

CREATIVITY IN THE AGE OF ARTIFICIAL INTELLIGENCE

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Abstract: *The rapid evolution of generative Artificial Intelligence (AI) has challenged human creativity, shifting the discourse surrounding AI from technical feasibility toward the redefinition of conceptual frameworks. This study investigates the attitudes of full-time university students toward AI creativity through the theoretical lens of Margaret Boden's computational creativity framework, which distinguishes between combinatorial, exploratory, and transformational creativity. Utilizing a quantitative approach, survey data from 129 respondents were analyzed to explore how individuals perceive the "novelty" generated by artificial intelligence. The sample demonstrated a clear divide, with 70.5% considering AI to be creative, while 29.5% remained skeptical. To examine the differences in opinion between the two groups, a non-parametric Mann-Whitney U-test was conducted. The results revealed highly significant differences ($p < 0.001$) regarding AI's capacity to generate entirely new ideas and its similarity to human creativity, aligning skeptics with the rejection of Boden's transformational tier of creativity. Concurrently, no significant differences were found regarding the perception of AI's technical limitations ($p = 0.124$) and its reliance on trained data ($p = 0.069$), indicating a universal consensus on the data-driven nature of machine processes. These findings suggest that the polarization among students stems from differing expectations of creative tiers rather than a misunderstanding of technology, highlighting the emergence of a hybrid, co-creative paradigm.*

Keywords: *creativity, artificial intelligence, student attitude, AI creativity.*

Introduction

The rapid development of generative artificial intelligence (AI) has challenged human creativity and shifted the discussion surrounding AI from technical feasibility toward a re-examination of the concepts used to understand creativity. Creativity—or, more precisely, how it is defined—has been described in countless ways. This article presents and defines the key concepts relevant to this discussion.

"Creativity refers to the abilities that are most characteristic of creative people" Guilford (1950, 444).

Guilford (1950) distinguished between convergent thinking (which seeks a single correct solution) and divergent thinking (which is multifaceted and generates many alternatives). According to him, creativity is the application of divergent thinking to problem-solving, which allows one to approach a problem from multiple angles and to find connections and relationships even among seemingly unrelated elements.

He defined creative thinking in terms of four dimensions:

- fluency,
- flexibility,
- originality,
- elaboration.

"Creativity, or in other words, creative thinking. The ability of an individual to discover new connections during problem-solving operations, and to produce novel ideas and original formulations relatively continuously and flexibly." (Fröhlich, 1996, 235). Fröhlich (1996) defines creativity in a similar way, emphasizing thinking that leads to different kinds of novel ideas.

According to Runco and Jaeger (2012), the two pillars of creativity are originality and effectiveness (or usefulness). The importance of originality is indisputable; it is often referred to as "novelty," and it certainly refers to what is new, unique, and unusual. However, an idea can be unique yet useless. For this very reason, originality alone is not enough for creativity; it must also be effective. This can manifest itself in the form of usefulness, suitability, or appropriateness. Thus, creativity is the ability of the human mind to produce outputs that are both novel and useful through divergent processes.

Does artificial intelligence meet these two criteria? The following section presents some of the most important theories.

Kaufman and Beghetto (2009) defined the levels of creativity in their "4C" model:

1. Mini-c: an internal, individual learning process,
2. Little-c: everyday creativity (e.g., a new recipe),

3. Pro-c: professional, expert level,
4. Big-C: epoch-making, genius level (e.g., Mozart, Einstein).

Throughout history, the capacity for creativity has been a uniquely human privilege, ranging from everyday creation (Little-c) to genius (Big-C). In the case of artificial intelligence — which is of paramount importance for the present study — this model can define the level of AI (see our own studies), which does not reach the Big-C level.

