

Lexical Density in Academic Writing: Lexical Features and Learner Corpora Analysis in L2 Tertiary Students' Essays and Didactic Implications

Martina Lipková, Slovak University of Technology in Bratislava, Slovakia

The Asian Conference on Education 2023
Official Conference Proceedings

Abstract

Academic writing is crucial for communicating ideas among scientists, researchers and academics across various disciplines. It may be an arduous process for students when composing academic texts to meet the university requirements and academic discourse conventions. This research study investigates lexical features of the independent technical essays related to academic writing proficiency in students of Mechanical Engineering. Examining the score of lexical density compared to lexical diversity help educators understand the difficulties that students encounter when composing essays around topics concerning various technical study areas. Correlation between academic and specialty vocabulary in relation to lexical density was investigated to measure the extent to which the variables are related. Lexical density shows the measure of linguistic complexity of 42 university student essays. Based on statistical analysis, a moderate correlation exists between the measure of the academic vocabulary used by the students and the lexical density. A low negative correlation between specialty words and lexical density was found. Syntactic and structural features of the texts are also significant indices of the academic writing proficiency. Computational tools and corpora-based analysis were used for statistical analysis. Outcomes of the research helped identify the students' lexical needs within academic and content-based discourse in tertiary education and have didactic implications in L2 academic writing courses in compliance with the conventions applied in the university academic context.

Keywords: Academic Writing, Complexity, Density, Diversity, Proficiency, Queries

iafor

The International Academic Forum
www.iafor.org

1. Introduction

Writing is a process that encompasses skills and strategies related to text analysis, critical thinking, text editing, generating, argumentation, effective communication. Understanding subject-matter content assumes such a learning environment in which thinking skills are developed, and students are taught to think critically. Higher-order thinking skills help students make their studies more effective and meaningful. The framework of educational objectives developed by Benjamin Bloom in his taxonomy (1956) consists of six major categories: knowledge, comprehension, application, analysis, synthesis, and evaluation (Armstrong, 2010). Teachers and university instructors are supposed to develop the needed skills and abilities, help students encounter problems and grow their intellectual skills (King, 1997). There are many concepts of describing higher order thinking, but implementing good teaching strategies aimed at tasks demanding critical, logical, reflective, metacognitive, and creative thinking are crucial for students' ability to enhance academic writing proficiency (Rhashvinder K. A. Singh, Charanjit K. S. Singh, Tunku M. T. M., Nor A. Mostafal & Tarsem S. M. Singh, 2017). "Higher order thinking skills in teaching academic writing is a challenging task nowadays since learners are exposed to an enormous information influx" (Klimova, 2013; Whittington, 1995).

The language and content awareness development in university students is a major factor of better understanding oral and written texts. With focus on English for academic purposes (EAP), including English for specific purposes (ESP), a precondition for academic writing within the field of studying areas, synergistic use of language is considered. To improve academic writing skills, academic reading is a crucial factor in understanding and dealing with a writing task properly. Writing is a process that assumes gaining appropriate knowledge in a specific scientific area. Thereby, accompanied by developing academic reading strategies, like reviewing, scanning, skimming, questioning, visualizing, summarizing (Sunggingwati, 2017), help students to achieve higher confidence to produce proper paragraph structure within the text where cohesion and coherence are important features of academic writing. Other practical skills, like searching for appropriate literature sources, referencing academic literature, final summarizing arguments demand application of higher order skills, also related to sorting and identifying reliable information based on strong evidence.

Based on the research analysis, the attempt is to identify students' needs aimed at vocabulary learning strategies in ESP, in combination with academic writing. In this, some views of vocabulary learning in ESP are provided. The lexis in scholarly texts has been analyzed in many types of research where it usually distinguishes between core vocabulary, technical vocabulary and semi-technical vocabulary (Baker, 1988, Widdowson, 1993, Zamfir, 2022). Another classification refers to academic vocabulary used across all disciplines, and content, or content-specific, vocabulary. The term academic language is often referred to as general academic vocabulary, "all-purpose terms that appear across content areas" (Baumann and Graves, 2010). It is the kind of vocabulary "used in academic contexts regardless of which discipline you are specializing in" (McCarthy and O'Dell, 2016). It does not include the specialist vocabulary of a particular content or subject.

