Research Article

Research on Digital Teaching of Creative Writing in the Context of Computer Big Data

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This paper is aimed at examining the effects of digital teaching on reconstructing creative writing skills and to judge the bettering of creativity and writing skills after accepting digital technology. Based on this paper, creativity and writing skills are the most required elements of creative writing. Fluency, flexibility, originality, and elaboration are the major constructs of creativity. From the contribution of Torrance, we find these constructs of creativity. Narrative and linguistics are the major components in writing skills to evaluate the pupils. Concept and background come under the narrative components as subscales. Likewise, content, the structure of grammar, punctuation, and spelling are considered as subscales in linguistic components. Digital teaching methods and traditional teaching methods are used for this research. We are using a nonequivalent comparison-group design for this research. The rubric is a scoring guide used to evaluate performance. We used this scoring guide to access the improvement of pupils. In total, 58 participants were selected from a primary school. 28 participants were selected from the section A class and 30 pupils from the section B class. In creativity, after the digital teaching, the experimental group is greater than the control group; therefore, the digital teaching method improves the pupils’ creativity level. In writing skill, after digital teaching, the experimental group is better than the control group; therefore, the digital teaching method increases the pupils’ writing skill. We proposed a SVM-based Chaotic Grasshopper Optimization algorithm for digital teaching of creative writing in the context of big data. The comparative analysis result shows that the SVM-Chaotic Grasshopper Optimization method accuracy rate is higher than the other three methods’ accuracy rate. The SVM-CGO method execution time (second) speed is fast when compared with that of the other methods. Thus, we have analyzed the effects of digital teaching and evaluated the improvement in creativity and writing skills after utilizing digital tools.

1. Introduction

Creative writing is a form of writing that involves creativity, and it is written from the imagination of a writer, and therefore, their ideas and thoughts are expressed [1]. Creativity and writing skill are the key factor elements of creative writing. Writing prose, poem, and drama which emerge from the creative imagination of an individual are some forms of creative writing [2]. Good writing can help the writer to connect with the reader through proper communication, and it clearly expresses the thoughts, ideas, and opinions of the author. A creative writing article stated, "creative writing can be considered any original composition writing that is in no way guilty of plagiarism." There are various benefits to the act of creative acting. For example, it can develop emotional skills. Creative writing narrates the information in such a way that a reader can get emotional while reading it. Fiction and nonfiction are the two types categorized under creative writing, and there is no such definition or rule for creative writing [3]. In some countries, it is considered as a discipline in its own right [4]. People from all age groups like to learn creative writing; for university students, it is a very popular subject. The creative writing skill of an individual can be improved by proper learning.

Learning creative writing guides and encourages the creative process of a writer and supports writing developments in all its components [1]. Creative writing can be effectively learned and taught using the various tools of digital technology. Digital learning technology provides a wide range of delivery methods to strengthen the skills of learners, thereby
improving their creative practices [5]. It benefits both the teachers as well as learners. A revolutionary transformation is caused by the digital technology in almost all aspects of people's lives, whether it is in communication, education, or creative writing. It caused many changes and makes us more dependent on the usage of technology. The 21st century is termed as the digital era in which digital teaching and learning stay mainstream, so being aware of the current trends in digital technologies is essential [6]. Simply we can say that digital education means teaching and learning facilitated through utilizing digital technologies [7]. Here, the way of presentation may differ from the traditional method, but the basic idea of teaching and learning remains the same. Teaching or learning through digital technology offers an opportunity to access and make use of the abundance of information.

Big data refers to the huge collection of data as it encompasses a wide variety of data; it may be structured data or unstructured data. The technology of big data analyzes and organizes an enormous amount of data by eliminating unwanted data to get only the right and useful information from various information sources [8]. In the context of digital learning, big data is the data that is created by learners while learning through digital technology. There is an increase in the number of learners who actively participate in learning through digital platforms [9–12]. The paper is aimed at analyzing the effects of digital teaching on improving creative writing skills and at evaluating the improvement in creativity and writing skills after utilizing digital technology. The major contributions of this paper are as follows:

(i) To propose a big data-based Support Vector Machine and Chaotic Grasshopper Optimization algorithm for improving the digital teaching of creative writing

(ii) The paper is aimed at examining the effects of digital teaching on reconstructing creative writing skills and at judging the bettering of creativity and writing skills after accepting digital technology

(iii) Comparative analysis is carried out for various techniques to evaluate the effectiveness of the proposed system

The following is how the rest of the paper is organized: The literature survey is presented in the second section. In the third section, the theoretical framework is given. In the fourth section, the proposed methodology is given. The fifth section is the methodology section. Results and discussion are given in the sixth section. Finally, the seventh section contains the conclusion.

