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Distinguishing between Student-Authored and ChatGPT-Generated Texts: A Preliminary Exploration of Human Evaluation Techniques

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ABSTRACT: The emergence of ChatGPT has opened up numerous possibilities as a supportive tool in the realms of education and research. However, the potential for students to engage in plagiarism facilitated by ChatGPT poses a significant challenge for university faculty members, particularly those possessing limited algorithm literacy and working in low-resourced educational contexts. The study draws upon the initial experiences and reflections of one of the authors and is accomplished by the collaboration of all the contributing authors. ChatGPT and forum posts within the learning environment served as the research tools. Employing the Turing Test, seven key human-detection techniques for deciphering ChatGPT-generated texts have been proposed in this study, including detecting discourse particles, conversational indicators, the degree of grammatical flawlessness and clarity, formulaic genre structure, numbered and sub-sectioned body paragraphs, use of transitional words and self-acknowledgment of ChatGPT's non-human nature. This study contributes to the emerging body of literature on ChatGPT by enhancing quality education, reinforcing academic integrity and catalysing further research endeavours in the development towards human-detection strategies to combat ChatGPT-facilitated plagiarism.

Keywords—ChatGPT, Plagiarism, AI, Virtual Learning, Human Detection

I. Introduction

Launched on November 30, 2022, ChatGPT has not even reached its one-year mark yet, but it has managed to create an enormous buzz worldwide. Currently, inquiries, prospects and scepticism are all swirling around this groundbreaking technology. Consequently, research attention has been directed towards it. Studies are resulting in diverse perspectives and insights about ChatGPT [e.g., 15, 28], including predictions concerning its future impact [e.g., 42, 10], experimental discoveries about it [e.g., 17, 38] and an articulation of ethical concerns [e.g., 22, 32] surrounding it in multiple disciplines.

As written texts pervasively infiltrate education [8], ChatGPT, a text generator, holds substantial promise for various educational disciplines [31]. A review by [31] underscores ChatGPT's versatility, demonstrating outstanding performance in some areas (e.g., Economics) and satisfactory performance in others (e.g., Programming), while it may fall short in certain subjects (e.g., Mathematics). The same review study also highlights ChatGPT's potential as a valuable tool in creating course materials and as virtual tutors for students. Despite holding significant promise in education, ChatGPT has also created challenges, including generating fake or incorrect information [31] and fake citations and references [14]. Thinking of alternative means and measures in this new context is crucial in education, where continuity matters [63].

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However, the most prominent challenge posed by ChatGPT so far is plagiarism, a concern increasingly reported by many studies on ChatGPT [e.g., 5, 26, 27, 48]. Particularly, the task of identifying and distinguishing between texts generated by humans (e.g., students) and by ChatGPT has emerged as a formidable challenge for educators when assessing students' essays and other written work, according to some recent studies [e.g., 7, 19, 30, 34]. It should be specially noted that the failure to effectively discern, detect and distinguish between human-generated texts—such as those written by students—and ChatGPT-generated texts will pose a significant threat to the quality of education, as well as and to students' academic and intellectual life (e.g., creativity), academic honesty and ethics [33, 45].

Therefore, ongoing research endeavours are seeking to devise methods for the reliable detection of ChatGPT-generated texts [34, 51, 52]. These studies (preprints) have proposed some computer-mediated algorithms and dataset-based approaches for detecting ChatGPT-generated content. For example, the 'Polish Ratio' method is developed by [51], the 'SHAP' model is proposed by [34], the 'CHatGPT-writtEnAbsTract' (CHEAT) technique is presented by [52], the 'XGBoost-based model' is proposed by [46] and the 'TSA-LSTMRNN' model is presented by [25]. The primary application of these methods has resulted in significant success in detecting ChatGPT-generated texts, particularly when it comes to detecting abstracts and essays. The problem is that these non-peer-reviewed studies exclusively focus on machine detection methods, which require educators to have algorithmic literacy, something primarily available only to educators in high-resourced contexts. Another drawback is that the proposed machine detections have a narrow scope, as they largely detect abstracts and essays. Notably unexplored in these studies are human-detection techniques for educators with limited proficiency in algorithms and machine learning, particularly those assessing and grading students' online short texts in discussion forums within low-resourced contexts, such as Bangladesh. The present study bridges this gap by proposing human-detection techniques for distinguishing ChatGPT-generated texts from student-generated texts posted in discussion forums.

The applications of the proposed human-detection techniques can positively impact educators' detection performance and potentially assist them in accurately assessing the quality of short texts in discussion forums. These forums have now been compromised by students' use of ChatGPT-generated texts. Thus, this study contributes to upholding the standard of online education and ensuring students' accountability, honesty, creativity and ethical conduct in educational settings where machine learning (ML)-based algorithmic models for detecting ChatGPT-generated texts may not be available in the near future.

A. Essential Requirement to Act as a Human Detector of ChatGPT-Generated Texts

This study outlines the basic requirements for educators (e.g., faculty) as human detectors of ChatGPT-generated texts. The study considers them as actors equipped with the tool of ChatGPT in a new situation, as identified by [63]. The proposed techniques pertain to human assessment of ChatGPT-generated texts; they do not necessitate faculty to have algorithmic proficiency and machine learning literacy, as [62] identifies as teachers' identity salience. Instead, educators must be proficient users of ChatGPT and have a solid grasp of the unique features of ChatGPT-generated texts. An educator who is a frequent user of ChatGPT and is familiar with the texts generated by it may have memorised some patterns of ChatGPT-generated texts [21]. Therefore, they can easily detect them. If educators have this essential skill, they can lead to pattern recognition and prediction assessment of ChatGPT-generated texts.

B. Theoretical Basis for the Proposed Human-Detection Techniques of ChatGPT-Generated Texts

There have been no remarkable theoretical underpinnings on ChatGPT text analysis yet. Primarily, the proposed techniques for the human evaluation of ChatGPT-generated texts are based on the Turing Test [13, 21, 36, 39, 44]. The essence of the Turing Test is to assess the intelligent behaviour (in this case, the generation of human-like texts) of a machine (in this case, ChatGPT) that is indistinguishable from a human (in this case, students) [21]. When it comes to the human evaluation of ChatGPT-generated texts, the evaluator or tester could be an educator with expertise in ChatGPT [21]. ChatGPT is able to generate human-like texts grammatically flawlessly [34], a quality seldom found in the writings of English as a foreign language (EFL) student. Therefore, in EFL contexts, it is possible to suggest some techniques for the human evaluation of the unique features of ChatGPT-generated texts when compared to the texts authored by EFL students. Thus, although the present study does not undertake a rigorous Turing Test on ChatGPT-generated texts, instead, it suggests some specific techniques for human testers (in this case, faculty members) to enable them to distinguish ChatGPT-generated short texts often posted by the tertiary students of the English Department on the online discussion forums.

C. Contextual Background of the Study

The inspiration for the current study originated from a university in Bangladesh. Students pursuing a Bachelor of Arts in English engaged in online discussion forums; these are considered to be an asynchronous modality of online learning [6] that enriches knowledge through interaction [2]. Discussion forums serve as an alternative to face-to-face focus group discussions [16]. Typically, English studies university students engage in extensive academic writing, which is a hallmark qualification to demonstrate their critical thinking abilities [64] and argumentative prowess [3, 35, 37, 50]. Before the introduction of ChatGPT, students in this context wrote their texts independently and posted them in discussion forums. However, with ChatGPT's advent, many students began posting ChatGPT-generated texts in discussion forums, claiming them as their own. The faculty was concerned that failing to detect ChatGPT texts among student-generated ones might hinder students' development of creativity, argumentative skills and thinking abilities. Against this backdrop, the faculty used some techniques for human evaluation (not any algorithmic model) and discovered that some texts posted in the discussion forums were not student-authored; they were ChatGPT-generated. In this context, all the authors of the present study collaborated to develop the techniques proposed in this study.

2. METHODOLOGY

A. Research Design

The aim of this study is to contribute human-detection techniques for distinguishing between student-authored texts and those generated by ChatGPT. This is based on real discussion texts and the faculty's self-study-based textual evidences. A qualitative study was designed to explore ChatGPT's ongoing role in education [12, 18, 20, 29, 40, 49].This study is, by nature, preliminary exploratory research [9, 11–43] on the latest AI (Artificial Intelligence) tool, ChatGPT. Preliminary exploratory research often leads to the discovery of new phenomena (e.g., ChatGPT) [47].

The present study applies a qualitative research concept, self-study methodology [24], to investigate ChatGPT's impact on higher education English students' discussion forums. According to [24], self-study methodology involves examining oneself (e.g., a faculty member) in action (detecting ChatGPT-generated and student-authored texts), typically in educational contexts (e.g., a university). This aims to understand an issue (e.g., discussion forum text detection challenges and techniques) where an educator (e.g., a faculty member) is engaged in relation to others (e.g., students and ChatGPT, an AI possessing human-like ability to generate text) [54].

B. Data and Data Collection

By employing self-study as the methodology for investigating various teacher-related issues (e.g., identifying and distinguishing between texts generated by ChatGPT and those authored by students), images, texts and text-images can be utilised as data [24]. Building upon [12], this study positioned AI, i.e., ChatGPT, as one of the two research tools. The other tool employed was a virtual learning environment (VLE). Consequently, text-images derived from materials posted within the VLE, specifically from discussion forums encompassing texts created by both students and ChatGPT.

Authors conducted self-explorations to discern ChatGPT-generated texts from those authored by students in the discussion forums. This process aimed to demonstrate the proposed human-detection techniques as depicted in the text-images. Initially, the learning environment was accessed, navigating to the Week-7 discussion forum. Clicking on the designated discussion forum led to the attempted 14 discussion texts. Leveraging their understanding of the students' writing skills and characteristics, faculty members segregated student-authored texts. They then captured these texts as images and copied them into a Word document. Similarly, ChatGPT-generated texts were identified, captured as images, and compiled in the same manner.

Additionally, this study interacted with ChatGPT, requesting the generation of two texts to showcase its features. These interactions occurred between August 12 and August 15, 2023. The resulting conversations were directly copied from ChatGPT and pasted into a separate Word document without alterations. To ensure research ethics, real names of students were replaced with letters (e.g., X, Y, A, M, N, O, P, Q, R, S, etc.), and platform details were removed from all the texts. Oral approval was obtained from the students under the condition of anonymity. The entire data collection process spanned two weeks. A total of 16 texts were gathered to establish the proposed detection techniques: two text-images were derived from conversations between researchers and ChatGPT, six were identified as genuinely student-authored and captured as text-images from discussion forum posts, while eight were identified as ChatGPT-generated but claimed by students as their own and were collected as text-images from the discussion forums.