On the other hand, specialist vocabulary, also referred to as domain-specific academic vocabulary (Meneses et al., 2018), or technical vocabulary (Fisher and Frey, 2008), is very specific and appears in studying and scientific content area texts, coursebooks, scholarly texts and published articles. The frequency of domain-specific or technical words occurs less

frequently in comparison with the academic vocabulary. Communication between scientific communities means that professionals from different scientific, technological and industrial environments are expected to interact and use a high level of specialist communicative competence. It includes very specific terminology to identify, for example, various processes, hypotheses, names of tools, machines and components, mathematical symbols, equations and specialty terms, including trends and proportions expressed by charts, etc. To participate in cross-border exchange of knowledge, from teachers' and students' perspectives, learning objectives must be considered to provide significant input for foreign language acquisition. A genuine and authentic environment creates good conditions for international communication strategies development in higher education. Authentic texts are used in L2 language training for a higher density of specialist lexis that conveys a real message. The notion of authenticity implies a question about how students-readers engage with them and learn from them. Efficient learning strategies, task-based activities that increase motivation in students contribute to enhancement of the language so that a learner is able to reproduce the information the authentic texts convey.

1.1 Lexical Density and Lexical Diversity

Lexical density, as one of the dimensions of lexical complexity, refers to the proportion of content (lexical) words (nouns, verbs, adjectives, and adverbs) to all words (tokens) in the texts within a particular discourse; the proportion of content-carrying lexical words to noncontent-carrying grammatical words (Ure, 1971; Camicottoli, p. 73, 2007). It is also sometimes expressed as the ratio of the number of content words to the number of clauses (lexical density of a sentence) based as Halliday (pp. 61-72, 1985) proposed.

Various ways of measuring language complexity have been applied across studies. The concept of language complexity is associated with and can be measured at various levels (Lahmann, Steinkrauss, Schmid, p. 173 – 191, 2019), for instance, at the level of the words, phrases, sentences, or syntactic complexity (Kuiken, Vedder, 2019, Larsson, Kaatari, 2020). It has been measured as the L2 complexity of the production, and for this research purpose, the lexical diversity of university students' essays was measured. Lexical diversity is defined as the measure of how many different words, phrases or sentences appear in a text. In this research, the lexical diversity was calculated as the type-token ratio, i.e. the ratio of the number of different or unique words (types) and the total number of words (tokens) in essays.

2. Methods

In this paper, the main focus lies on investigation of academic writing proficiency through analysis of the students' essays. For the needs of this research, not full essay texts were analyzed, as the texts of approximately equal length were included for further statistical analysis.

Correlation between academic and specialty vocabulary in relation to lexical density was investigated to measure the extent to which the variables are related. Next relationship strength was analyzed between lexical diversity and lexical density quantitative variables. Lexical density and lexical diversity show the measure of linguistic complexity of 42 university students' abstracts as a part of the assignment in the L2 ESP course.

3. Results

The relationship between the values was investigated with the use of Pearson's correlation. Whether the sample comes from a normal distribution, the values of the standardized skewness and standardized kurtosis were checked (Table 1). The values are not outside the range of -2 to +2, thus indicating that the statistical procedures can be normally applied to this data.

	<i>Academic words</i>	<i>Specialist words</i>	<i>Lexical density</i>
Count	42	42	42
Average	7,96119	10,9814	56,8333
Standard deviation	3,74925	4,60334	4,82835
Coeff. of variation	47,0941%	41,9193%	8,49564%
Minimum	2,48	1,92	46,0
Maximum	15,65	22,92	69,0
Range	13,17	21,0	23,0
Std. skewness	1,04472	1,93882	0,810887
Std. kurtosis	-1,18827	0,389734	0,156742

Table 1: Summary statistics

Based on statistical analysis, a moderate positive correlation exists between the measure of the *academic vocabulary* used by the students and the *lexical density*. Table 2 shows Pearson product moment correlations between each pair of variables. The correlation coefficients range between -1 and +1 and measure the strength of the linear relationship between the variables. The number of data values used to compute each coefficient are shown in parentheses. The third number in each location of the table is a P-value. It tests the statistical significance of the estimated correlations. P-values below 0.05 indicate statistically significant non-zero correlations at the 95.0% confidence level. The following pairs of variables have P-values below 0.05: *academic vocabulary* and *lexical density*. A low positive correlation between *specialty words* and *lexical density* was found (Table 2).

