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EDITED BY
Adeyinka Tella,
University of Ilorin, Nigeria

REVIEWED BY
Fezile Özdamli,
Near East University, Cyprus
Kateryna Boichenko,
Kyiv National Economic University,
Ukraine

*CORRESPONDENCE
Vladimir Beketov
vladbeketov35@rambler.ru

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Intellectual property and quality of education: Exploring the academic integrity among medical students

Vladimir Beketov* and Marina Lebedeva

Department of Internal, Occupational Diseases and Rheumatology, I.M. Sechenov First Moscow State Medical University, Moscow, Russia

This article offers an innovative course for building and improving knowledge on plagiarism. The tasks were as follows: (1) analyze existing knowledge about intellectual property and plagiarism among medical students before and after taking the special course; (2) examine the causes affecting students' intellectual property infringement. To assess the awareness of academic integrity and plagiarism among medical students, the author's questionnaire was used. The sample consisted of 658 students who were divided into two groups. The mean age was 22.41 ± 0.63 years (group 1) and 26.31 ± 0.83 years (group 2). In order to raise awareness of intellectual property and plagiarism, Intellectual Property in Medicine course was offered. The level of duplicate publication and compilation fell. The number of students who believe plagiarism is a moral issue increased. Plagiarism is mostly caused by: Large scale digitization; lack of special knowledge; the status value of academic titles; and low pay. The research findings make it possible to integrate courses on intellectual property and plagiarism into higher education, which will improve knowledge and high quality of education. There are also plans to introduce an online course in The Unified Anti-Plagiarism Principles in Higher Education for university students to improve knowledge and skills in dealing with aspects of plagiarism.

KEYWORDS

anti-plagiarism measures, authorship, ethics, higher education, intellectual property, plagiarism

Introduction

The World Declaration on Higher Education for the Twenty-first Century, adopted by UNESCO, insists on the idea of globalizing the quality of higher education, which will ensure the economic growth and stability of the world's economies (Yesenbayeva and Kakenov, 2015). Contemporary education is one of the crucial elements of social development, contributing to the Education Index, defined by the United Nations; which is also a key parameter of the Human Development Index (GMarket, 2022). The

quality of contemporary education is an important measure of the higher education's performance and depends on the quality of knowledge, instructors, facilities, and motivation of respondents. The issue of large scale infringement of intellectual property adversely affects the development of higher education (Sevostyanov, 2017).

Research articles, dissertations, and grant applications lend themselves to plagiarism (Garner, 2016). The issue of plagiarism attracts the attention of the entire academic community (Oganov et al., 2014). Misappropriation of authorship (plagiarism) occurs in all areas of human life: Education, science, industry, and medicine.

There are no clear arrangements for preventing plagiarism in medical research article. Plagiarism is facilitated by digitization, the widespread and easy integration of the Internet, improved computer literacy of the population (Oganov et al., 2014). Dishonest use of information (plagiarism) is supported by such factors as digitization, socialization, improved efficiency, motivation to learn, and methodological uncertainty. They facilitate fast and easy access to a lot of information data, though with intricacies in perception and punishment (Jereb et al., 2018).

The World Association of Medical Editors, the Office of Research Integrity, and the Committee of Publication Ethics are concerned with the normalization of plagiarism. They argue that the misappropriation of intellectual property causes enormous damage to the development of science and education (Abad-García, 2019). The Committee on Publication Ethics (UK) continually develops and improves the ethics of research and publication (COPE, 2022). The Good Publication Practice (GPP) also contains recommendations for improving the quality of scientific publications, the relevance, and transparency of medical papers. Good Publication Practice requirements include: The absence of ghost writers; unambiguous, not distorted research information; and information about research sponsors (Hesp et al., 2019). Scopus—Elsevier's abstract and citation database—is a proactive fighter for the research authorship (Elsevier, 2021). Scopus continuously monitors and manages the quality of research content sent for publication (Scientific Publications, 2020). Such steps ensure high standards of publications and the database efficiency. The list of journals needs to be updated 2–3 times a year (Scientific Publications, 2020). Web of Science platform also has high requirements for the content of research articles, especially in terms of possible plagiarism (Clarivate, 2020). All submitted research articles are reviewed for content compliance with ethical and anti-plagiarism standards. Yet, all information is accurate and up-to-date (Clarivate, 2020).

The principles of ethics of research publications are observed in two modes of reviewing: (1) single-blind review (the traditional method where the reviewer's name is hidden from the author); (2) double-blind review (both author and reviewer remain anonymous) (Tomkins et al., 2017). There

are also new formats of open review: The names of both the author and the reviewer are known, or an open review is published along with the article (Nedic and Dekanski, 2016). The issue of plagiarism has long been known, for example, in the United Kingdom, making up 20–25% in 1941 and 60–65% in the 1990s. Available studies suggest that plagiarism is on the rise, and student plagiarism is gaining epidemic proportions. In research articles, plagiarism should not exceed 5%, citations—25%, and the uniqueness level should be at least 85% (SOER, 2021). Plagiarism is a worldwide problem, faced by the US, UK, South Africa, Finland, and other countries (Heckler and Forde, 2014).