C. Data Analysis

The study aims to develop human-detection techniques to differentiate between texts authored by students and those generated by ChatGPT. To achieve this objective, a method involving within-text analysis and cross-text comparison was considered most suitable for data examination. Therefore, qualitative comparative analysis (QCA) was employed as it combines the two techniques [4, 55]. Through the application of QCA, the study delved into the features within texts and compared the characteristics of student-authored texts with those generated by ChatGPT.

The researchers initially closely examined screenshots of texts generated by ChatGPT. Various features were highlighted in red for exploratory data analysis. Subsequently, these highlighted features were compared with ChatGPT-generated texts posted in a discussion forum as students' original work. The corresponding features were similarly marked in red and presented in the findings. Following this, texts genuinely authored by students in the forum were scrutinised in a similar manner, revealing distinct features. These unique features were highlighted in red within the screenshots and showcased in the findings. The identified features of ChatGPT-generated texts, student-authored texts and ChatGPT-generated-student-claimed texts were presented sequentially in a comparative manner, culminating in the development of precise techniques for distinguishing between student-authored and ChatGPT-generated texts.

3. PROPOSED TECHNIQUES (PTS)

A. PT One: Detect the Discursive Particles as Service Confirmation

ChatGPT engages in conversation with its users in a seemingly natural way [56]. When users request a service (e.g., generating text or information) through **'questions'**, ChatGPT typically engages in the conversation using 'commentary discourse markers' [57] such as **'Certainly'** and **'Of Course'** (refer to **Fig. 1** and **2** below). Interestingly, EFL students with low proficiency in discourse particles do not delete them from the ChatGPT-generated texts before posting the text as their own work. Essentially, when students are tasked with writing in an academic context, they often do not treat the assignment as a discursive practice in the same way ChatGPT does. As a result, student-generated texts usually lack the aforementioned discourse particles at the beginning of their texts (refer to **Fig. 5**). Thus, a discussion forum text starting with the discourse particles 'Certainly' and 'Of course' serves as an indication that the student asked for the service of writing a text from ChatGPT, and the generated text is an output of the conversational response, which is a typical characteristic of ChatGPT.

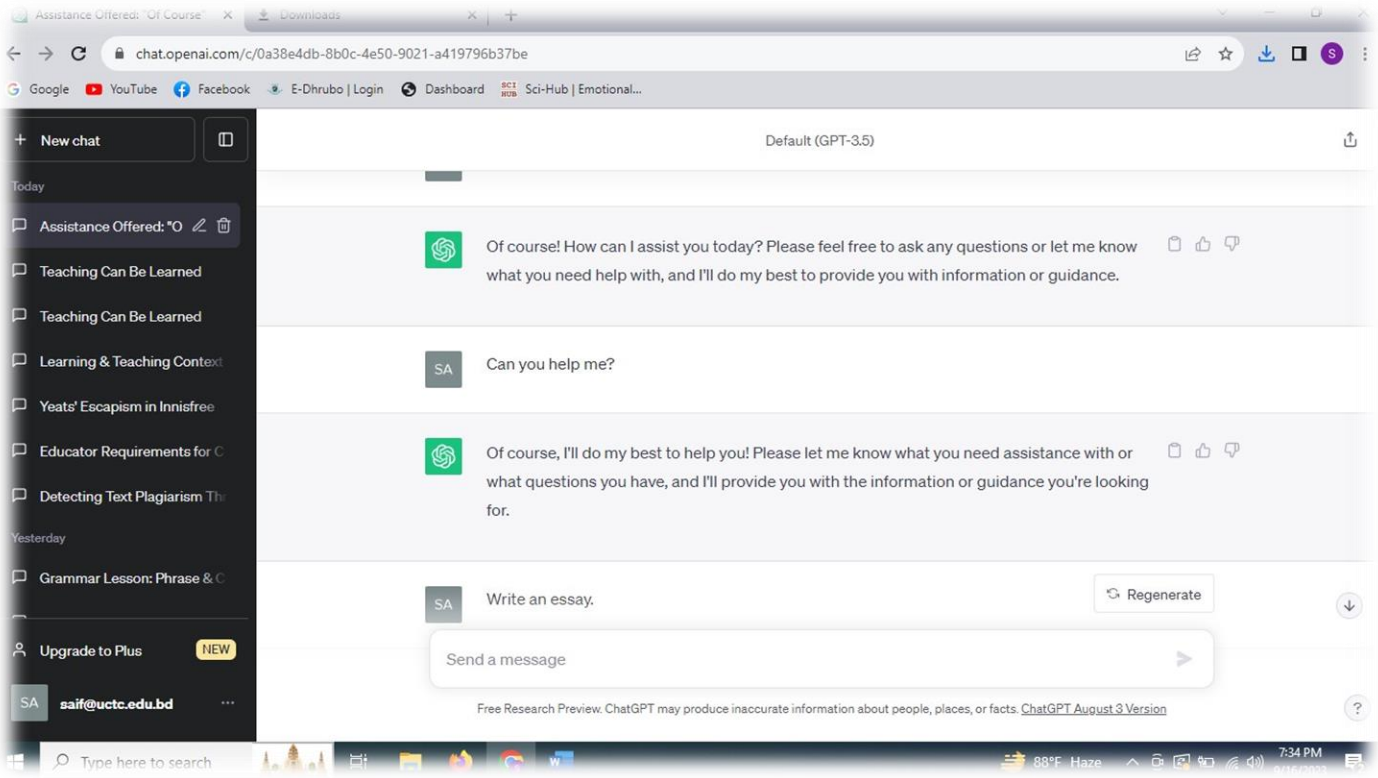

Fig. 1. A sample of real text generated by ChatGPT in response to a user's question, starting with the discourse particle 'Of Course'.

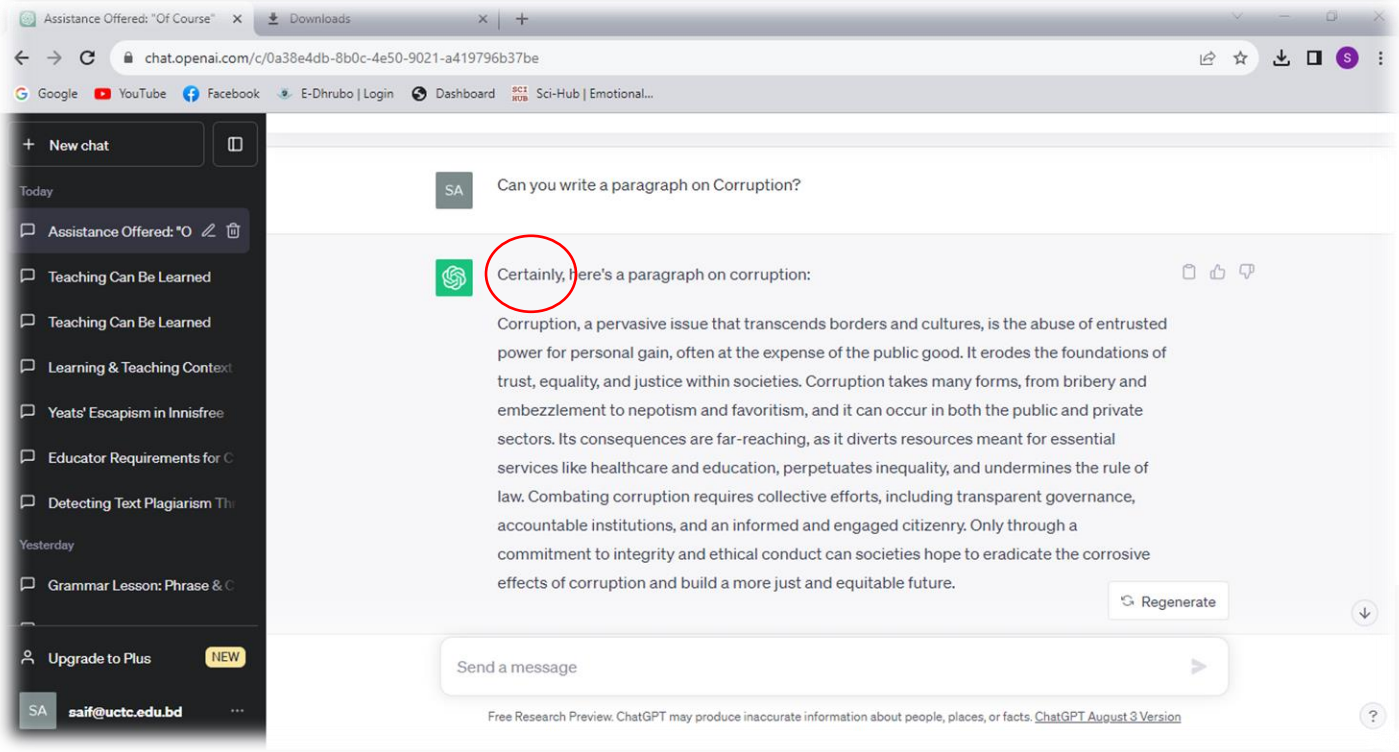

Fig. 2. A sample of real text generated by ChatGPT in response to a user's question, starting with the discourse particle 'Certainly'.

B. PT Two: Detection of Discourse Particles as Indicators of ChatGPT's Attitude towards/Stance on/Confirmation of the Input Statement

When a user inputs a statement for ChatGPT, it responds with discursive language by employing discourse particles like 'Certainly' and 'Indeed' to convey its attitude towards the provided statement. It then presents its interpretation of the statement. In educational forums, faculty often post statements for students to discuss, argue for or against. Notably, discourse particles like those present in ChatGPT's response are absent in student-generated discussion forum texts (**Fig. 3**, **4** and **5**).