	Academic vocabulary	Lexical density	Lexical diversity	Specialty vocabulary
Academic vocabulary		0,5332	0,1375	-0,1794
		(42)	(42)	(42)
		0,0003	0,3853	0,2556
Lexical density	0,5332		0,3431	0,2789
	(42)		(42)	(42)
	0,0003		0,0261	0,0736
Lexical diversity	0,1375	0,3431		-0,1718
	(42)	(42)		(42)
	0,3853	0,0261		0,2765
Specialty vocabulary	-0,1794	0,2789	-0,1718	
	(42)	(42)	(42)	
	0,2556	0,0736	0,2765	

Table 2: Pearson product moment correlations between each pair of variables

Visualization of the Pearson correlation coefficient can also be seen in Fig. 1, which displays how close the points are falling to the line of best fit. Based on the slope of the line of best fit, the Pearson correlation coefficient is either positive (above-mentioned correlation coefficient between the academic vocabulary and the lexical density) or negative (above-mentioned correlation coefficient between specialty words and lexical density).

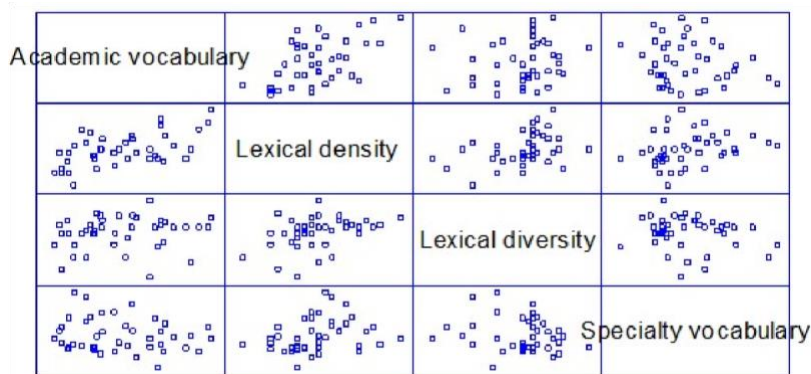


Figure 1: Visualization of the Pearson correlation coefficient

A moderate positive correlation exists between the values of *lexical density* and *lexical diversity* as can be seen in Table 3, where the Pearson correlation coefficient is between 0.3 and 0.5 indicating moderate strength and positive direction. The P-value is below 0.05 and thus considered statistically significant.

	Lexical diversity	Lexical density
Lexical diversity		0,3431
		(42)
		0,0261
Lexical density	0,3431	
	(42)	
	0,0261	

Table 3: Correlation between the values of lexical density and lexical diversity

Figures 2 and 3 refer to histograms for lexical diversity and lexical density variables frequency distribution. Summary statistics is displayed in Table 4.