Amabile (2020) states that progress is being made toward defining AI creativity: “I define it as the production of highly novel, yet appropriate, ideas, problem solutions, or other outputs by autonomous machines. I argue that organizational researchers of creativity and innovation should invest significant energy in studying AI and computer-assisted human intelligence, the ways in which they might yield creative breakthroughs, and how those innovations might impact—and be impacted by—workers, consumers, organizations, and society.” In her view, artificial intelligence supports creative processes and transforms creative work, but it lacks human motivation and emotions. Thus, with the emergence of generative algorithms, the exclusivity of human creativity has been overturned (Amabile, 2020).

Elgammal et al. (2017) investigated the artistic creativity of AI by having it generate new images using Generative Adversarial Networks (GANs), with the goal of maximizing deviation from established styles while minimizing deviation from the artistic distribution. They compared human-created artistic images with those generated by AI and concluded that the participants in the experiment were unable to distinguish between them.

According to Boden (2004), creativity is a fundamental characteristic of human intelligence and poses a challenge for artificial intelligence. AI can be used to generate new ideas by creating novel combinations of existing ideas and, by transforming them, can even generate ideas that were previously impossible. In other words, AI is capable of combinatorial creativity, but it is questionable whether it can reach higher levels.

He distinguishes between three different levels:

1. Combinatorial creativity: Combining existing, known ideas, schemas, styles, and data in some new or unusual way. For example, we give Midjourney AI the concepts of “cat” and “Renaissance painting” (which it recognizes from the data it has already learned), and it combines them into a new image.
2. Exploratory creativity: Searching for new paths within an existing set of rules or conceptual space while pushing its boundaries. It’s like a map that still has blank spots: the rules are set, but possibilities remain. For example, we tell

ChatGPT to write a poem but to strictly adhere to Shakespearean rhyme schemes. Within that system of rules, it creates a new variation.

3. Transformational creativity: This is the highest level of creativity. It changes the system of rules, abolishes the old one, and creates an entirely new dimension that did not previously exist even in our imagination. (E.g., when Picasso invented Cubism, or Einstein developed the theory of relativity.) (Boden, 2004). Is AI capable of this?

The aim of this study is to examine university students' attitudes toward AI creativity in light of these theories and based on empirical data, using Margaret Boden's theory of computer-mediated creativity as a framework.

Method

A questionnaire was used as the research instrument. It consisted of eight closed-ended questions and one open-ended question ("How do you use AI from the perspective of creativity?").

Of the closed-ended questions, seven were presented as statements to be rated on a five-point Likert scale ranging from strongly disagree to strongly agree. The questions addressed various aspects of artificial intelligence and creativity:

1. Do you consider AI to be creative? (Yes/No)
2. AI is capable of generating completely new ideas. (Likert scale)
3. AI's creativity is similar to human creativity. (Likert scale)
4. The limitations of AI influence its creativity. (Likert scale)
5. AI generates new ideas based on what it has learned. (Likert scale)
6. AI possesses systematic creativity. (Likert scale)
7. AI cannot create genuinely new things; it only recombines existing examples. (It only recreates them.) (Likert scale)
8. AI is creative. (Likert scale)

Questions 1 and 8 were both included to obtain a more nuanced understanding of participants' views on AI's creativity. Rather than relying solely on a binary yes/no response, participants were also able to express the strength of their agreement after considering the related statements throughout the questionnaire. At the same time, the yes/no question made it possible to divide the sample into two groups for comparative analyses. In addition, the Likert-scale item was suitable for use in statistical analyses such as Spearman's rank correlation and the Mann–Whitney U test.

The questionnaire was completed by full-time university students (aged 19–26, 16 men and 113 women) during a class session. A total of 129 responses were received. Date of data collection: February 2026.

Results

The first question in the survey concerned whether AI is creative.

As Table 1 clearly shows, 70.5% of respondents (91 people) believe that AI is creative, while only 38 people, or 29.5%, answered “no” to this question.

Response	Number of Cases (People)	Percentage
Yes	91	70.5%
No	38	29.5%
Total	129	100,00%

Table 1: Is AI Creative?

