INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN MULTIDISCIPLINARY EDUCATION

ISSN(print): 2833-4515, ISSN(online): 2833-4531

Volume 03 Issue 02 February 2024

DOI: 10.58806/ijirme.2024.v3i2n08, Impact factor- 5.138

Page No. 184 -191

Pedagogical Potentials of Technological Facilities in Developing the Writing Skills of L2 Learners: AI-Era Writing

Dr. Hatem Haddaji

Faculty of Arts and Humanities Kairouan, Sfax Road Km 10, Kairouan 3100, Tunisia

INTRODUCTION

L2 writing has always been a fundamental issue for second language learners and an essential skill for second language researchers. In order to enhance the writing abilities of learners, researchers and practitioners moved from one paradigm to another. The move from product-oriented (Silva & Leki, 2004) to process-oriented approach in writing to the genre approach (Silva & Leki, 2004; Hyland 2003) is well documented in the literature while less research has appreciated the impacts of technological facilities on the writing performances of L2 learners. Curriculum designers and educators are then encouraged by researchers to readjust their syllabi to open new horizons in the educational system to meet the worldwide trend of the "tech-era" (Stapleton & Radia, 2010, p. 175). To improve the writing achievements of ESL and EFL learners of English, computer-assisted language learning (CALL) researchers (Zheng & Warschauer, 2017; Haddaji, 2014) have discussed the possible pedagogical potentials of using the word processor and other available software programmes as tools for enhancing language learning skills. The latest innovations in technology brought in new concepts and resources such as, Online Text Generator, GPT-2 Text Generator, Wordtune, online communities, and virtual worlds. These technological advances have influenced many aspects of life and have inevitably challenged the teaching pedagogy and the means of instruction (Azah, 2019; Coenen et al., 2021).

This paper argues that L2 writing pedagogy needs to give more recognition to the impact emerging from the new technological tools and online resources. It suggests that using word processors or any other available tools like Online Instant Grammar Checker, Spell Checker, Open Chat GPT, and Online Text Content Analyser, helps promote learners' writing skill. Exposure to computer literacy and AI- assisted tools (Hegelheimer, 2013; Hamouma & Menezla, 2019) enhances the learners' writing quality and quantity. This emerging trend of research speculates that a new and post-disciplinary dimension has shaped L2 writing pedagogy through the implementation of recognized technological tools. It seeks to answer the following research questions:

Q 1: to what extent do AI driven tools help improve students writing quality performance?

Q 2: how has the use of computer-assisted writing tools impacted students' writing?

1. LITERATURE REVIEW

A plethora of thought-provoking and inspiring research and studies investigated the pedagogical potentials of technological facilities in developing writing. The word processor, for instance, encompasses encouraging facilities for learners. It provides linguistic features such as spell checker (red underline), grammar checker (green underline), style, and punctuation (green underline). It also provides instant correction of mistakes (11 types of grammar mistakes and their subsections, 21 style errors and their subsections) and more opportunities for active and motivating writing (Matsuda, et al., 2003; Bangert-Drowns, 1993), but it does not challenge the position of the teacher because of the possible pitfalls that the programme entails (Ware & Warschauer, 2006; Zhang & Zou, 2022). Peer correction, revising, error checking, feedback, and organization of an essay are all reduced through the word processor. That is, writing through the computer, could be very encouraging and helpful for many learners and teachers. Brierley and Kemble (1991) describe the word processor as the most enabling and beneficial of all the computer tool software and indicate the following seven major applications for word processor: formatting, cutting and pasting, insertion and deletion, searching, editing up, editing down, and editing across.