2. Literature Survey

Yalçın and Öztürk [13] analyzed the effect of digital storytelling on the student's skills of creative writing based on their gender. The analyses found that in the process of creating students' own digital stories, motivation and student participation increased, and also, in this process of digital storytelling success, the student's problem-solving skills and creativity improved. Lee [14] investigated a media transfer project in which a digital game was used to promote student creativity and creative writing in English as a Foreign Language (EFL) classrooms. To provide students with an authentic learning opportunity, a digital game (Her Story) was used and a creative writing project was designed. Torrance's model of creativity, originality, flexibility, and elaboration, demonstrated the students' writing creativity, and the participants' revealed that a project of creative writing enhances the student's motivation for engagement in learning.

Istiq Faroh and Mustadi (2020) [15] investigated the creativity and writing skills that developed the digital comics of primary school students. A quasiexperimental study method was conducted with preliminary and posttest methods. There were 56 fifth-grade pupils in all, with 27 students in the experimental group and 29 in the control group. The result found that pupils' innovation and written ability improved using the digital comics. The results revealed that digital comics considerably boost the experimental group's innovative and written abilities when compared to the control team. López-Belmonte et al. [16] determined the degree of digital talent in the instructional part of instructors and conclude the prediction of big data. A descriptive quantitative method study was conducted. The study took 832 Spanish instructors for data collection with structured questions. The outcome revealed that the instructor has an average level of digital talent in the instructional part. At last, our research expresses that the level of digital ability in the instructional part forces the degree of knowledge about big data.

Jin and Yang [17] proposed that big data drives creative writing. Cross-media fusion of writing styles, images, and text combination formats creates a new intellectual function for a variety of media. The result revealed that big data promotes new ideas and develops new media for creative writing. Parra [18] expanded the concept of literacy and writing under the analysis of poems, digital art, and accompanying analytical essays of 4 students, which was done in a Spanish heritage language (SHL) classroom. The analysis demonstrates how the digital art-making tool improves creative writing and the teaching of Spanish language literacy to heritage language learners. In the process of creativity, digital technology tools play a major role.

Bratitsis and Prappas [19] described dual approaches and the execution of a project of story creation, showcasing how creative ideas can help children learn more effectively and be more motivated to go to school. A total of 14 children took part in the study, which took place in a public primary school in a rural area of Greece. There were 13 activities in total, with durations ranging from 1 day to 2.5 months. The result revealed that digital storytelling and creative writing combinations provide a free, secure environment that engages the students in skill development. Tsiganis and Nikolakopoulos [20] analyzed the implementation of Web applications for the utilization of digital storytelling in the foreign language learning classroom. Narration and digital storytelling promote the students' engagement in improving their narrative texts. Also, students were motivated and activated and completed their
narrative eBooks by using Web applications in the foreign language learning classroom.

3. Theoretical Framework

3.1. Creative Writing. Creativity is defined as the capability of creating something new, surprising, and valuable, and the recombination of ideas must be worthwhile and unusual to be creative [21]. Torrance described four essential elements of creativity: (a) fluency, (b) originality, (c) elaboration, and (d) flexibility [22]. Figure 1 represents the constructs of creativity. Creative writing is an art and a part of the humanities. Creative writing can refer to any form including poetry, novels, short stories, novels, screenplay, songs, and scripts for drama, film, and television [23]. Creativity and writing are connected because the author wants to express creative ideas and imagination in writing. Any style of writing can be considered creative writing, but it involves imagination or originality to express a concept in a new way [24]. In academic writing, creative writing plays an important tool and creates a natural bridge because creative writing helps the students to address and overcome the issue in writing style, critical thinking in unfamiliar topics, and idea development in paragraphs [25]. Writing is an active learning activity that encourages students to think creatively. It can be a useful technique for encouraging student creativity [26]. Creative writing aids promote language growth at all grammatical levels and creative writing fosters “playfulness,” which engage the students to play creatively with language [27]. Writing skill is important in language production. Its importance grows when it comes to writing in the English language, which is widely utilized for global knowledge mediation, and it is believed that language development is dependent on improved writing skills [28]. Figure 2 expresses the components of writing skills. ESL programs help students become better writers and thinkers for their academic programs; in other words, it is a critical component of student success in academic writing [25]. Furthermore, creative writing provides language learners with a strong sense of confidence in their ability to develop a passion for an interest in writing. Creative writing plays a major role in the learning of language.

