HOW PHD STUDIES CAN BE IMPROVED IN KAZAKHSTAN IN VIEW OF ADVANCES IN DIGITIZATION AND ONLINE EDUCATION

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Akerke Auanassova* https://orcid.org/0000-0002-3952-1650

1Department of Biology and Biochemistry, South Kazakhstan Medical Academy, Shymkent, Kazakhstan

*Corresponding author:
Akerke Auanassova, Master of Medical Sciences, Senior Lecturer, Department of Biology and Biochemistry, South Kazakhstan Medical Academy, 160000 Shymkent, Kazakhstan;
Twitter handle: @AAuanassova; E-mail: dr.auanassova@gmail.com

Abstract
The current era is marked by digitization, which has significantly shifted scientific research, reporting, and publishing methods. Digital technologies have emerged as powerful instruments that can substantially improve education. Since gaining independence, Kazakhstan has made significant strides in developing its higher education system, particularly in doctoral education. Despite the achievements in the level and quality of doctoral studies in Kazakhstan over the past decade, the country’s postgraduate students still need help. This review aims to assess the current situation of doctoral studies in Kazakhstan and suggest possible ways to improve postgraduate programs. To improve postgraduate programs in Kazakhstan, the country’s doctoral students must undergo additional training through online modules, webinars, lessons or seminars on research methodology and ethics to ensure scholarly performance. It is also necessary to expand advanced training courses for statistical services at universities, develop specialized seminars designed for graduate students in related fields, such as biomedicine, medical biophysics, genetic engineering, etc., and provide opportunities for retraining specialists in the field of statistics and ethics of scientific research in the workplace.

Keywords: Postgraduate, Doctoral studies, Kazakhstan, PhD candidate


INTRODUCTION
Recruitment of academic staff with solid research skills is crucial for effective knowledge transfer in modern higher education [1]. Governments worldwide have ongoing initiatives to increase the number of doctoral candidates and make the pool of candidates more diverse. This underlies their recognition of the value of having highly educated doctoral graduates in their respective national economies. However, this vision requires changes to postgraduate programs to meet new or emerging needs [2]. Higher global education aims to develop rigorous doctoral studies that foster research skills and predict academic and professional decisions through necessary socialization. The self-identity of researchers is crucial for professional development during doctoral studies, as it determines their educational and research contributions. Academic medical postgraduates should be proficient in fundamental and cutting-edge theories, developed technology, scientific investigation, and creative thought relevant to their field of study [3].
The current era is marked by digitization, which has significantly shifted scientific research, scholarly reporting, and publishing methods. Researchers worldwide need support to cope with processing vast amounts of information and navigating through multiple online media, which has made the process of scholarly analysis and synthesis complex and intricate [4].

Since gaining independence, Kazakhstan has made significant strides in developing its higher education system, particularly in doctoral studies. A vital component of the three-cycle higher education system (Bachelor's degree, Master's, and PhD) is a program that prepares PhD candidates. As holders of the highest academic degree, PhD graduates are expected to set a standard for scientific and educational development, foster innovative projects, and contribute to the overall improvement of the country across all fields [41]. Despite the achievements in the level and quality of doctoral studies in Kazakhstan over the past decade, the country's postgraduate students still need help. This review aims to assess the current situation of doctoral studies in Kazakhstan and suggest possible ways to improve postgraduate programs.

FORMULATION OF HYPOTHESES AND RESEARCH QUESTIONS

Science is the organized analysis of natural phenomena that leads to creative thinking and the generation of ideas about related interventions. When you present ideas in a structured way, you create hypotheses. Once a hypothesis is formed, it must be tested to validate whether its correctness. Therefore, a hypothesis can be defined as a suggested explanation for a natural event or a proposed result of an intended intervention [4].

Hypothesis generation is a crucial initial stage in research, as it reflects accumulating evidence and experts’ opinions. Scientific hypotheses must be testable, using available technology and current scientific understanding, as they cannot be proven or disproven otherwise. For a hypothesis to be considered good, it must be testable using a relevant study design and supported by preliminary evidence. Additionally, it should have positive ethical and clinical implications. [5].

In today’s digital period, the availability of diverse platforms for data dissemination, social networking, and expert validation can facilitate hypothesis generation and testing. Expert evaluations can help identify the strengths and limitations of proposed ideas at the early stages of post-publication promotion. This can prevent unsupported and controversial points, ensuring that only well-supported arguments are implemented [6].