A separate, no less significant and serious problem is student plagiarism, which is widespread in contemporary higher education (Heckler and Forde, 2014). Students are increasingly looking for quick solutions when writing research articles and even dissertations. Student plagiarism is influenced by socio-economic contexts and even by gender issues (Jereb et al., 2017). For example, factors such as social life, living with parents/grandparents, living in a student hall of residence, motivation for studying and working during studies, shape the existing knowledge and responsibility, and instill ethical principles that affect the academic dishonesty. Beyond that, working male students have less knowledge about plagiarism and are less responsible for plagiarism than working female students (Jereb et al., 2017).

Plagiarism also strikes the medical academic community. According to Nature Publishing Group, 23% of research articles received for publication are rejected because of plagiarism. The prevalence of plagiarism in medical institutions ranges from 11 to 19%. These rates increase when there is no clear understanding, perception and adherence to the ideas and principles of intellectual property and copyrights (Mohammed et al., 2015).

Despite the existing academic research on the quality of education and plagiarism, detailed studies on academic Integrity in higher education remain scarce. Therefore, a study was conducted to offer an innovative course developing and improving knowledge on plagiarism.

Literature review

Plagiarism adversely affects the quality of higher education. Holistic approach to plagiarism in contemporary higher education has been developed by researchers from Portugal (Domingues, 2022). In education, plagiarism has the following components: (1) reality levels (macro-, meso-, and micro-levels) and (2) agents who use them by applying their emotions, knowledge, skills, perceptions, risk assessments, and by exercising reasonable care (Domingues, 2022).

Focusing on modeling technology in higher education, German researchers (Chernikova et al., 2020) showcased the

importance of, and the need for understanding, perceiving and applying ethical aspects in medical practice. Higher education programs are limited in their ability to engage in real-world ethical issues. For example, medical professionals need specific ethical knowledge when working with patients. These limitations make medical practice somewhat incomplete and create a suboptimal setting for learning and working (Chernikova et al., 2020).

Ethical issues in education were studied by Australian researchers (Braunack-Mayer et al., 2020). Big data in education contribute to the emergence and exacerbation of information-related ethical aspects. In general, ethical issues and plagiarism are caused by poor awareness and understanding among students and instructors, misinterpretation of data, poor transparency, and inadequate support. Ethical issues in healthcare are an important component of this field of expertise and have a major impact on human health. Consent, privacy, data sharing, return of results, benefit sharing, ownership, trust and custodianship are required in medical research, and practice (Braunack-Mayer et al., 2020).

Students' actual perceptions and understanding of plagiarism were studied by researchers in Hong Kong (Chu et al., 2019). Plagiarism is of great concern to the academic community. Because of the ease of copying and editing available information resources, plagiarism has become one of the most common forms of academic dishonesty; 24.5% of students admit to using others' texts without citation; 26.2% of student papers are plagiarized. As digital tools evolve, the level of plagiarism in higher education is increasing. According to 1986 data, up to 50.7% of students copied and used results other than their own, without citation. 2005 data show 60% plagiarism rate among students. Dealing with plagiarism requires understanding students' perceptions thereof. Students understand "obvious" plagiarism differently and misunderstand "hidden" plagiarism. The perception of plagiarism depends on the level of students' learning and their academic achievements (Chu et al., 2019).

A study of plagiarism among students was conducted by researchers in Spain and Ireland (Pàmies et al., 2019). Plagiarism in universities can be either intentional or unintentional. The instructors' attitudes toward plagiarism among students is also an important aspect. Most instructors believe that unintentional plagiarism should not be punished. When faced with plagiarism, professors typically prefer to do nothing:

- (1) Fearing retaliation or thus trying to avoid any escalation.
- (2) Due to lack of time to find proof.
- (3) Because of the additional workload.
- (4) Because of a lack of courage or a sense of hopelessness.
- (5) Due to misunderstanding of academic policy (Pàmies et al., 2019).

In their 5-year study, US (Levine and Pazdernik, 2018) researchers described a four-pronged anti-plagiarism program

and the prevalence of plagiarism. Maintaining academic integrity and combating plagiarism are frequent problems at institutions of higher education. These issues have become even more problematic with the rise of the Internet and the easy access to information, which enhances the students' ability to copy and paste information directly into their academic papers. Therefore, research and academic institutions are developing various strategies to combat this phenomenon. Such factors as (1) education module related to plagiarism, (2) Turnitin plagiarism detection software, (3) implementation of anti-plagiarism policies and procedures, and (4) support from the institution's writing policy reduced the plagiarism rate by 2.7 times over a 5-year period. These strategies help higher education institutions to combat plagiarism and improve academic integrity (Levine and Pazdernik, 2018).