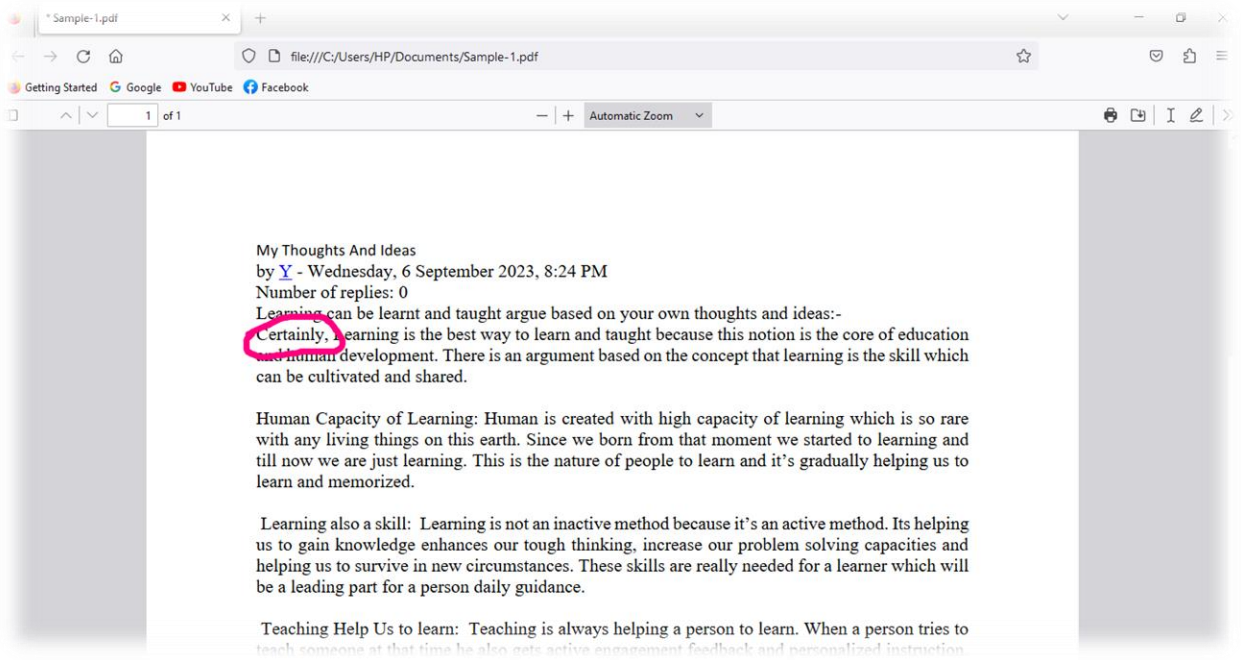

Fig. 3. A genuine post by student Y in the discussion forum, featuring the discourse particle 'Certainly' immediately following the statement.

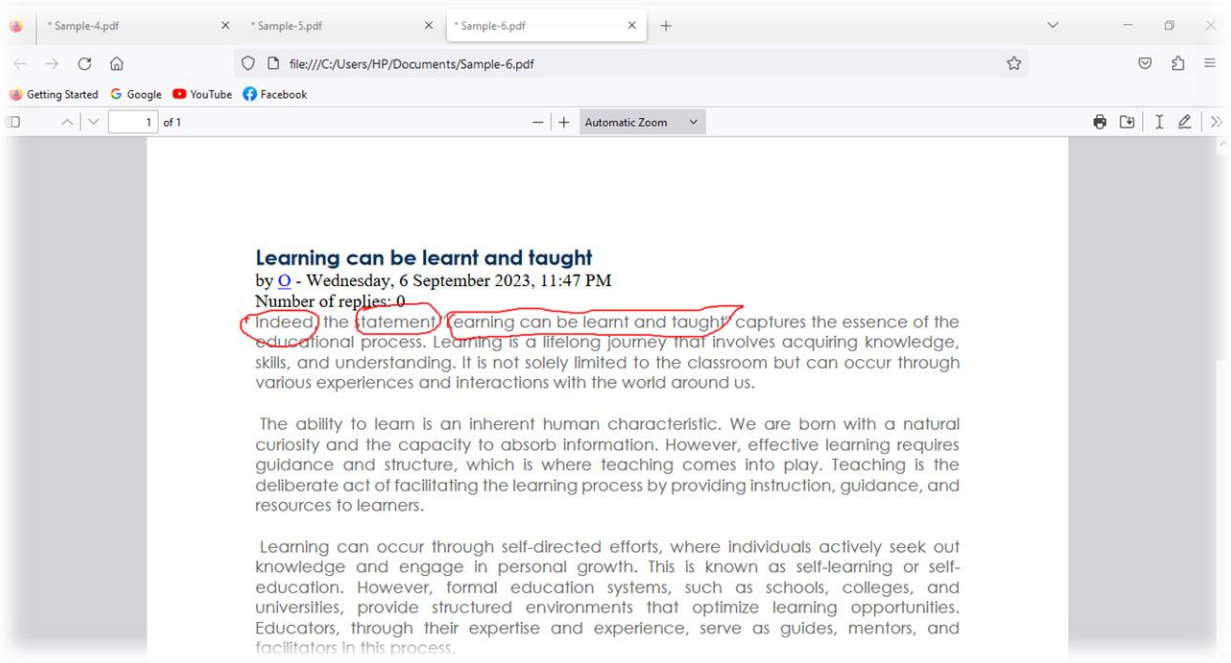

Fig. 4. A genuine post by student Q in the discussion forum, featuring the discourse particle 'Indeed' immediately following the statement.

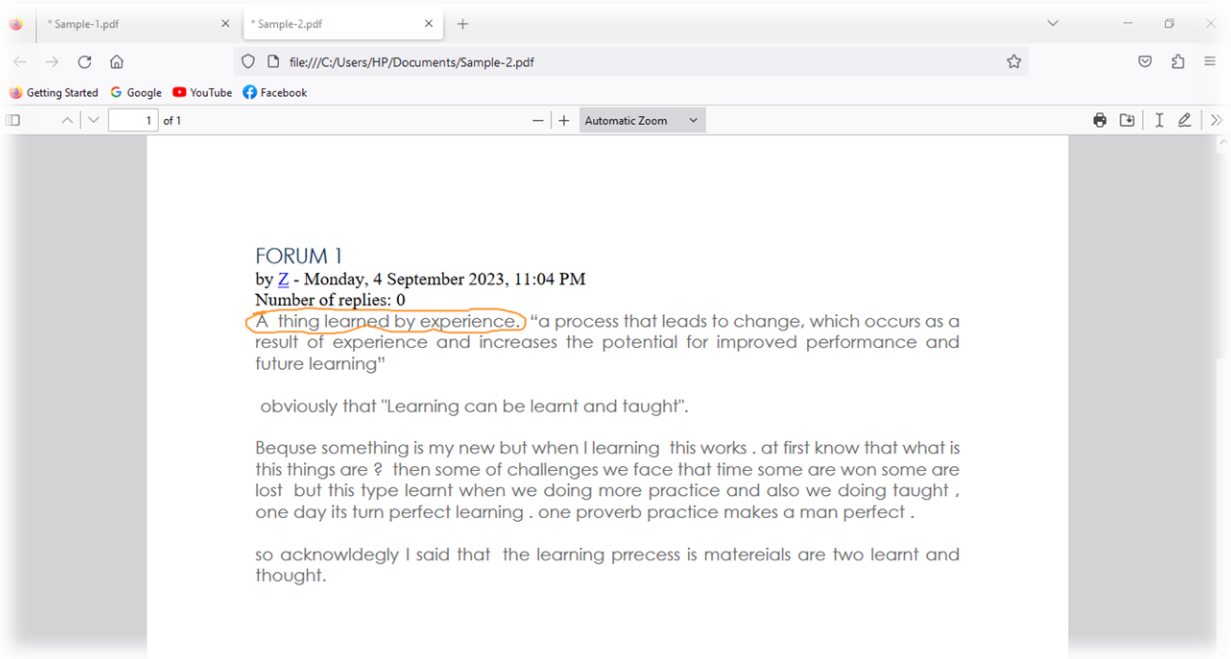

Fig. 5. A genuine post by student Y in the discussion forum, without the use of discourse particles such as 'Indeed,' 'Certainly,' or 'Of course' at the beginning of the text.

C. PT Three: Degree of Grammatical and Clarity Flawlessness

Errors, particularly grammar errors, in EFL students' writing are very common [53]. It is, therefore, no accident that there would be a few language errors in a low- or moderately proficient student's writing in a language that is foreign to him/her. For example, **Fig. 6** below is a real short text of 172 words written by student Z and posted in the discussion forum. The text contains 14 errors, including spelling, word choice, punctuation, subject-verb

agreement, verb-tense errors, missing helping verbs, faulty passive constructions, etc. Besides, EFL student-written texts also often suffer from clarity issues. Even highly proficient EFL students may have the aforementioned grammatical flaws and clarity issues in their writing (Refer to **Fig. 6, 7** and **8**).

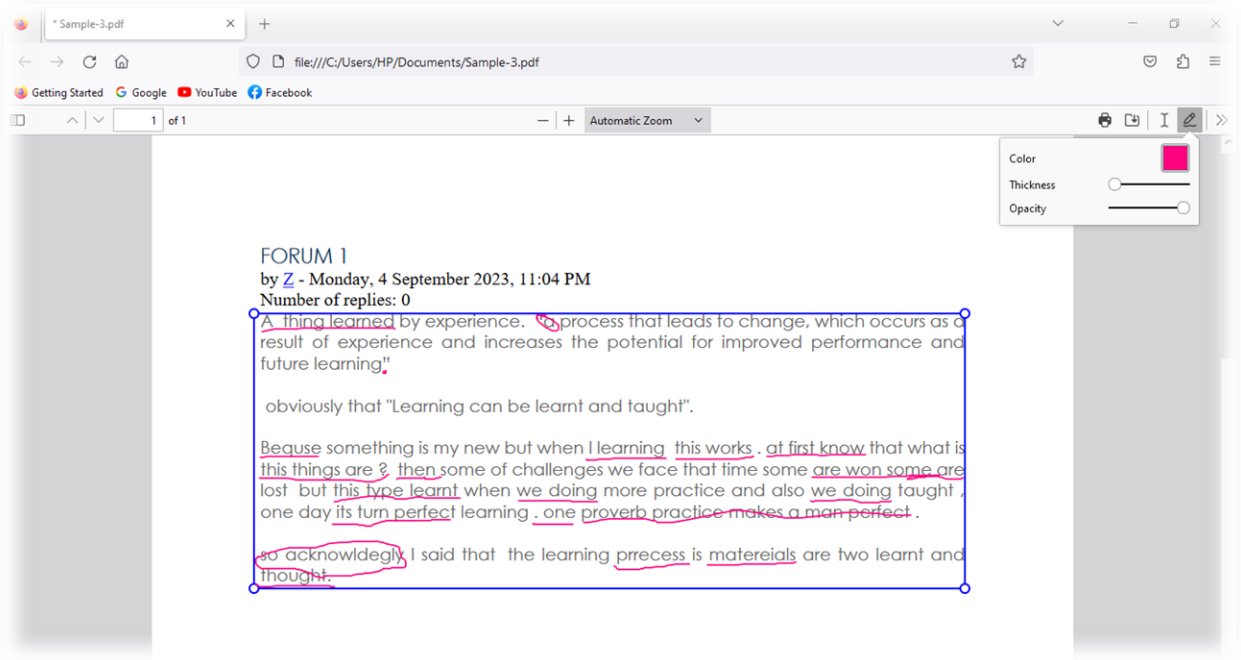

Fig. 6. A real forum text of 172 words, containing 14 errors, written by student Z.

