AI in Academic Writing of PhD Medical Students: The Institutional Approach and Students' Attitudes

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Abstract: The integration of artificial intelligence (AI) in higher education has significantly impacted teaching and learning methodologies, particularly in medical education for doctoral students. This paper explores the role of AI in enhancing academic writing and language skills, with a specific focus on Czech universities. The theoretical section of the study provides an analysis of Czech universities' approaches to adopting AI technologies in higher education, assessing both the advantages and disadvantages of AI implementation in academic settings. The practical part of the research consists of both quantitative and qualitative analyses. The quantitative component focuses on gathering data on students' academic backgrounds and experience with digital tools, while the qualitative section explores students' attitudes toward AI usage, particularly in relation to reliability, trust, and ethics. The paper aims to provide a comprehensive understanding of the role AI plays in language instruction and academic writing for PhD medical students, while also addressing the broader implications of AI adoption in higher education.

Key words: artificial intelligence, academic writing, PhD medical students, institutional approach, students' perspectives

Preface

The increasing integration of artificial intelligence (AI) into various sectors has significantly affected higher education (Zahrani and Alasmari, 2024), reshaping both teaching and learning methodologies (Wang et al., 2024) as well as other academic efforts, such as research and transfer of knowledge. In the field of medical education, especially for doctoral students, the use of AI-based tools is a trend that offers both opportunities and challenges (Narayanan et al., 2023). This paper explores the role of AI in enhancing academic writing and language skills, with a specific focus on the context of Czech universities.

The theoretical section of the study provides an analysis of Czech universities' approaches to adopting artificial intelligence technologies in higher education, with emphasis on the changing role of a teacher in the light of new technologies. It assesses both the advantages and disadvantages of AI implementation in academic settings, such as the possibility of improving writing quality, supporting research processes, and offering personalized feedback, while also considering challenges related to over-reliance on AI, ethical issues, and the risk of suppressing critical thinking skills. Additionally, an overview of commonly used AI-based tools in academic writing, including grammar checkers, citation managers, and automated

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content generators, is provided to highlight the current options of digital assistance available to students.

The practical part of this research consists of both quantitative and qualitative analyses. The quantitative component ($N = 42$) focused on gathering data, such as students' academic backgrounds and their experience with digital tools, as well as determining how many PhD medical students currently use AI-based tools for writing. It also examines the alternative sources of help students seek beyond digital tools, such as peer support or faculty mentorship. The qualitative section explores students' attitudes toward AI usage, particularly in relation to key factors such as reliability, trust, and ethics. This section of the study aims to show students' perceptions of AI's role in academic integrity and the ethical challenges of incorporating AI tools into their scholarly work.

By combining these perspectives, this paper attempts to provide an overall understanding of the role AI plays in language instruction and academic writing for PhD medical students, while also dealing with the broader context of AI adoption in higher education.

Theoretical background

1 Pros and Cons of AI in Higher Education

Whatever the next developments, at the moment, it is purely up to the educator to evaluate the pros and cons of AI and decide what they will perceive as beneficial in the classroom. This is given by the rather vague institutional approach of universities and it is a rather tricky task – it is not always easy to determine what may be beneficial, as the degree of usefulness of particular AI capabilities may vary according to circumstances and, among other things, depending on the specific discipline; what may be beneficial for the exact sciences, for example, may be more of a potential problem in the humanities.

1.1 Pluses

AI certainly can offer positives in teaching and learning as well as other academic tasks.

From the **students'** point of view, the major positives, according to many researchers, such as Ayala-Pazmiňo (Ayala-Pazmiňo, 2023) are:

- making it easier to write and edit texts, to re-style them, to check spelling and grammar
- facilitating the analysis of information, finding supporting arguments for claims

- speeding up searches, extracting key information from large amounts of text
- possibility of independent practice and study of the material, interactive ability to respond to student's questions, correct him/her, evaluate him/her
- motivation to learn new skills, such as formulating prompts, where the student practices the art of asking questions concisely and clearly and identifying the main ideas; in other words, practicing the general ability to express oneself concisely and factually, abstracting their intention
- improving communication skills and soft skills. It is believed that communication through, e.g., Chat GPT, can relieve students of shame, making it easier for them to make mistakes because they will not be afraid of ridicule from those around them (Brin, 2023). Chat GPT will make it easier for them to practice their communication skills before applying them in the real world.

Educators, too, can use many AI capabilities to the benefit of improving their teaching, but it should also be noted that they may sometimes encounter certain pitfalls when applying them (Singh, 2023). However, the following can be considered beneficial:

- the ability to formulate texts, which can then be used by the educator as a starting point for a deeper analysis in which students discuss what might not be true in the artificially written text, how they can tell, how the text could be formulated and styled better, etc. This work with the text is undoubtedly meaningful, but from a practical point of view, it is only possible when an individual approach to students can be applied, as it is time-consuming. Its use when working with a large number of students in a group is thus very limited.
- the ability to create tests, review questions for lessons, homework assignments, etc.
- help with lesson preparation, where AI can inspire the introduction of new lesson topics, help invent novel activities, teaching methods, etc.
- the ability to diversify and individualise teaching, which can facilitate the educator to create varied tasks and assignments on the same topic, reflecting the diversity of students (Seo et al., 2021).

In this sense, there are undoubtedly many practical advantages to applying AI in teaching. However, as mentioned, these also carry many potential risks, so although these new tools are a significant technological leap towards making our lives easier, these risks cannot be negated.