Attitudes toward academic integrity and plagiarism were studied by UK scholars (Du Rocher, 2018). A learner needs to have a purpose, value, self-efficacy, as well as to be motivated and engaged. Adverse attitudes toward plagiarism occur with increased self-efficacy and reliance of proactive learning strategies. Enhancement of proactive learning and student self-efficacy make up the cutting-edge tool for combating plagiarism (Du Rocher, 2018).

Awareness of plagiarism and gender-related aspects of its use have been studied by scholars from Slovenia (Jereb et al., 2017). The perception of plagiarism is culture-specific. In terms of awareness, students can be divided into three groups:

- (1) Students who are aware of plagiarism but do not think it is wrong or unethical.
- (2) Students who are unaware of plagiarism.
- (3) Students who know about plagiarism but continue to resort thereto even though they know it is wrong.

To promote a culture of academic Integrity, institutions of higher education are widely implementing advocacy tools and improving the cultural environment, which involves:

- Implementation of the anti-plagiarism policy in academic institutions.
- Severe sanctions for plagiarism.
- Teaching students how to avoid plagiarism.
- A national program to promote academic integrity.

The administration helps students to implement social and academic campaigns, including academic integrity requirements and time management training. Universities also support students' academic integrity by emphasizing learning over grades. The use of plagiarism is affected by socio-economic conditions (social life; living with parents/grandparents, in a dormitory; motivation to study and work while studying) and gender. Yet, there are statistically significant gender-related

differences among students' awareness of plagiarism: Men are more loyal to plagiarism than women (Jereb et al., 2017).

The issue of plagiarism among students in higher education was addressed by researchers in Vietnam (Do Ba et al., 2016). The similarity index can be used to compare and evaluate the prevalence of plagiarism, which shows the percentage of texts that match those found in the service's databases. The match rate (29.06%) was higher than described in earlier studies. The level of plagiarism has a negative correlation with students' academic achievements and with the probability of being caught; it positively correlates with the assignment's length (Do Ba et al., 2016).

Training in plagiarism prevention was conducted by researchers in Australia (Newton et al., 2014). Plagiarism is a widespread problem in academic communities, that includes the following serious infringements:

- Engaging a third party to write a research article.
- Purloining of source material.
- Purchasing of answers to assessment tasks e.g., from online repositories.
- Sham paraphrasing and illicit paraphrasing.
- Downloading the resources from the Internet and ease of use thereof.
- Patch writing.

Providing specific knowledge about in-text referencing builds applied skills among students and reduces unintentional plagiarism. Furthermore, confidence in writing in English has an important role in referencing skills, and students' confidence in completing tasks while preparing for an assignment can help them to avoid accusations of unintentional plagiarism (Newton et al., 2014).

Plagiarism in medical papers was described by researchers from Korea (Min, 2020). Plagiarism has long been a serious phenomenon in medical research. Scientific journals have strict anti-plagiarism policies, which are described in the guidelines for authors. If plagiarism is detected, a letter is sent to the author with explanations and request for a corrected version. If the answer is acceptable, the paper is reviewed. Severe disciplinary actions are taken against plagiarism: withdrawal of the article, suspension of the authors, informing the research project leaders, loss of funding. Plagiarism in medicine includes plagiarism of ideas, text, charts, tables, figures, mosaic plagiarism; self-plagiarism, and duplicate publications. The reasons include: Lack of knowledge, lack of ideas, authors' greed, lack of resources, increased pressure to publish articles; predatory services (Min, 2020).

Plagiarism in medical research was studied by a team of scientists from Saudi Arabia and Egypt (Mohammed et al., 2015). Plagiarism may take the following forms: plagiarism of ideas; plagiarism of text; self-plagiarism; collusion; and patch writing. Plagiarism is caused by: Lack of knowledge;

copy-cut-paste style; poor time management skills; writing under stress; immature writing skills; intentional wish; and enormous pressure on researchers to publish their results studies. Workshops and plagiarism detection software are important tools in preventing plagiarism (Mohammed et al., 2015).

Yet, this study of plagiarism and academic integrity in the medical education complements and deepens prior research on the problem.

Problem statement

Plagiarism is a violation of scholarly integrity and adversely affects the quality of education, science, and academic integrity. Plagiarism prevents passing up-to-date professional knowledge and skills down to students.

The article addresses such relevant issues as plagiarism and the quality of education, the academic integrity in the education of medical students.

