Received: 10 June 2023 | Revised: 9 November 2023 | Accepted: 10 December 2023

DOI: 10.1111/jcal.12929

ARTICLE

Journal of Computer Assisted Learning WILEY

Is Chatgpt a menace for creative writing ability? An experiment

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Abstract

Background: The increasing prevalence of Artificial Intelligence (AI) language models, exemplified by ChatGPT, has sparked inquiries into their influence on creative writing skills in educational contexts. This study aims to quantitatively investigate whether ChatGPT's use negatively affects university students' creative writing abilities, focusing on originality, content presentation, accuracy, and elaboration in essays. The research adopts an experimental approach to shed light on this concern.

Objective: This study aims to quantitatively investigate whether the utilization of ChatGPT, an AI chatbot, adversely affects specific dimensions of creative writing skills among university students, with an emphasis on originality, content presentation, accuracy, and elaboration.

Method: The experimental study involves 600 students from 10 universities, divided into a control and an experimental group (EGp). The EGp incorporates ChatGPT in their creative writing process as an intervention. The study evaluates originality, content presentation, accuracy, and elaboration, utilizing the Wilcoxon Signed-Rank Test for analysis.

Results and Conclusion: The findings reveal a detrimental association between ChatGPT use and university students' creative writing abilities. Analysing both machine-based and human-based assessments substantiates earlier qualitative observations regarding ChatGPT's adverse impact on creative writing. This study highlights the necessity of approaching AI integration, particularly in creative writing disciplines, with caution. While AI tools have merits, their integration should be thoughtful, considering the potential drawbacks. These insights inform future research and educational practices, guiding the effective incorporation of AI while nurturing students' writing skills.

KEYWORDS
AI, ChatGPT, creative writing, creativity, experiment, writing ability

1 | INTRODUCTION

ChatGPT is a state-of-the-art Generative Pretrained Transformer (GPT) language model-based Artificial Intelligence (AI) chatbot that has shown remarkable prowess in generating human-like responses and engaging in nuanced conversations (Lock, 2022). Its ability to retain contextual information from previous interactions, refuse inappropriate requests, and offer accurate solutions in coding and test scenarios has led to rapid user adoption, even outpacing major platforms such as Netflix, Facebook, and Instagram in terms of adoption rates (Sier, 2022). Some experts even speculate about its potential to challenge Google's dominance in traditional information retrieval

(Friedman, 2022). Beyond casual conversations, ChatGPT has demonstrated promise in diverse domains, raising the question of whether roles like content writers, programmers, and teachers could eventually be supplanted (Atlas, 2023; Hern, 2022). Educational contexts have particularly benefited, with ChatGPT supporting academic and professional writing, providing personalized feedback, and enhancing communication dynamics (Atlas, 2023; Qadir, 2022). Academic experiments have revealed that ChatGPT can achieve grades in the B to B- range, sparking discussions about its impact on educational practices (Atlas, 2023; Jack, 2023).

However, concerns have been raised regarding ChatGPT's limitations tied to its training data. It can inadvertently propagate biases and misinformation due to its learning from vast datasets (Dahmen et al., 2023; King, 2023). Despite its advanced capabilities, some commentators argue that ChatGPT lacks genuine authorial intent (Thorp, 2023). Such concerns are particularly relevant in academic contexts, where its potential use for generating substantial academic content may compromise originality and accuracy (Marche, 2022).

ChatGPT's remarkable conversational abilities and diverse applications have garnered attention, but its susceptibility to biases and the implications for creativity remain subjects of concern for prior authors (Khalil & Er, 2023). A notable area of concern is its influence on creative writing skills of tertiary-level students. The research question at the heart of this study aims to ascertain whether the involvement of generative AI, like ChatGPT, impacts the creative writing abilities of such students. To address this issue, the study delves into the qualitative assumptions and diverse opinions surrounding ChatGPT's impact on creativity and provide quantitative insights into the influence of ChatGPT on the creative writing abilities of tertiary-level students, contributing to a nuanced understanding of this complex topic.

RQ. Does ChatGPT affect the creative writing ability of tertiary level students?

2 | LITERATURE REVIEW

2.1 | The concept of ChatGPT

The concept of AI is not novel, with various AI forms emerging in the late 1990s and gaining prominence during the ongoing Fourth Industrial Revolution. Traditional AI algorithms, like neural networks, genetic algorithms, decision trees, and more, rely on structured data for tasks such as model building and data processing (Duan et al., 2019; Guan et al., 2019; Kushwaha & Kar, 2021). Recently, the role and functioning of text-generative AIs, like chatbots, have been explored (Lokman & Ameedeen, 2019). This field has grown significantly, marked by the development of language models such as GPT-3 and GPT-4 by OpenAI, which have found applications in diverse areas including creative writing.

Text-generative AI models, like OpenAI's GPT-3, GPT-2, and Google's BARD, operate through pattern analysis or prompted responses. These models, including the emergence of ChatGPT, primarily utilize Neural Transformer Models (Vaswani et al., 2017). ChatGPT, like GPT-3 and GPT-4, demonstrates human-like text generation by learning patterns and structures of human language through deep neural networks (Brown et al., 2020; Hughes, 2023). Unlike rule-based chatbots, ChatGPT generates contextually relevant and grammatically accurate responses, enabling more natural and engaging conversations.