Table 2 shows the descriptive statistics for seven statements on a Likert scale (1 = strongly disagree, 5 = strongly agree). Looking at the entire sample, the statement that received the highest score was “AI generates new ideas based on what it has learned” (mean: 3.53). Also notably high (mean: 3.52) was the respondents’ perception that AI actually “cannot really create new things, but only recreates examples.” The statement “AI’s creativity is similar to that of humans” received the lowest score (mean: 2.32).

Question / Statement N=129	Mean	Median	Mode	Standard Deation
AI generates new ideas based on what it has learned.	3.53	4	5	1.28
AI cannot create genuinely new things; it only recombines existing examples. (It only recreates them.)	3.52	4	4	1.2
The limitations of AI influence its creativity.	3.34	3	3	1.26

AI possesses systematic creativity.	3.14	3	3	1.22
AI is creative.	2.78	3	3	1.28
AI is capable of generating completely new ideas.	2.73	3	3	1.26
AI's creativity is similar to human creativity.	2.32	2	1	1.04

Table 2: Descriptive statistics for Likert-scale statements: 1 = strongly disagree, 5 = strongly agree

Table 3 and Figure 1 show the responses from those who believe AI is creative and those who do not:

Generating new ideas: Those who believe AI is creative strongly believe that it is capable of generating entirely new ideas (Mean: 3.00), while skeptics reject this notion (Mean: 2.08).

Similarity to humans: Skeptics are almost entirely dismissive of the idea that AI's creativity resembles that of humans (Mean: 1.55), but even AI proponents are cautious on this point (Mean: 2.64).

Merely recreating examples: This is where the greatest discrepancy is evident. Those who believe AI is not creative almost entirely agree that the algorithm merely copies and recreates (mean: 4.03), while the mean for the other group is 3.31.

These differences are even more evident in the first figure. For the statements "The limitations of AI affect creativity" and "AI is capable of generating completely new ideas," the means are higher among those who believe AI is not creative; for the other statements, the means are higher in the other group.

Interestingly, those who believe AI is creative scored an mean of only 3.15 on the Likert scale for the statement that "AI is creative"; when viewed in a more nuanced way, the respondents did not fully agree with this statement.

Question / Statement	Mean (According to those who consider it CREATIVE) N=91	Mean (Those who think it is NOT creative) N=38
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AI generates new ideas based on what it has learned.	3.63	3.29
AI cannot create genuinely new things; it only recombines existing examples. (It only recreates them.)	3.31	4.03
The limitations of AI influence its creativity.	3.31	3.42
AI possesses systematic creativity.	3.36	2.61
AI is creative.	3.15	1.87
AI is capable of generating completely new ideas.	3.00	2.08
AI's creativity is similar to human creativity.	2.64	1.55

Table 3: Means for the groups of students who consider themselves creative and those who do not