Scientific hypotheses are crucial for scientific progress and advancements in healthcare. To develop innovative ideas, it is necessary to critically examine related scientific facts and evidence-based data that others may have overlooked. Authors should thoroughly analyze the literature and propose an ethical and relevant design for future studies to generate fundamental hypothetical theories. Additionally, they should consider the research and publication ethics standards sufficient for their target journals while framing their hypotheses [4].

RESEARCH DESIGNS AND METHODOLOGY

One of the critical factors for the successful defence of a doctoral degree is the correctly chosen design and methodology of the research at the beginning of the doctoral research work, as this stage will affect the final results of the study. Therefore, postgraduate students must understand the topic and essence of the research, how to conduct this research and, accordingly, how to get high-quality results.

The study conducted by Yelibay et al. found that teaching research methodology is not a priority in some universities in Kazakhstan, and most doctoral studies need to provide training on academic integrity and writing. While many respondents expressed dissatisfaction with the program content at state and international universities in Kazakhstan, the data suggests that international universities in Kazakhstan make more significant efforts to enhance research skills and prepare doctoral students for independent research within their programs [7].

Courses on research methodology are crucial for enriching the postgraduate experience and timely completion of education, mainly when provided during candidacy. Participating in offline courses and webinars on research methods can significantly improve research literacy and provide students with essential theoretical and methodological skills. This helps them understand domain-specific knowledge better and effectively consume research produced in their respective areas. Additionally, students mentioned that developing research knowledge also helps them engage in knowledge translation, preparing them to become critical consumers of scholarly articles and thoroughly understand the knowledge that underpins research outcomes [8].
In addition to courses/webinars on the topic “Design and methodology of scientific research”, the skills and experience in this field of the doctoral student's supervisor play a considerable role.

**STATISTICS**

Valid conclusions can only be drawn from data by employing statistical methods. Postgraduate students must know various types of data, measures of central tendencies, and generally used tests in biostatistics. This will enable them to apply these tests and analyze the data independently. Statistical computations have become very feasible with the availability of computers and suitable software programs. Presently, computers are mainly used for diverse statistical tests as it is very tiresome to conduct them manually. The commonly used software programs for statistical computations are MS Office Excel, Graph Pad Prism, SPSS, NCSS, Instat, Dataplot, Sigmastat, Graph Pad Instat, Sysstat, Genstat, MINITAB, SAS, STATA, and Sigma Graph Pad [9].

Many non-mathematical higher education students need to understand quantitative research and statistics. As a result, there is a high demand for introductory courses in basic statistics and a need for more suitable teaching staff [42].

Statistics courses are crucial for students who intend to undertake mixed methods research, particularly in the social sciences. These courses equip students with a solid understanding of generating and analysing quantitative data [10].

Advanced courses in statistics and ethics should already be introduced into the program at the undergraduate level, as providing additional training and support concerning research ethics and bringing research ethics in line with the local context are very important and would help students understand research ethics.

**RESEARCH ETHICS**

Training PhD candidates involves a significant investment of funding, along with the organization of specific educational programs by the university and the time and commitment of supervisors. Negative impressions about research practices within the disciplinary field and the immediate work environment can harm the reputation of science, academia, and research institutes [11].

The work conducted by health professionals is crucial to society as it directly affects the health, safety and well-being of the people they serve. Research ethics refers to the principles, standards, norms, and guidelines that regulate scientific inquiry. Ethics in health research aims to safeguard the rights, integrity, and safety of research participants [12].

Postgraduate students frequently involve human participants in their research projects. Therefore, students must have a solid grasp of research ethics principles and apply them appropriately in their investigations. Students usually encounter research ethics when they apply for ethical approval from their universities [13]. Consequently, researchers should receive ethics training through online modules, lessons, or workshops to inculcate responsible research conduct [14].

Medical and dental postgraduate students receive rigorous training in their respective specializations, primarily in organ specialization. However, it is equally crucial for postgraduates to receive comprehensive training in bioethics. This will enable them to understand patients’ rights, cultural contrasts, and research ethics and effectively equip them with the tools to resolve ethical dilemmas [15].

A positive relationship between supervisors and their students is crucial for training the students on the application of the research ethics guidelines of the institution [13]. Responsible research conduct is promoted by a department's ethical research climate, which is reflected in the behavior of students and faculty who abide by research ethics values [14].

Introducing research ethics at the undergraduate level, providing additional training and support concerning research ethics, and bringing research ethics into line with the local context are very important and would help students understand research ethics from early courses.

**ETHICS COMMITTEES**

Research Ethics Committees (RECs) consist of specialists tasked with ensuring the rights of subjects and preventing human issues in research [16]. RECs consist of members from various fields who meet regularly and have a deep knowledge of the risks involved in research [17].