This study sought to examine and compare the existing knowledge about academic integrity and plagiarism among undergraduate medical students. The article sets the course for developing and improving academic knowledge among medical students. Research objectives:

- (1) Analyze the existing knowledge about academic integrity and plagiarism among medical students before and after taking the special course.
- (2) Explore the causes affecting students' academic integrity and plagiarism.

The authors were the first to study: the special course's impact on the existing knowledge about academic integrity and plagiarism; widespread use of contemporary education principles, ensuring strong academic effectiveness, and providing students with cutting-edge professional knowledge and skills.

Methods and sources

Research design and sample

The study was conducted at Sechenov First Moscow State Medical University in Russia. The authors developed the methodology and design of this study.

The study sample consisted of two groups: group 1 (346 members)—graduates of Medicine of the Future Program (Center for Innovative Educational Programs); group 2 (312 students)—postgraduates of Sechenov First Moscow State Medical University. The respondents' mean age was 22.41 ± 0.63 (group 1) and 26.31 ± 0.83 (group 2). Men

made up 51 and 54%, respectively, and women—49 and 46%, respectively. The sampling was based on requirements for students' professional activities. While performing their tasks, students in these groups will:

- (1) Develop new approaches to medical education.
- (2) Apply innovative technologies in education and medicine.
- (3) Consolidate the community of medical researchers.
- (4) Develop academic mobility and research.

To build knowledge about academic integrity and plagiarism, the authors offered an elective course in Intellectual Property in Medicine. This course provides medical students with knowledge in:

- Protection of intellectual property.
- Citation of medical research articles.
- Various phases of medical research.
- Publishing the results of clinical trials.
- Development of academic integrity among health professionals.
- Integration of academic mobility.
- Creating and conducting medical research.

This online course was developed by the authors and researchers of the Laboratory for the Development of Information and Internet Technologies in Healthcare at Sechenov First Moscow State Medical University. The course was offered in the 7th semester. It required 60 h of study (2 credits ECTS), including 14 h of lectures (L), 16 h of practical exercises (P), 30 h of independent study. Classroom hours (CH) and independent study accounted for 50% of the time each (Table 1).

The course is taught in Russian and English. The course was administered on the Microsoft Teams platform. The course content and learning resources were available 24/7. Online lectures were either live or recorded, and the practical training workshops were live. Such training format not just provided up-to-date knowledge, but also made the learning mobile. Classes were conducted by the Department's faculty.

The course in Intellectual Property in Medicine primarily develops the university students' knowledge about:

- The main sources of patent laws.
- The procedure for obtaining and using patent rights.
- The main infringements and protections of inventions' patentability.
- Methods for determining the patentability of inventions (utility models).
- Industrial design, etc.

The discipline develops:

- (1) Integral competencies (ability to solve typical and sophisticated special tasks and problems in healthcare industry, with application of provisions, theories and methods of fundamental, chemical, technological, biomedical and socio-economic sciences; ability to integrate knowledge and solve complex issues, formulate judgments relying on insufficient or limited information: Clearly and unambiguously convey their conclusions and knowledge, explaining them to professional and non-professional audiences).
- (2) General competencies (behaving in a socially responsible and conscious way; applying knowledge in real-world situations; the desire to preserve the environment; the ability to exercise own rights and responsibilities as a member of society, recognize the civil society's value and the need for its sustainable development, observe the principles of the rule of law, human and civil rights and freedoms in the country and globally); and
- (3) Special (professional, niche) competencies (applying in the healthcare industry the knowledge of regulations, pieces of legislation, recommendations, medical requirements and practices).

Upon completion of the course, students will acquire specific knowledge, skills, and competencies, consistent with Program Learning Outcomes (PLO):

- Application of knowledge in general and professional disciplines in the healthcare industry.
- Demonstration of independent ability to search, analyze and synthesize information from different sources to solve typical medical problems.
- Providing rationale for decisions, the perception of responsibility therefor in standard and non-standard professional situations.
- Compliance with the principles of deontology and ethics in professional activities.

The research was conducted in two phases: Phase 1 took place in the third year, before taking the special course; Phase 2 took place in the fourth year, after the course.

Research tools

To assess the awareness of academic integrity and plagiarism among medical students, the author's questionnaire was used. The questionnaire consists of 10 questions: nine questions were close-ended, with respondents specifying either "yes" or "no"; question 10 was an open-ended question, with respondents specifying the reason for plagiarism. Respondents were surveyed using the Google Forms. The authors sent to students a link

TABLE 1 Structure of intellectual property in medicine class.