Hamouma and Menezla (2019) investigated 80 EFL students and concluded that students proficient in the use of digital writing assistants were more likely to enhance written English than those who were not well-acquainted with the technical features of digital writing tools. Similarly, in their survey about teachers' acquaintance with digital writing tools, Purcell et al. (2013) ascertain that the recent digital writing platforms, such as Google Docs, with their advanced features, could improve students' writing. Darus, Ismail and Ismail (2008) and Li and Cumming (2001) say that these technological options enhance L2 writing,

reduce spelling errors and enhance the writing quality. During the procedure of keyboarding a word processed draft, the packaged tools for improving writing linked with the word processing software and the online resources may alert a writer that a given word is misspelled. This instant alert technique leads to some improvement in L2 writing (Stapleton & Radia, 2010). The spell checker facility associated with the word processor eases the task of writing for students and teachers alike because it helps the students to reduce writing apprehension and encourages the teachers to focus on the content of the essay instead of consuming the time in language enhancement. Similarly, Nobles and Paganucci (2015) and Dickson (2017) assert that AI- driven tools can heighten the level of learners' written English.

Similar to the spell checker facilities, the grammar checker, also called the green underline, though far from perfection, helps L2 learners and teachers to minimize syntactic mistakes, namely subject-verb agreement, singular-plural relationship, run on sentences, and some other mistakes like punctuation and styles inconsistencies (Stapleton & Radia, 2010). A click of a mouse saves time and encourages learners to feel safe when they write and boosts motivation especially for L2 learners who use English as a Second Language (ESL) or English as a Foreign Language (EFL).

Collectively, efficient use of these technological facilities and computer applications lead to some improvements in many areas of students' writing, both at the levels of language and content (AbdAlgane & Othman, 2023; Choo et al., 2017). If students (mainly L2 learners) know the linguistic variations provided by the word processors, they can significantly enhance their writing performances, both at the levels of quality and quantity. A right click on the mouse, a click on the "F7" tab key on the keyboard, and/or a click on the Shift key and "F7" together provide many suggestions for the depicted mistakes. These options help students reduce lexical and syntactic level mistakes and boost the writing quality of students (Harris, 2015).

Another equally important technological application is the Open Chat GPT. Using this writing assistant as an appropriate and effective new tool to enhance L2 writing is a relatively new medium in L2 writing pedagogy (Zhao, 2022). Despite the academic challenges emanating from the abuse of such educational facilities, Chat GPT is a text generator and an adequate scaffolding technique, which provides adequately and syntactically accurate writing models. It eases the task of learners and professionals in the sense that it generates well-structured content which can be semantically elaborated (Al Mahmud, 2023).

Last but not least, The tech-era also provides researchers and educationists with two more downloadable and easy software programmes which are motivating, manageable and time saving; they are Online Instant Grammar Checker (while writing tool) and Online Text Content Analyser (post writing tool).

Instant Grammar Checker software is available online and some stand-alone versions can even be downloaded and installed to the computer and attached with the word processor. It checks and corrects five major writing critical issues namely plagiarism, contextual spell check, grammar, punctuation, and style and word choice. It is a web-based program that checks for errors in grammar, spelling and punctuation and checks for plagiarism and provides explanations of errors and gives suggestions on how to best improve writing. This programme also provides a score for every checked text, which comprises three major remarks. Remarks contain *'poor, revision necessary'*, '*weak, needs revision',* and *'adequate, can benefit from revision'*. A score is linked to the appropriate remark and a graph is shown, which consists in three colours: red, yellow, and green. "Red" stands for the remark "poor". "Yellow" stands for "weak". "Green" stands for "adequate". Instant online grammar checker checks and corrects over 150 grammar rules, style and word choice, punctuation, and spelling rules and aspects and their subsections. These online tools are widely used to enhance students' writing quality (Zheng & Warschauer, 2017), reduce writing apprehension, and provide learners with autonomous learning. It is however crucial to know that, despite the advent of technological facilities, the role of the teacher is irreversible; technologies like these are usually designed to review texts primarily for grammatical or syntactic mistakes and are not used to inspect semantic aspects of language use such as coherence, argumentation structures, and pertinence (Strobl et al. (2019).