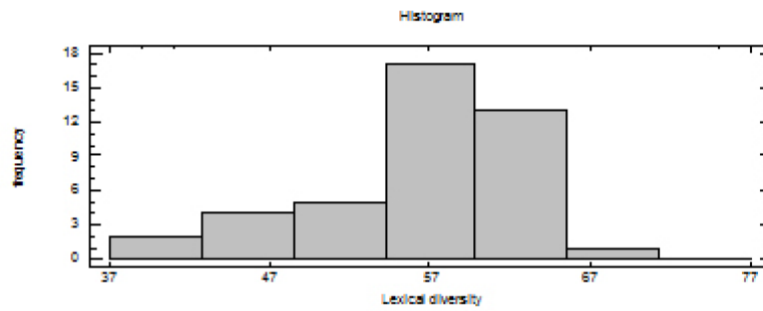


Figure 2: Histogram for lexical diversity

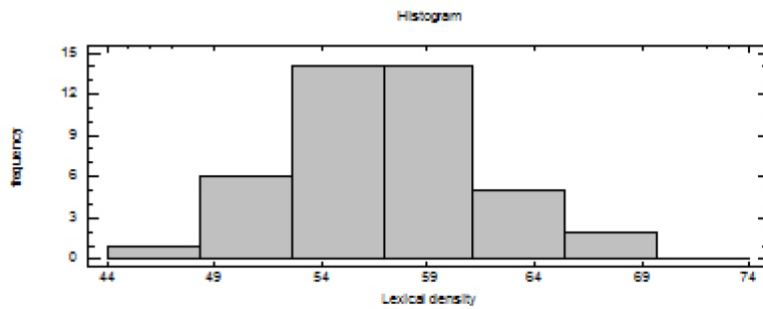


Figure 3: Histogram for lexical density

	<i>Lexical diversity</i>	<i>Lexical density</i>
Count	42	42
Average	56,9048	56,8333
Median	58,5	56,5
Standard deviation	6,48379	4,82835
Minimum	39,0	46,0
Maximum	70,0	69,0
Range	31,0	23,0
Std. skewness	-2,3261	0,81088 7
Std. kurtosis	1,02987	0,15674 2

Table 4: Summary statistics

A weak negative correlation, statistically insignificant (P-value is higher than 0.05), exists between the values of academic and specialty vocabulary (Fig. 4).

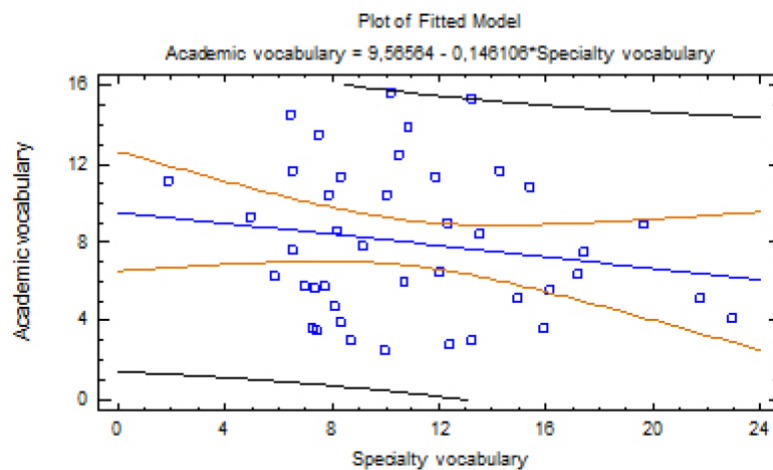


Figure 4: Relationship between academic and specialty vocabulary

Figure 5 displays the relationship between the values of specialty vocabulary and lexical density. A low positive correlation, statistically insignificant (P-value is higher than 0.05), exists between the values.

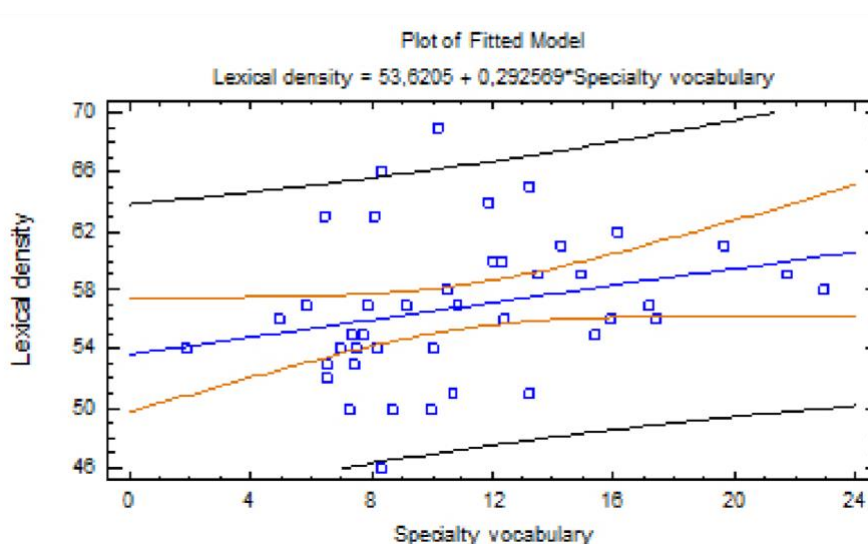


Figure 5: Relationship between the lexical density and specialty vocabulary

As can be seen in Fig. 5 displayed above, a moderate positive correlation, statistically significant (P-value is lower than 0.05), is between the values of specialty vocabulary and lexical density. As regards the relationship between specialty vocabulary and lexical diversity, a weak negative correlation, statistically insignificant (P-value is higher than 0.05), can be seen in Fig. 1.