No	Topics	Hours			
		L	P	CH	Total
1.	Intellectual property in medicine. Intellectual property market infrastructure	2	–	2	4
2.	Fundamentals of international and national policies on intellectual property in medicine	–	2	2	4
3.	Legal aspects of intellectual property in medicine	2	–	2	4
4.	Methods of protecting intellectual property rights. Related rights	–	2	2	4
5.	Citation as an element of academic integrity	2	–	2	4
6.	Results of clinical trials as a category of innovative products	–	2	2	4
7.	Registration of intellectual property	2	–	2	4
8.	Copyrights and patents as a category of innovative products	–	2	1	3
9.	License agreements, confidentiality agreements, and conflicts of interest. Collaboration of medical researchers with patent attorneys	–	2	3	5
10.	Regulation of intellectual property	–	–	4	4
11.	Plagiarism: Causes, characteristic features, and prevention	2	2	2	6
12.	Punishment for plagiarism	2	2	2	6
13.	Investment aspects of intellectual property in the healthcare services market	2	–	2	4
14.	Integrating intellectual property in medicine	–	–	2	2
15.	Final exam	–	2	–	2
Total		14	16	30	60

to the questionnaire, which was active for 1 month (phase 1–May 2021, phase 2–January 2022) and easily accessible from any modern device. After filling out the questionnaires, the students sent them back to the post office. Thus, there was a process of collecting the answers of the participants of the experiment, which were processed and based on which the research results were formed. The expert opinion was based on the beliefs of the teachers who developed the questionnaire and conducted the experimental study.

Student's *t*-test was used to evaluate the validity of the obtained indicators, which is equal to $p < 0.05$. Cronbach's test was used to assess the reliability of the survey. Cronbach's alpha ranges from 0.7 and above ($r = 0.7$ and above), which defines the obtained results as sufficiently reliable. Test-retest reliability Pearson's correlation was used to compare the indicators of two groups. The value for a Pearson's coefficient is 1.00.

Statistical analysis of data

Statistical analysis was performed in Microsoft Office Excel. Quantitative parameters were calculated using the formula ($x \pm m$), where x is the arithmetic mean and m is the standard error.

Research limitations

The survey did not include students of the medical, pharmaceutical, dental and military departments, because the

academic programs of these departments have other curricula, academic programs, and syllabuses.

Ethical issues

The study was conducted in accordance with the principles of clinical trials, as specified in the Declaration of Helsinki developed by the World Health Organization (Ethical Principles for Medical Research Involving Human Subjects). All respondents were informed of the goals and methods of the study. All respondents provided written informed consents to participate in the study. The anonymity requirements were met. No conflict of interest existed. The university's bioethics committee authorized the study: Phase 1–in 2020/2021 academic year; Phase 2–in 2021/2022 academic year.

Results

The level of knowledge about academic integrity and plagiarism among medical students changed before and after studying Intellectual Property in Medicine (Table 2).

Investigating the issue of whether students borrow from other authors without referring thereto revealed that, after taking a special course, the number of respondents resorting to such practices fell by 5.79% among Medicine of the Future graduates ($p < 0.05$) and by 2.88% among postgraduates of Sechenov First Moscow State Medical University ($p > 0.05$). The research findings regarding borrowing charts/diagrams/tables

TABLE 2 Level of knowledge about academic integrity and plagiarism among medical students.

No	Knowledge about academic integrity and plagiarism	Group 1 graduate students Medicine of the future (346 respondents)			Group 2 postgraduates Sechenov First Moscow State Medical University (312 students)		
		Before the course % (number)	After the course % (number)	<i>p</i> -value	Before the course % (number)	After the course % (number)	<i>p</i> -value
11.	When writing a thesis/article or research paper, do you borrow other authors' writings without referring thereto?	86.71% (300)	80.92% (280)	0.038*	84.29% (263)	81.41% (254)	0.054**
2.	Do you use other authors' charts/diagrams/tables in your article without referring thereto?	85.26% (295)	81.79% (283)	0.054**	82.05% (256)	79.49% (248)	0.061%
3.	Do you use the word-for-word borrowing because it is the best way to explain a term, a process, a situation?	76.01% (263)	72.25% (250)	0.058**	71.15% (222)	67.31% (210)	0.036*
4.	Do you use data/results of your classmates/colleagues?	72.25% (250)	70.23% (243)	0.061%	68.27% (213)	64.74% (202)	0.042%
5.	Do you use borrowed phrases in your work because you liked them?	32.37% (112)	28.90% (100)	0.041*	30.13% (94)	27.56% (86)	0.067%
6.	If you use a quote that is too long, can you leave out a sentence or two?	57.80% (200)	53.76% (286)	0.032*	52.24% (163)	49.36% (154)	0.058**
7.	Do you hire someone else to write a research article for you?	31.21% (108)	27.75% (96)	0.028*	25.00% (78)	22.76% (71)	0.056**
8.	Do you resort to duplicate publication and compilation in your work?	91.62% (317)	90.17% (312)	0.063**	87.18% (272)	84.29% (263)	0.062**
9.	Do you factor in morality aspects of plagiarism?	7.23% (25)	8.67% (30)	0.064**	4.81% (15)	7.05% (22)	0.064**