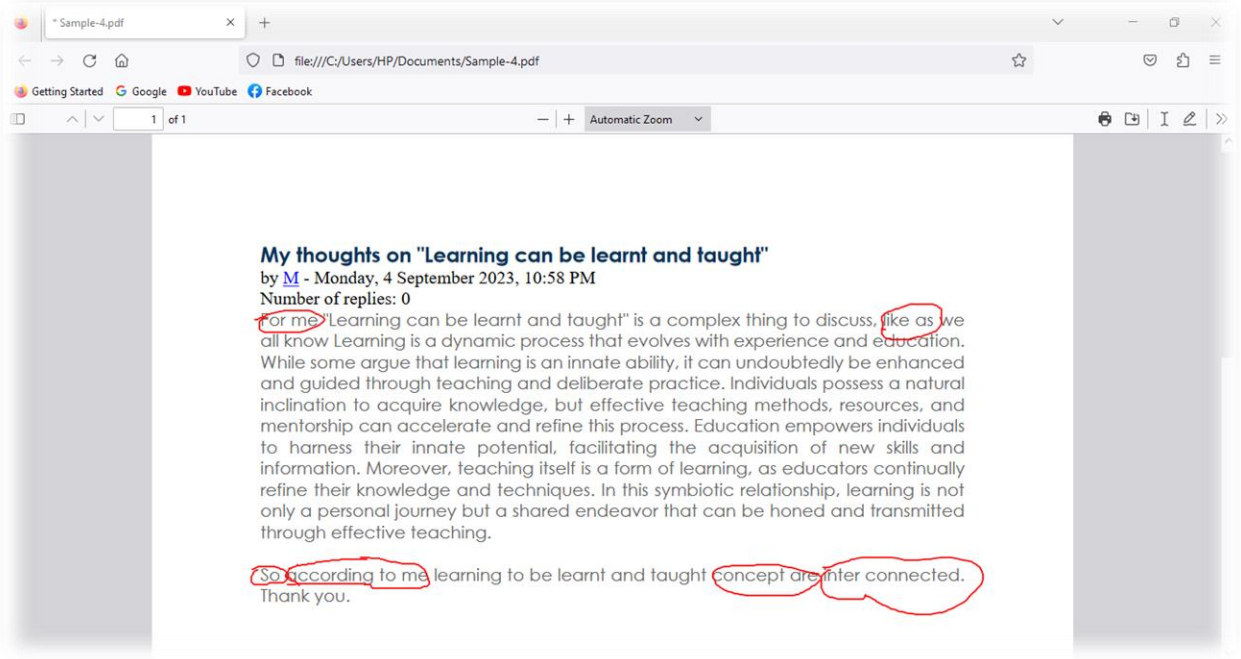

Fig. 7. A real forum text containing several errors; written by a high-proficient EFL student M.

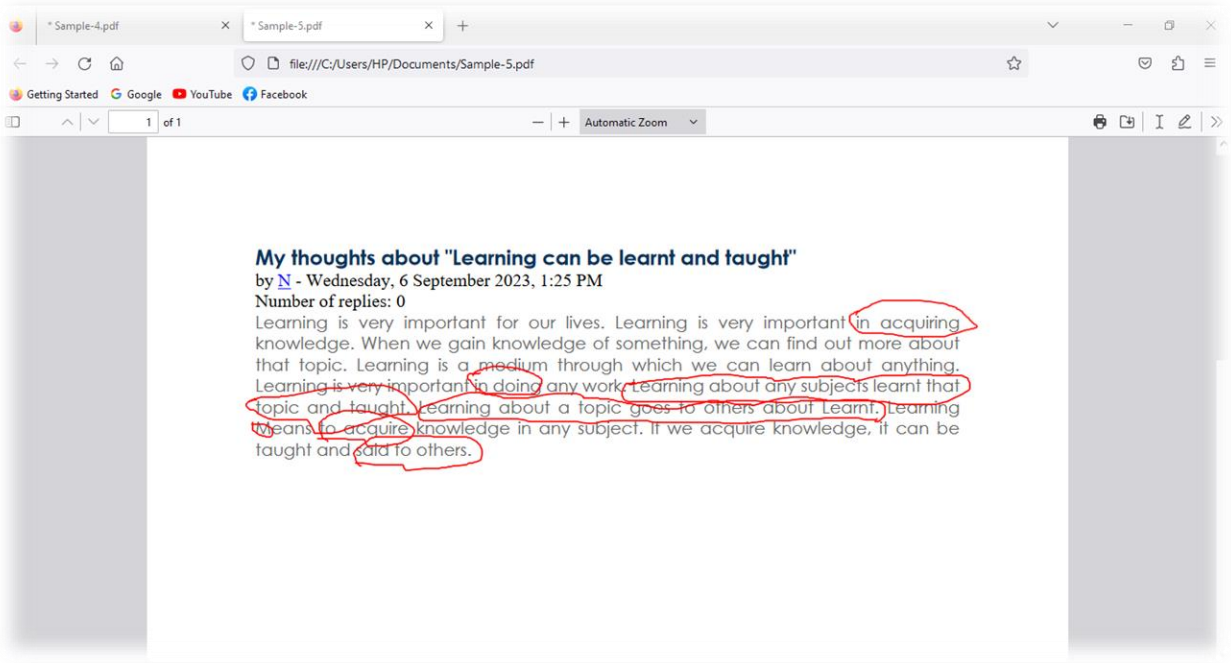

Fig. 8. A real forum text containing many errors; written by a moderately-proficient EFL student N.

Contrary to the reality of grammatical and clarity flaws in student-written texts, ChatGPT-generated texts are grammatically flawless [34]. When an EFL student with low or moderate proficiency in EFL in a familiar context posts a forum text with absolutely no grammar errors, it raises doubts that it is ChatGPT-generated. An example of a grammatically flawless ChatGPT-generated forum text is shown in **Fig. 9**. The text consists of 287 words with no grammatical errors or clarity weaknesses, which are typically two issues in tertiary EFL students' writings [58].

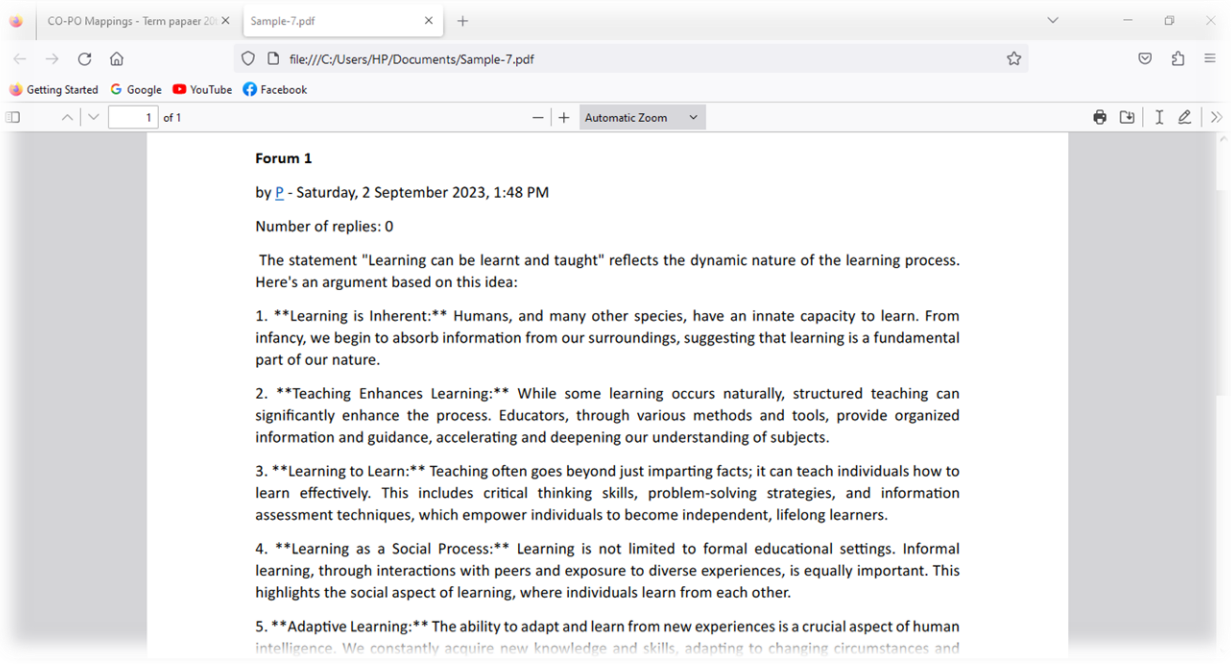

Fig. 9. A real forum text containing no errors; claimed by student P as their own but detected to be generated by ChatGPT.

D. PT Four: Detecting Formulaic Genre Structure of ChatGPT-Generated Texts—Lack of Creativity

As rightly pointed out by [59], ChatGPT-generated texts exhibit repetition of some formulaic phrases and (text) patterns. Consequently, while human-generated texts (in this case discussion forum posts written by tertiary students of varying EFL proficiency levels) normally showcase a variety of text features and creative aspects, ChatGPT texts are generated by identical, preset algorithms, resulting in unvarying formulaic features. As ChatGPT is built on fixed algorithms and operates based on given data, it lacks creativity. In every effort, it produces the same text patterns and formulaic genre structures. For example, a ChatGPT text formulaically ends with a closing paragraph that starts with 'In conclusion' (refer to **Fig. 10**).

