetual nature of these ambiguous losses makes it challenging to fully process grief thus exacerbating the experience of stress for caregivers. Caregivers are motivated by their compassion and feel responsibility for the direct care of their loved one [6]. Coupled with ambiguous loss, the act of caregiving comes with numerous demands on caregiver mental health. For example, stress, burnout, isolation, anxiety and self-neglect to name a few. Social support and psychological resilience are critical to caregiver mental health. In fact, a study of caregivers and mental health found that resilience was significantly correlated with a more positive experience of mental health by caregivers [6]. The research noted that providing caregivers resources on how to build resilience and social connectedness was imperative.

Rogers theorized that participation in creative activities enhanced well-being [1], and this holds true for caregivers as well. Creative activities offer a curative factor increasing wellbeing and combatting the negative effects of stress [4]. Creative activities can improve perspective regarding their daily challenges and increase flexibility in adjusting to their caregiver role [4]. Moreover, immersion in creative activities for caregivers increases social connection, and caregiver self-esteem and empathy while exploring new activities they might not have done previously. In a systematic review of research that explored the impact of creative interventions with informal caregivers, researchers found overwhelmingly that creative interventions allowed caregivers time and space to cognitively process and adjust to the caregiving role [4]. Also, they noted that group interventions were helpful by building a greater sense of social connection and community. Psychological resilience is a key characteristic in caregivers who demonstrate better coping mechanisms, adaptability to stress, and the ability to maintain emotional stability and overall well-being despite the challenges and demands of caregiving [6]. Additionally, creativity and resilience go hand in hand as creativity acts as a catalyst for key resilience factors such as flexibility and optimism.

The focus of our innovative approach is an experiential-based program that creatively enhances caregiver self-care and resilience. This retreat style program, Refresh and Create: A Caregiver Respite Program, offers practical tools and strategies through experiential and creative activities, helping caregivers manage their responsibilities while prioritizing their well-being. Unlike traditional educational settings, these hands-on experiences based in Kolb's experiential learning model immerse caregivers in learning that directly addresses their mental health and overall wellness [7]. This method fosters resilience by allowing caregivers to actively participate in a restorative experience and explore how they can apply these practices in their home environment. Through experiential learning, caregivers can reflect on their current situations, gain new insights, and develop tangible skills that empower them in their caregiving roles.

3. Experiential learning theory applied to Refresh and Create

Humans naturally seek engaging and enriching activities because continuous learning contributes to better health. This is especially true for caregivers, who also want to stay healthy. However, the demands of caregiving often create the perception that their opportunities to participate in these activities are limited.

Given the focus on personal experience, Kolb's model is likely one of the most applied learning theories [8]. In a study exploring the experience of applying Kolb to students working with dementia patients, researchers found learning through experience to increase their self-efficacy when working with dementia patients [8]. Applied to informal caregiving, experiential learning also has this effect. The Refresh and Create respite retreats were designed with Kolb's experiential learning model [7] offering caregivers a valuable opportunity to reengage in enriching activities while still fulfilling their responsibilities. Kolb's experiential learning model consists of four stages: concrete experience, reflective observation, conceptualization, and active experimentation [7].

For many caregivers, the concrete experience of daily caregiving can be exhausting. By attending a respite retreat, caregivers are introduced to a new experience. Although their caregiving responsibilities remain, they can engage in something different. While they come expecting education, they often do not anticipate experiential activities designed to help them connect with their caregiving experience and explore adaptive ways to enhance their well-being. This process aligns with the reflective observation stage in Kolb's model. During the conceptualization phase, facilitators help caregivers draw connections between the sense of refreshment they feel at the retreat and how they can apply and experiment with this newfound knowledge in their daily lives, corresponding to the fourth stage of active experimentation in Kolb's model. This type of format makes learning meaningful and increases the likelihood that caregivers will practice these coping strategies when back at home.

4. Refresh and Create: A Caregiver Respite Program

A caregiver Refresh and Create Respite Retreat Program has several components involved in engaging caregivers in their well-being, including logistics, planning, creativity, delivery, and connection with the activity and others. This has been an active program for 4 years in a University Extension Program delivered primarily

in rural communities of a western frontier state where resources for caregivers are scarce. The components are critical for engaging caregivers and creating a framework for the facilitator to foster caregiver well-being and resilience successfully. At the retreat, the experiential activities are structured using a behavior change framework. Kolb's experiential learning model fosters behavior change using experience. Using creativity and experiences takes the caregiver away from their daily routine and into a place of comfort, relaxation, learning, and engaging socially with other caregivers. What follows is a framework of how the Refresh and Create respite retreat is structured into four modules for a day retreat.