1.2 Minuses

The potential risks and negatives associated with the introduction of AI for **students** include (Karan and Angadi, 2023):

a) *False, incomplete or biased information*
It must be considered that AI, ChatGPT in particular, can mystify and create misinformation, generate false information (since it generates based on frequency, it can therefore repeat established prejudices, and clichés; it cannot critically evaluate information) (Zaphir, Lodge, 2023), mystify (it is not entirely clear how a particular AI model is constructed and who benefits from its use – i.e. we are using a tool whose mechanism we do not understand and the question arises to what extent it is then possible to know the truthfulness of information). The metaphorical term "hallucination" (Hatem et al., 2023) is used for some cases in which AI confidently presents certain facts as true when it has no justification.

b) *Sources*
AI does not always cite sources (Mikanovich, 2023) and quite often, when explicitly asked to do so, it simply makes up sources (Henderson, 2023). Thus, if we would like to cite it as a source of information, this is often not meaningfully possible.

c) *ghostwriting*
AI produces texts very swiftly and often more successfully than many students can manage. It will, therefore, be logically tempting to have students write the entire text and only partially re-style it (Dwivedi et al., 2023). Such a situation is again on the edge of academic integrity and definitely has a very limited didactic value.

d) *copyright problem*
Here we encounter a fundamental issue, which is the boundary of academic ethics. What are the authors of the newly created texts/works, and even if the authors only use partially artificial intelligence, to what extent must they sign work in order to assign the authorship? (Mohammad Hosseini, 2023)

The current legislation in the Czech Republic (Act No. 121/Coll. 2000) and other European countries attributes authorship only to a natural person; however, e.g. under the US Copyright Act, computer programs are responsible for autonomously created works, and their source code can be copyrighted as a literary work (Copyright Law of the United States, 2022).

Educators, too, have to be aware of certain challenges that AI usage brings.

a) *Difficulty in identification and demonstrability of AI use*

It is difficult to recognize that AI has been used, and even if we could recognize it without a doubt, we cannot practically prove its use (Fleckenstein et al., 2024). This will probably be solved technically over time, but the question of actionability remains: to what extent is plagiarism considered, and when is it still an author's work? If we partially allow the use of AI to, e.g., write a "rough" text, what percentage of the text produced by AI is already plagiarism? Educators may have to completely change the way they evaluate the production of texts – i.e. they may evaluate the "originality of ideas" resulting from original research, they may evaluate the fact that the student will be able to explain orally the essence of their text, but they will no longer evaluate the quality of the text itself. This brings us to another problem: this position may be applicable to the hard sciences, but not so much to the humanities, where writing texts is not always based on one's own research, so a student is consciously working with a synthesis of pre-existing ideas. Moreover, assessment is often related to the skill of writing itself, stylistics, and mastery of the parameters and conventions of academic writing, which, when done exclusively by AI, make this aspect virtually unassessable (Zachari Swiecki, 2022).

b) *responsibility for familiarising students with the workings and risks of AI*
The current policy of Czech universities assumes that it is the responsibility of the educator to introduce AI to students. Introducing students to AI is probably not technically a problem, but it is time consuming – it is hard to explain how AI works, point out the risks associated with it, and still discuss the material to be covered within our discipline in one hour. Not to mention that AI is likely to continue to undergo very dynamic developments (Hirsch-Kreinsen, 2023), so such familiarisation would need to be ongoing and frequently updated. Thus, systemic implementation of AI must include classroom changes, where courses in this area (or in this area as before) will be conducted, students will be introduced to technical innovations themselves, and teachers will automatically assume that they are at the forefront of the game, and teachers will simply set specific rules at class on how to use AI). There are not many training opportunities in this area available for teachers themselves; e.g. several somewhat isolated lectures focusing on the basic principles of artificial intelligence and the use of AI in education has been offered to UP staff so far (Palacky University, 2024).

c) *knowledge testing*
It will be necessary to change the form of assessment, i.e. to replace written exams with "another form" and to assess students according to the higher levels of Bloom's taxonomy (instead of checking whether the student has "remembered, understood", we will need to test whether students can "apply, analyse, evaluate and create") which means to rethink learning objectives. For written assignments, it is suggested that the emphasis should be on the "process of producing" and on the "presentation of written output" (Masaryk

University, 2024); it is, therefore, possible to assign tasks by clearly defining where AI is appropriate and where it is not. This also implies explaining why you, as an educator, (don't) want students to use AI. In reality, however, this is only possible with a small number of students; the situation would be quite different if there were a hundred students in the class. And again we face the problem already mentioned: it limits the educator in testing a certain kind of competence that we have so far considered crucial in some disciplines (writing and text production as such).

d) *final and seminar papers*
There is undoubtedly a risk that the AI will write the entire thesis for the student (Çela, 2024). For the term paper, there may be a solution for students' scheduled work (first research, the theory, then practical) so that they do not leave the work until the last minute, which motivates them to use AI more. But again, this is significantly more time-consuming and requires individual work while still not precluding the use of AI itself.

e) *writing as a form of grading thinking, analytical, critical and argumentative skills*
We assume that the purpose of writing texts is not only to master them formally but that this activity is also a way of developing critical thinking in general, improving expressive abilities, the ability to formulate arguments in a comprehensible way and expressing oneself in general. This ability is probably already declining with little reading (Frankl, 2014), resulting in students lacking vocabulary and the ability to formulate coherent sentences, let alone text. The use of AI may potentially reduce these abilities even further so that we will find it harder to express ourselves in general, which is a problem even in a native language, let alone a foreign language where writing text helps to learn how language works as a system and is, therefore, a key activity. One can assume that AI will do more harm in this field.

2 AI Integration at Czech Universities

It can be assumed that accepting all the potential risks and legitimising the use of GPT Chat will bring the need to clearly define the rules on how to use AI to comply with academic ethics. How to use AI and how to regulate it is therefore a very pressing issue, as it implies the creation of a new code of ethics, the birth of which is still in its infancy due to the rapid technical development, and it is evident from the current reactions of higher education institutions that they are still waiting to see which way this trend will go (Association, Artificial intelligence tools and their responsible use in higher education learning and teaching, 2023).