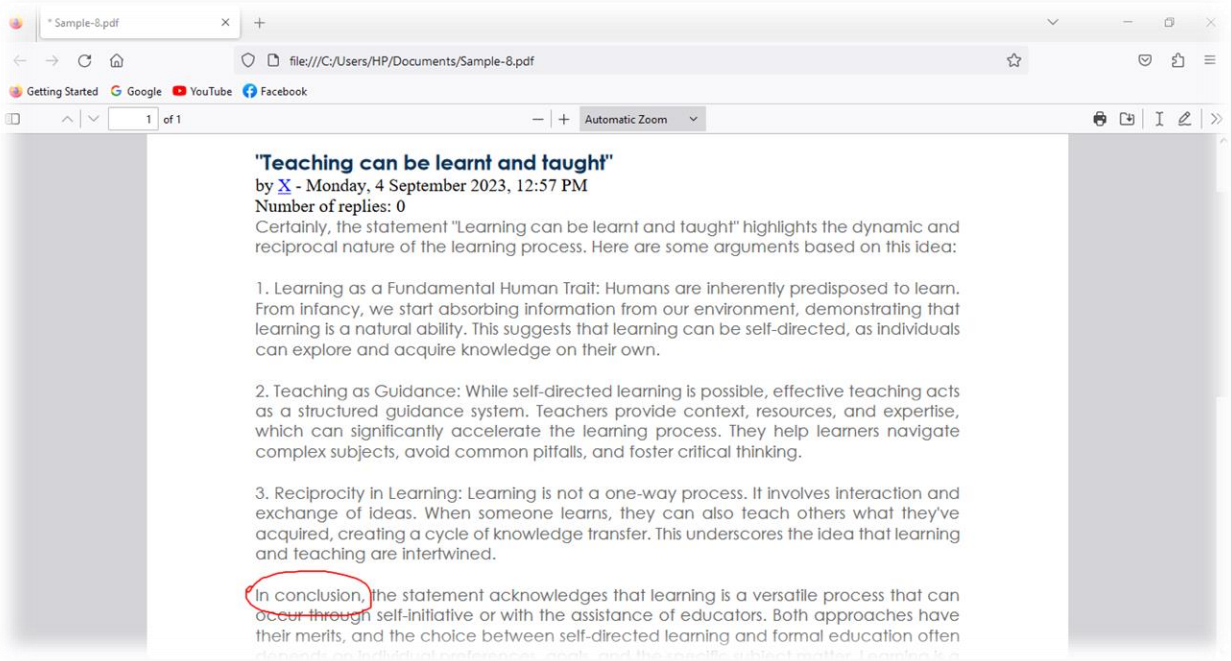

Fig. 10. Formulaic generic feature of a concluding paragraph with the common phrase 'In conclusion' in a real forum post detected to be generated by ChatGPT and claimed by student X to be their own.

E. PT Five: Detecting Formulaic Genre Structure of ChatGPT-Generated Texts—Numbered and Sub-sectioned Body Paragraphs

Another formulaic feature is that a ChatGPT-generated text typically numbers and sub-sections itself in the middle, accompanied by an introductory paragraph and a typical conclusion. This sort of neatness and formulaic organisation is often absent in EFL student-written essays and paragraphs [1, 41]. **Fig. 11** and **Fig.12** illustrate the above-mentioned contrast.

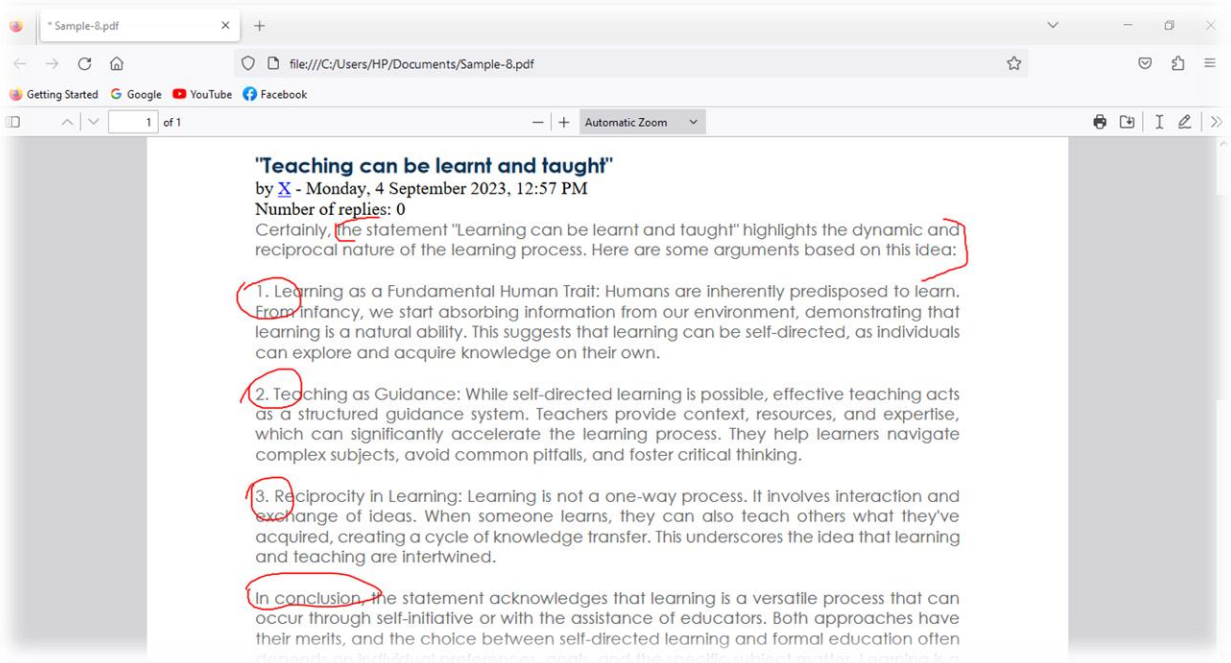

Fig. 11. A real ChatGPT-generated text formulaically numbered body paragraphs. It was posted by student X. who was claiming it to be their own.

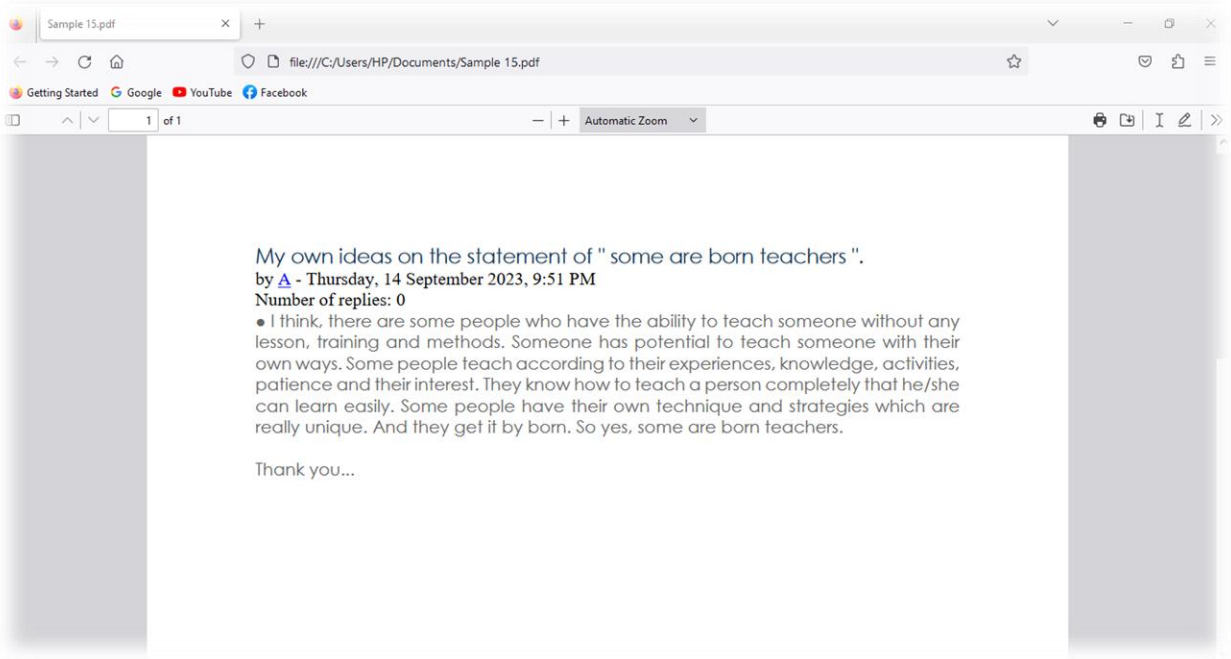

Fig. 12. A real student-generated discussion forum text without numbered body paragraphs or sub-sections, posted by student A

F. PT Six: Detecting Formulaic Genre Structure of ChatGPT-Generated Texts—Using Transitional Words

ChatGPT texts are normally coherent, and paragraphs are connected by transitional words such as ‘however’, ‘furthermore’, ‘nevertheless’, ‘additionally’, etc. These are inadequate in tertiary EFL students’ argumentative and persuasive writings [23] (refer to **Fig. 13** and **14**).

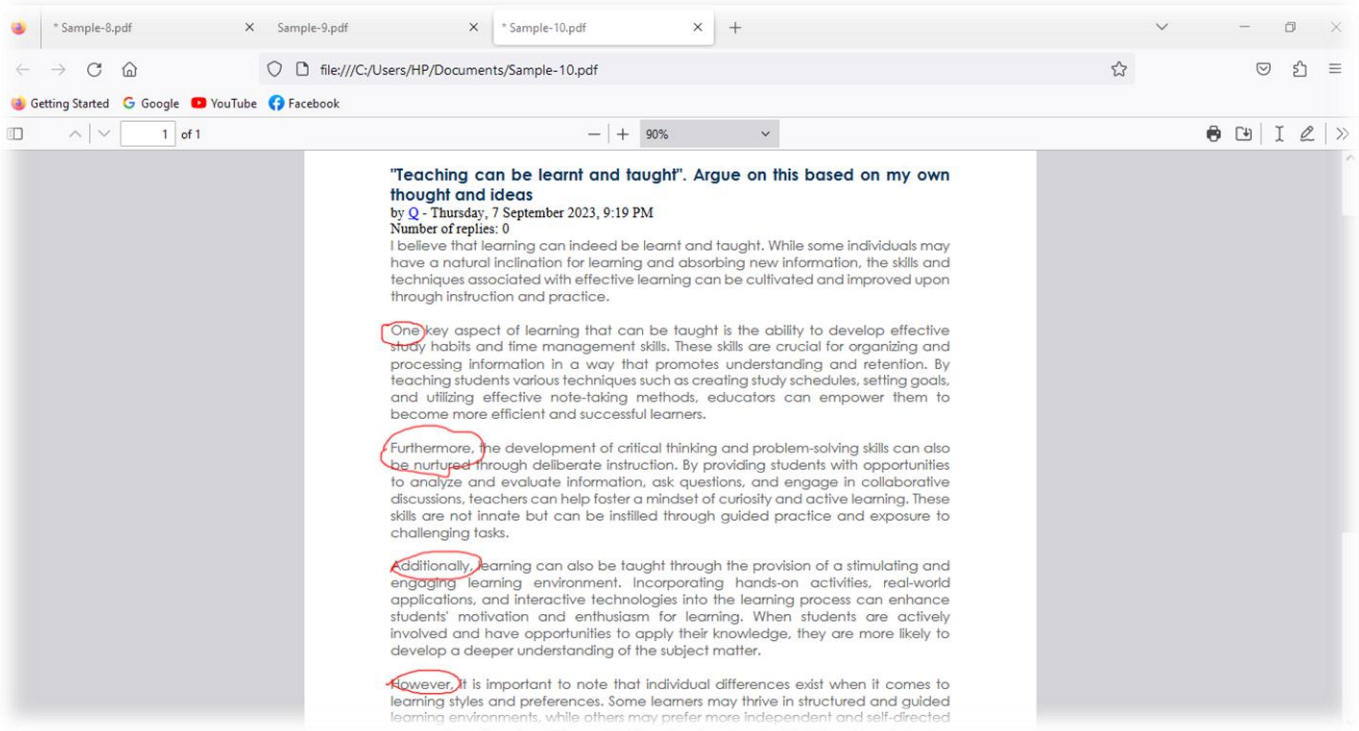

Fig. 13. A real discussion forum post detected to be generated by ChatGPT, exhibiting the transitional words ‘one’, ‘furthermore’, ‘additionally’ and ‘in conclusion’. This text was posted by student Q, who was claiming it to be their own.