Fluency is an important element in writing talent. Skilled writers use standard vocabulary ideas and content [29]. Skilled creators can help others to improve their fluency by connecting them in a difference of writing development skills [30]. Language takes a major part in fluency. Creative writing needs very good fluency, thinking skills, and literacy of language. Listening leads the creator towards very good fluency [31]. Then, the creator can provide an excellent outcome to the readers or learners. Fluency is complicated in joining words into significant series. In digital learning, it is the easiest thing with the help of internet sources and language labs [1]. Thus, fluency is the most required factor in digital teaching of creativity. According to Torrance, originality is the capability to produce new plans, thoughts, procedures, styles, and contacts. The creator’s originality comes from their interpretations of the work and the way of utilizing vocabulary [14]. In this creative writing, originality is the key factor. The content’s originality talks about the creator’s identity [32]. Originality proves the unique quality of the writer, polished skill, and academic-oriented interest. If the creator cannot present original or own work, the work returns under the guidance of plagiarism [33]. And readers are not interested in reading those types of works. Thus, originality is an important factor in the digital teaching of creativity. Flexibility is represented as the performance to accept variety or numerous outlooks [34]. Flexibility is the capability to bend without difficulty and cracking. The word flexibility is taken from a Latin root meaning “pliant, easily bent” [35]. When creators have to modify or bend their thoughts about something well-known and regular, they can find creative ideas that are new, strange, and wonderful. According to Einstein, flexibility is a “measure of intelligence.” Creators employ flexible thoughts in their creative writings; scientists, engineers, and mathematicians also do the same [36]. Through flexibility, creators can change a true story into a fictional one by changing a few key details. Thus, flexibility is a valuable influence in the digital teaching of creativity. Without elaboration, creators cannot present the fullness of their creative writing. Elaboration is defined as expressing something extraordinarily. Elaboration is the method of making beautiful a concept by accumulating details. It is helped the creators to extend, gather their thoughts, and articulate their thoughts through the writing process [37]. Creators have to ask questions on a particular topic like why, what, when, where, and how that is the best way to elaborate something on a specific topic. Also, creators can elaborate with methods, such as conversation, definition, and pacing, also actual vocabularies, and a group of words and sensory details [38]. Thus, elaboration is a worthwhile factor in digital teaching of creativity.

3.2. Digital Teaching. Innovations in the various technologies of this modern society play a significant role in everyone’s activities. It has created numerous changes and makes us depend on technology even for a very simple task. New applications in digital technology can support the process of teaching and learning [39]. Utilizing digital technology for the process of teaching and learning has various effects on the improvement of the performance of learners. It improves the way of acquiring knowledge. There are lots of technologies that help to teach and learn with comfort and allow gaining more data, thereby facilitating and improving the learning process. Past study has identified a few benefits of digital learning; they extend the learning
opportunities, facilitate personalized learning; promote high engagement in learning, competency-based learning, and collaborative learning; and provide quality learning products; relevant and regularly updated content learning is possible through digital technology, etc. [40].

Technologies of digital teaching facilitate the betterment of personalized learning, which is a type of approach in which the instructions and the data required for learning are provided based on a clear understanding of the strengths and needs of each individual [41]. These technologies are extending the learning opportunities, so the learners can gain knowledge easily because the information required for learning is easily accessible and is considered as the major advantage of digital teaching [42]. High engagement in learning can be achieved by the successful utilization of technologies; it helps the learner in understanding the content deeper [43]. Technology can be considered as key to competency-based education; it enhances learning and offers tools for critical and creative thinking [44]. Collaborative learning can be supported by digital technologies; it enhances the development of languages. And also, they can provide relevant and updated content. Big data has a greater impact on digital teaching and learning. The application of big data analytics and infrastructure in digital teaching and learning helps to solve the issues like collecting, analyzing, and organizing data from various informational sources [45]. The potential of big data and digital teaching is widely recognized.