The Online Text Content Analyser checks and analyses the quality and quantity levels of a text. The analysis of a text is mainly divided into two parts: '*General Statistics'* and *'Word Length Breakdown'.* General Statistics comprises eight major issues of investigation. They are '*Total Word Count'*, *'Total Unique Words'*, *'Number of Sentences'*, *'Average Sentence Length'*, *'Number of Paragraphs', 'Hard Words*[1]*', 'lexical Density'*[2], and *'Fog Index*[3]*'*. Word Length Breakdown analyses Word Length and Word Count and presents them in a graph. This application is a post writing computer programme.

Stapleton and Radia (2010) claim that "The new tools, described above, if fully utilized by students, not only give independence to the L2 writer, they also eliminate some of the more tedious tasks of teachers and editors at all levels of writing

[1] **Hard Words** are defined as words with three or more syllables. This definition is used in calculating the readability and difficulty of a text, including the Gunning Fog Index.

[2] **Lexical Density** = (Number of different words/ Total number of words) x 100

[3] The **Fog Index** is a readability test designed to show how easy or difficult a text is to read. It uses the following formula: Reading Level (Grade) = (Average No. of words in sentences + Percentage of words of three or more syllables) x 0.4.The resulting number is your Gunning Fog Index. For reference, the New York Times has an average Fog Index of 11-12, Time magazine about 11. Typically, technical documentation has a Fog Index between 10 and 15, and professional prose almost never exceeds 18.

ability. With spelling and grammar errors substantially reduced, teachers reviewing an essay or composition have more time for other aspects of the written product that may need attention" (p. 180). However, teachers clearly need to be knowledgeable about how to take advantage of these tools and adequately introduce them to their students.

These technological facilities have the potential to revolutionize the learning and writing processes in education. They provide numerous advantages such as improving writing skills, enhancing critical thinking, supporting L2 English speakers, and promoting personalized and autonomous learning. These AI-driven tools offer valuable grammar and spell-checking features, sentence and paragraph suggestions, vocabulary enhancement, and plagiarism detection, making writing processes more efficient for students. Integrating these tools in education is vital for enhancing students' learning experience and promoting academic success.

2. METHODOLOGY

This part delineates information about the method of the study. First, the participants and the instruments used in this study are introduced. Then, data analysis procedures are explained, respectively.

2.1. Participants

The participants in the study were 21 freshmen learners majoring in English at the English department at the Faculty of Arts and Humanities of Kairouan. Participants were chosen randomly from all English first year groups whose first term exam scores in writing were below par and showed methodological inconsistencies and poor language command as was evaluated by their class teachers.

2.2. Instruments

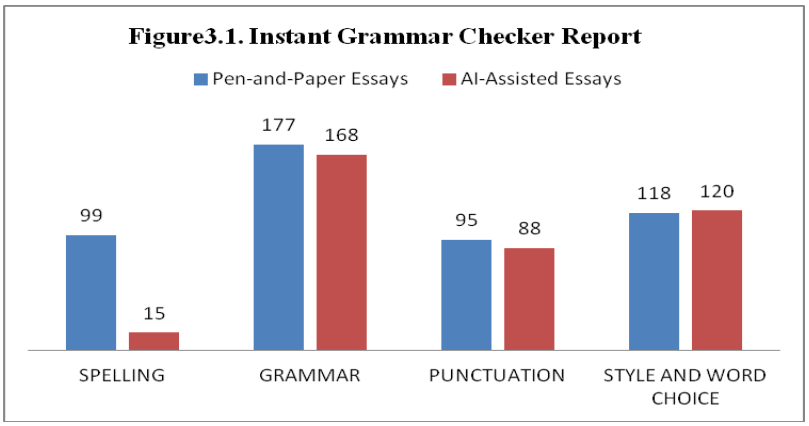
This section presents the instruments and techniques used in the study are introduced below. The software instruments, namely *Instant Grammar Checker*, *Online Content Text Analysis*, and *Microsoft office Word 2007* were discussed to explain their importance for the study. A latest and reliable version of the Statistical Package for the Social Sciences (SPSS) software was used to derive descriptive statistics from all collected data.