Upon arrival at the retreat location, caregivers are greeted with light refreshments and a brief introduction to the day's agenda. The morning typically begins with a sensory module facilitating relaxation to help caregivers feel more grounded. For example, they may begin by creating a sugar scrub or handmade soap. The purpose of an activity like this is to start the retreat by engaging the senses sight, smell and touch to reduce tension and lower the defenses of the caregiver. What follows the activity is a discussion of the connection between favorite scents which often engages the caregiver in memory recall. For these retreats a critical element is to not only engage in the activity, but to process it. So, for the sugar scrub participants not only make the scrub, but actually wash their hands with it. Following this activity, caregivers participate in guided meditation or light stretching. They are encouraged to reflect on how they are feeling now compared to when they started.

Mid-morning starts module 2 and this one focuses on more creative expression and reflection where participants are invited to do a variety of things from painting, candle making to planting. Again, they are encouraged to further explore their emotions, reflect on caregiving roles and express themselves. Regardless of the activity, it is crucial that the facilitator bring the activity back to some aspect of the caregiving role. For example, if planting flowers in a pot, caregivers are encouraged to consider how taking care of this plant can be a reminder of how to take care of themselves.

Lunch is provided for participants and is an important time to further relax and engage in informal conversations with means. Sharing a meal together in a supportive setting allows for bonding over shared experiences and challenges. Facilitators encourage light, non-structured conversation.

The afternoon begins with the third module—experiential learning and practical tools. The afternoon is centered around experiential learning activities that align with Kolb's experiential learning model. Caregivers engage in hands-on activities that offer practical, take-home tools they can use to support their well-being. This might include creating a 2-minute hourglass for mindfulness breaks, building a small wind chime to encourage outdoor relaxation, or crafting a globe jar for moments of reflection. These activities are paired with discussions on how caregivers can apply these practices in daily life.

The midafternoon module focuses on stress reduction and mindfulness techniques. Caregivers are encouraged to take a nature walk, engage in deep breathing exercises, or yoga where they are encouraged to take in their surroundings, reflect on what they see, what they hear, what they feel, what they smell. These activities are short but impactful, teaching caregivers how to manage stress.

Each of the described modules follows Kolb's stages: caregivers first experience the activity, then reflect on how it made them feel, conceptualize how it could help them at home, and finally, plan how they will implement it in their routines. Finally, caregivers are encouraged to set some realistic goals for themselves to recreate as best they can the feeling of relaxation and rest, they experienced at the retreat. They are

asked to reflect on how they felt during the retreat, identify the activities that resonated with them most, and develop a plan for maintaining their well-being after the retreat. Caregivers are guided in creating action steps, helping them identify small but meaningful changes they can implement.

Planning the modules takes creativity to engage the caregiver, so they feel relaxed, calm, and rejuvenated. Starting the retreat with a module that engages the senses of smell and touch is a way to reduce stress and body tension and lower the defenses of a caregiver. Creating a sugar scrub, making soap, or related sensory activity is a great way to refresh a caregiver. Discussing the connection between favorite scents engages caregivers in sensory memory recall to do something pleasing to them. Then, washing their hands with similar items helps them feel refreshed, taking them away from caregiving and metaphorically washing away their caregiving duties. Educating caregivers about self-care can be a short process, but it can be completed in a few minutes at any point in the day. The second activity module should engage and teach a caregiver about stress reduction, meditation, connecting to the outdoors through walks, or attending to the world around them. Caregivers often focus on completing the work rather than attending to themselves and what is happening around them. It only takes a few minutes to create a 2-minute hourglass, a globe/glitter jar, or a wind chime. Engaging in your senses of hearing, breathing, closing your eyes, envisioning something other than the work of care, and taking your mind to a relaxation point helps to calm the central nervous system. It only takes a few minutes a day to complete either of these activities to recenter themselves and replicate self-care at home. The afternoon modules focused on practical tools and stress reduction techniques to include activities around food, nutrition, physical activity, memories, meditations, and stress reduction, which all build resilient characteristics of healthy caregivers.

Logistics for caregivers to attend the Refresh and Create Caregiver Respite Program can be difficult for some caregivers. Caregivers often hold beliefs that they cannot get away. They may need an incentive to remove the barrier to attending a day-long retreat. Caregiver barriers include logistics in finding replacement care, paying for care, mistrust of hiring someone to do the care, missing work, exhaustion, and low well-being. Using a cash incentive, personal invitation, and sharing a small snippet of what a retreat entails to gain the attention of a caregiver will improve recruitment. The cash incentive does not have to be large; however, For Refresh and Create $100 helps pay for care, replace lost earnings, or be used as another method for the caregiver's well-being. Another barrier is finding someone to sit with their loved one. Facilitators could create a pool of temporary caregivers to aid in locating someone to step in if a family member or close friend cannot fill in for the day. Caregivers often know when they are tired, burned out, and need a break from their everyday caregiving routine, and when recruiting caregivers, the facilitators should be proactive in sharing that the focus of the Refresh and Create respite retreat is to take a break, learn ways to improve self-care, and engage with other caregivers like them.