4. Proposed Methodology

The Support Vector Machine-based Chaotic Grasshopper Optimization algorithm is proposed to analyze the effectiveness of digital teaching of creative writing in the context of big data. In the big data context, we proposed a Support Vector Machine-based Chaotic Grasshopper Optimization algorithm for improving the digital teaching of creative writing.

4.1. Big Data Processing. From 2006 to 2011, the research on educational big data is lower, and the creations are by comparison imperfect. The essential outlines in those periods concentrated on “data mining,” “algorithm,” “computer,” and “educational environment.” Considering the possibility of big data, researchers in the realm of education have created hard works to exploit the use of technology to use as well as analyze the large, valuable data-ineffective paths. They adapted themselves to big data. The research in those periods paved the path for the additional inquiry of big data in education. Many familiar researchers and experts treated data from the educational framework as very important to trace pupils’ performance. Big data has become a research concentration in the platform of education. The publications start to gather. The specific words like “learning analytics,” “classroom,” “blended learning,” and “self-regulated learning” show the path to unification of big data and education [10]. Higher education is the domain that contains variety, velocity, and volume. These methods could be utilized to allow the improvement of perspicacity about pupil performance and learning approaches and could serve as an example within big educational data like pupils’ trusted performance according to the instructed curriculum, which can be impacted in a positive manner [11].

Data capture, analysis, storage, search, transfer, sharing, visualization, updating, querying, information privacy, and data source are all issues in big data analysis [12]. The three main features of big data are the “3V,” which are volume, velocity, and variety. Volume: volume refers to the generated quantity. The value and potential insight are determined by the magnitude of the data. Velocity: the rate at which data is generated and processed in order to fulfill the needs and problems that come with progress and development. Big data is frequently accessible in real time. Frequency of generation and the frequency of handling, recording, and publishing are the two types of velocity in big data. Variety: the nature and type of data. Big data technologies arose with the primary goal of capturing, storing, and processing semistructured and unstructured (variety) data created at fast speeds (velocity) and in large volumes (volume) [46].

From the different formats in higher education and different sources, educational data in huge amount are acquired and generated daily. The need for applying special techniques to discovering new constructive knowledge which presently is covered within data is signified by the big educational data’s limited exploitation and the size and variety of these data within the higher education context. From other
areas that are categorized by big data, such techniques could be derived and utilized, and for manipulating big educational data, it can be used successfully. To represent areas within big educational data and to activate the development of insights regarding students’ performance and learning approaches, these techniques can be used. In recent times, big data and analytics promote different actions of higher education [11]. Big data has brought new ideas for creative writing and pushed it into a new stage.

4.2. SVM-Based CGO Algorithm for Creative Writing of Big Data. For the process of digital teaching of creative writing in the context of big data, we proposed a Support Vector Machine-based Chaotic Grasshopper Optimization algorithm. The different machine learning techniques used by various researchers [47] for processing big data are illustrated below.

4.2.1. Support Vector Machine (SVM). The SVM is a supervised ML algorithm that is utilized for classification and regression tasks. Let \( D_{\text{set}} \), defined in Equation (1), represent the training dataset, where \( D_{\text{set}} \) is a pair \((a_i, b_i)\) of an \( n \)-dimensional feature vector, \((b_i)\) = label of \((a_i)\) and \( i = 1, 2, 3, \ldots, n \).

\[
D_{\text{set}} = \{(a_i, b_i, \ldots, (a_n, b_n))\} \in \mathbb{R}^n \times -1, 1, (1)
\]

\[
b = v_0 + v_1a_1 + v_2a_2, (2)
\]

\[
b = y + \sum_{i=0}^{d} (a_i b_i(a_i)) \cdot a, (3)
\]

\[
b = y + \sum_{i=0}^{d} a_i b_i K(a_i, a_j), (4)
\]

\[
\min_{\varepsilon_i \geq 0} \frac{1}{2} W^T W + \sum_{i=1}^{n} \varepsilon_i, (5)
\]

subject to \( b_i(W^T \phi(a_i + y) \geq 1 - \varepsilon_i), \)

\[
\varepsilon_i > 0,
\]