The current attitudes of educational institutions both in the Czech Republic and across Europe, if they exist at all, are thus rather vague and based on relatively general theses. At the European level, one of the first institutions to issue a state-

ment on the implementation of AI in education was the European University Association. In February 2023, it published a statement expressing the assumption that universities will split into two streams: the first will restrict or ban AI as a tool that goes against academic values, and the second will accept AI as a regular tool that we must learn to work with and use (Association, Artificial intelligence tools and their responsible use in higher education learning and teaching, 2023). The European University Association itself leans towards the second approach, declaring that AI cannot be banned, but must be taught to be used responsibly with respect to academic ethics. This position is clearly the prevailing one among European Universities (MacGregor, 2023), and it is therefore not surprising that it is also held by all major Czech universities that have so far expressed themselves to a greater or lesser extent on the issue. It can be demonstrated at the three main stone universities, i.e. Charles University, Masaryk University and Palacký University.

2.1 The Position of Masaryk University in Brno

Masaryk University (MU) was the first to address the issue head-on, and as early as April 2023, it issued an official statement in which it expressed its willingness to support AI and, at the same time, articulate conditions and recommendations on how it should be used (University M., Statement on the Application of Artificial Intelligence in Teaching at Masaryk University, 2023). These recommendations are directed to both students and educators.

As MU suggests, students are advised to be inquisitive, pragmatic and honest because, as the document points out, unacknowledged use of AI is plagiarism. In addition, the use of AI must be transparent, i.e. must follow principles of academic and personal moral integrity, should be responsible, i.e., critical of the results achieved through AI, and always in accordance with the recommendations of the instructor or thesis supervisor.

Educators are also expected to be open and follow developments in the field of AI, which they then try to integrate into their teaching, while at the same time present its risks and show students its ethical use. They are also advised to be cautious, as it is difficult to prove misuse of AI, and to be clear about the conditions under which they will allow the use of AI. Simultaneously, the university leaves educators the option of not recommending the use of AI, provided that they give students adequate justification for their decision (University M., Statement on the Application of Artificial Intelligence in Teaching at Masaryk University, 2023).

2.2 The Position of Charles University in Prague

The official position of Charles University (CU) followed immediately in April 2023. This statement builds up on the recommendations issued by Masaryk University, which it then elaborates on. It declares that it welcomes the use of modern AI technologies and tools but stresses the need to set boundaries for their use (University C., AI at Charles University, 2023). It supposes that AI tools can improve not only education but also research, provided that they are used ethically and only in a complementary way, not as a substitute for human thinking.

The role of the educator in the process of integrating AI into education is also defined quite clearly. Similarly to Masaryk University, emphasis is placed on the teacher's active approach to absorbing innovations in the field of AI, on his/her responsibility for accepting or rejecting the use of AI (where rejection is possible but not recommended by the university), as well as for determining the way in which it can be used. Another way to minimize the unethical use of AI in teaching is seen by the university in recommending that educators set up an atmosphere of trust in the classroom to the extent that it will motivate students to make mistakes, which will make them less likely to feel such a need to misuse AI just to achieve a flawless result.

In 2019, the Charles University, in cooperation with academics at CTU and scientists at the Academy of Sciences, established the Prg.AI Association (prg.ai, Transforming Prague, 2019), which could contribute to a better understanding of future issues of artificial intelligence in education.

This association aims to "turn Prague into a European centre of artificial intelligence" (prg.ai, Transforming Prague, 2019). As part of this long-term goal, they subsequently established a working group under the influence of turbulent developments in the field of large language modules, which brings together academics from the CTU and the Academy of Sciences, but also from many universities, such as Palacký University, Masaryk University, University of West Bohemia and J. E. Purkyně University (prg.ai, Established by leading Czech scientists, 2023). This group set the ambitious goal of preparing Czech education for the inevitable changes related to AI and developing principles and recommendations for students, educators, researchers and school administrators primarily intended for Universities (prg.ai, Výroční zpráva, 2020). In the longer term, the group wants to "help transform and redefine educational programmes and graduate outcomes." (University C., Artificial Intelligence at Charles University, 2023). Although most of the ambitious goals set is achieved only in the future, the group's cooperation already has partial results: it continuously publishes methodological recommendations to educators and students, as well as links to a number of AI materials and online and face-to-face training related to this problem on the website AI.cuni.cz.

Currently, this is probably the most transparent source of information for students and educators who want to learn about the topic.

2.3 The Position of Palacky University in Olomouc

Compared to the swift reactions of the two above-mentioned Universities, Palacky University in Olomouc took its time to express its official position and provide an opinion on this issue; this only happened in the autumn of 2023 (P. University, 2023). Only the Faculty of Education of Palacký University had been more systematically dealing with the issue of AI in higher education up to then, and it is the only one that has issued at least partial recommendations on the use of AI. In them, it recommends the use of AI, but appeals to students to use it ethically, not to let it work instead of them, to use it only as a tool and to be aware that AI has its limits and that the student is always responsible for the final result. Teachers themselves were given much less attention in the recommendations and were only urged to actively get acquainted with the new technology, critically evaluate it and then pass on their knowledge to students (Faculty of Education, 2023).

On 1 September 2023, the faculty launched a new website dedicated purely to AI (https://AI.e-bezpeci.cz/), where it tries to comment on practical and technical issues related to the functioning of AI and to point out the potential benefits and risks (Faculty of Education, 2023). Although the website and the website of the Charles University working group represent a valuable source of relevant basic information, it should be noted that, unfortunately, the ethical issue of whether artificial intelligence tools are appropriate and who is able to decide on them is again neglected.