Realistically, to run these retreats does cost money and if they are free the likelihood of getting caregivers is greater. Costs associated with these retreats include: the location, securing supplies, food and the gift cards if possible. Funding can be secured through many different sources if the organization hosting the event does not have a budget for a retreat. In many communities, non-profit organizations, In-home care businesses, and local retail outlets are often sources of donations and assistance with funding. Libraries, hotel conference centers, university extension offices, churches, and community centers can be secured as suitable spaces to host a Refresh and Create respite retreat. Activity resources can be purchased, or local retail outlets

may be willing to donate activity items, such as food for snacks and lunch. The event's facilitators should decide how long the retreat will be held and include multiple modules to help caregivers feel like they get a modest break from caregiving.

Delivering the program in a Refresh and Create respite retreat also takes planning. Creating scripts allows new facilitators to incorporate the four stages of Kolb's Experiential model into the modules. The stages of the model are concrete experience (activity), reflective observation (how did I feel), abstract conceptualization (how can I do this at home) and active experimentation (attempt activity at home). The script you create will focus on providing details of the activities, creating a welcoming, open, and accessible process for each caregiver. The goal is not to frustrate caregivers with complex activities but to feel like the process is easy to complete. After the activity, a time for reflective observation and processing with the caregivers about what it was like participating in the activity, which includes asking open-ended questions about the experience. How do they feel? Was it relaxing, and why? Most often, caregivers enter the retreat tired and reserved, and after the first activity, they begin to shed the stress and heavy weight of caregiving responsibility. After each activity, the caregiver can share their thoughts on the activity, and the facilitator should discuss how each caregiver could use it at home. When, how often, and where caregivers can use it at home are good questions. Following the discussion, and if some of the caregivers push back and reject the activity as something they do not prefer to use, it is okay to redirect them to a deeper discussion on what alternatives can be done at home. Facilitators should focus on helping with self-care and building ways to reduce stress and anxiety and promote well-being. The script allows the facilitator to be ready for all types of interactions that may arise, allowing for the flow of the retreat to be a unique experience for each caregiver. After each caregiver has conceptualized a sustainable self-care method, the next step is to develop a plan of action. Active experimentation is a practice to promote behavior change, specifically when it is for caregivers who struggle to care for their well-being.

Creating goals and planning for when the caregiver will use sustainable self-care practices is the last step of the process. It is helpful to include an actual goal setting sheet in the materials because writing down these goals aids the caregiver in remembering how they felt during the Refresh and Create respite retreat. The items made during the activities are also a reminder when they see them in their home. Combining a plan and taking home the experiential creation will bring the caregiver to a place of being refreshed and improve the outcome of self-care at home. Providing tools to build resilience as they re-engage their caregiving roles but allow them to attend to their well-being simultaneously. A caregiver Refresh and Create retreat is an innovative and new approach to caregiver well-being and respite.

The program that has been outlined will engage caregivers and give them words to describe how they can sustain their well-being and build resilience to face the challenges of everyday caregiving. In post assessment data collected after these retreats which were held in rural communities, it was found that participants "came with an empty cup" and then leave the day of respite with a "full cup of tools to focus on themselves." In addition, caregivers found that they will use the activities daily, weekly or whenever they feel overwhelmed, building resilience to face the difficult emotional and physical aspects of caregiving. Creative activities are easy to replicate because they are open to a caregiver's interpretation on how they feel about using them. Creative activities also inspire caregivers to use them frequently for building resilience and the ability to overcome challenging circumstances. One caregiver went home to a loved one suffering from Dementia and she used the glitter/globe jar to

help him calm down so she could re-direct sundowning that was causing anxiety and feelings of desperation. She explained to us in a follow up phone call "I was able to get back into a place of wellness after using the activity I learned at the retreat." She showed her partner the glitter jar and it calmed him down. Not only did she create the jar for her own meditation and relaxation, but it decreased a tense moment when she reengaged with her responsibility of caregiving. Aiding in the creation of a resilient mindset and ability to create a positive effect on her personal wellbeing.