Recent studies have explored ChatGPT's potential in creative writing tasks. Gupta et al. (2023) discovered that ChatGPT could produce imaginative and high-quality creative writing prompts. AlAfnan et al. (2023) explored its use in collaborative creative writing for business contexts. Dwivedi et al. (2023) highlighted ongoing observations and expectations of improved versions of ChatGPT. Kappel (2023) praised its grammar correction and document modification abilities, especially for researchers. Dahmen et al. (2023) acknowledged its potential for faster analysis of medical data. ChatGPT has also been credited with aiding idea generation, hypothesis development, and efficient data analysis (Gervais, 2020; Weir, 2022).

While ChatGPT's capacity for instant data generation and analysis holds promise, concerns arise within academia. Birkinshaw and Cohen (2013) and Dwivedi et al. (2023) propose that text-generative AI can alleviate the burden of lengthy and less valuable writing and proofreading tasks. Despite its functionality, ChatGPT is seen as both a beneficial tool and an algorithm with limitations (Mollick, 2022). Its potential to assist students and researchers in generating answers, summaries, and details is particularly noteworthy (Basu, 2023). However, its documented capabilities come with notable gaps (Mollick, 2022).

2.2 | Measures of creativity

Based on the factors identified through prior literature, a model for evaluation of creativity in writing can be determined. The model considers 4 variables, of which, 2 variables are – Elaboration and Similarity, suggested by Torrance (1988). Singleton (1996) identified accuracy as a measure of creativity in creative writing, for both fiction and non-fictions. Burke and Tinsley (1992) argued about content presentability (CP) as a significant factor in creative writing. Zulkifli et al. (2013) and Gopalan et al. (2016) independently experimented the effects of CP over creativity, further providing strong argument in support of the claim by Burke and Tinsley (1992).

2.2.1 | Content accuracy (CA)

Singleton (1996) accentuated CA as a crucial factor measuring creativity of any content. Runco and Charles (1993) defined an accurate idea as one that satisfies the situation's test criteria and could solve the problem. According to several studies, for an idea or piece of content to be considered creative, it must be accurate and original; otherwise, the creative credibility is questioned (Horan, 2007; Kilgour & Koslow, 2009; Runco & Charles, 1993; Vom Brocke et al., 2010). Further empirical studies revealed that the presence of appropriate

inclusion and reliable details in a creative act or content increases its creative value (Runco & Charles, 1993). Hence, the following relationship can be deduced from the preceding discourse:

$$\uparrow \textit{Content accuracy} = \uparrow \textit{Creativity in writing}$$

2.2.2 | Content presentability

Guilford (1950) proposed that there are several factors that can be used to decipher variations in creativity, with presentability being a significant one. Presentability refers to the cognitive capacity to approach concepts or objects from a variety of perspectives in response to a single stimulus, fostering creativity by generating new perspectives (Vidal, 2005). True creativity is the presentation of the thought as idea generation is only a partial representation of creativity (Weir, 2022). Weir (2022) suggests, presentability of content has a high association with creativity. A study investigating the role of cognitive presentability as a mediator between bilingualism and creativity indicated that, individuals having a greater potential for presentability increases the likelihood of creativity in various domains, including but not limited to, generating written contents (Kim & Runco, 2022). Another study concluded that mind wandering promotes creativity, while presentability plays a vital role (Preiss, 2022). Preiss (2022) further adds that content presentability and creativity perform as a positively correlated factor to each other. Therefore, an association can be conceived of as:

$$\uparrow \textit{Content presentability} = \uparrow \textit{Creativity in writing}$$

2.2.3 | Elaboration (En)

Neto (2022) noted that content elaboration and logical reasoning is a measure of creativity. This relationship provides additional historical evidence that—refining and expanding an idea enhances its quality. Since quality is correlated with creativity, the level of elaboration in a piece of content may increase its level of creativity (Forster & Dunbar, 2009). In accordance, mind mapping, a component of the critical thinking process, is a visual and verbal tool used as creative problem-solver to organize complex circumstances in an expanding manner and generate a logical and creative outcome (Hidayati et al., 2019; Vidal, 2005). Creativity and logical reasoning or elaboration of content is positively associated (Van Aken, 2016). Additionally, study finds that elaboration is an important and independent determiner of both individual and team creativity (Yuan & van Knippenberg, 2020). Therefore, the following relationship can be inferred from this discussion:

$$\uparrow \textit{Elaboration} = \uparrow \textit{Creativity in writing}$$

2.2.4 | Similarity (Sy)

Torrance (1988) signified similarity as an essential consideration for evaluating the level of creativity in any content. Higher content similarity indicates a lower level of creativity as originality of the content reduces. Any content found to be more similar with another content is less perceived to be creative and original (Alser & Waisberg, 2023; Dahmen et al., 2023). Gonsalves (2023) and Alzate (2023) independently commented that generalized contents tend to have a greater similarity among them, making the compared contents less creative to each other. Thus, a relationship can be conceptualized as:

$$\uparrow \textit{Similarity} = \downarrow \textit{Creativity in writing}$$

Considering the above-mentioned literary foundation, Figure 1 illustrates a relationship between creativity in writing and its measuring variables.