3.1 Learner Corpus Analysis

The extent to which particular lexical features are used by students, and how they correlate, has been analyzed with the use of Pearson's correlation.

The Sketch Engine corpus tool provides the data source for investigating the language use. For the purpose of the research, the learner corpus in mechanical engineering compiled from the students' essay abstracts, was applied. Word frequency counting, concordances, keywords, collocation analysis and automatically extracted grammatical relations based on statistical patterns in the corpus enable discourse analysis, thus providing an overview of language variation in students' academic writing. The general info about the corpus of 42 students' essays used in the research is provided in Table 5.

Tokens	7,991
Words	7,104
Sentences	399

Table 5: The total numbers of tokens, words and sentences are shown in the general info.

Some of the outcomes from the Sketch Engine tool are displayed in the following figures. For instance, the Word Sketch function was used to identify multiword collocations with the word "transmission", which stands on the 14th position of the wordlist based on how frequently the words occur in the corpus. Sample modifiers of the word used by the students are:

- 10-speed automatic transmission*
- Hydraulic automatic transmission*
- Dual-clutch transmission*
- 3-speed manual transmission*

Verbs used with “engine” as an object, the second most frequent word in the corpus, can be extracted:

... type of vehicles that **combines** an internal combustion engine ...
... they also **introduced** new engines from ...
... used to **power** the engine ...

The N-Grams function enables extracting the sequences of a particular number of items how they were mostly used by students. For example, the following most often 3-item sequences of words occurred:

Of the car: ...can fully rely on the capabilities **of the car** on the roads ; ... in the second last generation **of the car**.

Internal combustion engine: ... a type of vehicle that combines an **internal combustion engine** with ... ; Heat is the product of the **internal combustion engine**.

Zero energy house: In short we can say that the **zero energy house** produces... ; ... equality between consumed energy and energy produced by **zero energy house**.

Connection between patterns and meaning, as the examples mentioned above indicate, enables students to understand a particular technical term as part of a phrase rather than in isolation, thus leading to better understanding of authentic materials. “From this perspective, the lexical approach lies in teaching collocations, i.e. how lexical items co-occur and what grammar they tend to be associated with. In addition, knowledge of collocations supports effective sentence producing and enhances L2 proficiency development in students” (Lipková, 2021).

4. Conclusion

Concerning the moderate positive and statistically significant (*P-value is lower than 0.05*) correlation between the values of academic vocabulary and lexical density, it can be seen that with increased lexical density also more academic words are used by students in their written texts, and more frequently, compared to specialty words. Relationship exists between the variables and we can reject the null hypothesis.

With increased lexical density also more academic words are used by the students in their written texts, and more frequently, compared to specialty words. A relationship (moderate positive correlation, *P-value is lower than 0.05*) exists between the variables and we can reject the null hypothesis.

With increased lexical density also more specialty words are used by the students in their written texts, though very little (low positive correlation; statistically insignificant, *P-value is higher than 0.05*). We cannot conclude that the independent variable affects the dependent variable (if lexical density affects specialty vocabulary).

With increased density also lexical diversity, i.e. richness of vocabulary increases. Relationship exists between the variables (moderate positive correlation; statistically significant, *P-value is lower than 0.05*) and we can reject the null hypothesis.

If the number of the used academic vocabulary increases, it does not mean that specialty vocabulary word number increases too as a weak negative and statistically insignificant (Pvalue is higher than 0.05) correlation exists between the variables. We cannot conclude that the independent variable affects the dependent variable (if academic vocabulary affects specialty vocabulary).

