

Sequencing Human-Artificial Intelligence Creative Writing Collaboration Affects Perceived Authorship

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Abstract

As generative AI tools enter domains traditionally considered uniquely human, questions arise about their impact on creative processes. This study tests how the sequencing of human and AI contributions in creative writing affects perceived creativity, authorship, and satisfaction. In a between-subjects experiment (n = 84), participants either wrote a story and then used generatestory.io to improve it (AI-enhanced) or revised a draft generated by the tool (AI-generated). Results show that participants reported similar satisfaction in both conditions. However, authorship feelings differed strongly after the first step (human writing first vs. receiving an AI draft) and became much more similar after people revised the story. Mediation analyses suggest that early perceived authorship helps explain later satisfaction, whereas perceived creativity does not. Overall, the findings imply that who contributes first mainly shapes early feelings of ownership and that hands-on revision can restore perceived authorship, which matters for designing co-creative writing tools that keep users engaged and satisfied without undermining their sense of being the author.

Categories: HCI Appliances and applications, Human Factors and Ergonomics, User Experience (UX) Design

Keywords: human-ai collaboration, ai-assisted writing, co-writing, perceived authorship, collaborative creativity

Introduction

As generative AI tools rapidly enter domains once considered uniquely human, the boundaries between human- and machine-generated content become blurred. Writing is one of those creative tasks humans engage in, whether it is drafting an email or capturing one's thoughts in a journal. Today, tools like ChatGPT are being used by millions to edit or even fully generate creative texts. Despite these capabilities, the use of AI tools also raises complex questions: Who feels like the author of AI-assisted writing? Does collaborating with AI make writing more enjoyable? And does it matter who contributes first? To examine these questions, we studied how participants use generatestory.io in two co-writing sequences. Participants either wrote a short story first and then used AI to improve it or revised an AI-generated draft. After each phase, perceived creativity, authorship, and satisfaction were measured. AI tools are evolving, and a growing body of research discusses their application in the creative domain. Recent human-AI co-writing studies highlight concerns about authenticity and ownership in AI co-writing, and evidence from co-writing systems like Wordcraft motivates revision-oriented workflows that preserve user agency [1,2]. When co-creating poems, perceived creativity and confidence in one's creative ability are higher when a human writes first [3,4]. Accordingly, adaptive AI mechanisms are better suited for creative tasks [5]. In this study, we shift away from poems and prompt participants to write creative stories instead. Writing short stories better represents everyday writing tasks and is more accessible for most people than

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composing a poem. A notable research gap remains regarding how different ways and orders of collaborative writing with AI tools affect perceptions of text authorship. Specifically, it is not yet fully understood whether it matters if the human writes first and the AI improves, or if the AI generates first and the human revises, how users view authorship of the final output, and whether they enjoy the collaboration process. Hence, this study analyses perceived creativity, sense of authorship, and overall satisfaction in relation to the sequencing of AI engagement in users' experience throughout the writing process. This leads to the following research question:

RQ: What is the effect of sequenced collaboration on perceived authorship, creativity, and satisfaction in human-AI co-writing?

In this study, we operationalize collaboration patterns as two co-writing sequences: Participants either write first and use AI to improve the text (AI-enhanced) or revise an AI-generated draft (AI-generated). We examine how these sequences relate to perceived creativity, perceived authorship, and satisfaction. Several psychological processes are relevant for understanding these collaboration sequences. Lyell and Coiera [6] compare different types of experimental tasks, examining their characteristics. According to the automation bias phenomenon, humans' reliance on automated systems is task-specific. In one task, humans trust the system's output, failing to verify it, and in the other task, humans are hesitant to trust the system. While reliance on technology reduces the mental effort involved, it may come at the cost of output quality or reduced engagement. Collaboration with AI systems has become increasingly relevant, given the improving output quality and human-sensitive design. Human satisfaction depends on the AI system's design and its form of collaboration [7]. Moreover, self-determination theory suggests that when users initiate the creative process, they experience greater autonomy and intrinsic motivation, which, in turn, improves creative engagement and enjoyment [8]. Furthermore, expectancy-value theory suggests that outcome expectations are related to ability beliefs and strongly influence satisfaction with an outcome. When people feel their contributions matter, they tend to report higher satisfaction with their work [9]. Based on this theoretical framework, 3 hypotheses were formulated:

H1: The condition (AI-enhanced vs. AI-generated) has a direct effect on the mean satisfaction with the creative work.

H2: The effect of content generation conditions on satisfaction is mediated by perceived creativity.

H3: The effect of content generation conditions on satisfaction is mediated by perceived sense of authorship.