3 The Role of the Teacher Resulting from Institutional Attitudes

In summary, all institutions show a fairly consistent attitude. They do not reject AI, do not attempt to ignore it, or even prohibit it, but openly allow AI to enter the academic world. However, they leave the manner and extent of its use entirely in the hands of individual educators and, for the time being, they also leave the responsibility for its regulation to them, which is to some extent a rather alibistic attitude, although understandable in the current situation.

Although according to the universities' position, the educator can refuse the use of AI or significantly limit its use, it is obvious that none of the universities supports or recommends this position and puts the educator in a rather mediating role. Universities primarily assume that the educator will integrate AI into teaching, which in practice implies that he or she will become familiar with AI on his or her own, learn how to work with it, keep his or her knowledge up to date, then communicate his or her knowledge to students and give them clear rules on how

he or she wants them to use it or not. It is left up to the educator to decide and take full responsibility for what he or she perceives as a use compatible with academic ethics, and to subsequently control and draw consequences for any misuse of AI, in accordance with his or her understanding of academic ethics. Universities are thus placing educators in a new role – their main field of expertise will no longer be sufficiently valid and educators must expand their competencies to include knowledge from often diametrically contradictory areas. At the same time, teachers are responsible for determining what they consider to be the pros and cons of AI and to decide to what extent the use of AI can be considered beneficial and compatible with academic integrity. This is quite a large portion of new competencies and responsibilities that appear to be necessary for an educator to remain "sustainable". However, the question remains whether it will be possible to fully assume this responsibility if educators do not receive institutional support and a more or less uniform methodology backed by the university.

4 AI-based Tools in Higher Education

4.1 AI Tools for Writing

AI tools include a wide range of software or applications, many of which are freely available and can be, and often are, applied at the higher education level. These include, for example, the following applications:

- Grammarly – a tool used to check the spelling, grammar and style of English texts
- Quillbot – an application used for paraphrasing and summarizing texts
- Turnitin – a system used to detect plagiarism
- Writefull – a tool that gives support for academic writing, paraphrasing and text editing in English
- Consensus – a search engine that helps collect relevant scholarly texts
- DeepL – a machine translator that allows the translation of entire documents while preserving their format

Last but not least, there are tools that are referred to as large language models (LLMs), which use huge amounts of data, often a substantial part of the Internet, cleaned up in various ways to make sense of the data for the purposes of algorithms. The LLM is then trained on these datasets to be able to serve a given purpose (Slouka, 2023), exhibiting the ability to understand texts and subsequently generate text that resembles a human-created text. Among these models, we can mention the tools Bing Chat or Google Bard, but of course also, and above all, the aforementioned Chat GPT, which is one of the best-known innovations in the field

of AI and represents not only the most widespread of the aforementioned tools, but also the most discussed.

Let us explain exactly what Chat GPT is, using GPT directly. If we enter a prompt into this application formulated as "What is Chat GPT?", the application will immediately generate the following definition:

"ChatGPT is an AI-powered conversational model developed by OpenAI. It is based on the GPT (Generative Pre-trained Transformer) architecture, which is a type of large language model designed to understand and generate human-like text based on input" (OpenAI, 2024).

Thus, we can conclude that Chat GPT is a tool that is able to find the answer to a given question and formulate it into a coherent text within seconds, but this is only one of its many uses and capabilities. From this point of view, it is one of the most widely used tools in higher education, but probably also the most problematic, because its use involves significant risks that both Universities and teachers as individuals will have to accept and assess their scale in some way.

4.2 AI Tools Supported by Palacky University

As mentioned above, AI-based tools including Chat GPT have many skills and abilities that can be widely used by both university students and educators, such as personalised learning for students and supportive tasks in creating and evaluating assessments for teacher. However, in the debate about whether and to what extent it is desirable to legitimise the use of AI-based tools (and whether the opposite is even possible), how and whether to regulate or sanction this use, and who should be responsible and accountable for these crucial decisions, Universities are still being rather cautious not to directly and openly support their usage. For example, Palacky University in Olomouc only provides its employees and students with upgraded (supported and prepaid) version of Copilot and Grammarly.

Copilot is primarily intended to enhance users' productivity. It provides intelligent, real-time features that enable users to perform tasks more efficiently, increase their productivity and skills, and improve their overall work environment. Users are promised to get content that is relevant to their tasks, such as writing concepts, summarizing, and answering questions, all in the context of their work in their Microsoft 365 application. (Microsoft, 2024).

Grammarly, on the other hand, focuses on editing and revising English-written texts, including punctuation, spelling, grammar, but also a style and tone of the written discourse. Lately, it has also received a function of plagiarism checker which can be of a great use to academics to avoid unintentional plagiarism. Although Grammarly corrects the texts in real time, is quite accurate, simple and is

able to be customized, it does not really help with everything, its free version is not very impressive and moreover Grammarly quite aggressively advertises buying its Premium version. (Emmorey, 2021).

The study

1 Introduction to the Study

As the theoretical part implied, AI integration into academic environments is to some extent an institutional imitative but also a feature which needs to be shaped by individual academics and their personal experience. Although universities tend to recognize the potential of AI to support academic productivity, the perspectives of the people in academia, i.e., teachers and students, should be studied and considered. Therefore, after providing the macro-level attitude towards AI and its use in academic endeavors (i.e., the institutional approach), this paper aims to offer the micro-level perspectives of PhD medical students to gain insights into personal experience with adopting AI in academia.

Their perspectives on using AI, on limitations and ethical issues AI brings, not only prove the students' critical evaluation of digital technologies but can also help identify gaps between rather theoretical frame established by universities on an institutional level and everyday academic practice these young researchers live. In this sense, the empirical examination of PhD medical students' perceptions complements the theoretical overview of the policies Czech universities hold towards AI integration. These two (and perhaps other) perspectives could work together in shaping approaches leading towards a more complex and even holistic grasp of AI use in academia; such a fusion might contribute to an academic environment in the digital era more understandable to all its members. In such a perspective, the institutional requirements could meet the real practical issues in which the members of academia live.