* $p > 0.05$, not significantly different. ** $p < 0.05$, significantly different.

without citations suggested that studying Intellectual Property in Medicine reduced the number of students resorting to such practices by 3.47% in group 1 ($p > 0.05$) and by 2.56% in group 2 ($p > 0.05$). When it comes to explanations of terms, processes and situations, there were 3.76% fewer students of the Medicine of the Future program ($p > 0.05$) and 3.84% fewer postgraduates ($p < 0.05$) resorting to word for word borrowing. Upon completion of a course on intellectual property, the number of students who borrowed the results of their classmates' and colleagues' work fell by 2.02% in group 1 ($p > 0.05$) and by 3.53% in group 2 ($p < 0.05$). There was a 3.47% reduction in the number of graduates from the Medicine of the Future program ($p < 0.05$) who used borrowed phrases in their articles and a 2.56% reduction among postgraduates ($p > 0.05$). Students were more attentive to citations, with 4.04% improvement in group 1 ($p < 0.05$) and 2.88% improvement in group 2 ($p > 0.05$). Upon completion of the Intellectual Property in Medicine course, the percentage of students who hired someone else to write research articles fell by 3.46% in the Medicine of the Future graduate group ($p < 0.05$) and by 2.24% in the postgraduate

group ($p > 0.05$). Duplicate publications and compilation rates fell by 1.45% in group 1 ($p > 0.05$) and by 2.89% in group 2 ($p > 0.05$). The number of respondents looking at moral and ethical standard in plagiarism increased by 1.44% in the group of Medicine of the Future graduates ($p < 0.05$) and by 2.24% in the group of Sechenov First Moscow State Medical University postgraduates ($p > 0.05$) (Table 1).

Upon completion of the special course in Intellectual Property in Medicine, medical students' knowledge about academic integrity and plagiarism might improve, with reduction in plagiarism occurrences by 1.44–5.79%.

The research findings also suggested that postgraduates at Sechenov First Moscow State Medical University had initially lower levels of plagiarism, which might be attributed to the fact that while preparing a thesis they need to have a greater number of publications and work with a large number of reviewers.

The study revealed that 79% of graduates in Medicine of the Future program believed that plagiarism was caused by the widespread use of mobile devices and easy access to resources and new technologies. A total of 68% respondents believed that

plagiarism was caused by lack of courses on ethical and legal aspects of working with web resources and a poor consumer culture, with 65% of respondents thinking that plagiarism resulted from poor student culture, and 53%—from the lack of knowledge about citation rules. A total of 87% postgraduates at Sechenov First Moscow State Medical University consider the society's digitization to be the reason for plagiarism. A total of 75% respondents believe plagiarism is caused by lack of specific knowledge about academic integrity and plagiarism, with 73% referring to the academic title's status value and the desire to have more publications. A total of 69% respondents believe plagiarism is caused by low pay (Figure 1).

The research suggests that the number of postgraduates perceiving the challenges of integrating mobile devices and opportunities into medical student education is 8% higher compared to graduates. The number of postgraduates referring to lack of specific knowledge and courses is 7% higher than the number of graduates.

The study shows that more than 53% of students resort to plagiarism in their papers. This is attributed to large scale digitization, lack of special courses on digital data, lack of special knowledge about academic integrity and citation rules, the academic title's status value, and low pay.

Discussion

The results of the study show that the number of students who borrowed the works of their peers and colleagues fell by 2.02 and 3.53%, respectively. Borrowing other people's phrases fell by 3.47 and 2.56%, respectively. Correct citations improved by 4.04 and 2.88%, respectively. The percentage of students who hired someone to write their research articles fell by 3.46 and 2.24%, respectively. The level of duplicate publication and compilation fell by 1.45 and 2.89%, respectively. The number of respondents who believe plagiarism is a moral issue increased by 1.44 and 2.24%, respectively.

A team of researchers from Mexico, China, and Hong Kong (Abbas et al., 2021) has been working on scholarly integrity issues in higher education. The findings made it clear that Internet access has a negative correlation with student plagiarism. The current study showcased quite opposite results—79% of respondents believe that plagiarism is caused by easy access to resources and new technologies on the Internet, while 68% of respondents believe that plagiarism results from a low level of Internet culture.