In 2000, the WHO stated that RECs aim to protect all study participants' dignity, rights, and well-being, both actual and potential [18]. It is mandatory to obtain approval from RECs before commencing any research project.
Postgraduate students are an essential group, as they must understand the ethical aspects of research early in their education. This will help them conduct safe and responsible research throughout their careers [19]. Cases of research misconduct, violations of research ethics and integrity, and ethically questionable behavior are frequently reported [20].

A study conducted in Myanmar showed that graduate students needed to become more familiar with the role of REC, the role of Research Ethics Committees (REC) and ethical principles in research than those who only knew about REC in theory. In addition, the study found that 32.8% of the participants considered falsifying research data as an acceptable practice. In comparison, 26.0% believed that the review process conducted by RECs would cause delays in research [21].

Instances of research misconduct in China, such as falsification, plagiarism, unacceptable authorship, and duplicate submissions, highlight the need to address these issues [22]. Postgraduate students have expressed dissatisfaction with the lack of support provided by their supervisors in dealing with research ethics committees during the research ethics application process, as reported by Van Den Scott in 2016. Supervisors should mention or advise students about RECs [23].

RECs ensure that research proposals meet ethical standards. Their primary responsibility involves providing an independent review of research proposals to determine whether they comply with ethical guidelines. Given the significance of research ethics, enhancing education in research ethics is vital. This will help researchers better comprehend ethical standards and policies and enhance ethical critique and decision-making, providing human subjects with adequate protection [24].

To enhance the quality of scientific research, medical universities should increase the development of courses on the ethics of scientific research and modify the curricula or teaching methods for doctoral students. This will enable students to have a better understanding of international regulations. Furthermore, the Ministry of Science and Higher Education should foster a culture of research integrity to raise the knowledge of medical graduate students and encourage their commitment to conducting ethical and informed research.

PUBLICATION ETHICS

A scientific paper is a well-structured document that describes a hypothesis, presents data, and draws conclusions. Its primary purpose is to educate readers. Any research must be published or documented; otherwise, it is not considered finished. Publishing a paper is crucial for advancing modern science, as one scientist’s work builds on others’ work [25].

Getting research articles published in highly visible and peer-reviewed scholarly journals is crucial for showcasing individual, institutional, and national research productivity. However, many non-Anglophone countries need help educating their scientific authors to write, review, and edit scholarly articles and increase the number of publications in periodicals indexed by Scopus, Web of Science, and PubMed/MEDLINE. Non-Anglophone editorial organizations are investing in local and regional journals to improve publication practices, considered domestic hubs of knowledge collection [26,27].

Publications in international journals often measure academic productivity, but this can lead to unethical behavior due to publication force.

Doctoral students in Kazakhstan are required to meet specific criteria to attain their degree. One of the essential criteria is that they should have published at least one article in a scientific publication recommended for scientific research publication or in an international peer-reviewed scientific journal. This requirement is specified in Order №127 of the Ministry of Education and Science of the Republic of Kazakhstan (Order of the Minister of Education and Science of the Republic of Kazakhstan dated March 31, 2011, №127. On approval of the Rules for awarding Degrees.).

Scientific misconduct often occurs because of insufficient understanding, and it can take multiple forms, including disputes over authorship, conflicts of interest, copyright infringement, data copy, plagiarism, duplicate publication, absence of informed consent, ethics approval, predatory and segmented publication, and editorial misconduct. Postgraduate medical training can be a stage where ethical lapses and publishing misconduct are more likely because of the pressure to publish and the absence of proper training [28].

Maintaining scientific and ethical integrity is crucial while conducting and reporting research. To avoid scientific misconduct, the International Committee of Medical Journal Editors (ICMJE), the World Association of Medical Editors, and the Committee on Publication
authority considerably to the conception and design, acquisition of data, or investigation and interpretation of data [33].

Researchers must uphold ethical principles in academic writing. Journal editors and institutions should establish and enforce policies that prevent any form of authorship manipulation. Failure to do so may result in losing credibility for everyone involved, including researchers, the pharmaceutical industry, journals, and funding agencies. This could lead to a lack of trust from the medical community and the general public towards research practices. Such unethical practices do not benefit anyone and must be avoided [34].

It is not sufficient to merely include the discipline or course “Publication Ethics” in the medical curriculum to address the lack of awareness among medical graduate students regarding ethical aspects and violations related to scientific publications. Adequate guidance from scientific supervisors during research writing and publication, and regular and mandatory webinars for graduate students are also required. By providing instruction on manuscript writing and the publishing process through seminars, the knowledge and skills of students will inevitably improve, resulting in high-quality research and trustworthy manuscripts [28].