Thus, this paper attempts to describe both these perspectives – the institutional and the personalized ones. As AI continues to affect the medical field, understanding its adoption among early-career researchers is crucial for assessing its impact on scientific innovation and education as well as publishing activities in this area specifically. The study focuses on identifying the categories of AI and digital tools commonly used by PhD students, such as reference managers or plagiarism software. Furthermore, it examines the reasons behind their (un)usage and other resources that these students find relevant for their scientific writing. By taking these insights into account, the research aims to provide an overview of current trends in the adoption of artificial intelligence and its potential impact on medical research training.

2 Methods

In this study, a mixed-methods approach was employed, combining both quantitative and qualitative methods to provide a comprehensive understanding of the research topic. The quantitative methods made it possible to gather numerical data, offering insights into trends, patterns, and statistical relationships. Its statistical analysis was essential in gaining generalizable insights and measuring the extent to which AI tools are perceived and utilized by PhD medical students.

On the other hand, the qualitative methods, including semi-structured interviews and focus group discussions, brought valuable and detailed data pointing to underlying behaviors, motivations, and contextual factors that shape these perceptions. Using open-ended questions and discussion allowed the students to share their views in their own words which helps understanding the topic more efficiently than quantifying. This aspect of the study was a key component in understanding all the personal, practical and even ethical themes related to the way and extent the students integrate AI into their scholarly work.

By integrating these two approaches, the study aims to not only quantify the phenomena under investigation but also to gain a deeper understanding of the reasons and behaviours behind the observed data. While the quantitative findings offer an overview of the generalized trends and patterns, these qualitative results offer context and meaning, implying the reasons and even emotions behind the numbers. This holistic approach enriches the findings, providing both solid and well-explained data. Moreover, it can be argued that this complex approach contributed to the validity and reliability of the study by enabling triangulation, where different data sources supported and validated each other. As a result, the mixed-methods approach offered a more holistic understanding of the subject, showing both the measurable aspects and the fundamentally human experiences that motivate the observed patterns.

2.1 Quantitative Method

The first part of the study was conducted using comprehensive questionnaires designed specifically for PhD students of the Faculty of Medicine and Dentistry at Palacký University in Olomouc (see below the text). The questionnaire was distributed in two ways: online via the survey platform Survio (www.survio.com) and in person during Writing for Publication courses aimed at enhancing PhD students' academic writing skills. The survey had 24 items, covering demographic data and a mix of open-ended and closed questions. Its main goal was to gather insights into students' experiences with AI-based tools, as well as their approaches to developing and practicing writing skills in

English throughout their medical studies. The full results can be accessed at https://my.survio.com/D9N0M8Y5K4Z1J1H1Y1A8/results/individual).

The questionnaire has been available online to all 433 PhD students at the faculty since 2023 while the paper-based versions were distributed between 2022 and January 2024. The focus of the study extended beyond general writing skills, focusing on the use of digital tools specifically designed to aid in academic writing and research tasks. These tools were categorized into three key areas: reference management software (e.g., Zotero, Mendeley, EndNote), bibliographic databases (e.g., Scopus, PubMed), and plagiarism detection tools (e.g., iThenticate).

Additionally, the study attempted to cover other relevant resources students rely on for academic writing support, including supervisors, colleagues, literature, and similar. This broader scope provided a nuanced understanding of what role digital tools and resources play in the academic life of PhD students, highlighting both their benefits and potential challenges in facilitating scholarly communication.

2.2 Qualitative Method

The qualitative part of the survey was carried out through in-depth interviews within several focus groups of 58 PhD medical students in total. These interviews aimed at emerging trends, gather insights into students' opinions and attitudes, and gain a deeper understanding of their current perceptions regarding the use of AI in academic writing. The focus group discussions were structured to encourage open dialogue, allowing participants to share their experiences and perspectives in detail and in their own words.

Participants were asked key questions such as: "Do you ever use AI in your academic/scholarly writing? Why or why not?" These questions provoked them to reflect on their motivations, hesitations, and the perceived advantages or challenges associated with AI tools in the context of scholarly work. Responses were recorded in writing by the survey administrator, capturing not only the direct answers but also relevant keywords and themes that appeared throughout the discussions.

The focus groups shared various aspects of AI usage, including its role in generating ideas, improving grammar and style, facilitating research processes, and ensuring adherence to academic standards. Some participants expressed interest in the potential of AI to enhance productivity and reduce time spent on routine tasks, while others emphasized their concerns about ethical implications, accuracy, and over-reliance on technology.

The recorded keywords and recurring themes from these interviews are analyzed and presented in the Results section, providing a comprehensive overview of the

students' collective views and addressing the broader implications of AI integration into academic writing.

3 Results

3.1 Results of the Quantitative Survey

Out of the overall number of 433 PhD medical students (either full-time and part-time), the questionnaire was completed by 42 (almost 10%), out of which 37 students completed it in person during the courses on academic writing, and 5 did so online. Fig. 1 and Fig. 2 show the language and age characteristics of the group of respondents; 60% of the students were native Czech speakers, and 53% were at the age between 26 and 30.