RBF: \( K(a_i, a_j) = \exp \left( -\frac{\|a_i - a_j\|^2}{2} \right), \quad b > 0, (7) \)

\[
P_k(a) =\begin{cases} 1 & \text{if } \sum_{i=1}^{n} p_{i,k}(a) > n, \\ 0 & \text{otherwise} \end{cases} (8)
\]

where \( p_k(a) \) is the prediction of ensemble on \(a\) for category \(k\), \( p_{i,k}(a) \) is the prediction of a specific SVM \((i)\) on category \((k)\) for review \((a)\), and \( n \) is the number of SVM ensembled.

4.2.2. Chaotic Grasshopper Optimization Algorithm. Grasshopper Optimization Algorithm (GOA) is the latest metaheuristic algorithm attracted by the grasshoppers’ swarming nature. These algorithms can exploit the necessary details of the population to identify the optimal solutions. These effective and robust algorithms are used to overcome different issues like economic dispatch optimization. \( a_1 \), as well as \( a_2 \), and are the qualities that make smaller the repulsion zone, comfort zone, and attraction zone [48]. The parameter \( a_1 \) and parameter \( a_2 \) are regarded as the same parameter which is also remodeled utilizing the following equation:

\[
a = aqrn - S \frac{aqrn - aqit}{\epsilon}, \quad (9)
\]

where \( S \) indicates the recent number’s iterations and \( \epsilon \) signifies the iteration’s highest number. In this, \( aqrn \) as well as \( aqit \) token the highest and lowest values of \( a \). The important parameters of GOA are \( a_1 \) and \( a_2 \) which are accountable for the grasshopper’s convergence toward the aim over the iteration’s course. The parameter \( a_1 \) manages the population’s exploration and exploitation, with \( a_2 \) diminishing the attraction zone, comfort zone, and repulsion zone among grasshoppers [49, 50].

(1) Tuning \( a_1 \) with Chaotic Maps. The parameter \( a_1 \) manages the exploration as well as the exploitation of the whole bevy around the aim utilizing Equation (8). We make use of dissimilar chaotic maps to describe the value of the \( a_1 \) parameter.

\[
B^t_1 = a_1(d) \left( \sum_{f=1}^{c} a_2 \frac{g_{h}^d - k_{h}^d}{2} m \left( n_{j}^d - n_{i}^d \right) \right) + \bar{p}_d, (10)
\]

(2) Tuning \( a_2 \) with Chaotic Maps. The chaotic map function to determine the \( a_2 \) value is stated in the following equation.

\[
B^t_2 = a_2 \left( \sum_{f=1}^{c} a_3(d) \frac{g_{h}^d - k_{h}^d}{2} m \left( n_{j}^d - n_{i}^d \right) \right) + \bar{p}_d, (11)
\]

where \( a_3(d) \) signifies the chaotic map value in the \( d \)-th iteration and \( B_2 \) indicates the \( i \)-th grasshopper.

5. Methodology

5.1. Research Design. A nonequivalent comparison-group design is used in this study. A nonequivalent comparison-group method was the major effective quasieperimental method with preliminary and posttesting intervention. Afterwards, we compared the experimental and control groups before and after the intervention. Table 1 represents the nonequivalent comparison-group design between the experimental and control groups. This paper analyzes the effects of digital teaching and evaluates the improvement in creativity and writing skills after utilizing digital tools. In creative writing, the innovative and written abilities are important. Therefore, innovative and written abilities are used as dependent variables.

5.2. Participants. A total of 58 participants were 5th-standard pupils (age 11 to 12) from a primary school. In the experimental group, there were 28 pupils (16 males and 12 females) selected from the section A class. In the control group, 30 pupils (14 males and 16 females) were selected.
from the section B class. Pupils in the experimental group were taught digital teaching methods using digital storytelling, digital comics, pictures, etc. Pupils in the control group were taught the traditional teaching method using the blackboard. In addition, both groups of students were taught by two distinct female teachers (ages 34–37) with similar teaching experience of more than 7 years. The teachers are all graduates of a local university with a bachelor’s degree.