2.3 | Hypothesis development

The educational implications of ChatGPT remain relatively unexplored, with limited studies examining its impact on creative writing ability. While existing literature often relies on qualitative approaches or personal assumptions, a quantitative and experimental perspective is lacking. While broader research discusses AI's general influence on education, there's a dearth of experimental investigations into how advanced chatbots like ChatGPT affect creative writing ability.

Kappel (2023) experimented with ChatGPT and concluded that it holds promise for enhancing scientific writing. Liebrenz et al. (2023) observed that ChatGPT's involvement in writing could foster critical writing skills. Similarly, Kasneci et al. (2023) suggested that ChatGPT might enhance critical thinking and creativity among university students. Research exploring text-generative AI models and creative writing has surfaced. For instance, Brown et al. (2020) studied GPT-2's impact on creative writing and identified its capacity to generate high-quality creative prompts. Hosseini et al. (2023) found that text-generative AI models improved writing quality in educational settings. Other research also suggests that such models aid idea generation and overcome writer's block (Gervais, 2020; Gupta et al., 2023; Rahman et al., 2021).

A pilot study in Honduras evaluated ChatGPT's perceived creativity, indicating that it could enhance creativity to a similar degree as human-generated poetry (Landa-Blanco et al., 2023). Arvind Narayan from Princeton highlighted that ChatGPT might encourage critical and creative thinking (Stokel-Walker, 2022). Hitsuwari et al. (2023) suggested that AI-generated creative writing, like poetry, can resemble human-authored content. Hamdan (2023) and Richard et al. (2021) separately praised ChatGPT's response customization ability for enhancing self-learning and creativity. Researchers like Van Dis et al. (2023) and Köbis et al. (2020) highlighted time-saving benefits and support for creative thinking.

However, a contrasting view by Lesia Viktorivna et al. (2022) reported about reduced creativity among AI users, while others expressed concern about compromised originality and ethical implications (Mollick & Mollick, 2022; Taiyeb, 2023). Questions arise about content bias, inaccuracies, and the risk of plagiarism (Bass, 2022; Bender & Friedman, 2018; Cain, 2023; Gao et al., 2022; Homolak, 2023; Stokel-Walker & Van

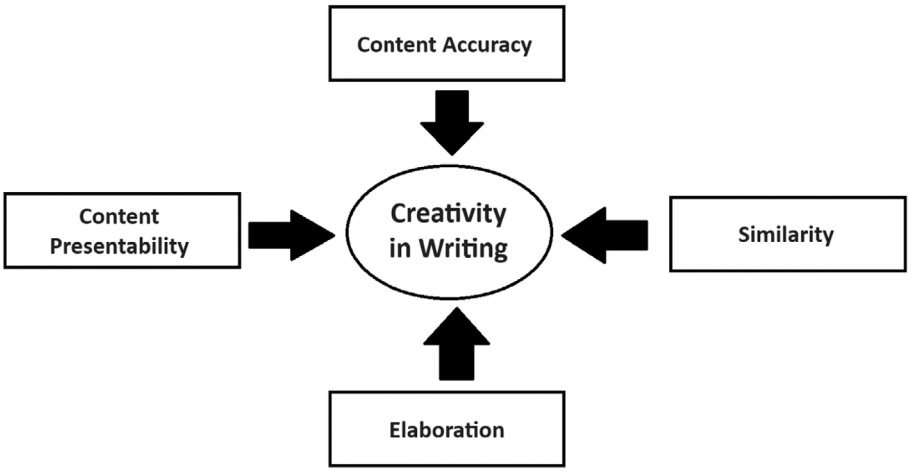

FIGURE 1 Factors measuring creativity in writing. Source: Authors' work.

Noorden, 2023). ChatGPT's role in facilitating superficial learning and hindering critical understanding is also discussed (Taiyeb, 2023). Concerns extend to academic integrity, with suggestions that ChatGPT could negatively impact education quality and originality (Dwivedi et al., 2023; Stokel-Walker & Van Noorden, 2023).

Notably, writers might overly rely on AI-generated content, potentially stifling creativity (Puntoni et al., 2021). Puntoni et al. (2021) further claimed that the risk of homogenized writing styles and reduced diversity is evident. Critics point to ChatGPT's lack of critical thinking and knowledge acquisition (Marshall, 2023; Neto, 2022). Student tendencies to use ChatGPT for academic tasks raise concerns about learning and integrity (Tech Business News, 2023). Surveyed sentiments underscore scepticism over ChatGPT's impact on creativity (Haque et al., 2022). The need for quantitative validation of factors like originality, versatility, and impact is evident (Dwivedi et al., 2023).

Sharples (1996) highlighted the significance of an unrestricted environment that fosters unconstrained thinking, promoting creative writing. This assertion was subsequently explored by Zedelius et al. (2021), who arrived at parallel conclusions with Sharples (1996). They underscored the adverse impact of constraining free thought by furnishing predefined content, as it could potentially introduce bias and hinder the creative thinking process.

Overall, existing literature presents mixed perspectives on ChatGPT's influence on creative writing. The qualitative nature of these claims necessitates a quantitative examination. This study thus formulates a hypothesis to investigate ChatGPT's impact on creativity in writing, aiming to offer a more conclusive understanding:

H1. There is a significant difference in CA score between the two groups.