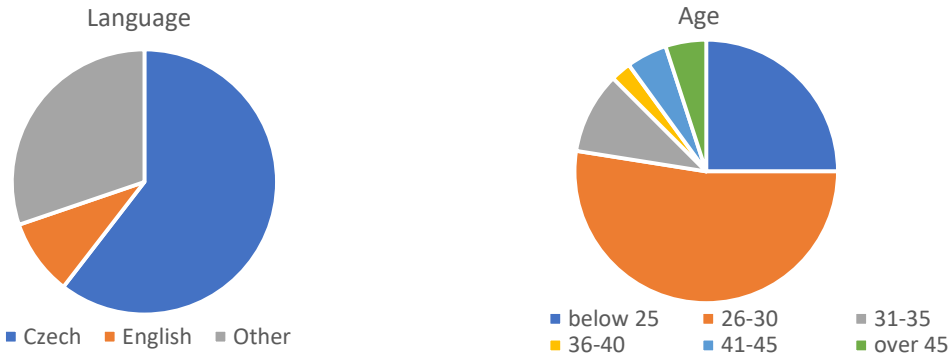

Fig. 1 and Fig. 2: *The demographic data*

Concerning the main topic – examining the use of digital tools in research writing practices – the PhD students spoke of different methods of using AI tools. Most participants (83%) reported that they frequently work with bibliographical databases such as Scopus and PubMed to search for relevant literature, gather evidence, and stay updated with the latest research in their respective fields. They described these databases as indispensable resources for writing literature reviews, compiling references, and ensuring that their work is grounded in the context of current scientific knowledge.

However, in the case of plagiarism-detection software, the trend was different. Despite the availability of tools like iThenticate and Turnitin, the participants stated that they rarely or never use these programs to check their texts. Some explained that they rely on supervisors or editors to handle plagiarism checks, while others mentioned they are not even familiar with how such tools work or are not certain how to reach them, also mentioning this is up to reviewers and editors to regulate. A few students admitted that exploring the options for these tools provide is too

time-consuming or doubted their necessity, particularly if they felt confident in their own authorial voice.

Overall, while bibliographical databases seem to be an integral part of their academic path, they do not make use of plagiarism checkers relying on either their supervisors or even editors of journals to cover this aspect (Fig. 3).

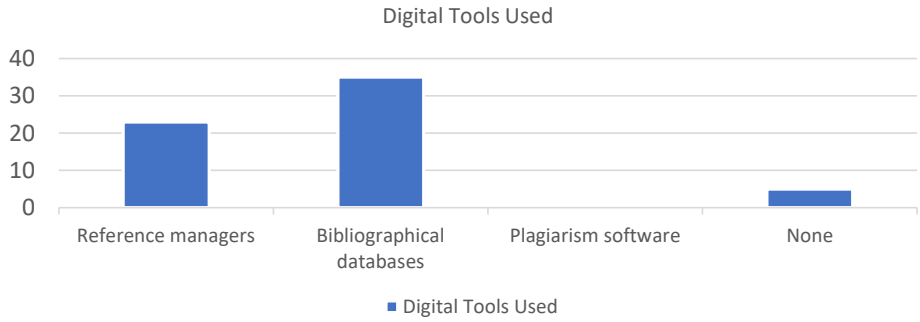

Fig. 3: *Digital tools used*

Another relevant part of the questionnaire focused on additional resources that students seek to assist with scientific writing. The findings showed that students mainly rely on human support (e.g. 9.5% on their colleagues, 14% on the Writing Lab faculty service[1] and 7% on friends) rather than digital tools. Specifically, the majority of respondents (22.5%) stated that they expect guidance and feedback from their supervisors or even their colleagues throughout the writing process.

Supervisors were perceived as mentors, who bring personalized assistance on structure, style, and content, as well as providing critical feedback on drafts. Some students also mentioned consulting peers or senior colleagues for informal counseling and suggestions. Also, several students appreciate the help from the faculty's Writing Lab, although their awareness of it is rather low

The fact that the students rely more on interpersonal support highlights the perceived value of tailored, expert feedback over digital tools, which proves the importance of mentorship in acquiring effective scientific writing skills. (Fig. 4).

[1] Academic Writing Lab is a service provided by the Department of Foreign Languages at the Faculty, offering PhD students help and support with their scholarly writing. More information here https://www.lf.upol.cz/cja/studium/doktorske-studijni-programy/#c70248

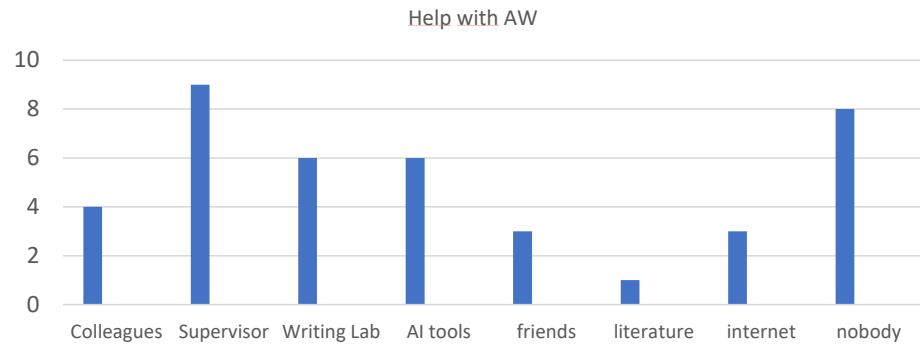

Fig. 4: *Sources of support in academic writing (AW)*

3.2 Results of the Qualitative Survey

The qualitative survey revealed a complex and ambiguous attitude among medical PhD students toward the use of AI-based tools in their scientific writing, with key themes of trust, reliability, complexity, responsibility, and ethics arising from the data.

(Mis)trust and (Un)reliability: A significant number of students expressed mixed feelings regarding the trustworthiness of AI tools. While some found them useful for usage in their medical practice, research, or even primary care, mostly all of them had doubts about the reliability of AI-generated content in scientific writing. Several respondents indicated that they often felt uncertain about whether the AI's suggestions were accurate or scientifically sound, raising doubts about how appropriate it is to rely on these tools for critical sections of their paper ("I know it makes mistakes a lot." or "What if there was some nonsense? That wouldn't help me").