5.3. Data Analysis. The experimental and control group students’ pretest and posttest scores from the creative writing skill rubric were calculated in this paper. The acquired data were analyzed using the SPSS 20 software package. An independent-sample test was used to determine the difference between the experimental and control groups’ pretest and posttest scores during data processing. Within-group comparisons of pretest and posttest scores were conducted using a dependent-sample T-test. The threshold for statistical significance was established at .005.

6. Results and Discussion

6.1. Rubric for Creativity (RCr). To evaluate the creativity of students in writing, a rubric for creativity (RCr) was used.
The constructs of creativity (fluency, flexibility, originality, and elaboration) are adopted from the contribution of Torrance. The validity of creativity constructs is presented in Table 2. The validation of students’ creativity writing is shown in Figure 3.

6.2. Rubric for Writing Skills (RWS). To evaluate the writing skill of students, the rubric for written skills (RWS) was utilized based on the aspects of linguistic components and narrative components. The reliability coefficient of RWS is 0.77. The rubric validity is presented in Table 3.

6.2.1. Interpretation. Table 4 represents the independent-sample $T$-test for pupils’ creativity. The $P$ value is greater than .05 in the pretest score. It is identified that there is no meaningful variation in innovation among pupils instructed with digital teaching methods using digital storytelling, digital comics, pictures, etc. and pupils instructed in the traditional blackboard teaching method before treatment. After the intervention of digital teaching, there is a meaningful variation in innovation level among experimental and control groups ($P = .000$). The experimental group’s mean value ($M = 78.33$) is greater than the control group’s mean value ($M = 61.44$); therefore, the digital teaching method improves the pupil’s creativity level.

6.2.2. Interpretation. Table 5 represents the independent-sample $T$-test for pupil writing skill. The $P$ value is greater than .05 in the pretest score. It is identified that there is no significant difference in writing skills among pupils instructed in digital teaching methods using digital storytelling, digital comics, pictures, etc. and pupils instructed in the traditional blackboard teaching method before intervention. After the intervention of digital teaching, there is a meaningful variation in written skill level between the experimental and control groups ($P = .000$). The experimental group’s mean value ($M = 81.22$) is greater than the control group’s mean value ($M = 63.72$); therefore, the digital teaching method improves the pupil’s writing skill.

6.3. Comparative Analysis. The comparative analysis in Table 6 shows the accuracy rate of various techniques. The SVM-Chaotic Grasshopper Optimization technique accuracy rate is 94.65%, the Support Vector Machine (SVM) method accuracy rate is 91.09%, the Artificial Neural Network (ANN) method accuracy rate is 88.32%, and the Deep Neural Network (DNN) method accuracy rate is 74.59%.
94.65% higher than the other three methods' accuracy rates. The result of the analysis shows that the SVM-Chaotic Grasshopper Optimization method execution time (second) speed is fast when compared with that of the other methods (see Figure 4).

7. Conclusion

The paper is aimed at analyzing the effects of digital teaching on reconstructing creative writing skills and at evaluating the bettering of creativity and writing skills after using digital technology. In this paper, creativity and writing skills are the most important elements of creative writing. Creativity and writing skills are utilized as dependent variables. Fluency, flexibility, originality, and elaboration are considered as the constructs of creativity. Listening helps for the perfect fluency. Originality is the capability to express new plans extraordinarily. Narrative components and linguistic components help to evaluate the writing skills of students. Content, the structure of grammar, punctuation, and spelling are the subscales in linguistic components. Thus, the validity of creativity and writing skills are discussed in a good manner. We used a nonequivalent comparison-group design for this study. Rubric (scoring guide) was used for this research to access the improvement of pupils in digital teaching. The limitations are that for this paper, while comparing creativity, we mentioned a few components for writing skills in this paper. For future research, the researcher can add more components. It will present a standard outlook for future research. For this research, we are investigating school students; the researcher can examine college pupils for future research. We have analyzed the effects of digital teaching and evaluated the improvement in creativity and writing skills after utilizing digital tools.

Data Availability

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

Conflicts of Interest

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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