If lexical diversity (richness) increases, there is still an insufficient number of specialty words used by students, based on the weak negative, statistically insignificant (P-value is higher than 0.05) correlation. We cannot conclude that the independent variable affects the dependent variable (if lexical diversity affects specialty vocabulary). As a result, teaching strategies aimed at developing specialist content-based terminology must be applied.

Currently, it is worth mentioning that a diverse approach to increasing the needed vocabulary considering the terminology used in translated texts has been investigated. Text complexity, including syntactic complexity (Vanmassenhove, Shterionov, Way, 2019), has been observed across research into comparison of machine translation, post-edited machine translation and human translation with special attention to lexical diversity, error rates and differences between the reference human translation and the machine translation, also with respect to their communicative function (Hudecová et al., 2021). Development of writing in a second language is a complex process and demands further expertise with respect to L2 learners' proficiency, including the ability to compose the texts. Studies examining learners' decision-making process when composing their texts followed by translating the texts into L2 have been surveyed to enhance text production skills in a second language (Jahangard, Holderread, 2017), as well as with the use of parallel corpora-based translation where, based on comparison of English texts and their corresponding translations, students studied lexical features and syntactical structures to be able to do back-translations from L1 to L2, thus becoming familiar with discourse patterns (Cappuzzo, 2020).

Corpus Query System (CQS) enables teachers, students, translators and other users to work with large amounts of texts according to their needs and objectives. From this perspective, computational linguistics and corpora-based teaching of L2 might be thought as an effective solution for teachers in their effort of designing study materials that meet teaching/learning objectives and learners' needs. This can be used to facilitate designing ESP lessons for professionals. Language structures and phrases typical for various text registers, or types of discourse, allow us to answer great number of research questions and hypotheses, or verify our intuition about the language. The relationship between vocabulary and the quality of written texts was examined in the research based on the lexical features analysis. The use of multi-word collocations is one of the indicators of the sophistication and complexity of the written compositions, along with vocabulary density and diversity lexical indicators.

Acknowledgements

The author gratefully acknowledges the contribution of the Cultural and Educational Grant Agency (KEGA) MŠVVaŠ SR under the grant 021STU-4/2023.

References

- Armstrong, P. (2010). Bloom's Taxonomy. Vanderbilt University Center for Teaching. Retrieved [11.08.2023] from: <https://cft.vanderbilt.edu/guides-sub-pages/bloomstaxonomy/#2001>
- Baker, M. (1988). Sub-technical vocabulary and the ESP teacher: An analysis of some rhetorical items in medical journal articles. *Reading in a foreign language*, 4 (2), pp. 91- 105.
- Baumann, J. F., & Graves, M. F. (2010). What is academic vocabulary? *Journal of Adolescent & Adult Literacy*, 54(1), 4-12. doi:<https://doi.org/10.1598/JAAL.54.1.1>. Available from: <https://www.proquest.com/docview/750429274?pqorigsite=gscholar&fromopenview=true>
- Biber, D., Connor, U., Upton A. T. (2007). *Discourse on the Move: Using Analysis to Describe Discourse Structure*. Library of Congress Cataloging-in-Publication Data. John Benjamins B.V. 2007. (pp. 290). ISBN 978 90 272 2302 9.
- Biber, D., Conrad, S., & Reppen, R. (1998). *Corpus Linguistics*. CUP. Online ISBN 9780511804489.
- Camittioli, Crawford B. (2007). *The Language of Business Studies Lectures: A corpusassisted analysis (Pragmatics and Beyond New Series)*. John Benjamins Publishing Company. 236 pp. ISBN-10: 9027254001. ISBN-13: 978-9027254009.
- Cappuzzo, B. (2020). *Using Parallel Corpora for Translation Activities in L2 Medical English Undergraduate Teaching, with Specific Reference to Italian Sports Sciences Courses*. In: ESC 2020 Proceedings. ISBN: 978-608-4642-74-9
file:///C:/Users/acer2/Downloads/14091-Article%20Text-41172-1-10-20210322.pdf
- Fisher, D., & Frey, N. (2008). *Word wise and content rich: Five essential steps to teaching academic vocabulary*. Portsmouth, Heinemann. NH 03801 – 3912. ISBN – 13: 978-0325-01382-4.
- Halliday, M. A. K. (1985). *Spoken and Written Language*. Deakin University. Oxford University Press. ISBN 019 437153 0.
- Hudecová, E. et al. (2021). Comparison of Machine Translation, Post-Editing and Human Translation of Technical Documentation from Slovak to German. *Slovak Language*, 2021, Vol. 86, No 2, pp. 192 – 207. Ludovit Stur Institute of Linguistics, Slovak Academy of Sciences. ISSN 0037-6981
<https://www.sav.sk/journals/uploads/12101122porovnanie-strojovehoposteditovaneho-a-ludskeho-prekladu-technickej-dokumentacie-zo-slovinciny-donemciny.pdf>