Complexity: Many students found that AI-based tools were too complicated in terms of writing prompts from raw data. Many of them shared the belief that writing such a prompt is more challenging than writing the section in question alone. Although they expressed their appreciation for help with the management of large datasets and the analysis of complex statistics data or even literature sources, they found most of the tools too complex ("I can't imagine writing the command[2]. That would take ages!" "I can write my text faster than writing the prompt.").

[2] The student was not sure about the word *prompt* at that time.

Responsibility: A recurrent concern involved questioning the responsibility in the use of AI tools. Students emphasized that, despite the potential benefits, the final responsibility for the integrity and quality of their work rested with them, not the AI. This caused them to hesitate to fully accept AI-based assistance because they believed that excessive dependence on AI would reduce their sense of responsibility for the rigorous academic content of their writing ("I won't have someone else write something instead of me and it's the same, isn't it?").

Ethics: Ethical considerations were a strong theme throughout the survey. Students expressed concerns about the ethical implications of using AI tools, particularly regarding issues such as plagiarism, the originality of their work, and transparency in AI-assisted writing. Some felt that the use of AI tools could blur the line between their own contributions and those of the AI, leading to potential ethical dilemmas in scientific authorship ("This is plagiarism, no?" "How would the journals see it? As plagiarised?"). In this context, they frequently asked about the University's approach to AI usage (the summary of this approach is explained in the first part of this paper). Overall, medical PhD students did not express a strong belief in the potential of AI-based tools to aid in scientific writing; on the contrary, there were significant reservations regarding trust, responsibility, and ethics, indicating a cautious approach to AI use ("I know it can be a useful thing but I don't know, I just don't believe it much. And also, I don't have time to study it in detail right now.").

4 Discussion

The findings of this study show that medical PhD students are rather reluctant to incorporate digital/AI tools into their scientific writing and prefer instead the guidance and feedback of their supervisors and colleagues. This preference underscores several significant themes, including mistrust in AI, concerns about the reliability of AI-generated content, ethical considerations, and a strong sense of authorial responsibility.

One possible explanation for the limited use of AI in scientific writing is the perceived unreliability of AI tools. Medical research requires a high level of accuracy and precision, particularly when presenting data, interpreting results, and ensuring the integrity of findings. Many students may feel that AI-generated content could make errors, misinterpret data, or oversimplify complex scientific ideas, which could lead to a lower quality of their work. Furthermore, AI probably lacks the deep domain-specific knowledge that human supervisors and peers provide, making personalized guidance from these sources far more valuable for nuanced scientific writing.

Another crucial factor is the ethical dimension. Many PhD students express concern about the ethical issues of using AI in the writing process. They may view it as a potential shortcut that undermines the rigor and authenticity of academic research. Issues such as plagiarism, improper citation, or even concerns about ownership of ideas generated by AI contribute to a hesitation to use these tools. In an academic environment where originality, transparency, and accountability are paramount, the risk of violating ethical norms can outweigh the convenience offered by AI technology.

Authorial responsibility also plays a significant role in the reluctance to adopt AI. Writing is an essential aspect of the PhD journey, allowing students to develop and demonstrate their expertise, critical thinking, and unique authorial voice within the scientific community. By relying too much on AI, students may feel they are compromising their own intellectual contribution, thus jeopardizing the authenticity and ownership of their work. The collaborative nature of seeking feedback from supervisors and peers also reinforces a sense of collective responsibility, ensuring that the final output is a result of thorough academic scrutiny rather than AI-driven shortcuts.

Moreover, some of the students admit that they do not have the time to examine and test the AI tools as their number, functions, and possible applications are changing very rapidly, and it is difficult to keep pace with such extreme development. Thus, the students might not be fully aware of all the options AI tools offer.

Interestingly, while AI has the potential to assist with certain aspects of writing, such as grammar checking or literature review automation, the current attitude among medical PhD students suggests broader cultural and educational aspects. This may indicate a need for future education and training on how AI tools can be used ethically and effectively, without compromising the integrity of academic writing. Trust-building measures and clear guidelines on AI usage may gradually change these attitudes, allowing students to benefit from AI while maintaining high academic standards.

In conclusion, although the number of respondents reached approximately 10% of the total of PhD students at the Faculty of Medicine and Dentistry at Palacky University, it should still be considered that the fact that medical PhD students tend to avoid AI for scientific writing reflects deeper concerns about the reliability, ethics, and ownership of their work. As AI technology evolves, it will be essential for academic institutions to address these concerns by fostering a balanced understanding of how AI can complement, rather than replace, the critical role of human expertise in scientific research. As the theoretical part showed, this aspect is rather underestimated now.

4.1 Insights and Suggestions

The reluctance of medical PhD students to use AI for scientific writing reveals several deeper insights about the AI technology being incorporated into academic practices, as well as opportunities for improvement.

Many students show mistrust and are concerned about the ethical implications of using AI, such as issues related to plagiarism or the undermining of academic integrity. Institutions could address this by offering training on responsible AI usage in academic writing. This would ensure students are aware of best practices, proper AI use, and the potential consequences of misuse, creating a culture of informed, ethical AI use in academic environment. Also, educational programs focused on AI as a tool could emphasize that AI should be viewed as a supplementary device rather than a replacement for the student's intellectual contributions. And finally, such programs can focus on how students could benefit from exploring its potential in other aspects of the research process, such as data analysis, hypothesis generation, or literature review automation. This might encourage students to experiment with AI in different stages of their research, where AI tools have proven more reliable and beneficial.