Students' awareness of plagiarism and its causes in higher education was studied by researchers from Pakistan and China (Malik et al., 2021). Academic plagiarism is a serious problem for institutions of higher education because it affects not only the quality of the teaching, learning and research, but also the educational institution in general. The research findings suggest that 52.43% of students had insufficient special knowledge about

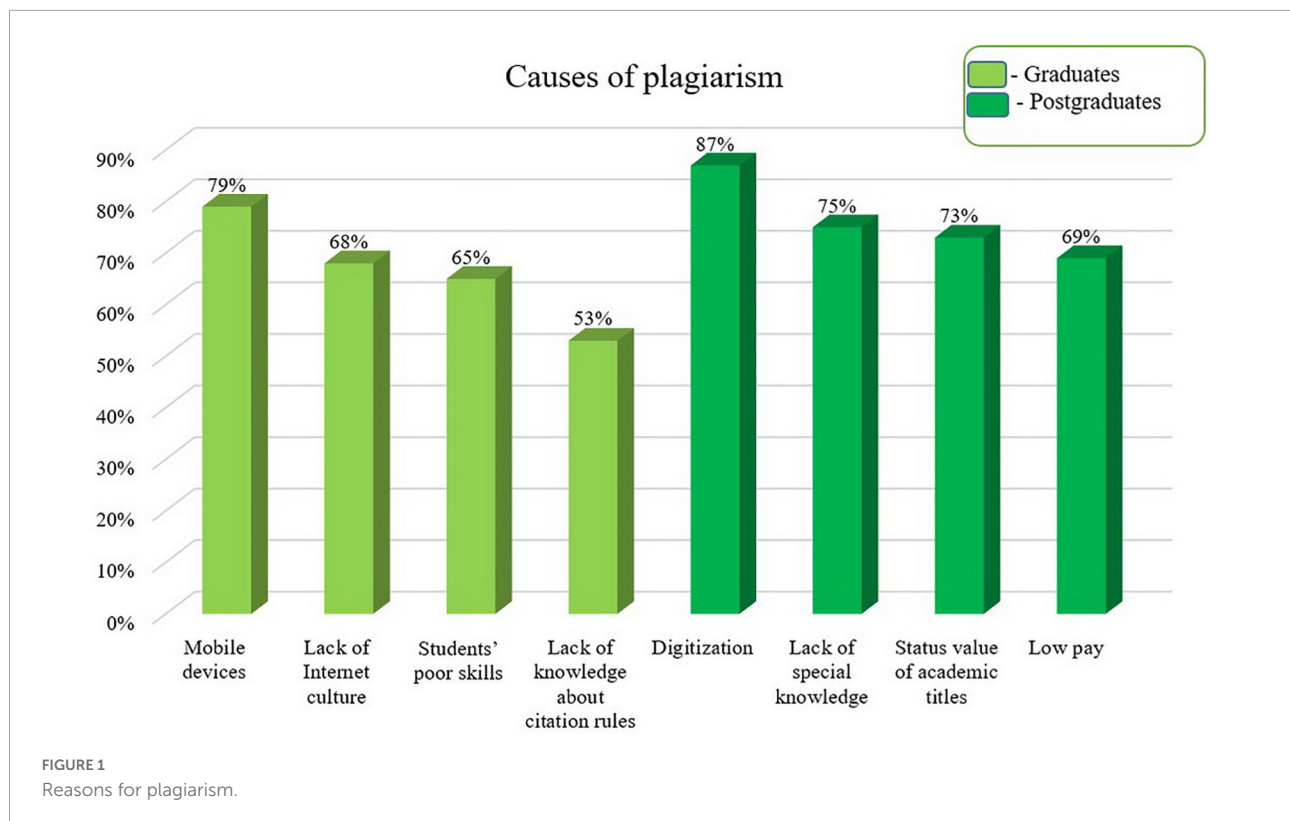
aspects of plagiarism and citation requirements. This study showed that lack of special knowledge about academic integrity, plagiarism, as well as lack of knowledge about citation rules also constituted problems for 53% of graduates and 75% of postgraduates. Researchers from Pakistan and China believe that plagiarism is caused by poor time management skills.

Perceptions of plagiarism by students in different courses have been studied by researchers from Pakistan and Australia (Javaid et al., 2020). The research suggests that students lack special knowledge and understanding of what constitutes plagiarism. To improve the quality of higher education and to be aware of the plagiarism's ethical aspects, universities need to take various steps to prevent plagiarism. Such steps include, for example, the development and integration of university anti-plagiarism policies, awareness campaigns as a strategy to reduce and eliminate plagiarism in higher education. The research findings made it clear that despite the implemented anti-plagiarism policies (i.e., awareness campaigns), students ignored such knowledge and the integration of such a program was ineffective. This study demonstrated quite the opposite effect. Upon completion of the special course, plagiarism cases fell by 1.44–5.79% and, accordingly, the level of knowledge about academic integrity and plagiarism among students improved. Despite these findings, the researchers from Pakistan and Australia recommend to:

- (1) Introduce mandatory courses and programs in research ethics.
- (2) Set up workshops to raise awareness of plagiarism and its consequences.
- (3) Explore issues of authorship and intellectual property.
- (4) Develop academic integrity among students.