Most participants leave the day of a Refresh and Create retreat with a completely different demeanor from how they arrived. Caregivers often have anxiety about engaging in the retreat and wonder if this is the type of program they should engage in. As soon as the facilitator shares that the day is for them to Refresh and Create and you begin to engage the senses of smell and touch, the mood instantly changes. One caregiver commented "you had me when you asked me what my favorite smell was." The caregiver was already taking their mind away from their caregiving responsibilities and was able to create their own scented soap with the design they chose themself. What pleases the caregiver most is the creative activities are simple but connect directly to what makes them feel good and is a tool for sustainable self-care and building resilience. Facilitators share the experience with the caregivers and develop a sense of social connection with the group and know if the retreat has been a success with all the positive feedback they receive as caregivers leave. A follow up post assessment would be advisable to determine what works well and does not work well in different communities. Being respectful to different cultures is always something to be cognizant of, because what works for younger caregivers may be slightly different for older caregivers and for different identities.

5. Summary of practice recommendations

The Refresh and Create Respite Retreat Program is designed to provide caregivers with a meaningful break from their caregiving responsibilities while equipping them with coping strategies to enhance their well-being and resilience. Based on Kolb's Experiential Learning Model, the retreat offers creative learning experiences to promote sustainable self-care practices. The Refresh and Create program provides a creative and innovative approach to address caregiver exhaustion, stress and logistical barriers.

To review a successful retreat is dependent upon several key components: addressing logistical barriers, creating engaging and therapeutic activities and assessing whether caregivers are leaving with practical strategies they can immediately implement. The following practice recommendations outline how to overcome obstacles caregivers face while also enhancing the overall caregiver retreat experience. We offer six practice recommendations: *addressing barriers for caregivers, creating the activities, structuring the learning, preparing for facilitation, encouraging goal setting, seeking funding*. The intent of these recommendations is to foster an environment where caregivers can relax, reflect and re-energize.

To effectively support caregiver attendance at a program such as Refresh and Create, it is essential to *address common barriers* caregivers' encounter. For example, offering a financial incentive helps cover costs associated with replacement care, travel or lost income. Financial support eases the burden thus making in more feasible for caregivers to participate. Additionally, providing resources for caregivers to find and hire substitute care is essential. Be aware of what is available in your area. Additionally,

personalized invitations are also important—emphasizing the retreats benefits such as self-care, relaxation and networking with other caregivers in their area.

Creating activities requires thoughtful planning to ensure that caregivers experience relaxation and refreshment. The retreat's structure is dependent upon the creation of experiential activities that engage creativity and the senses. The activities should be simple, enjoyable and provide a therapeutic benefit. When designing activities, consider sensory engagement. Caregivers often carry a significant amount of stress and tension, activities aimed at the senses such as making sugar scrubs, crafting soap or creating candles can be highly effective as they engage touch and smell. Additionally, when creating activities consider stress reduction such as guided meditation, deep breathing or short nature walks. Integrate in some physical movement when you can, simple stretching exercises or a light walk to release tension. Caregivers are also more likely to engage in activities that have personal significance or hold. Finally, the activities are only helpfully helpful if you incorporate reflection, so ask open-ended questions such as "How did you feel during this activity?" or "What did you take away from this activity?" Keep reflections positive and focused on self-care.

The *retreat's structure* is guided by Kolb's experiential learning model, a foundational theory ensures that caregivers not only experience relaxation but also engage in meaningful reflection about how to integrate this experience in their daily practice. The use of theoretical base when designing a retreat is essential, as it provides a clear, structured path for both the facilitator and the participants. For Refresh and Create, Kolb's model provides a four-step framework-concrete experience, reflective observation, abstract conceptualization and active experimentation—embedded in each module. The use of theory ensures that caregivers do not passively experience the retreat, rather actively engage with the experience to produce longer term results. A theoretical framework incorporated in the retreat structure ensures that the retreat has a more meaningful impact.

Facilitators play a critical role in shaping a successful retreat experience as they guide caregivers through activities. In *preparation for the facilitation role*, it is important that detailed scripts should be developed for each module. These scripts provide step-by-step guidance about how to conduct activities, including instructions on each task, managing the flow of the activity and types of reflections. Coupled with facilitation, facilitators must also maintain flexibility to adapt to the specific needs and preferences of each group of caregivers. The balance between structure and flexibility is in many ways characteristic of the experience that caregivers have on a daily basis. Following each activity, facilitators must allow enough time for reflection. Reflection is a critical aspect of the program as it provides a mechanism for caregivers to consider how they could apply what they experience at the retreat in their daily practice. Facilitators encourage reflection and application to allow for deeper engagement and allows caregivers to internalize the benefits of the retreat.

Goal setting is another important component of the retreat. Caregivers are encouraged to write down their self-care goals and develop a plan for implementing these practices once they return to their caregiving roles. To reinforce these new habits, the items they create during the retreat, such as the sensory tools, serve as tangible reminders about the importance of self-care and resilience. These takeaways help caregivers maintain a connection to the retreat experience and continue practicing self-care long after the retreat has ended.