H2. There is a significant difference in CP score between the two groups.

H3. There is a significant difference in En score between the two groups.

H4. There is a significant difference in Sy score between the two groups.

H5. There is a significant difference in Total Creativity Score (TCS) between the two groups.

3 | METHODOLOGY

3.1 | Research design and sampling

This study employs a quantitative approach and utilizes an experimental research design to explore the impact of using ChatGPT as an assistance tool on the creative writing performance of tertiary-level students.

In order to ensure the robustness of the findings, the study employs both a control group and an experimental group (EGp). The participant pool is drawn from the top 10 ranked universities in Bangladesh, comprising a total of 600 participants. The selection process employs a strategic sampling method, taking into consideration factors such as gender and prior experience with ChatGPT usage (more than at least 20 times prior to this experiment) to enhance the sample's representativeness. The respondents were from a minimum of undergraduate level and the mode of education of the organizations was English, thus, the respondents are assumed to have a sound understanding of writing English prompts.

The participant pool is meticulously divided to maintain gender parity within the groups, resulting in a balanced gender-based distribution. For instance, if each group in a university consists of 60 participants, then the allocation ensures that there are an equal number of male and female participants, totaling 30 each. Within this framework, out of the selected 30 male and 30 female participants from each university, 15 possess substantial experience with ChatGPT (more than 20 times), while the remaining 15 either have limited exposure to ChatGPT or have used it fewer than 20 times. Figure 2 provides a more comprehensive division of the two groups in a visual manner.

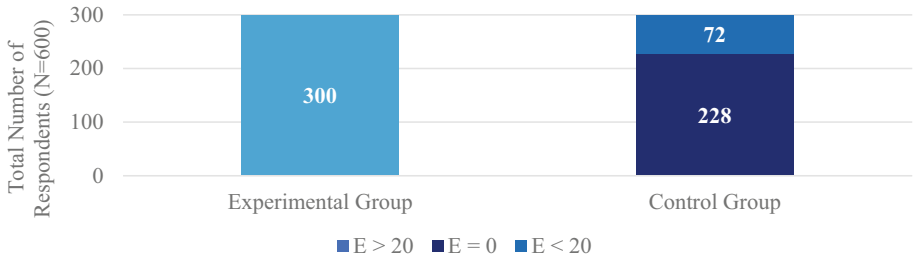

FIGURE 2 Division of group based on controlling criteria. E, experience of using ChatGPT. Source: Authors' work.

Given that the study encompasses a total sample size of 600 participants, with each group comprising 300 respondents, this exceeds the recommended minimum total sample size of 200 (Hair et al., 2021). Consequently, the study's sample size is deemed statistically significant, ensuring the capability to yield robust and meaningful outcomes.

3.2 | Data collection and analysis method

The study adopted a pre-test and post-test design to assess the impact of ChatGPT on the sample. This design employed a within-subject approach, wherein both pre-test and post-test data were collected from the same set of participants. Within the time-limit of 60 min, participants were required to compose an essay within 1500 words on the given topic using electronic means. The topic had to be written in English by the respondents. The topic had an adequate number of available secondary electronic sources within the first 6 pages of google search with the direct search prompt writing the title of the topic and Table 2 presents the summary of results found through the prompt in the Google search bar.

The pre-test was conducted at the same venue, 3 h prior to the post-test session. Both the experimental and control groups were presented with an electronic script, each containing a specific topic. Importantly, in the pre-test phase, neither the experimental nor the control group was allowed to use ChatGPT for assistance.

During the post-test phase, which involved the intervention, the EGp was instructed to use ChatGPT 3.5 as an assistance tool, while the control group remained prohibited from using any AI language models, including ChatGPT (Shown in Table 1). Instead, the control group was only allowed access to publicly available secondary sources, primarily via Google Search, to aid their writing. Both groups, experimental and control, were granted the freedom to use their designated assistance tools to craft their content within the allocated timeframe.

The EGp had the option to replicate text generated by ChatGPT, correct grammatical errors, paraphrase text, and leverage other features of ChatGPT for content generation. The control group, in contrast, was restricted from using any platforms offering assistance in grammar checking, paraphrasing, or similar functions. They were solely permitted to rely on published secondary sources for data collection. Microsoft Excel and PowerPoint usage was allowed for both groups to create supporting analyses, flowcharts, or graphs, if required.

Internet access and laptops were provided to students, with the EGp able to access ChatGPT while the control group's laptops had restricted access during the post-test. Invigilators, including the authors and volunteers, were present to ensure adherence to the designated platforms for each group. Volunteers and invigilators, both, received tokens of appreciation in the form of gift boxes for their support during the experiment at the venue.

TABLE 1 Experimental design.

Group	Intervention	Measurement
CGp		1
EGp	λ	2

Abbreviations: CGp, control group; EGp, experimental group; λ, intervention of ChatGPT.
Source: Authors' work.

TABLE 2 Number of supporting electronic sources for the given topics.

	News sources	Open access publications	Webpages/ blogs
Pre-test topic	13	12	22
Post-test topic	16	11	25

Source: Authors' work.