Researchers from China, Australia, and Mexico (Fatima et al., 2019) addressed the drivers of plagiarism among university students. The research suggests that unethical environment and plagiarism are driven by: Lack of knowledge about the ethical and legal standards of plagiarism, lack of students' skills, academic pressure and poor self-efficacy. In the current study, 68% of respondents believed that plagiarism was caused by the lack of courses on the ethical and legal aspects of working with digital data. Researchers from China, Australia, and Mexico also believe that students require proper training, awareness and the necessary skills.

Plagiarism cases among postgraduates were studied by Malawi researchers (Selemani et al., 2018). The study showed that despite the visionary understanding of plagiarism, most postgraduates resort to plagiarism, either intentionally or unintentionally. Such a behavior was caused by the desire to have good grades (86.7%), lack of time (84.9%), and lack of special knowledge and academic writing skills (84.9%). In this study, 75% of respondents also believed that plagiarism was caused by the lack of special knowledge. The Malawi case study



also revealed that 69.8% of respondents resort to paraphrasing, while the postgraduates involved in the current study used paraphrasing 49.36% of the time.

The problems of plagiarism were addressed by researchers in Nigeria (Nordling, 2018). This African country also faces the problem of plagiarism, both in public and private universities and colleges. Plagiarism might be more common in poorer economies. The researchers outlined that 88% of the respondents in the medical settings encountered an ethics and plagiarism problem. In the current study, the number of respondents who infringed ethical standards and resorted to plagiarism ranged from 72.25 to 86.71%.

The reasons for plagiarism in higher education have been described by researchers from Slovenia (Šprajc et al., 2017). The Slovenia case study suggests that plagiarism is facilitated by the ease of copying and access to resources and innovative technologies, the digitization processes in the contemporary society. In terms of the current research, 79% of respondents also cite the widespread use of mobile devices and easy access to resources and innovative technologies as a reason for plagiarism, and 87% of respondents cite contemporary society's digitization. The Slovenian case study also showcased that the plagiarism level depends on students' motivation: The less the motivation, the more the plagiarism.

Understanding of plagiarism by university students has been studied by researchers from New Zealand (Adam et al., 2016). Although most institutions of higher education have adopted

policies to minimize and combat plagiarism among students, this is still a serious issue in research and education.

The findings suggest that debates on moral and prescriptive aspects, injustice, confusion and learning contribute to plagiarism. The authors suggest that plagiarism should not be viewed as a moral issue. Instead, special activities should be integrated into university policies to improve students' awareness of academic writing and plagiarism.

The integration of special anti-plagiarism activities and courses in higher education will help to streamline research and teaching processes through improvements in academic integrity, reduced plagiarism and better quality of contemporary education.

Conclusion

Introduction of anti-plagiarism courses in university not only improves students' academic integrity, but also the quality of education. The research findings suggested that completion of the course in Intellectual Property in Medicine might reduce the occurrence of unattributed borrowings by 1.44–5.79%. Upon completion of the course, the number of respondents borrowing other authors' writings without reference thereto fell by 5.79% in group 1 and by 2.88% in group 2. The use of borrowed charts/diagrams/tables without references fell by 3.47 and 2.56%, respectively. The number of word-for-word

borrowings fell by 3.76 and 3.84%, respectively. The number of students who borrowed the works of their peers and colleagues fell by 2.02 and 3.53%, respectively. Borrowing other people's phrases fell by 3.47 and 2.56%, respectively. Correct citations improved by 4.04 and 2.88%, respectively. The percentage of students who hired someone to write their research papers fell by 3.46 and 2.24%, respectively. The level of duplicate publication and compilation fell by 1.45 and 2.89%, respectively. The number of respondents who believe plagiarism is a moral issue increased by 1.44 and 2.24%, respectively.

The research findings make it possible to integrate special courses about academic integrity and plagiarism into higher education, taking into account the major, thus improving knowledge on these aspects and ensuring a high quality of education. There are also plans to introduce an online course in the Unified Anti-Plagiarism Principles in Higher Education for university students to improve knowledge and skills in dealing with aspects of plagiarism.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of I.M. Sechenov First Moscow State Medical University. The patients/participants provided their written informed consent to participate in this study.

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Author contributions

VB and ML contributed equally to the experimentation. VB wrote and edited the manuscript and designed the experiment. ML conducted the experiment and studied scientific literature about the topic. Both authors read and approved the final manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2022.1012535/full#supplementary-material>

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