2.3. Procedure

After collecting and categorizing students' written products, a cohort of 21 participants was trained about the use of the provided software at the lab room with the help of the ICT teacher. The learners showed adequate know-how about the use of the word processor and the procedure of keyboarding, cutting and pasting, editing up and editing down techniques, which facilitated the aim of the study. The second step was modeling and exploring the writing assistant tools required for the experiment. Then, participants were accompanied to keyboard their pen-and-paper essays using Microsoft Word Office 2007 installed at the lab computers and assess them using Instant Grammar Checker and Online Content Text Analyser to receive reports about the quality of their written products. They were then guided to make use of all possible facilities entailed in the word processor to enhance their writing quality following the highlighted spelling, grammar, or style mistakes. Finally final versions of participants' essays were assessed via Instant Grammar Checker and Online Content Text Analysis to receive second reports about their enhanced essays. Both received reports were compared and contrasted using SPSS to depict possible enhancement in students' writing. The results were encouraging.

3. FINDINGS AND DISCUSSION

The results show variation in the students'writing achievements when they use the word processor. They indicate difference in the quality of writing between pen-and-paper and word-processed composition on the basis of four writing levels: spelling, grammar, punctuation, and style. The results indicate that the change varies from one type of mistake to another in both types of essays, and varies from one student to another in both types of essays.



The findings show a significant decline in spelling mistakes in the word processed essays compared to the pen-and-paper essays (99 mistakes in PPE compared to 15 mistakes in AI-assisted essays). Improvement is also demonstrated in grammar and punctuation mistakes with a decrease of 10 mistakes in grammar and 7 mistakes in punctuation, whereas findings depict no improvement in style and word choice mistakes. These results are justified because students displayed lack of adequate command of English and showed inconsistencies in writing methodology. Detailed results show that some essays were significantly improved in all types of mistakes and mainly in grammar and spelling mistakes, while others exhibit enhancement only in spelling and grammar. The fact that some students were more acquainted with the use of technology led to the variance between their reports and their peers' reports. Some students showed regression in their writing quality, instead. Almost all final essay scores were improved after using the technological tools available as is shown in table 3.1.

Table 3.1: Instant Grammar Checker Assisted Statistics

Essay Number	Score/100 (Pen-and-Paper Essays)	Score/100 (AI-Assisted Essays)
1	44	63
2	75	78
3	68	68
4	47	64
5	58	64
6	37	46
7	43	50
8	54	58
9	57	62
10	51	51
11	53	58
12	41	57
13	46	64
14	49	52
15	57	61
16	54	54
17	62	68
18	43	39
19	57	59
20	24	31
21	41	52

It is advised not to neglect the fact that the spell checker failed to detect some keyboarding mistakes and some homophones. One student, for instance, wrote '*fee*t' and '*cab*' instead of '*fit*' and '*can*', respectively, and student 11 wrote '*luck*', '*law*' and '*week*' instead of '*lack*', '*low*', and '*weak*', respectively. The word processor did not detect these types of mistakes. Students who were trained to confide in this new technology may retreat from revising and checking their essays. This view seems to be in line with Li and Cumming (2001) and Fang. The results seem to be in line with previous studies (e.g. Abu Seileek, 2004, 2006; Al'Mansour and Al-Shorman, 2009) which estimate that composing with the computer improved the writing quality of L1 and L2 students.

Despite some pitfalls and challenges, and regardless of students learning differences and preferences, "new writing tools, powered by Artificial Intelligence (AI) and available in mobile devices, are promising tools to assist students in learning and develop writing skills that are hard to learn from traditional training" (Nazarii et al., 2021, p. 1). The following figures illustrate some of the advantages entailed in the above mentioned programmes.