The evaluation of both, pre-test and post-test scripts, took place incorporating two processes—human review and machine review. For the human review, six qualified evaluators assessed all 1200 anonymous scripts, focusing on CA, Content Presentability, and Elaboration – the three components outlined in the model. Each factor received equal weightage in measuring creativity. Under each factor, qualified reviewers gauged specific aspects according to predetermined weights, mentioned below:

Content accuracy

Is the factual information provided by the respondent accurate? (2.5)
When writing creatively, is the information provided explained accurately? (2.5)

Content presentability

Is the content visually readable? (1.5)

Does the writer maintain a coherence between the written paragraphs? (1)

Does the written content create an interest in the reader for reading it? (1.5)

Does the writer use any visual tools? If not, is the text-based content adequate? (1)

Elaboration

Does the essay tell a story? (2.5)

Did the writer explain enough on the topic? (2.5)

In the human review process, Reviewer 1 evaluated only CA for all the scripts of both pre-test and post-test. Similarly, Reviewer 6 evaluated only En for all the scripts of both pre-test and post-test. Reviewer 2, 3, 4, and 5 evaluated i, ii, iii, and iv under CP consequently. All the reviewers performed independently, reviewing certain sub-sections of all 1200 scripts including both pre-test and post-test.

Against each of the assigned evaluation criteria, reviewers gave their scores based on a five-point Likert scale, which were later converted to their designated weights. Once all the scores were collected, it was summed to a get a score ranging between 0 and 5 for each of the evaluation factors (CA, CP, and En) of human review. Each of the evaluation factors carried 25 marks, which was calculated by multiplying the summed values obtained ranging between 0 and 5. Each of the human reviewers received gifts as a token of appreciation for their dedicated effort after completing their review process.

In the process of machine review, all the scripts of pre-test and post-test were evaluated in 3 different ways. The first evaluation approach (MRR_1) consisted of comparing the script of the respondent against a script generated through ChatGPT on the same topic that the respondent had responded to, through WCopyFind Version 4.1.5. In the 2nd approach (MRR_2), Grammarly Premium was used for checking the 4th factor "Similarity" between the two scripts. By comparing between the generated script and the respondent's script, a similarity score was found highlighting how much of the script is AI generated.

In the 3rd approach (MRR_3), Turnitin is further used to measure similarity, as Turnitin claims it can independently identify the percentage of content generated through AI (Chechitelli, 2023). However, as different machine reviews may provide a slightly deviated result compared to each other, the average of 3 machine reviews is considered as the final score of machine review for this analysis. As among the 3 methods Turnitin is assumed to be more credible while the other approaches are assumed to be less credible, the study considered different weights for each of the calculated MRRs.

Calculation formula of machine review (Similarity):

$$\text{Score of Sy} = \frac{0.2 \times MRR_1 + 0.3 \times MRR_2 + 0.5 \times MRR_3}{3} \quad (1)$$

where, MRR, machine review result (on a scale of 100).

The results of both the Human Review and Machine Review were compiled and a composite result of 100% was generated naming "Total Creativity Score" or "TCS". While calculating TCS, as Sy has an inverse relationship with originality, the score of Sy was deducted from 100 and the result was multiplied by 0.25 to get a meaningful TCS.

As no prior studies have developed such a formula that can measure creativity based on the variables mentioned in the study, combinedly, in assessing creativity of writing in an AI intervened situation, the formula considers equal weight for all the constructs.

Calculation formula of TCS by the authors:

$$\text{TCS} = (CA \times 5) + (CP \times 5) + (En \times 5) + \{(100 - Sy) \times 0.25\} \quad (2)$$

By utilizing a control group and an EGp, the study aims to establish a causal relationship between the variables. Level of difference in creativity between the control group (CGp) and the EGp was calculated using a Wilcoxon signed-rank test, and the effect of intervention was measured through the value of correlation coefficient (r) calculated through U statistic. Specifically, the study compares the writing performance of students who used ChatGPT as assistance with those who solely relied on Google sources. To calculate effect size, the study follows the formula mentioned in Equation (3). IBM SPSS Version 26 was used for performing statistical analysis.

Formula for calculating effect size:

$$r = \frac{U}{\frac{N(N+1)}{2}} \quad (3)$$

where, r = correlation coefficient, $U = U$ statistic obtained from Wilcoxon signed rank test, N = number of paired observations.

3.3 | Ethical consideration

The participants, prior to their involvement, were provided comprehensive information regarding the study's purpose and procedures. Informed consent was obtained from all participants, ensuring their voluntary participation in the experiment after they were briefed about the study's objectives and the utilization of the data they would provide. Importantly, participants retained full autonomy in choosing whether or not to partake in the study.

To uphold privacy and confidentiality, respondents were not required to furnish any personal identifiers such as Name, Race, Religion, or E-mail address. Solely demographic information necessary for the purpose of demographic analysis was solicited from the participants. The digital script encompassed two pages: the first page dedicated to collecting demographic information and the second page serving as the space for participants' written responses.