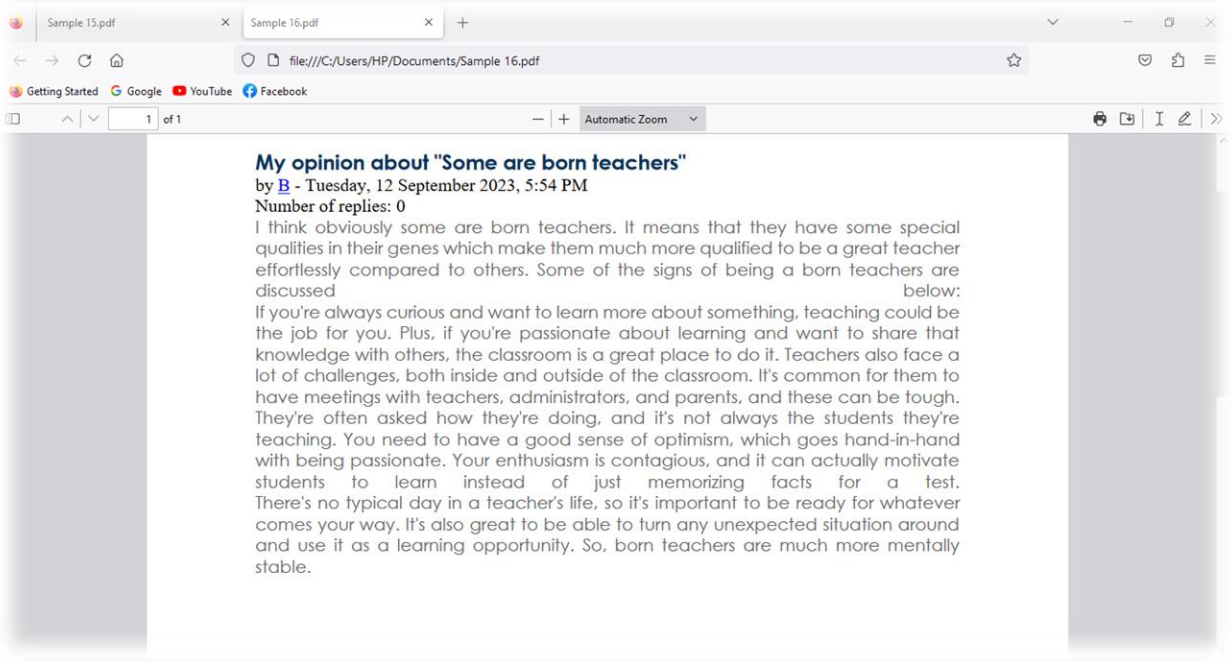

Fig. 14. A real discussion text detected to be written by student B, with no numbered body paragraphs or sub-sections.

G. PT Seven: ChatGPT's Reiterated Non-Human Nature

ChatGPT is an artificial intelligence system operating on predetermined algorithms and devoid of human emotions and experiences. Therefore, when prompted to generate text concerning human feelings, emotions and experiences, it invariably responds by reiterating its non-human nature and emphasises that it does not have any personal emotion or human experiences of a phenomenon. Students in the authors' context often forget to delete this prior to posting the text on forums (refer to **Fig. 15** and **16**).

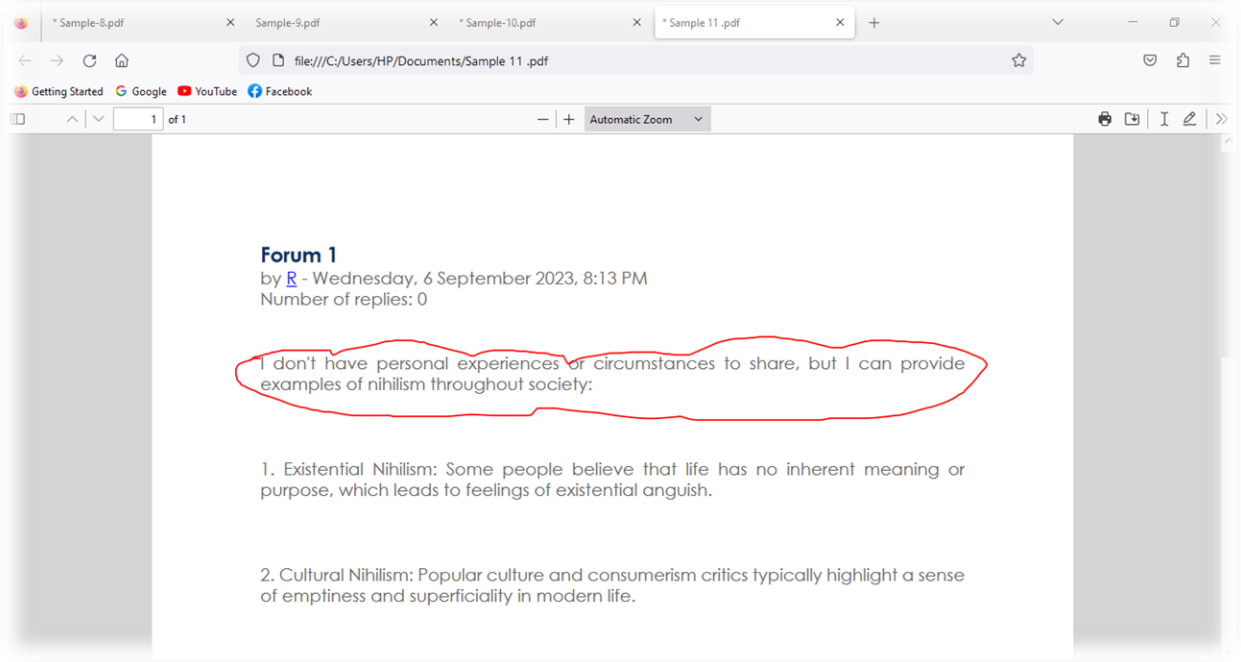

Fig. 15. A real discussion forum text generated by ChatGPT with its reiterated non-human nature. It was posted by student R, who claimed it to be their own.

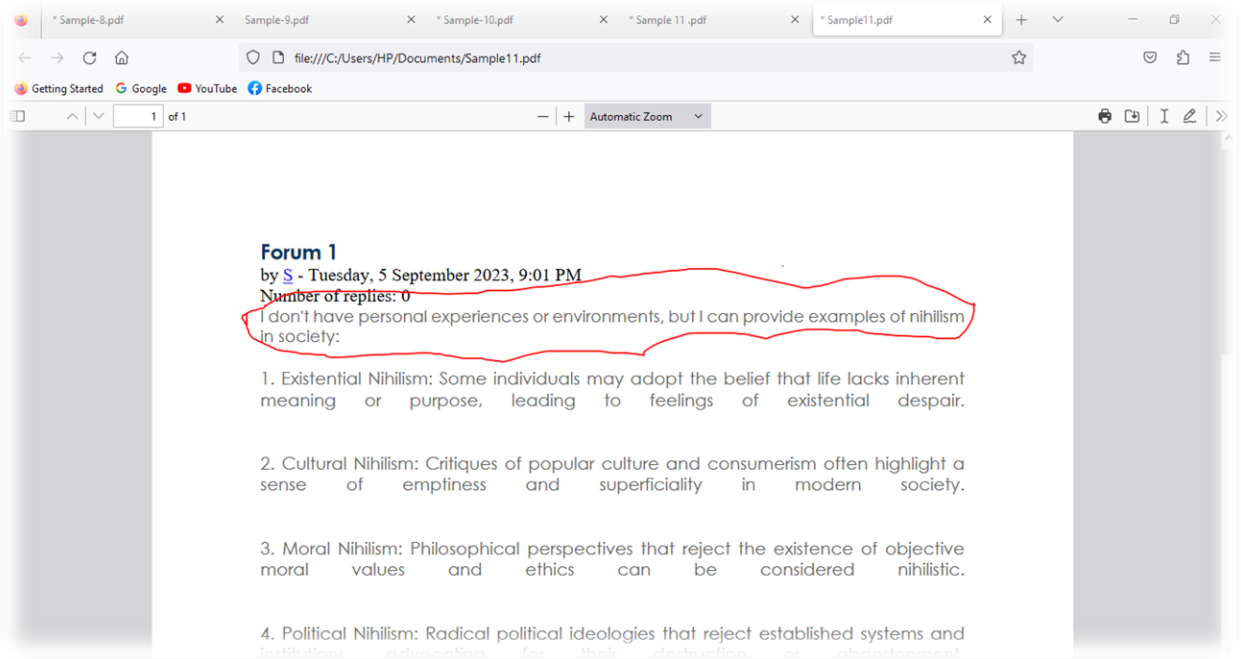

Fig. 16. A real discussion forum text generated by ChatGPT with a reiterated non-human nature. It was posted and claimed by a student as her own.

3. DISCUSSING THE PROPOSED TECHNIQUES

The techniques for human detection of ChatGPT-generated and student-authored texts were contextualised in response to the sudden emergence of ChatGPT. This emergence raised new concerns regarding ChatGPT-assisted plagiarism among undergraduate English students, whose own writing holds significant importance. The proposed techniques in this paper are distinct from the other developed ones (e.g., Polish Ratio, 'SHAP', 'CHatGPT-writtEn AbsTract (CHEAT)', 'XGBoost-based model' and 'TSA-LSTMRNN') in some highlighted features. Firstly, the proposed techniques involve human-detection in some highlighted features. Firstly, the proposed techniques involve human detection methods, contrasting with the previous computer-based detection techniques. In that sense, the proposed human-detection system operates as an independent system, whereas the previous method relies on a computer. Secondly, the complexity and disadvantages of computer-detection systems lie in the passive role of the faculty (teachers), wherein the computer and algorithms play the major roles. Both student-authored and ChatGPT-generated texts must be fed into the algorithms, with the faculty merely performing the straightforward tasks of importing and exporting the texts while remaining unaware of the nature of ChatGPT-generated texts. Should the computer yield inaccurate detection results, the faculty would be compelled to accept them blindly. Additionally, faculty members need to possess literacy in algorithms to effectively utilise computer-detection systems, a crucial aspect of the purposive teacher model [60].