Materials And Methods

Experimental design

To investigate how user perceptions of interacting with AI differ across co-writing sequences, a pilot study and a main study were conducted. In both, participants were assigned to two experimental conditions. In the AI-enhanced condition, participants were first asked to write a short story based on a given prompt independently, without external assistance (Phase 1), and then to use the AI tool (generatestory.io) to improve their own story (Phase 2). In the AI-generated condition, participants initially generated a story with the AI tool using a given prompt (Phase 1), then manually revised and edited it (Phase 2). The pilot study ($n = 6$) employed a within-subject design to gather preliminary qualitative insights and participant feedback, which informed minor refinements to the study materials for the main study. The primary research ($N = 84$) adopted a between-subjects design to reduce demand effects. Participants were randomly assigned to either the AI-enhanced or AI-generated condition. To mitigate potential biases (e.g., social desirability), the study's intent was not disclosed to participants [10]. The study was pre-registered on AsPredicted.org as AsPredicted #227777.

Survey, data preparation, and analysis

The study was conducted using a Qualtrics online survey. To assess participants' prior experience with AI tools, the ChatGPT usage scale [11] was adapted. After each task phase of the study, participants self-reported perceived creativity, attribution of authorship, satisfaction, and enjoyment. All items were measured on 7-point Likert scales (1 = 'strongly disagree' to 7 = 'strongly agree'), and for each construct, one item was operationalized. Prior experience in AI usage includes measurement items such as 'I use GenAI to generate ideas for my writing', 'I use GenAI to generate drafts that I

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edit and finalize myself', or 'I use GenAI to overcome writer's block when starting essays'. Perceived creativity has been operationalized using the item 'I think this story is creative', adapted from the original item 'I feel this algorithm is creative' in [5]. Attribution of authorship has been operationalized using the item 'I am the author of this story', adapted from the item 'I am an author of this image' in [12]. Satisfaction has been operationalized using the item 'I am satisfied with this story', based on an item in [13]. Recruitment for the main study was conducted via Prolific to reach respondents with diverse demographic backgrounds [14]. Informed consent was obtained from all participants. Ethical approval was not required because no participants' personally identifiable information was collected. To ensure data quality, a two-step quality control process was implemented: a completion-time check to detect careless responses and a manual task-compliance review to remove task-unrelated responses. This process yielded a final sample of 84 participants out of 93. To test the hypotheses, Welch two-sample t-tests were used for mean comparisons, and mediation analyses were performed using the PROCESS macro for R (Version 4.3.1) [15].

Results And Discussion

Pilot study

The pilot study ($n = 6$) collected qualitative data on participants' collaboration with generatestory.io. This pilot study aimed to refine H1, H2, and H3 by empirically evaluating them. Participants in the AI-enhanced condition reported the highest level of authorship; respondents felt 'much [better] because [they] contributed their own ideas and added personally created thoughts'. The AI enhancements in Phase 2 made the story more well-written, creative, and 'exciting'. In the AI-generated condition, participants saw AI as a 'starting point' and brainstorming partner: 'It offers ideas I might not have thought of myself, or at least it would have taken much longer to come up with'. Participants valued originality and 'surprise' (e.g., plot twists) but criticized stories that felt generic or unadventurous, even if technically well-written. These themes informed our focus on perceived creativity, perceived authorship, and satisfaction in the main study.

Main study

Descriptive Statistics

To understand the demographic structure of our sample ($N = 84$), we asked participants about their age (in years), gender (in nominal categories), and highest level of education (in ordinal categories). The gender distribution was 50% female, 49% male, and 1% non-binary. Participants had diverse educational backgrounds (43% with a bachelor's degree, 27% with a master's degree, and 20% with a high school diploma) and a mean age of 33 years ($SD = 9.7$). Furthermore, we assessed participants' AI use frequency by asking, 'How often do you typically use AI tools (such as ChatGPT)?'. Most participants reported using AI systems daily (46.4%) or several times a week (32.1%). When asked about their prior experience using generative AI for writing, participants reported using AI primarily for idea generation (58%) and drafting text for human editing (61%). A majority stated that GenAI helps explore new ideas (79%), overcome writer's block (57%), and organize thoughts and outlines (76%), while also emphasizing that it provides a starting point rather than replacing human writing (74%). Overall, participants reported a mean satisfaction of 5.51 ($SD = 1.56$) out of 7 using AI, and many indicated that AI increased enjoyment (76%) and engagement (70%). We compared perceived creativity, authorship, and satisfaction across conditions; Table 1 reports the mean values for each dimension.