In an effort to maintain anonymity and ensure an unbiased review process, the demographic information on the first page of the questionnaire was removed before submitting the scripts for human review. Instead, a unique code was assigned to each script to facilitate

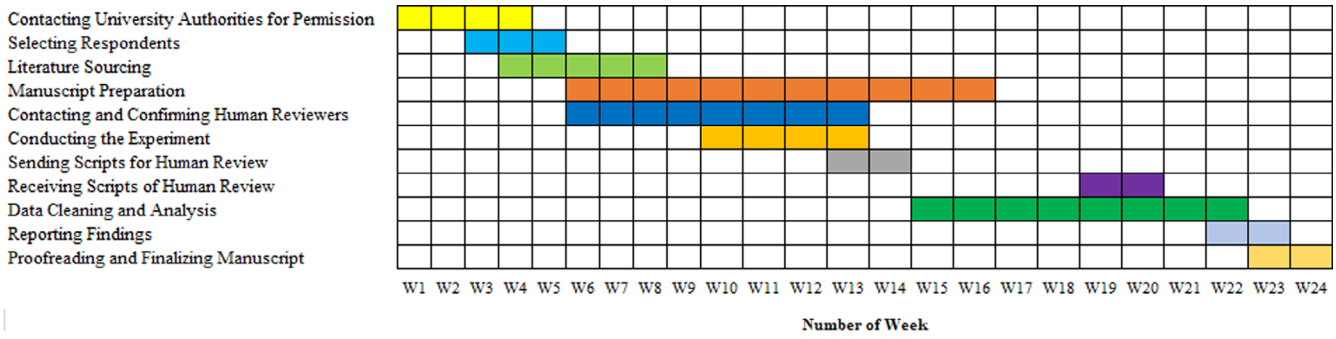

FIGURE 3 Timeline of the study. Source: Authors' work.

TABLE 3 Demographic analysis of total sample respondents.

	Frequency			Percentage		
	CGp	EGp	Total	CGp	EGp	Total
Gender						
Male	150	150	300	50%	50%	50%
Female	150	150	300	50%	50%	50%
Others	-	-	-	-	-	-
Current CGPA (On a Scale of 4)						
Below 3.00	8	12	20	40%	60%	3.3%
3.01–3.50	95	115	210	45.2%	54.8%	35%
3.51–3.75	142	108	250	56.8%	43.2%	41.7%
3.76–4.00	55	65	120	45.8%	54.2%	20%
Subject area						
Science (STEM)	80	120	200	40%	60%	33.3%
Business and economics	112	128	240	46.7%	53.3%	40%
Social sciences	100	60	160	62.5%	37.5%	26.7%
Year						
1st year bachelors	38	62	100	38%	62%	16.7%
2nd year bachelors	105	135	240	43.7%	56.3%	40%
3rd year bachelors	130	70	200	65%	35%	33.3%
4th year bachelors	18	22	40	45%	55%	6.7%
5th year bachelors or more	4	6	10	40%	60%	1.7%
Masters	5	5	10	50%	50%	1.7%
PhD	-	-	-	-	-	-

Source: Authors' work.

tracking. Reviewers were intentionally kept unaware of whether the script under evaluation belonged to the control group or the EGp. This measure was taken to prevent any potential preconceived bias and to guarantee the integrity of the results.

3.4 | Timeline

The study took 6 months (24 weeks) to complete from initiation to preparation of final manuscript. The overall research project was divided into 11 major steps. The detail regarding the timeline is shown in Figure 3 through a Gantt Chart.

4 | ANALYSIS AND FINDINGS

4.1 | Demographic analysis

The comprehensive demographic analysis of the 600 participants, presented in Table 3, offers valuable insights into distinct clusters, providing a foundation for further in-depth examination. The utilization of a strategic sampling method ensured a balanced gender representation, with male and female respondents maintaining an equal distribution ratio of 50:50. Importantly, none of the participants identified themselves under other categories, such as Transgender, 3rd Gender, homosexual, or Bisexual.

When considering the clustering based on Current CGPA, a discernible variance in distribution emerged. The majority of respondents fell within the CGPA range of 3.51–3.75, constituting the highest proportion at 41.7%. Subsequently, CGPA ranges of 3.01–3.50, 3.76–4.00, and Below 3.00 encompassed 35%, 20%, and 3.3% of respondents, respectively. A divergent distribution pattern was observed in the cluster based on the current academic year of tertiary level. The largest segments were represented by 2nd Year Bachelors (40%) and 3rd Year Bachelors (33.3%). Cumulatively, the remaining subgroups accounted for the residual 26.7% of responses. Notably, there were no participants from the Ph.D. level, whether ongoing or completed.

4.2 | Results of score comparisons – Pre-test versus post-test

In order to ascertain whether a notable distinction exists within the sample when both groups are exposed to a neutral condition, a pre-test was conducted. The outcomes of this pre-test yield to valuable insights into the initial bias between the two groups.

Analysis of the pre-test results reveals that the scores of both groups exhibited a negligible difference ($p = 0.682 > 0.05$). This outcome suggests, shown in Table 4, that respondents from both the experimental and control groups exhibit a comparable capacity to generate essays when provided with an equivalent level of support.

The pre-test and post-test analysis on the control group, shown through Table 5, indicated a statistically insignificant difference in the TCS, encompassing specific scores of all independent variables ($p = 0.497 > 0.05$).

The post-test analysis over the EGp indicated a statistically significant difference in the TCS, encompassing specific scores of all independent variables ($p = 0.000 > 0.05$). Notably, the mean difference between the pre-test and post-test was found to be positive for Control Group in terms of TCS. The EGp, on the contrary, exhibited a negative mean difference in terms of TCS (showed in Table 6).