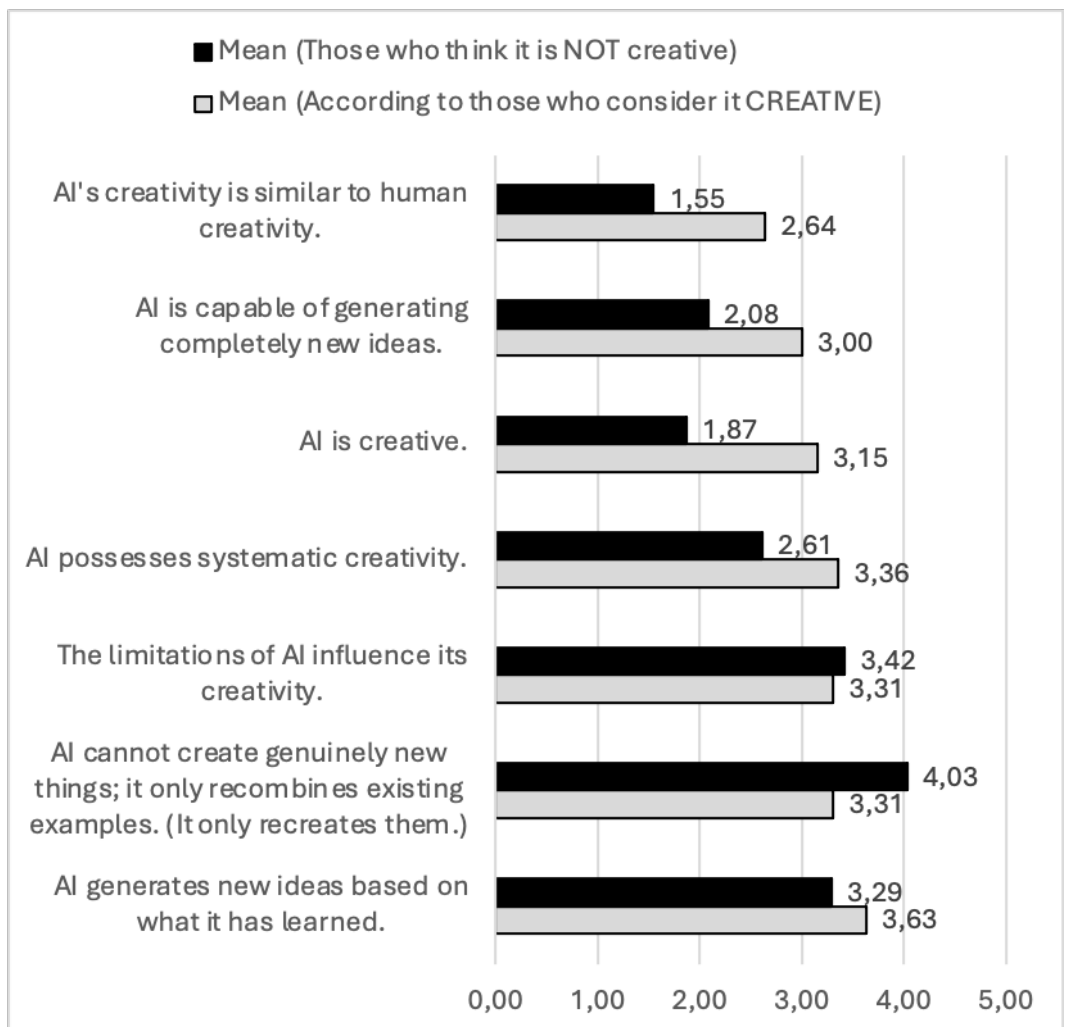


Figure 1: Means on the Likert scale for the groups that consider AI to be creative and those that do not

Because the Likert scale uses values ranging from 1 to 5, I used Spearman's rank correlation to compare the statements (Table 4). The correlations between statements 1 and 7 ($\rho = 0.53$) and between statements 2 and 7 ($\rho = 0.50$) stand out. Thus, the more creative someone considers AI to be on the scale, the more they believe it generates new ideas and that this resembles human creativity. Question 6 ("It only recreates schemas") received a negative score across nearly all positive-attitude questions ($\rho = -0.36$ for new ideas and creativity). This confirms that, according to respondents, "copying" and "true creativity" are mutually exclusive concepts. Those who believe that a machine merely repeats schemas do not consider it creative in the true sense of the word.