*Grammarly found **52 critical writing issues** and generated*
***74 vocabulary enhancement suggestions** for your text.*
Score: 49 of 100
See full report
(weak, needs revision)

Plagiarism		Plagiarism checking is turned off. To get information on plagiarism, re-run the report with plagiarism detection turned on.
Contextual Spelling Check	6issues	Spelling (6) Ignored words Commonly confused words

Grammar	20issues	Use of articles (2) Subject and verb agreement (1) Verb form use (1)
Punctuation	5issues	Punctuation within a sentence (5) Closing punctuation Formal punctuation
Style and Word Choice	20issues	Writing style (12) Vocabulary use (8)

Figure 3.2 Online Instant Grammar Checker Student's Report

As figure 3.2 shows, this report of a student' essay checked and analysed through the Instant Grammar Checker detects 6 spelling mistakes, 20 grammar mistakes, 5 punctuation mistakes, and 20 style and word choice mistakes. The overall remark was "weak, needs revision", and the score was 49 out of 100. More enhancements can be done if the student followed all the suggestions provided by the programme.

Online Text Content Analyser helps students describe the "the lexico-grammatical and phraseological levels rather than the structural level" (Lee & Swales, 2006, p. 57). This post writing application provides two types of statistics, mainly '*General Statistics'* and *'Word Length Breakdown'*. General Statistics ('*Total Word Count'*, *'Total Unique Words'*, *'Number of Sentences'*, *'Average Sentence Length'*, *'Number of Paragraphs'*, *'Hard Words'*, *'lexical Density'*, and *'Fog Index'*). Word Length Breakdown analyses Word Length and Word Count and presents them in a graph. The overall results of writing quality in terms of coherence and cohesion, as well as readability level, were introduced below.

Table 3.3: Online Text Content Analyser Assisted Report

	Pen-and-Paper Essays		**AI-Assisted Essays**	
Essay Number	**Word Count**	**Sentence Count**	**Word Count**	**Sentence Count**
1	307	16	292	18
2	245	17	247	17
3	206	14	210	14
4	512	31	476	31
5	364	28	356	27
6	548	29	556	29
7	196	9	193	9
8	462	24	459	24
9	345	26	343	26
10	334	24	321	21
11	322	24	320	23
12	262	8	267	10
13	182	12	144	8
14	813	45	807	44
15	445	25	437	25
16	170	6	186	6
17	158	14	250	21
18	149	9	211	14
19	601	33	600	35
20	370	8	361	9
21	628	32	621	32
Total	**7619**	**434**	**7657**	**443**

As for total word count and total sentence count, students produced fewer words when they used this programme. Machine apprehension and lack of command of English vocabulary may very well be serious reasons for this poor enhancement of the total word count of the students' essays. The results would have been better if students had used a thesaurus or a bilingual dictionary endowed with the word processor or other facilities available online.

As for total sentence count, 6 students wrote more sentences when they used one of the available tools, 5 students wrote fewer sentences, and 10 students showed no impact of the word processor on their writing as far as the total sentence number is concerned. Upon further inspection, the results are encouraging and could be better improved if the tools were adequately employed and students were more engaged (Schindler et al., 2017). The results are partially in line with some previous studies

(e.g. Draus, Ismail & Ismail, 2008) which claim a significant effect of the technological assisted software on the writing quantity (word count, paragraph count, and sentence count). The following graphic (graphics 3.1) is a sample report of the Online Text Content Analyser.

Text Statistics

General Statistics

Total Word Count:	**813**
Total Unique Words:	**338**
Number of Sentences:	**45**
Average Sentence Length:	**18.07**
Number of Paragraphs:	**1**
Hard Words:	**63** (7.75%)
Lexical Density:	**41.57%**
Fog Index:	**10.33**

Word Length Breakdown

Length	Count	Graph
1 letter words	14	*1.7%*
2 letter words	142	*17.5%*
3 letter words	142	*17.5%*
4 letter words	183	*22.5%*
5 letter words	101	*12.4%*
6 letter words	57	*7.0%*
7 letter words	47	*5.8%*
8 letter words	40	*4.9%*
9 letter words	28	*3.4%*
10 letter words	22	*2.7%*
11 letter words	21	*2.6%*
12 letter words	2	*0.2%*
13 letter words	2	*0.2%*
14 letter words	1	*0.1%*

Graphics 3.1: Online Text Content Analysis Tool

As graphics 3.1 shows, the Text Content Analyser provides the learner with detailed statistics about the quantity and quality of her essay (essay number 14). The student wrote an essay of 45 sentences and 813 words before using the software assisted writing. After the experiment, her total word count was 807, with a decline of 6 words, while her total sentence count was also reduced to 44 sentences.