Positive mean difference indicates that the group scored higher in the post-test compared to the pre-test and vice-versa. Alongside the mean difference, the *p* value provides a more meaningful understanding regarding how significant the difference is. Effect size adds to the analysis by showcasing the effect of the intervention. To gauge

TABLE 4 Bias determination between samples through pre-test.

Variable	Group	$\bar{x}$	σ	Mean difference	*p*	Decision
TCS	Control	61.91	8.98	0.87	0.682	Insignificant Bias
	Experimental	62.78	8.55			

Note: $\bar{x}$, sample mean; σ, standard deviation.
Source: Authors' work.

TABLE 5 Pre-test and post-test scores of the control group.

	Pre-test		Post test			Test statistic			
Variable	$\bar{x}$	σ	$\bar{x}$	σ	Mean difference	Z	*p*	Effect size	Decision
CA	19.13	4.52	18.11	3.03	−1.02	1.21	0.427	−0.122	Opposes H_1
CP	14.47	5.84	13.22	5.45	−1.25	2.58	0.394	−0.094	Opposes H_2
En	15.65	4.06	16.72	5.61	1.07	−0.01	0.506	0.106	Opposes H_3
Sy	13.66	3.03	15.01	2.74	1.35	−0.03	0.349	0.149	Opposes H_4
TCS	61.91	8.98	63.08	7.55	1.17	3.28	0.497	0.187	Opposes H_5

Note: $\bar{x}$, sample mean, σ, standard deviation.
Source: Authors' work.

TABLE 6 Pre-test and post-test scores of the experimental group.

	Pre-test		Post test			Test statistic			
Variable	$\bar{x}$	σ	$\bar{x}$	σ	Mean difference	Z	*p*	Effect size	Decision
CA	19.03	4.03	14.13	3.97	−4.90	1.77	0.000	−0.444	Supports H_1
CP	12.72	5.45	14.71	4.11	1.99	−0.21	0.001	0.340	Supports H_2
En	16.97	5.61	18.22	4.56	3.75	1.07	0.000	−0.678	Supports H_3
Sy	14.06	1.74	10.01	2.29	−4.05	2.24	0.000	−0.977	Supports H_4
TCS	62.78	8.55	57.08	8.81	−5.70	3.82	0.000	−0.352	Supports H_5

Note: $\bar{x}$, sample mean; σ, standard deviation.
Source: Authors' work.

the effect size of the intervention, r based on U statistic was employed. An effect size exceeding 0.8 is considered as substantial, while the value within 0.5 is moderate and within 0.2 is small.

Apart from scores of TCS, that answers to the research question, specific changes in factors affecting the creative writing ability are also observed through the experiment. For the control group, in both pre-test and pot-test, all the measuring variables of TCS (CA, CP, En, and Sy) were statistically insignificant ($p > 0.05$). Furthermore, Sy showcased the highest effect size (0.149) among the 4 measuring variables of TCS for the control group, but the value still represents a small effect size. For the control group, mean difference of CA and CP showcased a negative value, indicating that the respondents of the control group scored lower in the post test in these two aspects. On the contrary, they scored higher under the measuring aspects related to En and Sy as their mean differences for these two variables were positive. Notably, in all four aspects, the control group's mean difference was within ±1.5 which can be considered as a very small difference since for each of the variables the score allocated was 25.

Upon exploring the TCS of the EGp, a moderate effect size ($|-0.352| > 0.80$) was observed. This outcome signifies that the intervention had a moderate impact on the EGp, leading to a significantly distinct score in the post test compared to the pre-test. The EGp, who received intervention, showcased a different situation compared to the control group in all the measuring variables (CA, CP, En, and Sy) of TCS, showcasing statistical significance ($p < 0.05$) and a large effect size in all specific cases by generating a value greater than |0.08|. The EGp showcased a positive mean difference in CP and En but a negative mean difference in CA and Sy. The negative mean difference of CA and Sy indicated that due to the intervention of ChatGPT, the EGp's accuracy in the produced content dropped significantly and the generated content lost its originality compared to the state when ChatGPT did not intervene. On the positive side, the positive scores obtained in CP and En represents that ChatGPT improved the EGp's presentability of the content and increased their ability to elaborate the content. Apart from CP, having the positive mean difference of 1.99, the three other variables had a significantly higher mean difference ranging within ±3.75 to ±5. Among the individual variables, the variable Similarity displayed the most substantial effect size ($|-0.977| > 0.80$) for the EGp.

This counterintuitive observation can be attributed to the EGp's access to ChatGPT, which potentially influenced their creativity levels in writing. The pre-test and post-test results demonstrate a consistent pattern, wherein the EGp exhibited a higher mean score during the pre-test but a lower mean score in the post-test. Conversely, the control group's mean score remained relatively stable across both the pre-test and post-test assessments.

5 | DISCUSSION

The findings of this experiment highlight a significant decline in students' creative writing ability as a result of using ChatGPT. Notably, the scores of the EGp displayed a substantial difference in the post-test compared to the pre-test. As this disparity was not evident in the pre-test, the result signified that the introduction of ChatGPT led to a notable impact on students' creative writing capabilities. This experiment also underscores the moderate role that ChatGPT plays in causing such disparities between the Control Group and the EGp.