Finally, community engagement is essential for making the retreat both affordable and sustainable. Facilitators can *seek funding* from local non-profit organizations, home care businesses, and retail outlets, which may provide financial support or

donate activity materials. Partnering with community spaces, such as libraries, conference centers, or churches, can also help secure suitable locations to host the retreat. By utilizing these resources and partnerships, facilitators can ensure that the retreat remains accessible to caregivers while fostering a supportive environment where caregivers can truly benefit from the respite and self-care opportunities offered.

These recommendations focus on making the retreat practical, engaging, and easily replicable for caregivers, allowing them to build sustainable self-care habits that promote long-term well-being.

6. Conclusions

The integration of creativity and experiential learning within the caregiving experience offers a powerful approach to enhancing caregiver well-being and resilience. Drawing on Rogers' emphasis on creativity as a therapeutic process, it becomes clear that when caregivers engage in creative activities, they gain access to new perspectives, flexibility, and emotional expression, all of which contribute to improved mental health. The Refresh and Create caregiver respite program exemplifies how Kolb's experiential learning model can be applied to provide caregivers with the tools they need to cope with the stresses of caregiving. By participating in hands-on, creative, and reflective activities, caregivers are not only given a much-needed break but are also equipped with practical strategies to maintain their self-care and resilience beyond the retreat setting. Ultimately, the combination of creativity, community, and experiential learning fosters an environment where caregivers can thrive, leading to healthier, more sustainable caregiving practices that benefit both the caregiver and those they care for. Informal caregivers provide a critical role within our society, and by empowering them with creative tools for self-care, we not only support their well-being but also strengthen the foundation of care that sustains families and communities.

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Chapter 9

Creativity, Resilience, and Mental Health: A Conceptual – Theoretical Study

Lisete Barlach

Abstract

Well-known and widespread mental health problems, such as depression and suicide, more and more present in the contemporaneous scenario, are analyzed from a theoretical perspective, investigating the foundations of mental health through the lens of Donald Winnicott, Hector Fiorini, Jean Piaget, Csikszentmihalyi, and Fritz Perls, scholars who establish important relations between well-being and creativity as a way of overcoming adversities, solving problems, discovering new possibilities of facing old problems, and allowing energy flow. Creativity is understood as an antidote to the various kinds of compulsive disorders and obsessive behaviors of contemporaneity. Results of the present study indicate that, instead of associating creativity with madness, new avenues open up for understanding creativity as a key element of mental health.

Keywords: creativity, mental health, compulsion, contemporaneity, possibles

1. Introduction

For decades, creativity was associated with madness, and the stereotype of a crazy scientist or unbalanced artist dominated the social imagination. In other words, the psychopathological approach prevailed over the identification of the sane aspects that could exist between creativity and mental health [1].

In the last decade, however, scholars tended to see creativity as a positive and relevant characteristic of human development, present in all individuals, varying only in degree or intensity of its expression [1]. At the same time, the understanding of the health-sickness dyad has been reviewed by psychology, focusing not only on dealing with pathology but also on enhancing the health and well-being of individuals. No doubt, positive psychology has contributed to the changes in the last decade.

The contemporary approach understands that any individual has creative potential and that its repression could make it impossible to achieve a feeling of personal self-realization and discover new talents [2].

Creativity is a way to help an individual to develop his (or her) full potential. It will give him (her) internal strength to solve his (her) actual problems and the ability to

react creatively to future ones. Thus, *creativity can be seen as a way of assuring mental health throughout the entire life cycle*" (highlights by us) [3].

Studying the interface between creativity and mental health becomes even more important when one considers the role it [creativity] can exert in the development of resilience, defined as searching and finding creative solutions when facing adversities and psychic distress [4, 5].

In this study, the contributions of Donald Winnicott, the Gestalt psychotherapeutic approach, as well as Piaget's theory, are presented and discussed as subsidies to the analysis of compulsion, contemporary pathology, and its antidote, creativity, component of resilience and support for mental health.

2. The contributions of Winnicott and Fiorini

Winnicott [6] invites his reader to "avoid the misguide of referring the word creativity only to the succeeded and acclaimed creation," proposing its meaning as a "color of every attitude toward external reality." For him, "*it is by creative apperception, more than anything else, that the individual feels that life is worth to be lived*" (highlights by us).

Other attitudes toward life, especially those that put the individual in a submissive position to external reality, are pathological. "Creatively living is a healthy state, as well as submission is the foundation of a sick life" [6].

That is why, as stated above, it is crucial to detach creativity from art for a better comprehension of the phenomenon.