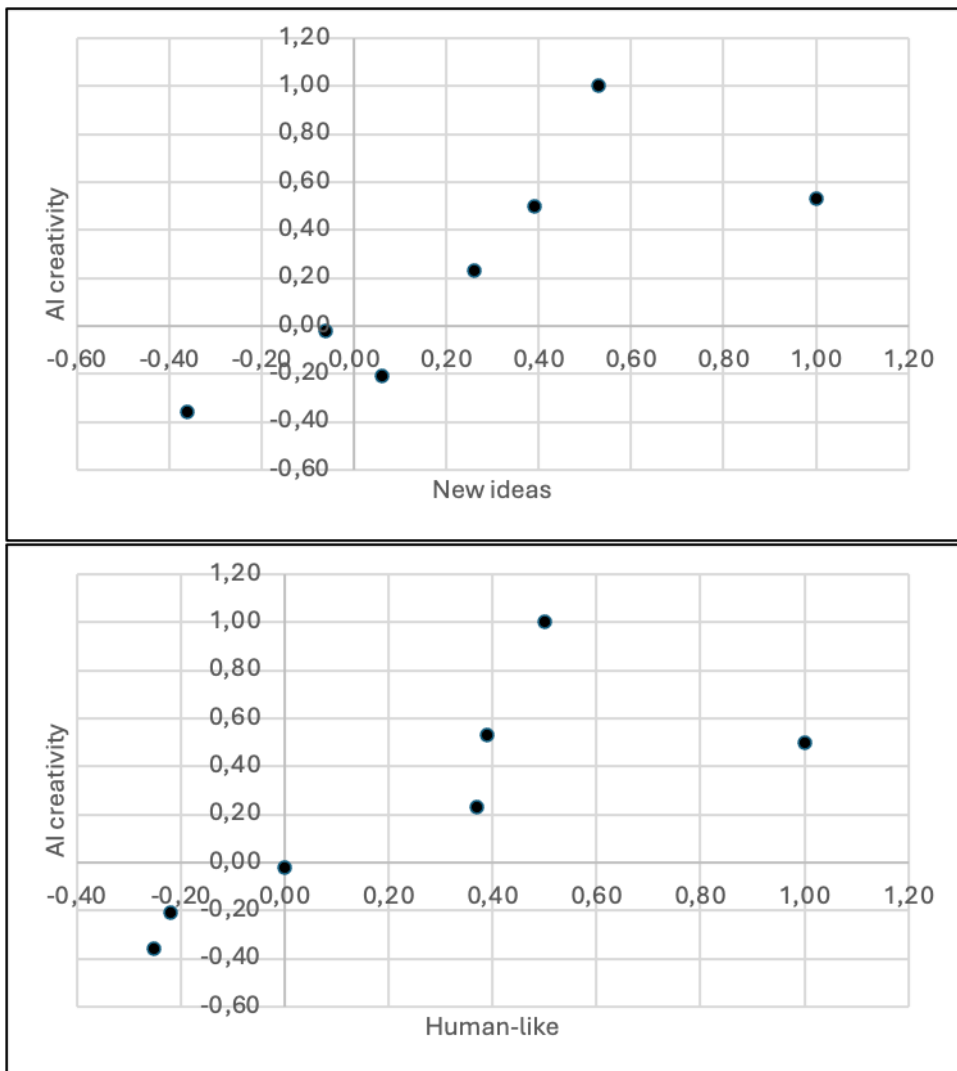
Interestingly, there is no correlation between questions 4 and 7 ($\rho = -0.02$), which shows that the fact that AI learns from the data it is fed is completely independent of whether someone considers it creative or not. Respondents view the “learning process” as a fundamental characteristic of the technology, regardless of their attitude toward it.

The relationships between 1 and 7, 2 and 7, and 4 and 7 are shown in the scatter plot in Figure 2.

Table 4: Spearman's correlation matrix

(Explanation of Table 4: 1. AI is capable of generating completely new ideas. (New ideas); 2. AI's creativity is similar to human creativity. (Human-like); 3. The limitations of AI influence its creativity. (Influenced by limitations); 4. AI generates new ideas based on what it has learned. (Based on what it has learned); 5. AI possesses systematic creativity. (Systematic creativity); 6. AI cannot create genuinely new things; it only recombines existing examples. (Only recreates); 7. AI is creative (AI creativity (on a scale))

ρ	1.	2.	3.	4.	5.	6.	7.
1.	1.00	0.39	0.06	-0.06	0.26	-0.36	0.53
2.	0.39	1.00	-0.22	-0.00	0.37	-0.25	0.50
3.	0.06	-0.22	1.00	0.12	0.17	0.19	-0.21
4.	-0.06	-0.00	0.12	1.00	0.29	0.17	-0.02
5.	0.26	0.37	0.17	0.29	1.00	0.13	0.23
6.	-0.36	-0.25	0.19	0.17	0.13	1.00	-0.36
7.	0.53	0.50	-0.21	-0.02	0.23	-0.36	1.00