Based on a previous experiment (Haddaji, 2014) done at the English Department at the Faculty of Arts and Humanities of Kairouan, with 35 second year students, it was proved that computer-assisted writing positively affects students' writing performances. The efficient use of these mentioned tools leads to a significant improvement in students writing quality and quantity and creates a friendly and motivating atmosphere, especially for digital natives[4]. Digital immigrants[5], however, may benefit from these facilities if they are adequately trained about the potentiality of such applications. Many researchers (e.g. Anderson & Corbett (2010); Fageeh, (2011) claim that such computer programmes may reduce apprehension and boost students' attitudes towards writing and celebrates English as a "friendly language" (Anderson & Corbett, 2010).

4. IMPLICATIONS OF THE USE OF TECHNOLOGICAL ADVANCES

From pedagogical perspectives, using ICT in teaching can be effective, satisfactory, and efficient. It motivates and involves students in class activities and tasks and boosts interaction (Mahmud, 2023). This new pedagogical horizon inspires students' positive thinking and communication skills in social practices and equips them with resourceful information not available through the traditional teaching paradigms (Shymalee & Phil, 2012). Within this emerging pedagogical perspective, technology can enrich the learning environment, stimulate students' initiatives, and inspire teachers with differentiated and varied teaching practices.

CONCLUSION AND RECOMMENDATION

It was found that using artificial intelligences assistants and incorporating them in the educational system may offer students gradual lexical and syntactic gains and eases the task of the teacher in many ways. Teachers should also benefit from this technological boom and foster students learning styles. Yet, technology should not be overused and students' natural differences and learning preferences should not be neglected.

Integrating technology into the process of writing provides further possibilities for L2 learners to enhance their writing production and achievement (Kelly, 2002). The various artificial intelligence assistants that technology offers may reduce apprehension and enhance writing. Using text generator through Chat GPT, Wordtune, Word Processors or any other available

[4] **A Digital Native** is an individual who is comfortable and confident with new technology; that is, a person who has a fair knowledge about the latest technology.

[5] **A Digital Immigrant** is an individual who comes late to the world of technology; that is, a person who has no good command of the technological facilities.

tools help promote learners' writing skill. Despite the resistance to the integration of technology in many educational fields, from many digital immigrants (teachers and learners), tech-pedagogy is gaining a considerable recognition next to the old prototypes. The stereotyped traditional teaching and learning methods are giving ground to modern trends in pedagogy which entail different disciplines and modes and suggest new dimensions in ELT.