	AI-enhanced condition		AI-generated condition	
	Phase 1	Phase 2	Phase 1	Phase 2
I think this story is creative	4.62	5.49	4.67	5.21
I am the author of this story	6.57	3.76	2.13	3.59
I am satisfied with the story	5.04	5.47	4.74	5.38

TABLE 1: Perception of Creativity, Authorship, and Satisfaction at Different Experiment Phases (1 = strongly disagree, 7 = strongly agree)

Mean Comparison

To test H1 (the condition has a direct effect on mean satisfaction), we conducted Welch’s t-tests comparing mean satisfaction between the AI-enhanced and AI-generated conditions. In Phase 1, satisfaction was higher in the AI-enhanced condition (5.04 out of 7) than in the AI-generated condition (4.74), but the difference was not statistically significant ($t = 1.06$, $df = 70.01$, $p = 0.054$). In Phase 2, satisfaction ratings were very similar (AI-enhanced: 5.47; AI-generated: 5.38) and again not significantly different ($t = 0.24$, $df = 75.33$, $p = 0.81$). Hence, H1 is not supported. Overall, satisfaction differences were larger after Phase 1 and converged after participants revised the story in Phase 2.

Mediation Analysis

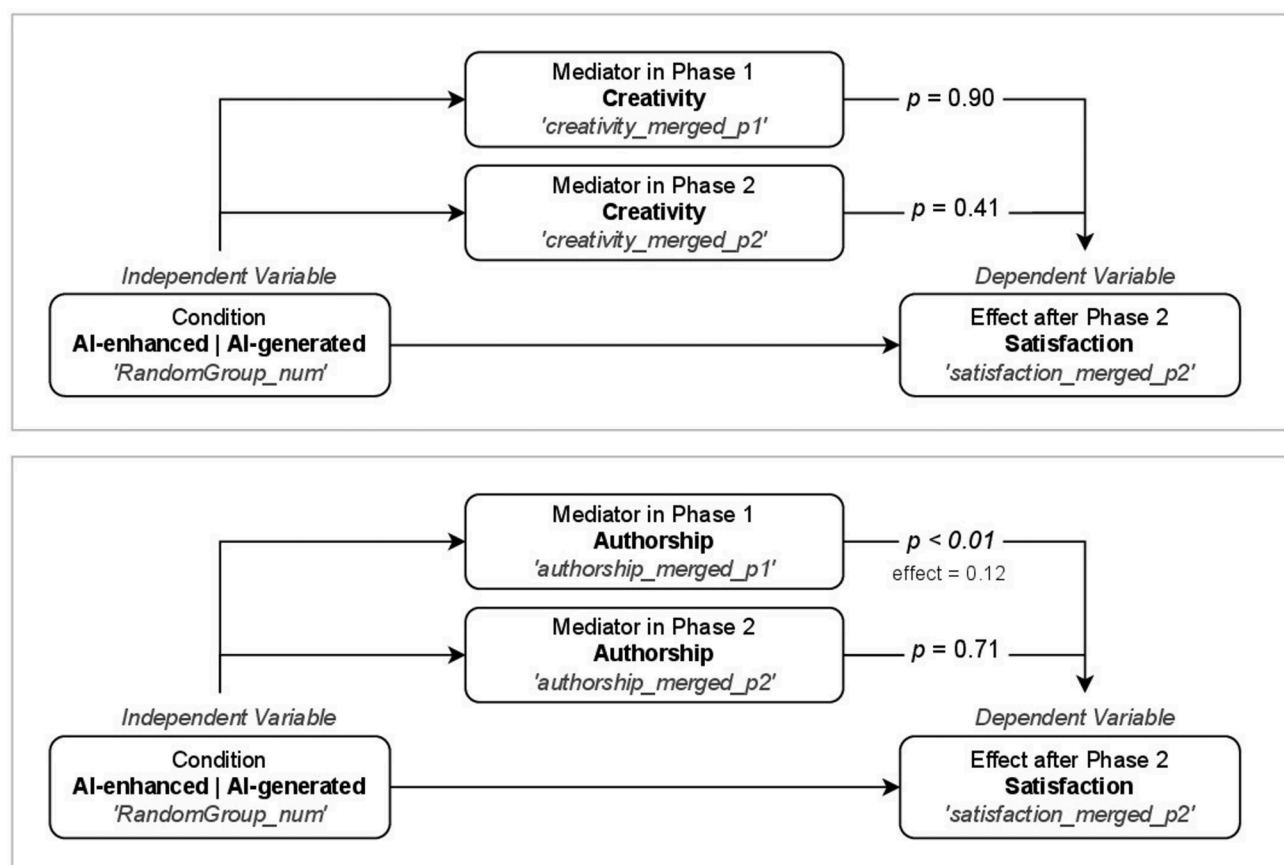


FIGURE 1: Visualization of Mediation Models

A mediation analysis was conducted with satisfaction after Phase 2 as the dependent variable and collaboration sequence (AI-enhanced vs. AI-generated) as the independent variable. Perceived creativity and perceived authorship were included as mediators in both phases to capture phase-specific effects (Figure 1). First, H2 (The effect of condition on satisfaction is mediated by perceived creativity) was tested. No significant mediation effect of perceived creativity was found in either phase (Phase 1: $F = 0.016$, $p = 0.901$; Phase 2: $F = 0.684$, $p = 0.41$), so H2 is not supported. In contrast, H3 (The effect of satisfaction is mediated by perceived authorship) is partially supported. Perceived authorship significantly mediated the relationship between collaboration sequence and satisfaction in Phase 1 ($F = 15.29$, $p < 0.01$), but this mediation effect was not significant in Phase 2 ($F = 0.144$, $p = 0.706$). This suggests that sequencing mainly affects satisfaction through early perceptions of authorship, before participants have revised the story. In summary, perceived authorship, rather than creativity, significantly mediates the relationship between AI involvement and user satisfaction. While the direct effect of condition on satisfaction was only marginally significant ($p = 0.054$), according to Hayes, a substantial direct impact is not a prerequisite for testing mediation, as indirect effects can exist even in the absence of a significant total effect [15].

Our results show that the collaboration sequence has an effect on early perceptions of authorship. If the first story draft is written by a human (AI-enhanced condition), perceived authorship has a mean of 6.6. In this sequence, perceived authorship is very high. If the first story draft is generated by an AI system (AI-generated condition), perceived authorship has a mean of 2.1. In this sequence, perceived authorship is critically low. In both conditions, perceived authorship converges after Phase 2 towards an almost common mean (Figure 1). Mediation analyses indicate that perceived authorship mediates the relationship between AI involvement and satisfaction in Phase 1. High perceived authorship is a

psychological mechanism with implications for the design of human-AI co-writing systems: To sustain perceived authorship, AI system collaboration benefits from a design in which the author writes a story draft before AI system revision occurs.