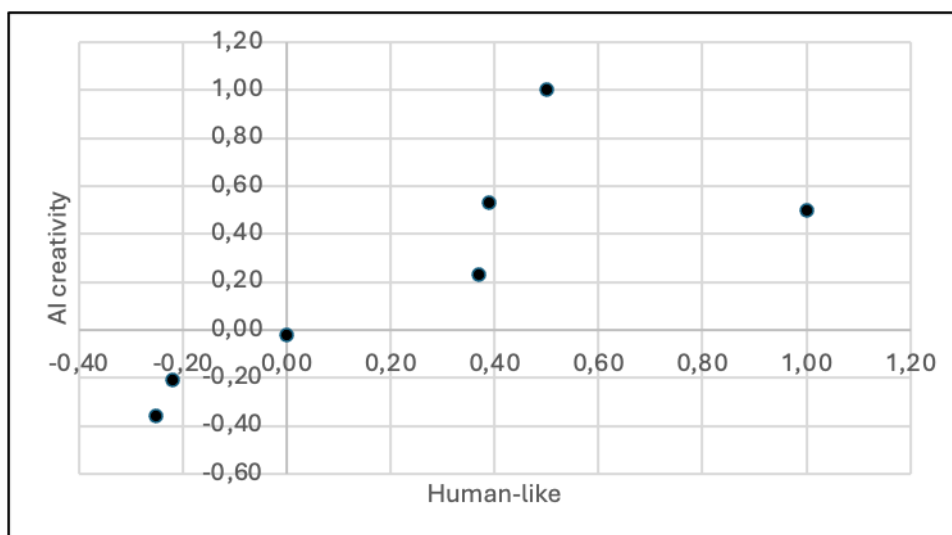


Figure 2: Depiction of Connections in Key Areas

I conducted a reliability test on my questionnaire. The Cronbach's alpha value is 0.538, which indicates moderate consistency. Respondents have very complex and nuanced opinions about AI. For example, many agree to both that AI is creative and that it merely replicates what it has learned. In people's minds, these two ideas are not mutually exclusive; respondents do not think in stereotypes about this topic.

We compared the opinions of the two groups using the Mann-Whitney U test. I examined whether the differences previously calculated between the two groups (those who consider AI to be fundamentally creative vs. those who do not) actually exist statistically, or whether they were merely due to chance.

Based on the results, there was a statistically significant difference ($p < 0.05$) in the assessment of the similarity of AI-generated ideas to human creativity. At the same time, there was a significant difference ($p < 0.05$) regarding the statements "It only recreates," "AI possesses structured creativity," and "AI is creative." There was no significant difference ($p > 0.05$) regarding the statements "It generates new ideas based on what it has learned" and "AI's limitations influence creativity" (Table 5).

AI is capable of generating completely new ideas.	$U(n_{yes}=91, n_{no}=38) = 2450.0; p < 0.001$
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AI's creativity is similar to human creativity.	$U(n_{yes}=91, n_{no}=38) = 2765.0; p < 0.001$
AI cannot create genuinely new things; it only recombines existing examples. (It only recreates them.)	$U(n_{yes}=91, n_{no}=38) = 1095.0; p < 0.001$
AI possesses systematic creativity.	$U(n_{yes}=91, n_{no}=38) = 2104.5; p = 0.045$
AI is creative (on a scale of 1–5):	$U(n_{yes}=91, n_{no}=38) = 2984.5; p < 0.001$
AI generates new ideas based on what it has learned.	$U(n_{yes}=91, n_{no}=38) = 1386.5; p = 0.069$
The limitations of AI influence its creativity.	$U(n_{yes}=91, n_{no}=38) = 1438.0; p = 0.124$

Table 5: Results of the Mann-Whitney U test

The answer to the open-ended question is: how is artificial intelligence used in terms of creativity? Of the 129 respondents, 99 had already used AI for some form of creative activity. Fifty-one people used it for text generation, 44 for image generation, and 4 for audio, music, or video editing.