REFERENCES

1) AbdAlgane, M., & Othman, K. A. J. (2023). Utilizing Artificial Intelligence Technologies in Saudi EFL Tertiary Level Classrooms. *Journal of Intercultural Communication*, *23*(1), 92–99. https://doi.org/10.36923/jicc.v23i1.124.
2) AbuSeileek, A. (2004). The effect of using a computer-based program on students' writing ability in English. Unpublished Doctoral Dissertation, Arab University, Amman, Jordan.
3) Abu Seileek, A., F. (2006). "The Use of Word Processor for Teaching Writing to EFL Learners in King Saud University". J. King Saud University, Vol. 19, edu. *Sci. & Islamic Stud*. (2), pp. 1-15. Riyadh.
4) Al Mahmud, F. (2023). Investigating EFL Students' Writing Skills Through Artificial Intelligence: Wordtune Application as a Tool. *Journal of Language Teaching and Research, Vol. 14, No. 5, pp. 1395-1404*, DOI: https://doi.org/10.17507/jltr.1405.2
5) Al-Mansour, N.S. & Al-Shorman, R. A. (2011). "The effects of Computer-Assisted Instruction on Saudi University Students' learning of English". *Journal of King Saud University- Languages and Translation*. Xxx, xxx-xxx. www.sciencedirect.com
6) Al-Menei, A. M. O. (2008). An Investigation of the Effect of Computer-assisted Writing Instruction on Saudi Learners' Ability. MA Dissertation. King Saud University, 2008.
7) Anderson, W., & Corbett, J. (2010). Teaching English as a friendly language: lessons from the SCOTS corpus. ELT Journal: English Language Teachers journal; vol. 64(4), pp. 414- 423.
8) Azah, D. N. (2019). The effectiveness of Grammarly Checker Toward Student's Writing Quality of the Fourth Semester of English Department at IAIN Tulungagung [Unpublished undergraduate thesis]. IAIN Tulungagung.
9) Bangert-Drowns, R. L. (1993). The word processor as an instructional tool: A meta-analysis of word processing in writing instruction. Review of Educational Research, 63(1), 69–93
10) Brierley, B. & Kemble, I. (1991). Computers as a Tool in Language Teaching. New York: Ellis Horwood.
11) Chapelle, C. (2001). Computer Applications in Second Language Acquisition: Foundations for teaching, testing and research. Cambridge: Cambridge University Press.
12) Choo, Y. B., & Li, K. L. (2017). Digital Writing in English Language Writing Instruction. *ARIEL- An International Research Journal of English Language and Literature, 8, 1- 16. Retrieved from* https://sujo.usindh.edu.pk/index.php/ARIEL/article/view/19/16.
13) Coenen, A., D, L., Ippolito, D., Reif, E., & Yuan, A. (2021). Wordcraft: A Human-AI Collaborative Editor for Story Writing. arXiv. https://doi.org/10.48550/arXiv.2107.07430.
14) Darus, S., Ismail, K., & Ismail, M.B. (2008). Effects of Word Processing on Arab Postgraduate Students' Essays in EFL. European journal of Social Science. Vol. 7 (2).
15) Dickson, B. (2017). How Artificial Intelligence is Shaping the Future of Education. *PC Magazine*. Retrieved from https://www.pcmag.com/news/how-artificial-intelligence-is-shaping-the-future-of-education
16) Dudeney, G. & Hockly, N. (2007). *How to Teach English with Technology.* (J. Harmer, Éd.) PEARSON Longman.
17) Fageeh, A. I. (2011). EFL Learners' use of Blogging for Developing Writing Skills and Enhancing Attitudes Towards English Learning: an Exploratory Study. *Journal of Language and Literature* , Vol. 2. No. 1.
18) Fang, Y. (2010). "Perceptions of the Computer-Assisted Writing Program among EFL College Learners". *Educational Technology & Society*, 13 (3), 246–256.
19) Ferris, R. D., (2009). Teaching College Writing to Diverse Student Populations. http://www.press.umich.edu/titleDetailDesc.do?id=263445 Michigan ELT, 2009
20) Golberg, A., Russell, M., & Cook, A. (2003). The Effect of Computers on Student Writing: a meta-analysis of studies from 1992 to 2002. Journal of Technology, Learning, and Assessment, 2(I). available from http://www.JTLA.org.
21) Haddaji, H. (2014). The Effects of Computer Assisted Writing on Tunisian University Students' Production of Cause/Effect Essays. (Unpublished) MA Dissertation, University of Kairouan.
22) Hamouma, C., & Menezla, N. (2019). The Impact of Digital Literacy Proficiency on EFL Students' Academic Writing Performance: A Case Study of Algerian Third Year EFL Students. *International Journal of Digital Literacy and Digital Competence (IJDLDC), 10*(4), 40–55. https://doi.org/10.4018/IJDLDC.2019100103.
23) Harris, K. (2015). Integrating digital literacy into English language instruction (Issue Brief). Washington, DC: U.S. Department of Education, Office of Career, Technical and Adult Education. Retrieved from https://lincs.ed.gov/programs/eslpro