- Jahangard A., Holderread, S. (2017). Translation from L1 to L2 vs. direct writing: A new assessment model. In: *Translation and Translanguaging in Multilingual Contexts*. Published by John Benjamins Publishing Company. Online ISSN: 2352-1813. Print ISSN: 2352-1805. Volume 3, Issue 2, January 2017, p. 210 – 228. DOI: <https://doi.org/10.1075/tmc.3.2.04jah>
- King, F. J. (1997). State wide assessment of listening and verbal communication skills, information literacy skills, and problem-solving skills. Tallahassee: Florida State University.
- King, F. J., Goodson, L. & Rohani, F. (2018). Higher Order Thinking Skills: Definition, Teaching Strategies, & Assessment. Florida: *A Publication of the Educational Services Program*, Now Known as the Center for Advancement of Learning and Assessment, Florida.
- Klimova, F. B. (2013). Developing Thinking Skills in the Course of Academic Writing. *Procedia - Social and Behavioral Sciences*, Volume 93, 2013, Pages 508-511, ISSN 1877-0428, <https://doi.org/10.1016/j.sbspro.2013.09.229>. (<https://www.sciencedirect.com/science/article/pii/S1877042813033326>)
- Kuiken, F., Vedder, I. (2019). *Syntactic complexity across proficiency and language: L2 and L1 writing in Dutch, Italian and Spanish*. In: Special Issue: Special Issue on Syntactic Complexity. *International Journal of Applied Linguistics*. Volume 29, Issue 2: July 2019. Pages 173 – 191, ISSN 1473-6106, <https://doi.org/10.1111/ijal.12256>
- Lahmann, C., Steinkrauss, R., Schmid, M. S. (2019). Measuring linguistic complexity in long-term L2 speakers of English and L1 attriters of German. In: Special Issue: *Special Issue on Syntactic Complexity*. *International Journal of Applied Linguistics*. Volume 29, Issue 2: July 2019. Pages 173 – 191, ISSN 1473-6106, <https://doi.org/10.1111/ijal.12259>
- Larsson, T., Kaatari, H. (2020). Syntactic complexity across registers: Investigating (in)formality in second-language writing, *Journal of English for Academic Purposes*, Volume 45, 2020, 100850, ISSN 1475-1585, <https://doi.org/10.1016/j.jeap.2020.100850>. (<https://www.sciencedirect.com/science/article/pii/S1475158519304680>)
- Lasta Pita Duinarti Sianturi , Dumaris E. Silalahi , Christian Neni Purba. (2020). Improving Students' Writing Ability based on Higher Order Thinking Skills (HOTS) Questions at 8th Grade in SMP Swasta Kartika 1-4 Pematangsiantar. *JETAFL (Journal of English Teaching as a Foreign Language) Publishing*, Volume 6, Issue 2: June 2020 ISSN: 2459-9506 ([https://uhn.ac.id/files/akademik_files/2006231133_2020_Journal%20of%20English%20Teaching%20as%20a%20Foreign%20Language%20Vol%206%20Issue%202%20June%202020_01.%20Lasta%20Sianturi,%20Dumaris%20E.%20Silalahi,%20Christian%20Neni%20Purba%20-%20Improving%20Students%E2%80%99%20Writing%20Ability%20based%20on%20Higher%20Order%20Thinking%20Skills%20\(HOTS\).PDF](https://uhn.ac.id/files/akademik_files/2006231133_2020_Journal%20of%20English%20Teaching%20as%20a%20Foreign%20Language%20Vol%206%20Issue%202%20June%202020_01.%20Lasta%20Sianturi,%20Dumaris%20E.%20Silalahi,%20Christian%20Neni%20Purba%20-%20Improving%20Students%E2%80%99%20Writing%20Ability%20based%20on%20Higher%20Order%20Thinking%20Skills%20(HOTS).PDF))