Discussion

Based on the responses to the questions and taking into account Kaufman and Beghetto's (2009) "4C" model, the AI is capable of reaching the Pro-c (professional) level, as it produces finished "designs" and texts, but it does not yet reach the Big-C (genius) level due to its lack of human-like qualities ($p < .001$).

Taking into account Boden's (2004) three levels, the following can be observed:

1. Combinatorial creativity

According to respondents, AI is strongest in this area. The statements "AI generates new ideas based on what it has learned" (mean: 3.53) and "AI cannot truly create new things; it only recreates examples" (mean: 3.52) describe this precisely. Most people accept that AI possesses good combinatorial creativity.

2. Exploratory creativity

Regarding this statement, “AI possesses systematic creativity” (mean: 3.14), respondents perceive that AI creates based on structures, systems, and rules.

3. Transformational creativity

Respondents are most skeptical here: the mean score for the statement “AI is capable of generating completely new ideas” is only 2.73, while the mean for “AI’s creativity is similar to that of humans” is just 2.32.

The results showed a significant difference ($p < 0.001$) in the ability to generate completely new ideas and in the assessment of similarity to human creativity, which identifies skeptics as those who reject Boden’s transformational level. In contrast, no significant difference was found in the assessment of AI’s technical limitations ($p = 0.124$) and its reliance on trained data ($p = 0.069$), indicating a universal consensus on the data-driven nature of machine processes.

The results suggest that the students’ divided opinions stem not from a misunderstanding of the technology, but from differing expectations regarding various levels of creativity, foreshadowing the emergence of a hybrid, collaboration-based creative paradigm.

Limitations

A limitation of this study is the representativeness and homogeneity of the sample, which stems from the fact that the respondents were full-time undergraduate students (although the sample size of 129 is sufficient for the chosen statistical analyses); thus, the sample is not representative of society as a whole. The technological openness and digital literacy of the younger generation enrolled in higher education may skew the general picture of AI’s creativity. Another limitation is the cross-sectional research design, as the sampling took place at a specific point in time; over time, students’ opinions and attitudes can change rapidly. Given that generative AI technology is evolving at an extremely rapid pace, perceptions of user experiences and technological limitations may change radically within a short period of time. Another limitation is that the questionnaire is based on self-reporting. The study measured students’ subjective perceptions and attitudes toward AI creativity, rather than their actual, objective creative performance during practical interactions. Finally, the ordinal nature of the measurement tool (Likert scale) limited the applicability of parametric statistical methods. Although the Mann-Whitney U test provided reliable and methodologically sound results based on the rankings, future research may benefit from using more refined, continuous measurement scales or qualitative interviews to explore deeper correlations.

Despite the limitations discussed, the study provides a valuable starting point for understanding generational attitudes toward technology. For future research, it is recommended that the sample be expanded to include older age groups and that longitudinal studies be conducted to track changes in attitudes.

Summary

This study has highlighted that, in the age of artificial intelligence, the concept of creativity is undergoing a fundamental structural transformation. The sharp division observed among college students (70.5% consider AI to be creative, while 29.5% consider it to be non-creative) finds its true explanation within Margaret Boden's theoretical framework. According to the research findings, the social debate does not stem from a misunderstanding of how the technology works—since there is consensus among the groups that AI is data-driven and constrained by limits—but rather from expectations regarding levels of creativity.

While the majority acknowledges AI's strong combinatorial and exploratory creativity (its ability to create novel patterns and useful outputs from existing schemas, thus meeting Runco's definition), skeptics strongly reject the idea that this functioning reaches the transformative, deeply human level.

In summary, it can be said that AI does not currently replace human creators, but rather creates a new, hybrid co-creative paradigm. The key question for the future of higher education and the labor market will therefore no longer be whether machines are capable of creating, but rather how people can use this hybrid intelligence to enhance their own human creativity.

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