24) Hegelheimer, V., Lee, J., (2013). The Role of Technology in Teaching and Researching Writing. In: Thomas, M., Reinders, H., Warschauer, M. (Eds.), Contemporary Computer-Assisted Language Learning. Bloomsbury Academic, pp. 287–302.
25) Hyland, K. (2003). *Second language writing*. Cambridge, UK: Cambridge University Press.
26) Kelly, K. (2002). Computer Assisted Writing Instruction: a Marriage of Effective and Technology: a Review of the Literature. Kelly_Litrev.htm.
27) Lankshear, C. & Knobel, M. (2007). 'Sampling "the new" in New Literacies' in M. Knobel and C. Lankshear (eds.). a New Literacies Sampler. New York: Peter Lang.
28) Leki, I., Cumming, A., & Silva, T. (2008). A Synthesis of Research on Second Language Writing. London: Routledge.
29) Li, J. & Cumming, A. (2001). Word Processing and Second Language Writing: a longitudinal case study. Writing in the L2 Classroom: Issues in Research and Pedagogy. Vol. 1, No. 2. International Journal of English Studies.
30) Matsuda, P., K., Canagarajah, Suresh, A, Harklau, L., Hyland, K., & Warschauer, M. (2003). "Changing Currents in Second Language Writing Research: A Colloquium." Journal of Second Language Writing 12 (2003): 151-179.
31) Nazarii, N. Et al. (2021). Application of Artificial Intelligence Powered Digital Writing Assistant in Higher Education: Randomized Controlled Trial. *Heliyon 7 (2021) e07014.* https://doi.org/10.1016/j.heliyon.2021.e07014
32) Nobles, S., & Paganucci, L. (2015). Do Digital Writing Tools Deliver? Student Perceptions of Writing Quality Using Digital Tools and Online Writing Environments. *Computers and Composition*, *38*, 16–31. https://doi.org/10.1016/j.compcom.2015.09.001
33) Purcell, K., Buchanan, J., & Friedrich, L. (2013). The Impact of Digital Tools on Student Writing and How Writing is Taught in Schools. *Pew research Center. Retrieved from* https://www.pewresearch.org/internet/wp
34) Richards, J. C. & Schmidt, R. (2002). Longman Dictionary of Language Teaching and Applied Linguistics. Pearson Education Limited 2002 (Third Edition).
35) Schindler, L.A., Burkholder, G.J., Morad, O.A., Marsh, C., (2017). Computer-Based Technology and Student Engagement: a Critical Review of the Literature. *Int. J. Educat. Technol. Higher Educat. 14 (1).*
36) Shymalee, S., D. & Phil, M. (2012). Use of Technology in English Language Teaching and Learning: an analysis. International conference on Language, Medias and Culture. IPEDR, Vol. 33. IACSIT Press, Singapore.
37) Silva, T. & Leki, I. (2004). Family Matters: The Influence of Applied Linguistics and Composition Studies on Second Language Writing Studies- Past, Present, and future. The Modern Language Journal, 88(1), 1-13.
38) Stapleton P. & Radia,P. (2010). Tech-era L2 writing: towards a new kind of process. *ELT Journal , 64* (2), 175-183.
39) Strobl, C. et al. (2019). Digital Support for Academic Writing. Computers & Education, 131, 33– 48.
40) Zhang, R., & Zou, D. (2022). Types, Features, and Effectiveness of Technologies in Collaborative Writing for Second Language Learning. *Computer Assisted Language Learning*, *35*(9), 2391–2422. https://doi.org/10.1080/09588221.2021.1880441
41) Zhao, X. (2022). Leveraging Artificial Intelligence (AI) Technology for English Writing: Introducing Wordtune as a Digital Writing Assistant for EFL Writers. *RELC Journal*. https://doi.org/10.1177/00336882221094089
42) Zheng, B., & Warschauer, M. (2017). Epilogue: Second Language Writing in the Age of Computer-Mediated Communication. *Journal of Second Language Writing*, *36*, 61–67. https://doi.org/10.1016/j.jslw.2017.05.014
43) Ware, P. D. and Warschauer, M. (2006). Electronic feedback and second language writing. In K. Hyland & F. Hyland (Eds.), Feedback in second language writing: Contexts and issues (pp. 185-205). New York : Cambridge University Press .