- Lipková, M. (2021). Role of Authentic Texts in Second Language Lexical Acquisition and Corpora-Based Approach to Language Teaching. In. Conference proceedings: *Global Education, Teaching and Learning (IAC-GETL 2021)*. Budapest. (pp. 8-19). ISBN 978-80-88203-24-7. Available from:
<https://www.conferencesscientific.cz/file/9788088203247>
- McCarthy, M., O'Dell, F. (2016). *Academic Vocabulary in Use. Vocabulary reference and practice*. Second Edition. Cambridge University Press. ISBN 978-1-107-59166-0
- Meneses, A., Uccelli, P., Santelices, M. V., Ruiz, M., Acevedo, D., & Figueroa, J. (2018). Academic language as a predictor of reading comprehension in monolingual Spanishspeaking readers: Evidence from Chilean early adolescents. *Reading Research Quarterly*, 53, 223–247 (PDF) *Domain-Specific Academic Vocabulary Network Development in Elementary Grades Core Disciplinary Textbooks*. Available from:
https://www.researchgate.net/publication/333930635_Domain-Specific_Academic_Vocabulary_Network_Development_in_Elementary_Grades_Core_Disciplinary_Textbooks [accessed Aug 14, 2023].
- Rhashvinder K. A. Singh, Charanjit K. S. Singh, Tunku M. T. M., Nor A. Mostafal & Tarsem S. M. Singh. (2017). A Review of Research on the Use of Higher Order Thinking Skills to Teach Writing. *International Journal of English Linguistics*; Vol. 8, No. 1; 2018 ISSN 1923-869X E-ISSN 1923-8703 Published by Canadian Center of Science and Education. Available from:
<https://pdfs.semanticscholar.org/cec0/e5a6ffefeaba30413b7fccc14ae1d5f0bf13.pdf>
- Sunggingwati, D. (2017). Reading and Writing Skills of Scientific Articles for Undergraduate Students: Benefits and Challenges. *International Conference on Learning Innovation (ICLI 2017): Advances in Social Science, Education and Humanities Research*, volume 164. Available from: <file:///C:/Users/acer2/Downloads/25891051.pdf>
- Ure, J. (1971). Lexical Density and Register Differentiation. In: Camittioli, Crawford B. (2007). *The Language of Business Studies Lectures: A corpus-assisted analysis (Pragmatics and Beyond New Series)*. pp. 73-76 John Benjamins Publishing Company. 236 pp. ISBN-10: 9027254001. ISBN-13: 978-9027254009.
- Vanmassenhove, E., Shterionov, D. and Andy Way. (2019). Lost in Translation: Loss and Decay of Linguistic Richness in Machine Translation. In *Proceedings of Machine Translation Summit XVII: Research Track*, pages 222–232, Dublin, Ireland. European Association for Machine Translation. Available from:
<https://aclanthology.org/W196622.pdf>
- Whittington, M. S. (1998). Higher Order Thinking Opportunities Provided by Professors in College of Agriculture Classrooms. *Journal of Agricultural Education*. Volume 36. Number 4. Pp. 32-38. DOI: 10.5032/jae.1995.04032
https://web.archive.org/web/20170812055210id_/http://www.jaeonline.org/attachments/article/588/36-04-32.pdf

Widdowson, H. G. (1983). *Learning purpose and language use*. Oxford: Oxford University.
Zamfir, T. (2022). On Vocabulary Learning Strategies in ESP: A Students' Perspective. *Bulletin of the Transilvania University of Braşov Series V: Economic Sciences*. Vol. 15(64) No. 1 - 2022 <https://doi.org/10.31926/but.es.2022.15.64.1.10>

Contact emails: martina.lipkova@stuba.sk
marlipkova@gmail.com