Instead of considering AI and human mentoring as mutually exclusive, institutions can promote a collaborative approach to the development of the process of writing, including students, supervisors, and AI tools. Supervisors can guide students to effective use of AI without jeopardizing academic integrity, advising them on how AI may help automate or perform repetitive tasks, giving more time for critical thinking and human feedback. However, this may be limited by supervisors' ability to keep pace with the rapid development of AI and to inform their students accordingly.

Students might benefit not only from their supervisors and teachers but also from peer-led workshops where fellow PhD candidates who have successfully integrated AI tools into their workflow can share insights, tips, and best practices. This could help demystify AI tools and show how they can be used to enhance, rather than ban from, the writing process.

Therefore, academic institutions need to establish formal ethical guidelines for the use of AI in scientific writing. These guidelines could clarify how AI should be used, where its limitations lie, and how students can incorporate it without risking violations of academic integrity. Such guidelines would build confidence in AI, showing students that there is a structured, approved way to use it responsibly.

All these suggestions, however, assume some conceptual changes at schools and uniform approaches adopted by universities on an institutional level.

4.2 Limitations of the Study

Despite the valuable insights gained from this study, several limitations must be acknowledged.

First, the relatively small number of respondents limits the generalizing of the findings. A larger sample size would have provided a more representative understanding of the diverse experiences and attitudes of PhD students across different medical fields and perhaps even institutions. The limited sample may not capture the full range of perspectives on AI tools, particularly in terms of varying levels of adoption and use cases.

Second, the study started in early 2022, a period when general awareness and usage of AI tools in academic writing were still in their beginnings. At that time, AI applications such as language models and writing assistants had not yet achieved the widespread recognition or adoption they have more recently. This time factor could have influenced the participants' familiarity with and perceptions of AI, potentially underestimating the current level of engagement with these technologies. As AI tools continue to evolve rapidly, the findings of this study may not fully reflect the current or future landscape of AI use in academic writing.

Finally, the qualitative data obtained through interviews and open-ended survey responses may be influenced by self-report biases. PhD students might underreport or overstate their use of AI tools due to concerns about academic integrity or lack of awareness of how AI applications work. Future research with a larger, more diverse sample and longitudinal design could address these limitations and provide a more nuanced understanding of the evolving role of AI in academic writing.

5 Conclusion

The findings indicate a broad spectrum of concerns about AI, but they also highlight potential opportunities for improving AI integration in academic research. By educating students on ethical usage and clarifying the role of AI as a support tool, academic institutions can gradually help students see AI as a valuable assistant rather than a threat to academic rigor and responsibility.

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Attachment 1.

The questionnaire distributed for the quantitative research

1. **Mother tongue:**
   Czech
   English
   Other: ……
2. **Gender:**
   M
   F
   Other: ……
3. **Age:**
   Below 25
   26–30
   31–35
   36–40
   41–45
   Over 45
4. **Year in the Ph.D. program**
   1st 2nd 3rd 4th 5th 6th 7th
   Other: ……
5. **Study program:**
   ……
6. **Did you spend more than a month period abroad during your Ph.D. studies? If yes, where?**
   ……
7. **What was the working language/language of instruction?**
   English
   Other: ……
8. **For what purpose do you use English most often?**
   E-mail Reading Meeting/consultations Regular work/interactions with colleagues Conference/presentation Social networks Writing papers Teaching Free time I do not use English
   Other: ……
9. **Did you take any international language exam? What?**
10. **How would you evaluate you English level?**

	A1 Beginner	A2 Basic	B1 Pre-intermediate	B2 intermediate	C1 advanced	C2 proficiency
Reading						
Writing						
Listening						
Speaking						

11. **Approximately how many texts have you written during your university studies in Czech? What genres (conference presentations, academic journal article, research proposal, conference posters, etc.)**
12. **Approximately how many texts have you written during your university studies in English? What genres (conference presentations, academic journal article, research proposal, conference poster, etc.)?**
13. **Have you written any other texts in English? If so, what and how many?**
14. **Have you ever been trained to develop any of the following skills?**
    a) Writing academic texts
    b) Summarizing information/paraphrasing
    c) Plagiarism and citation
    d) Searching resources in databases
    e) Evaluation of results in sciences (understanding of H-index, p-index, review process)
15. **Do you utilize any of the following tools?**
    a) Reference manager (CitacePRO, Zotero, Mendeley, EndNote)
    b) Bibliographical databases (Scopus, PubMed, Web of Science)
    c) Plagiarism software (iThenticate)
16. **Do you need writing in your field?**
    Never – sometimes – quite often – mostly – always
17. **Do you feel you need to improve your writing skills?**
    Not at all – a bit – quite a lot – significantly
18. **Do you believe writing is a skill one is born with and cannot be learned?**
    No – I don't know – Yes
19. **How do you assess your skills in the following areas?**
    Searching for literature on a specific topic
    Choosing an appropriate journal
    Summarizing info from various sources
    Structuring an introduction for a research article
    Writing an abstract
    Writing a discussion section
20. **Where do you turn to if you need**
    a) Help with English ……
    b) Help with writing an academic text in English ……
21. **Who provides you feedback on your writing?**
    Your supervisor – colleagues – someone else (specify)
22. **Which section of a paper do you find the most difficult to write?**
    Results Discussion Abstract Introduction and review of the literature
    Conclusions Methods/materials Bibliography Don't know
23. **What aspect of your grammar are you worried about?**
    Articles Spelling Tenses Relative clauses (that × which) Other
    Prepositions Phrasal verbs Active × passive Conditionals
24. **Which reason do you consider the most relevant for a referee to reject a paper in terms of the quality of English?**
    Poor vocabulary Redundancy / lack of conciseness Grammar errors Poor overall structure
    Poor sentence and paragraph structure Message not clear due to poor language skills

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