WEBINARS AND CONFERENCES

Digital technologies have emerged as powerful instruments for improving education. Such technologies have made it easier for instructors to create and distribute instructional materials while providing learners new opportunities to learn and collaborate. With the advent of the internet and the proliferation of intelligent devices, we are witnessing a new era in education where geographical boundaries do not limit access to knowledge and resources [35]. In recent years, universities worldwide have significantly changed because of technological advancements and social trends towards digitization [36].

In today’s digital ecosystem of knowledge transfer, webinars play a crucial role and have immense potential. Communication technology has become an integral part of knowledge exchange. Over time, numerous advancements in this field have made it an indispensable tool for imparting and disseminating information. One of the most compelling aspects of information and communication technology (ICT) is the webinar, which holds immense potential yet to be fully explored [37].

Webinars are an effective method of delivering research methodology content to postgraduate students with high satisfaction rates. In addition to live sessions, the availability of recorded online material allows participants to watch at their own pace, increasing their accessibility. A successful webinar on research methodology in physiology requires thorough planning, efficient execution, and engaging content. Obtaining feedback from postgraduate students on future webinar topics can help address specific needs.

Attending conferences is an excellent way for researchers to meet and interact with their peers. It provides an opportunity to discover, discuss, and gain inspiration from the work of other scientists. Engaging in conference conversations can generate new research questions or inspire ideas for new ways to address existing ones. Additionally, presenting research findings at a conference allows students to receive feedback, gain recognition as active researchers from their colleagues, and create a professional network [38].

The supervisor also plays an important role when solving and improving the above points. Supervision is often viewed as a vital aspect of teaching in many institutions. However, the process of assigning students to supervisors is only occasionally transparent. Students are usually given supervisors based solely on shared research interests, regardless of their supervisor’s formal training in the subject matter. Students rely on their supervisors to possess the necessary skills and knowledge in the subject area and the methods and procedures for conducting research. The lack of a clear rationale for assigning students to supervisors can cause anxiety among supervisors, particularly those early in their careers. They worry about their ability to successfully guide students to completion, as their success or failure will reflect on their competence and future reputation. Even experienced supervisors with extensive knowledge in a single methodological area share these concerns [39].

Managing research project deadlines and supervising researchers from diverse backgrounds require supervisors to possess many skills. Although expecting supervisors (or anyone) to have all these skills naturally is unreasonable, supervisors should be open to upgrading their professional skill set and actively share

Ethics (COPE) have issued guidelines on research reporting [29,30,31].

Authorship of a medical paper should be earned, declared, and not taken for granted [32]. Based on the ICMJE guidelines, authorship credit should be given to those who contribute considerably to the conception and design, acquisition of data, or investigation and interpretation of data [33].

Researchers must uphold ethical principles in academic writing. Journal editors and institutions should establish and enforce policies that prevent any form of authorship manipulation. Failure to do so may result in losing credibility for everyone involved, including researchers, the pharmaceutical industry, journals, and funding agencies. This could lead to a lack of trust from the medical community and the general public towards research practices. Such unethical practices do not benefit anyone and must be avoided [34].

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Managing research project deadlines and supervising researchers from diverse backgrounds require supervisors to possess many skills. Although expecting supervisors (or anyone) to have all these skills naturally is unreasonable, supervisors should be open to upgrading their professional skill set and actively share
their best practices while supporting their colleagues' development. This will enable supervisors to empower their teams to produce innovative research beyond boundaries [40].

CONCLUSION
In the era of digitization, doctoral students must undergo additional training through online modules, webinars, lessons, or seminars to ensure scholarly performance. The supervisor's role in cultivating competitive and high-quality researchers remains essential. It is also necessary to expand advanced training courses for statistical services at universities, develop specialized seminars designed for graduate students in related fields, such as biomedicine, medical biophysics, genetic engineering, etc., and provide opportunities for retraining specialists in the field of statistics and ethics of scientific research in the workplace.

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CONFLICTS OF INTEREST
The authors state that they do not have any conflicts of interest associated with this article.

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Туынды көрсетеді:

Профессиональное обучение в докторантуре в Казахстане может быть улучшено с учетом достижений цифровизации в области образования.

В статье рассматриваются достижения цифровизации в докторантуре в Казахстане за последние годы. В проведенном анализе использовались результаты исследований, публикаций и презентаций, посвященных проблеме.

Ключевые слова: докторантура, Казахстан, PhD докторант.

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