In contrast, the advantages of the techniques proposed by this study lie in their simplicity. The faculty play an active role without relying on computer dependence. Furthermore, faculty members do not require literacy in computer algorithms because the proposed detection is text-based. The faculty directly engage with both student-authored and ChatGPT-generated texts rather than solely importing or exporting them. The essence of the proposed human-detection techniques lies in the faculty's personal familiarity and awareness of ChatGPT-generated texts. Through their understanding of academic English language, assessment of students' language proficiency and comprehension of ChatGPT, they meticulously scrutinise various textual features present in the texts purportedly generated by ChatGPT or authored by students. Subsequently, they engage in a comparative analysis of these features to determine the origin of the text—whether it belongs to the students or originates from ChatGPT. Finally, while computational detection techniques have proven effective in detecting abstracts and essays, the proposed human-detection techniques have demonstrated effectiveness in scrutinising smaller texts, such as discussion forums. In low-esourced contexts where faculty members have limited algorithmic knowledge, the proposed techniques offer a straightforward solution. They serve as a means to identify potential ChatGPT-assisted plagiarism and enable fair evaluations of authentic students' written work.

4. CONCLUSION

ChatGPT, launched in September 2022, is the latest AI language model. It has ushered in a new era of immense potential within the realm of education. However, it is also accompanied by anticipated challenges on the horizon. One pressing concern in the educational landscape is the issue of plagiarism facilitated by ChatGPT. As ChatGPT generates human-like texts, distinguishing between the texts generated by ChatGPT and those written by students is a big challenge. The education system must foster students' creativity, thinking abilities, argumentative and persuasive power, necessitating a clear differentiation between ChatGPT-generated and student-authored work.

Although algorithm-based machine detection models have started to emerge, it is crucial to recognise the significance of human-detection techniques, particularly for faculty members with limited algorithmic literacy working in low-resourced educational contexts. Until now, questions around the effective human detection of ChatGPT-generated texts outnumber the available answers.

This study does not provide a comprehensive discussion, but serves as an initial foray grounded in experience and reflection. It aims to lay the foundation for broader discussions and empirical findings on the issue in the future. Following the experiences of an author who encountered both ChatGPT-generated texts and student-written content, the authors of this study collaboratively propose a set of human-detection techniques to distinguish between the two. According to this study, a proficient faculty member familiar with ChatGPT texts can employ seven key human-detection techniques to discern the distinctive characteristics of ChatGPT-generated content: detecting discourse particles 'Of course' and 'Certainly' at the beginning of the ChatGPT-generated text, detecting discourse particles 'indeed' and 'Certainly' as conversational indicators at the start of the text; detecting grammatical and clarity flaws in ChatGPT-generated texts; detecting formulaic genre structure features, i.e., lack of creativity in ChatGPT-generated texts; detecting formulaic genre structure features, i.e., numbered and sub-sectioned body paragraphs in ChatGPT-generated texts; detecting formulaic genre structure features, i.e., uses of transitional words in ChatGPT-generated texts; identifying ChatGPT's reiterated declaration of its non-human nature, typically found at the outset of its generated texts.

This preliminary exploratory study is poised to serve as a valuable resource for university faculty members regarding human detection of ChatGPT-generated texts, especially within forum submissions. The study will aid educators in maintaining the quality of education by curbing instances of ChatGPT-facilitated plagiarism, and enhancing students' abilities to produce original written work. Furthermore, it is expected to act as a catalyst for further research, paving the way for the development of more comprehensive human-detection strategies to effectively differentiate ChatGPT-generated texts from student-authored work, thereby fortifying academic integrity in higher educational institutions.

5. Availability of Data And Materials

The data used for this study may be available upon request to the corresponding author.

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Declaration of Conflict of Interest

The authors declare that there are no conflicts of interest.

References

[1] F. E. Y. Ahmed, "Errors of unity and coherence in Saudi Arabian EFL university students' written paragraph-A case study of College of Science & Arts, Tanumah, King Khalid University, Kingdom of Saudi Arabia," European Journal of English Language Teaching, vol. 4, no. 3, 2019, https://oapub.org/edu/index.php/ejel/article/view/2281.

[2] M. Allan, "A peek into the life of online learning discussion forums: Implications for web-based distance learning," International Review of Research in Open and Distributed Learning, vol. 5, no. 2, Aug 2004, https://www.erudit.org/en/journals/irrodl/1900-v1-n1- irrodl05606/1072807ar/abstract/.

[3] T. A. A . Alodwan, and S. S. K. Ibnian, "The effect of using the process approach to writing on developing university students' essay writing skills in EFL," Review of Arts and Humanities, vol. 3, no. 2, Jun 2014, http://rah-net.com/journals/rah/Vol_3_No_2_June_2014/11.pdf.

[4] A. Marx, B. Rihoux, and C. Ragin, "The origins, development, and application of Qualitative Comparative Analysis: the first 25 years," European Political Science Review, vol. 6, no. 1, pp. 115–142, Feb 2013. doi: https://doi.org/10.1017/s1755773912000318.

[5] B. A. Anders, "Is using ChatGPT cheating, plagiarism, both, neither, or forward thinking?" Patterns, vol. 4, no. 3, March, 2023, https://doi.org/10.1016/j.patter.2023.100694Get rights and content.

[6] M. A. Andresen, " Asynchronous discussion forums: success factors, outcomes, assessments, and limitations," Journal of Educational Technology & Society, vol. 12, no. 1, Jan 2009, https://www.jstor.org/stable/jeductechsoci.12.1.249.

[7] S. Ariyaratne, K. P. Iyengar, N. Nischal, N. Chitti Babu and R. Botchu, "A comparison of ChatGPT-generated articles with human-written articles," Skeletal Radiology, vol. 52, Sep 2023, https://doi.org/10.1007/s00256-023-04340-5.

[8] C. Bazerman, (January, 2006) "Analyzing the multidimensionality of texts in education," in Handbook of complementary methods in education research. Routledge, J. L. Green, G. Camilli, P. B. Elmore, Eds. London: Lawrence Erlbaum Associates Publishers, 2006, pp. 77–94.

[9] W. R. Bin-Hady, A. Al-Kadi, A. Hazaea, and J. K. Ali, "Exploring the dimensions of ChatGPT in English language learning: A global perspective," Library Hi Tech, vol. ahead-of-print, no. ahead-of-print, 2023. doi:10.1108/lht-05-2023-0200

[10] S. S. Biswas, "Potential use of ChatGPT in global warming," Annals of Biomedical Engineering, vol. 51, no. 6, pp. 1126–1127, Mar 2023. doi:10.1007/s10439-023-031718

[11] C. M. Chiesa-Estomba, J. R. Lechien, L. A. Vaira, A. Brunet, G. Cammaroto, M. Mayo-Yanez, A. Sanchez-Barrueco and C. Saga-Gutierrez et al., "Correction: Exploring the potential of chat-GPT as a supportive tool for sialendoscopy clinical decision making and Patient Information Support," European Archives of Oto-Rhino-Laryngology, vol. ahead of print, no. ahead of print, 2023, doi:10.1007/s00405-023-08267-4

[12] G. Cooper, “Examining science education in ChatGPT: An exploratory study of Generative Artificial Intelligence,” Journal of Science Education and Technology, vol. 32, no. 3, pp. 444–452, Mar 2023, doi:10.1007/s10956-023-10039-y
[13] B. J. Copeland, “The Turing Test,” Minds and Machines, vol. 10, no. 4, pp. 519–539, Nov 2000, doi:10.1007/s10956-023-10039-y
[14] T. Day, (2023) “A Preliminary Investigation of Fake Peer-Reviewed Citations and References Generated by ChatGPT,” The Professional Geographer, pp. 1–4, Apr 2023, doi: 10.1080/00330124.2023.2190373
[15] Y. K. Dwivedi, N, Kshetri, L. Hughes, E. L. Slade, A. Jeyaraj, A. K, Kar, ... and R. Wright, “So what if ChatGPT wrote it? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy,” International Journal of Information Management, vol. 71, Mar 2023, https://doi.org/10.1016/j.ijinfomgt.2023.102642
[16] F. Ferri, P. Grifoni, and T. Guzzo, “Online Learning and Emergency Remote Teaching: Opportunities and Challenges in Emergency Situations,” Societies, vol. 10, no. 4, p. 86, Nov 2020, doi: 10.3390/soc10040086.
[17] H. G. Fill, P. Fettke, and J. Köpke, (2023). “Conceptual modeling and large Language models: impressions from first experiments with ChatGPT,” Enterprise Modelling and Information Systems Architectures (EMISAJ), vol. 18, no. 3, pp. 1–15, 2023, https://doi.org/10.18417/emisa.18.3
[18] K. Fuchs, “Exploring the opportunities and challenges of NLP models in higher education: is Chat GPT a blessing or a curse?” Frontiers in Education, vol. 8, May 2023. doi: 10.3389/feduc.2023.1166682
[19] C. A. Gao et al., “Comparing scientific abstracts generated by ChatGPT to real abstracts with detectors and blinded human reviewers,” npj Digital Medicine, vol. 6, no. 1, Apr 2023, doi:10.1038/s41746-023-00819-6
[20] S. Grassini, “Shaping the future of education: Exploring the potential and consequences of AI and CHATGPT in educational settings,” Education Sciences, vol. 13, no. 7, p. 692, Jul. 2023. doi:10.3390/educsci13070692
[21] B. Guo, X. Zhang, Z. Wang, M. Jiang, J. Nie, Y. Ding, ... and Wu, Y. (2023), “How close is ChatGPT to human experts? comparison corpus, evaluation, and detection,” Computer Science > Computation and Language, 2023. https://doi.org/10.48550/arXiv.2301.07597
[22] R. Gupta, K. Bagdady and B. A. Mailey, “Response to: Truth or lies? The Pitfalls and Limitations of CHATGPT in Systematic Review creation,” Aesthetic Surgery, vol. 43, no. 8, pp. NP656–NP657, Aug 2023. https://doi.org/10.1093/asj/sjad108
[23] F. M. Hama, “An investigation into the difficulties of using transitional words in Kurdish EFL students’ writing at the university level,” UKH Journal of Social Sciences, vol. 5, no. 1, pp. 107–117, 2021. https://10.25079/ukhjss.v5n1y2021.pp107-117
[24] M. L. Hamilton, L. Smith, and K. Worthington, “Fitting the methodology with the research: An exploration of narrative, self-study and auto-ethnography,” Studying teacher education, vol. 4, no. 1, pp. 17–28, Aug 2009. https://doi.org/10.1080/17425960801976321
[25] I. Katib, F. Y. Assiri, H. A. Abdushkour, D. Hamed, and M. Ragab, “Differentiating chat generative pretrained transformer from humans: Detecting ChatGPT-generated text and human text using machine learning,” Mathematics, vol. 11, no. 15, p. 3400, 2023. doi:10.3390/math11153400
[26] M. Khalil, and E. Er, “Will ChatGPT get you caught? Rethinking of plagiarism Detection,” Computer Science > Artificial Intelligence, arXiv preprint arXiv:2302.04335, 2023. https://doi.org/10.48550/arXiv.2302.04335
[27] M. R. King and ChatGPT, “A Conversation on Artificial Intelligence, Chatbots, and Plagiarism in Higher Education,” Cellular and Molecular Bioengineering, vol. 16, no. 1–2, Jan 2023. doi: https://doi.org/10.1007/s12195-022-00754-8.
[28] J. Kleesiek, Y. Wu, G. Stiglic, J. Egger, and J. Bian, “An opinion on ChatGPT in health care—written by humans only,” The Journal of Nuclear Medicine, vol. 64, no. 5, pp. 701–703, May 2023. https://jnm.snmjournals.org/content/jnumed/64/5/local/complete-issue.pdf#page=43