Conclusions

In this paper, we discuss the effect of sequenced contribution on perceived authorship, perceived creativity, and satisfaction in human-AI co-writing. In this study, there is no evidence to support the hypothesis that a direct effect of sequenced contribution on human satisfaction exists. However, there is evidence supporting the hypothesis that an indirect effect of contribution sequence on human satisfaction, mediated by perceived authorship, exists. Having the human write the first draft themselves has a positive effect on perceived authorship, which then affects perceived satisfaction with the first draft. Based on self-determination theory, we conclude that a human initiating the writing process of a story experiences greater autonomy, intrinsic motivation, and higher perceived authorship. According to expectancy-value theory, perceived satisfaction is strongly influenced by outcome expectations and ability beliefs. Based on the findings, we conclude that perceived authorship affects this psychological mechanism. When perceived authorship is high, humans feel that their contributions matter. This has a positive effect on perceived satisfaction. The study results support several implications for human-AI co-creative writing tools. Perceived authorship serves as a focal psychological pathway linking the sequence of collaborations to satisfaction, particularly in a human writing sequence (AI-enhanced Phase 1). Sequencing matters early; revision restores authorship perceptions. Starting from an AI draft may reduce early authorship perceptions, while hands-on revision can help restore perceived authorship and bring satisfaction ratings closer. AI co-creative writing systems can benefit from supporting revision-oriented workflows and user engagement, as authorship perceptions were most sensitive early and converged after participants revised the text. This aligns with prior work on AI co-writing concerning authenticity and ownership and supports revision-oriented, agency-preserving workflows.

This study has several limitations. The sample size ($N = 84$) limits generalizability and statistical power. The study examined a single tool (generatestory.io), and results may differ from those of other systems (e.g., ChatGPT). Measures were self-reported and may be influenced by self-assessment biases. Future longitudinal work could further explore human-AI co-creative writing sequence patterns; assess how repeated use changes perceived creativity, authorship, and satisfaction; and compare different co-writing interfaces (e.g., transparency and controllability features) to better support authorship and user experience.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Philipp Lizat, Daria Leus, Melani Da Cunha Alves, Laureen Vanessa Schmidt

Acquisition, analysis, or interpretation of data: Philipp Lizat, Patrick Jost, Daria Leus, Melani Da Cunha Alves, Laureen Vanessa Schmidt

Drafting of the manuscript: Philipp Lizat, Daria Leus, Melani Da Cunha Alves, Laureen Vanessa Schmidt

Critical review of the manuscript for important intellectual content: Philipp Lizat, Patrick Jost, Daria Leus, Melani Da Cunha Alves, Laureen Vanessa Schmidt

Disclosures

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Data Availability Statements

The datasets (and/or code) supporting this study are available from the corresponding author upon reasonable request.

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