Interestingly, the study finds positive changes in factors – Elaboration and Presentability. Such findings suggest that ChatGPT may have the capability of explaining certain qualitative facts in a broader and more understandable manner for better communication. Qadir (2022) and Atlas (2023), both claimed earlier that ChatGPT is a useful tool for self-learning due to its ability of providing concise and customized feedback. Thus, this study provides quantitative proof of the qualitative claims by the two mentioned authors. However, as the result of this study also shows how CA is a significant matter of concern, the study opines self-learning through ChatGPT should be considered only for theoretical or explanatory topics, not on quantitative data-driven facts or debatable topics where any biased opinion could take place.

Contrary to the claims put forth by Liebrenz et al. (2023), Hitsuwari et al. (2023), Kasneci et al. (2023), and Hamdan (2023) that ChatGPT does not influence students' creative writing skills, the core finding of this study stands in opposition. Through this study, earlier assertions by Vargo et al. (2008) regarding the application of generative AI in creative content creation are validated, suggesting that while ChatGPT can contribute as a partner in value creation, its exclusive use may not guarantee the production of distinct and meaningful content. This aligns with the perspective of Jena and Goyal (2022) who emphasize that human intervention in creative content writing ensures distinctiveness, which may be lacking when solely relying on AI tools like ChatGPT. This experimental study contradicts certain claims, as the results indicate that creativity is more likely to be compromised when ChatGPT is utilized, leading to lower scores in measures of creativity for human write-ups aided by ChatGPT.

Given the absence of prior experimental studies focusing on this quantitative aspect, this study not only provides empirical evidence to support the qualitative assumptions found in existing literature (AlAfnan et al., 2023; Alzate, 2023; Basu, 2023; Gessert, 2023; Gonsalves, 2023; Lesia Viktorivna et al., 2022; Neto, 2022; Puntoni et al., 2021; Taiyeb, 2023), but also contributes to the fields of communication sciences and behavioural psychology (Li et al., 2022). Although Thorp (2023) acknowledges ChatGPT's positive impact on various aspects of our lives, this study emphasizes that despite ChatGPT's functional benefits, it should not be perceived as an author. By extending the knowledge on this debatable topic, this study's outcomes underscore the potential threat ChatGPT poses to students' creative writing abilities by potentially reducing their reliance on critical thinking and creativity. In addition, the study also highlights that ChatGPT's use should be limited to self-learning qualitative facts only as the tool shows positive changes in Elaboration and Content Presentability.

6 | CONCLUSION AND SCOPE OF FUTURE RESEARCH

The study's conclusions are accompanied by a candid recognition of its limitations. A larger and more diverse sample could enhance

understanding, while exploring additional factors associating creativity could deepen insights. The study focused on essays, leaving room to extend the investigation to other literary forms.

Despite acknowledged limitations, the study offers valuable insights and a practical framework for future research. Replication with larger samples across diverse contexts could yield richer insights. Amid evolving AI models, future studies could compare effects, refine creativity scoring, and explore long-term impacts.

In summary, the study sheds light on ChatGPT's creative impact and paves the way for future investigations into AI-human creativity dynamics. The study, thus, provides a way forward for policymakers and the management in understanding the extent to which tools such as ChatGPT should be permitted. The study also provides valuable insights about the existing limitations of ChatGPT in a quantitative manner, suggesting further scope of improvement for the betterment of academic integrity.

AUTHOR CONTRIBUTIONS

Ahnaf Chowdhury Niloy: Conceptualization; investigation; visualization; validation; methodology; writing – review and editing; writing – original draft; formal analysis; project administration; supervision; data curation. **Salma Akter:** Data curation; writing – original draft; writing – review and editing; resources; project administration; formal analysis; supervision; validation. **Nayeema Sultana:** Writing – original draft; writing – review and editing; resources; validation; methodology; project administration; supervision. **Jakia Sultana:** Software; writing – original draft; investigation; formal analysis; data curation. **Sayed Imran Ur Rahman:** Writing – review and editing; data curation; software; formal analysis.

ACKNOWLEDGEMENTS

The study acknowledges the effort of Juby Marcus (Lecturer, University of Pecs, Hungary), Kohinoor Biswas (Asst. Professor, East West University, Bangladesh), Md. Arefin Rabbi Emon (Lecturer, Islamic University of Technology, Bangladesh), Asst. Professor M. Abullah Al Mamun (Doctoral Candidate, Universiti Putra Malaysia, Malaysia), Dr. Md. Abdul Momen (Retired Asst. Professor, East West University, Bangladesh), and Sadid Al Amaz (Doctoral Candidate, University of Hawaii, U.S.A) for performing as the panel members of blind reviewers for the human review process of the study. The study also acknowledges the effort of Reaz Hafiz (Senior Lecturer, East West University, Bangladesh) for significantly assisting the authors in gathering responses.

FUNDING INFORMATION

The authors declare that the study received no funding, grants, or other support during or before the preparation of this manuscript from any 3rd party, agency, or institute.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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How to cite this article: Niloy, A. C., Akter, S., Sultana, N., Sultana, J., & Rahman, S. I. U. (2024). Is Chatgpt a menace for creative writing ability? An experiment. *Journal of Computer Assisted Learning*, *40*(2), 919–930. https://doi.org/10.1111/jcal.12929