"It is true that a creation can be a canvas, a house, a garden, a dress, a coiffure, a symphony or a sculpture; even a home-made meal. Best to say: all of these could be creations. The creativity I am interested in here is a universal proposition: to be alive" [6].

Based on Winnicott's words, one can assume that, in depressive states—one of the pathologies of contemporaneity—the patient suffers from never-ending same days and an elevated degree of submission to thoughts of escaping from facing reality, as well as, in many cases, a refusal of living, by finding no meaning in the continuation of one's existence.

Nevertheless, the scholar, an important author when the subject is the key role of creativity for mental health, states that it is a total destruction of the individual's ability to live creatively that is impossible, because, even in the hypothesis of an extreme degree of submission and by the emergence of a fake personality, a secret satisfactory life remains in the shadow, due to the creative and original quality of [any] human being" [6].

The impossibility of a complete destruction of the individual's creative abilities is crucial to understand the search for human fullness and emancipation, as well as the resilience defined as a creative kind of coping with adversities [5].

Due to the fact that creativity is not a synonym of art but is life itself, the oriental perspective is more appropriate for understanding creativity as promoting mental health because it views it as a state, not a product [7]; it is a mental state characterized by vital energy's flow, almost the opposite of the compulsion for repetition, described by Freud as the basis for neurosis.

In 1920, Freud pointed out the fact that, by avoiding displeasure experiences, there was a trend to a repetitive functioning of the psychic apparatus. By using, for the first time, the concept of compulsion to repetition (*Wiederholungszwang*),

he refers to repressed experiences, which the patient, not willing to remember, tends to repeat in the analytical process. As well-known, in psychoanalytic theory, compulsion to repetition, expressed as transference, is an expression of the repressed unconscious. Thus, neurotic patients repeat emotional experiences, even those that were unpleasant at the time they occurred. In short, those drives, originally destined for satisfaction, produced, in the end, only dissatisfaction. Although having failed to reach their original goal, they [the drives] are compelled to be repeated, unraveling a mechanism beyond the pleasure principle [8].

If understood as opposed to repetition, creativity can be seen as the counterpoint of neurosis and compulsion. In this sense, creativity is the productive mobilization of a system of psychic dynamism that leads to realization, construction, growing up, and development, that is, the opposite of stagnation.

A special place should be granted to these dynamisms in the psychic apparatus, avoiding the emphasis that psychology, psychotherapy, and psychoanalysis attributed to sickness and illnesses, with the correlated lack of emphasis on health and well-being. So, it is necessary and possible to think about creativity as a special system with proper characteristics, which do not derive from those proposed by Freud as pleasure and reality principles [9].

The idea of a third principle of the psychic functioning envisions a system capable of building bridges, as to say, in-between different worlds, as well as within the structures inside them, reshaping the relationships among them, supporting one of the definitions of creativity as the combination of elements [4], and Koestler's bisociation hypothesis.

Creativity can be associated with the transformation of anything, be it an object or a situation, with changes operated individually or collectively, depending on the individual's (or individuals') belief in its possibility, through overcoming pseudo-impossibilities [10], as in Piaget's theory, presented later on in this chapter.

A group of psychological functions based on transforming capacities, including various ego functions, such as registers, confrontations, assessments, elaborations, inquiries, and also the capacity of dealing with uncertainty, frustration, and tolerance to a certain degree of anguish, as well as functions related to the control of impulses [9].

The analysis of creativity should be based on a tripod, with three major aspects: The creative potential, the creative experience, and the emotional conditions that favor the emergence of the creative act, that is, the "climate" surrounding the individual or group. As an innate potential of human beings, creativity is associated with the approach to external reality, impacting human development both in personality structuring and in establishing a "true" relationship with the world, that is, a relationship shaped by reality parameters. In other words, as said before, creative experience is a "basic way of life," in the sense of its foundation [11].

The analysis of the relationship between creativity and mental health would not be complete without Csikszentmihalyi's approach [12], which states that people involved in creative activities feel more completeness and plenitude and have a sensation of being part of something bigger than themselves.

Csikszentmihalyi is referring to the state of flow, in which an individual is absorbed by whatever he (she) is doing, completely focused and concentrated, losing track of time, but, instead of getting tired, exhausted by such intense work, he (she) gets mentally energized and psychologically satisfied with himself (herself) [12].

Playfulness, as in Winnicott, as well as state of flow in Csikszentmihalyi's theory, are two relevant contributions for understanding the relationship between creativity

and mental health, but equally important is the Gestalt approach to mental flexibility, as in resilience, as follows.

3. Gestalt theory: Mental flexibility

Creativity is at the core of Gestalt theory, and some of the concepts—especially the concepts of ground-figure and productive-reproductive thought—are helpful to explain how mental flexibility is crucial to mental health.