[29] H. Lee, “The Rise of ChatGPT: Exploring its Potential in Medical Education,” Anatomical Sciences Education, Mar 2023. doi: https://doi.org/10.1002/ase.2270.
[30] W. Liao et al., “Differentiate ChatGPT-generated and Human-written Medical Texts,” Computer Science > Computation and Language, arXiv.org, Apr 23, 2023. https://arxiv.org/abs/2304.11567
[31] C. K. Lo, “What is the impact of ChatGPT on education? A rapid review of the literature. Education Sciences,” vol. 13, no. 4, 410, Apr 2023. https://doi.org/10.3390/educsci13040410
[32] B. D. Lund, T. Wang, N. R. Mannuru, B. Nie, S. Shimray, and Z. Wang, “ChatGPT and a new academic reality: Artificial Intelligence-written research papers and the ethics of the large language models in scholarly publishing,” Journal of the Association for Information Science and Technology, vol. 74, no. 5, Mar 2023. doi: https://doi.org/10.1002/asi.24750.

[33] C. R. Maboloc, “Chat GPT: the need for an ethical framework to regulate its use in education,” Journal of Public Health, Jul 2023, https://doi.org/10.1093/pubmed/fdad125.
[34] S. Mitrović, D. Andreoletti, and O. Ayoub, “ChatGPT or Human? Detect and Explain. Explaining Decisions of Machine Learning Model for Detecting Short ChatGPT-generated Text,” arxiv.org, Jan 2023. doi: https://doi.org/10.48550/arXiv.2301.13852.
[35] M. L. B. M. Tarmizi and A. A. Hussin, “Expressions of Criticality in Expert and Student Writing: A Corpus Contrastive Analysis of Literature Reviews,” International Journal of Modern Languages and Applied Linguistics, vol. 5, no. 3, pp. 19–41, Jul 2021. doi: https://doi.org/10.24191/ijmal.v5i3.12190.
[36] J. H. Moor, “An Analysis of the Turing Test,” Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition, vol. 30, no. 4, pp. 249–257, Oct 1976, Available: https://www.jstor.org/stable/4319091
[37] L. S. Norton, “Essay-writing: what really counts?,” Higher Education, vol. 20, no. 4, pp. 411–442, Dec 1990. doi: https://doi.org/10.1007/bf00136221.
[38] Faruk Enes Oğuz, Mahmut Nedim Ekersular, Kubilay Muhammed Sünnetci, and A. Alkan, “Can Chat GPT be Utilized in Scientific and Undergraduate Studies?,” Annals of Biomedical Engineering, Jul 2023. doi: https://doi.org/10.1007/s10439-023-03333-8.
[39] A. Pinar Saygin, I. Cicekli, and V. Akman, “Turing Test: 50 Years Later,” Minds and Machines, vol. 10, no. 4, pp. 463–518, 2000, https://doi.org/10.1023/a:1011288000451.
[40] Md. M. Rahman and Y. Watanobe, “ChatGPT for Education and Research: Opportunities, Threats, and Strategies,” Applied Sciences, vol. 13, no. 9, p. 5783, May 2023, https://doi.org/10.3390/app13095783.
[41] R. A. Rass, “Challenges Face Arab Students in Writing Well-Developed Paragraphs in English,” English Language Teaching, vol. 8, no. 10, Sep 2015, https://doi.org/10.5539/elt.v8n10p49.
[42] D. B. Rathore, “Future of Textile: Sustainable Manufacturing & Prediction via ChatGPT,” Eduzone: International Peer Reviewed/Refereed Multidisciplinary Journal, vol. 12, no. 1, pp. 52–62, Feb 2023, https://eduzonejournal.com/index.php/eiprmj/article/view/253
[43] K. I. Roumeliotis and N. D. Tselikas, “ChatGPT and Open-AI Models: A Preliminary Review,” Future Internet, vol. 15, no. 6, p. 192, Jun 2023, https://doi.org/10.3390/fi15060192.
[44] S. C. Shapiro, “The Turing Test and the economist,” ACM SIGART Bulletin, vol. 3, no. 4, pp. 10–11, Oct 1992, https://doi.org/10.1145/141420.141423.
[45] S. Sharma and R. Yadav, “Chat GPT – A Technological Remedy or Challenge for Education System,” Global Journal of Enterprise Information System, vol. 14, no. 4, pp. 46–51, May 2022, https://www.gjeis.com/index.php/GJEIS/article/view/698
[46] R. Shijaku and E. Canhasi, (Jan. 2023). ChatGPT Generated Text Detection. Publisher:Unpublished. License, CC BY 4.0, Jan 2023, DOI:10.13140/RG.2.2.21317.52960
[47] R. Swedberg, “Exploratory Research,” in The Production of Knowledge: Enhancing Progress in Social Science, C. Elman, J. Gerring, and J. Mahoney, Eds. Cambridge: Cambridge University Press, 2020, pp. 17–41.
[48] A. Taloni, V. Scorcia, and G. Giannaccare, “Modern threats in academia: evaluating plagiarism and artificial intelligence detection scores of ChatGPT,” Eye, pp. 1–4, Aug 2023. doi: https://doi.org/10.1038/s41433-023-02678-7.
[49] Q. Wang, W. Wen, Z. Dou, L. He, and L. Yang, “Performance and Exploration of ChatGPT in Medical Examination, Records and Education in Chinese: Pave the Way for Medical AI,” International Journal of Medical Informatics, vol. 177, pp. 105173–105173, Sep 2023. doi: https//doi.org/10.1016/j.ijmedinf.2023.105173.
[50] U. Wingate, “‘Argument!’ helping students understand what essay writing is about.” Journal of English for Academic Purposes, vol. 11, no. 2, pp. 145–154, Jun 2012. doi: https://doi.org/10.1016/j.jeap.2011.11.001.

[51] L. T. Yang, J. Feng, and H. Li, “Is ChatGPT Involved in Texts? Measure the Polish Ratio to Detect ChatGPT-Generated Text,” arXiv (Cornell University), Jul 2023, doi: https://doi.org/10.48550/arxiv.2307.11380.
[52] P. Yu, J. Chen, X. Feng, and Z. Xia, “CHEAT: A Large-scale Dataset for Detecting ChatGPT-writtEn AbsTracts,” arXiv (Cornell University), Apr 2023. doi: https://doi.org/10.48550/arxiv.2304.12008.
[53] C. Kaweera, “Writing Error: A Review of Interlingual and Intralingual Interference in EFL Context,” English Language Teaching, vol. 6, no. 7, Jun 2013. doi: https://doi.org/10.5539/elt.v6n7p9.
[54] Pinnegar, S., & Hamilton, M. L. (2009). Self-study of practice as a genre of qualitative research: Theory, methodology, and practice (Vol. 8). Springer Science & Business Media.
[55] N. Legewie, “An Introduction to Applied Data Analysis with Qualitative Comparative Analysis,” Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, vol. 14, no. 3, Sep 2013. doi: https://doi.org/10.17169/fqs-14.3.1961.

[56] A. Rudolph, Maria Petropoulou, W. Winter, and Ž. Bošnjak, "Multi-messenger Model for the Prompt Emission from GRB 221009A," The astrophysical journal, vol. 944, no. 2, pp. L34–L34, Feb 2023. doi: https://doi.org/10.3847/2041-8213/acb6d7.
[57] B. Fraser, "What are discourse markers?," Journal of Pragmatics, vol. 31, no. 7, pp. 931–952, Jul 1999. doi: https://doi.org/10.1016/s0378-2166(98)00101-5.
[58] A. Aunurrahman, F. A. H. Hamied, and E. Emilia, "EXPLORING THE TERTIARY EFL STUDENTS' ACADEMIC WRITING COMPETENCIES," Indonesian Journal of Applied Linguistics, vol. 7, no. 1, p. 72, May 2017. doi: https://doi.org/10.17509/ijal.v7i1.6860.
[59] L. Mindner, T. Schlippe, and K. Schaaff, "Classification of Human-and AI-Generated Texts: Investigating Features for ChatGPT," in International Conference on Artificial Intelligence in Education Technology, pp. 152–170, Jun 2023, Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-7947-9_12
[60] M. S. Alam et al., "An Appreciation of the EFL Teacher Model in Bangladesh: A Content Analysis of Job Advertisements," The international journal of diversity in education, vol. 24, no. 1, pp. 41–64, Jan 2023. doi: https://doi.org/10.18848/2327-0020/cgp/v24i01/41-64.
[61] M. S. Alam et al., "Navigating the aftermath of the pandemic: exploring school challenges and changes in Bangladesh," Education 3-13, pp. 1–14, Jun 2023. doi: https://doi.org/10.1080/03004279.2023.2221265.
[62] M. S. Alam and A. Asmawi, "Understanding identity salience and English as a Foreign Language teaching practices: A case study of multi-subject generalist teachers," Review of Education, vol. 11, no. 3, Sep 2023. doi: https://doi.org/10.1002/rev3.3424.
[63] M. S. Alam et al., "A Local Alternative to Global Wholesale Online Schooling during COVID-19: A Phenomenological Single-Case Study of a Standalone School in Bangladesh," Education Research International, pp. 1–12, Sep 2022. doi: https://doi.org/10.1155/2022/6003710.
[64] M, M. Ullah, E. Uddin, K. Karmakar, M. S. Alam, and T. Islam, "Exploring EFL Teachers' Facilitating Critical Thinking Skills in Teaching Writing to Low-Proficient Undergraduate Students in Bangladesh: A Mixed Method Approach," International Journal of English Language and Literature Studies, vol. 11, no. 4, pp. 222–234, Dec 2022, doi: https://doi.org/10.55493/5019.v11i4.4690.