Productive thought is defined as the ability to go beyond past experience, allowing one to bring about the new, meaning, among other things, surpassing conditioned and rigid forms of thinking.

Perceiving new as really new depends upon a process that involves ground-figure, that is, the new "object" tends to be opposed to the old and known one or compared with mental images cataloged in the brain.

These two concepts—segregating figure and ground and productive versus reproductive thinking—are now presented in the context of Gestalt psychotherapy, with the fundamental contributions of Perls, complemented by recent authors.

4. Gestalt psychotherapy: Creative adjustment

As human beings are constantly looking for balance, creative adjustment refers to this balance throughout different circumstances. Homeostasis is another term in Gestalt theory for this kind of equilibrium. It is the way the individual relates to the here-and-now in order to face the challenges presented either by others, by the environment, or by himself (herself).

"Anxiety is the vacuum between the now and the afterwards" [...] If someone is immersing in the now, he (she) cannot be anxious, because energy is flowing through spontaneous activity [13].

To achieve self-regulation, creative resources are fundamental, meaning that the individual will be able to open up to the unknown with curiosity rather than fear.

Creative adjustment implies overcoming hesitation related to necessary changes, the "old way" of behaving, adapting and self-regulating oneself, and replacing dysfunctional relationships with sane ones [13].

Gestalt therapy understands the subject as an open functional system and as a self-in-the-world, searching for individualization. The Gestalt therapeutic goal is "to assist clients to progress from environmental support to self-support" [14], which demands a figure-ground change.

The therapy holds that humans tend to organize their experiences into meaningful, structured, and organized wholes and that this creative activity is the basis for healthy functioning, and to promote creative adjustment, it focuses on stimulating productive thinking, "the kind of intellectual independence that requires insight, holistic perception, and bestowal of meaning" [15]. A completely new way of addressing psychotherapy, with the understanding that therapists should not only encourage play and artistic production, confirming that creativity means more than art. The interaction between therapist and patient must be a creative one, exploring the fertile complexity through a creative interchange, envisaging this relationship as an experiment.

A second goal of the psychotherapeutic process is "reorganizing the field in search of *good form*" [15]. As it is well-known, the concept of good form derives from Gestalt theory. Applied to the therapeutic process, it means the integration of the blend of mind, emotions, body, and soul that constitutes each and every individual. Similar to a Platonic ideal, good form represents the highest form one can reach, closer to the source of all forms.

The field, in this context, represents the patient's wholeness, including the individual and his (her) surroundings. Thus, achieving a good shape in the field can demand changes, either internal or external. So, creative adjustment means both new perspectives of old issues or leaving behind life conditions that no longer suit the individual, as well as being creative in adverse situations.

This last statement leads to a brief review of the concept of resilience, which follows.

5. Resilience and mental flexibility

Contemporaneity, within which the only constant is change, brings about numberless potentially stressful conditions, demanding creative forms of coping and adapting to reality. This scenario brings forward the control of emotions, self-efficacy, and efforts toward professional and personal success, as well as the ability to have a sharp perception of the environment, that is, cognitive and metacognitive dexterities to adapt.

Defined as the main attribute of the human being's ontological condition, adapting is the process through which the individual manages his (her) relationship with himself (herself) and with the environment.

Adaptation can be passive or negative, false or pseudo-adaptation, or creative. In the negative one, the individual is subject, passively, to environmental influences. In the fake one, the individual is actively dealing with the environmental issues for his (her) own benefit, that is, in a selfish way.

The third kind of adaptation is the most similar to resilience, involving a permanent creative solution to problems in a non-selfish, broader way of seeing the problem. According to Barlach [5], resilience is a creative kind of adaptation, far from conformism: It transforms the individual and the environment through protagonism and self-determination, representing the most adequate administration of one's own subjectivity. New Gestalts are perceived by the subject during this process, as figures and ground are altered.

Resilience means opening up to new possibilities of seeing oneself and the society surrounding the individual, transforming and being transformed by the process. Thus, new possibilities are the following theme of the analysis, bringing up Piaget's approach to the relationship between creativity and mental health.

6. Piaget's approach: Overcoming pseudo-impossibilities

Piaget and Feider [10] studied the possibles and the necessaries, cognitively speaking. According to the authors, the genesis of the possibles is related to the limitations the individual has to surpass, considering the initial indifferentiation among what is real, possible, and necessary.

What is possible is related to the subject, not pre-determined by the real, meaning "when a real transformation is interpreted as an actualization of the possible, it

Author	Main contribution
Winnicott	Through creativity, an individual feels life is worth living.
Fiorini	Beyond pleasure and reality principles, proposed by Freud, is the transformation principle.
Csikszentmihalyi	Creative activities give an individual a sensation of flow and completeness.
Gestalt theory	Figure-ground and mental flexibility as the basis of the relationship between creativity and mental health.
Gestalt psychotherapy	Creative adjustment as a foundation of mental health.
Piaget	Overcoming pseudo-impossibilities is crucial to creative solution of problems.

Table 1.
Summary of authors and theories and their contributions to creativity - Mental health relationship.

was already real, [...], though not observable" [10]. In other words, to be considered possible, something depends on its recognition by the subject.

The authors state that, throughout phases of development, the individual becomes capable of seeing things differently from the way they are and can become aware of the "fake" limitations of reality. As he (or she) gets able to recognize pseudo-impossibilities and possibilities, they can be actualized, because they depend on the subject's perception, instead of reality itself. For example, when an individual figures out creative solutions for a problem, new possibilities of the matter (or substance) can be brought about.

At the beginning of cognitive development, such as in the pre-operatory phase, the subject understands that real is what it is, and it is necessary that it is this way, excluding other possibilities regarding an object or situation. In this stage, the individual cannot imagine other solutions due to pseudo-impossibilities. As cognitive development evolves, real, necessary, and possible/impossible can be altered; that is, reality, as a subjective construction, can be enriched with new possibilities as individuals recognize them.

The processes described by the authors [10] represent the birth of mental structures subjacent to creativity and creative problem-solving.

Important to say that, based on Piaget's theory, *subjectivity and mental health depend, in greater or lesser extent, on what the individual considers necessary or impossible. During the psychotherapeutic process, this could represent the inflection point from which necessaries and impossibles turn to be seen under a different perspective; that is, a new figure-ground is established, implying overcoming pseudo-necessities and pseudo-impossibilities.*

A **Table 1** with a synthesis of authors and main contributions is presented.

7. Final considerations: Creativity as an antidote to compulsive repetition

As mentioned before, according to Freud, a neurotic condition has its origin in a compulsive repetition in which the individual attempts to "elaborate" previous affective unpleasant experiences.

In psychoanalytic theory, any compulsive repetition is associated with death instinct, and, as a conclusion of the present study, it is possible to state that creativity is related to its opposite, that is, the pleasure principle. Better to say, following

the words of Fiorini [9, 10], creativity is a third principle of the psychic apparatus, beyond pleasure and reality, as described by Freud. In short, based on a psychoanalytical approach, creativity is one of the factors that enable an individual to attain or maintain mental health.

For many of the authors discussed in the present study, creativity is a color of life, a healthy way of living it, and an attitude toward it.

Winnicott's theory emphasizes playfulness as the key element for mental life. He also states that Luddism is a psychological state that remains latent in the individual, regardless of obstacles and adversities faced during their lifetime. So, even when the individual loses his (her) connection with this important element for mental health, it can be recovered through therapeutic means or by developing resilience.

Resilience involves developing creative ways to face adversities and goes beyond recovering mental health and well-being: The phenomenon can explain the psychological growth of an individual (or a group) through a transforming process.

Pointing out the cognitive factors of the relationship between creativity and mental health, Piaget opens up new avenues for the theme by discussing the endless process of overcoming pseudo-impossibilities and, at the same time, realizing new possibilities. According to this approach, mental flexibility is, thus, the core element of mental health.

In a similar way, Gestalt theory understands mental health as a dynamic mental system of alternation between ground and figure, with a permanent creation of new Gestalt, in search of a good form. Creative adjustment, a central concept in Gestalt therapy, states that adapting is a bidirectional process, with the individual and environment being subject to the necessary transformations for this good shape.

For Csikszentmihalyi, creativity, leading the individual to a state of flow, puts him (or her) in contact with the best state of mental health, a state of sanity that allows an individual to be in touch with the flow of life and the flow of the Universe.

The present study, in short, reviewed classic authors of psychology, each of them introducing a different view, all of them disclosing positive relationships between creativity and mental health, contributing to demystifying the erroneous—but still prevailing—association between creativity and madness.

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Over the last decades, scholars and practitioners have studied creativity as the production of original and effective ideas capable of being applied to different fields of existence. More recently, it has been recognized as one of the most important skills for the 21st century, as a differential for professionals, and as a basis for innovation. Even with this acknowledgement, creativity is being challenged by advances in Artificial Intelligence, especially generative intelligence, which is seen as capable of performing creative activities and, eventually, replacing human creativity. Besides that, more and more is said about the role of schools in preparing for this new world by developing creativity to enhance opportunities for work and careers. The book goes beyond by introducing the relationship between creativity and mental health, defying the standard view which associates creativity with madness and taking creativity as a tool for therapeutic processes.

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