ISSN: 2582-4686 SJIF 2021-3.261, 2022-2.889, 2023-5.384, 2024-6.875 ResearchBib IF: 9.948 / 2024

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-5, ISSUE-2

THE FORMATION OF SCIENTIFIC THINKING OF GRADUATE STUDENTS

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Abstarct. The article is devoted to the study of the problem of the formation of scientific thinking among graduate students in psychological-pedagogical field of training. The theoretical review analyzes the research of foreign and Russian authors from various points of view covering this problem. The d-efinition of scientific thinking is given as a type of intellectual activity conditioned by a specific motivation of a person and representing the process and result of solving a scientific problem, which consists in building an algorithm for its solution. The methods and conditions contributing to the formation of scientific thinking of graduate students are considered. The results of an empirical study of the masters' understanding of the specifics of scientific thinking and attitudes towards it are presented.

Key words: scientific thinking, joint productive creative activity, understanding, self-knowledge, self-development Acknowledgements.

СТАНОВЛЕНИЕ НАУЧНОГО МЫШЛЕНИЯ МАГИСТРАНТОВ

Аннотация. Статья посвящена изучению проблемы становления научного мышления у магистрантов психолого-педагогического направления подготовки. В теоретическом обзоре анализируются исследования зарубежных и отечественных авторов, с различных позиций освещающих данную проблему. Дается определение научного мышления как вида интеллектуальной деятельности, обусловленного специфической мотивацией личности и представляющий собой процесс и результат решения научной задачи, заключающийся в построении алгоритма ее решения. Представлены результаты эмпирического изучения понимания магистрами специфики научного мышления и отношения к нему.

Ключевые слова: научное мышление, совместная продуктивная творческая деятельность, понимание, самопознание, саморазвитие.

Introduction. In the modern world, the issue of scientific knowledge and scientific thinking increasingly attracts researchers' attention in both theoretical and practical aspects. Scientific thinking is regarded as the primary method of understanding the surrounding world, other people, and oneself. It manifests as the ability to analyze, systematize, interpret, and generate scientific knowledge. "Scientific thinking performs not only cognitive, practical, cultural, and social functions, but also reflects the worldview of its bearer." Almost all experts agree that the concept and structure of scientific thinking are insufficiently covered in modern publications, as is the issue of its formation at different stages of university education.

After analyzing available sources such as monographs, textbooks, expert-analytical reports, and grant reports, we found that the concept of "scientific thinking" is defined as follows:

ISSN: 2582-4686 SJIF 2021-3.261, 2022-2.889, 2023-5.384, 2024-6.875 ResearchBib IF: 9.948 / 2024

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1. Analysis of phenomena, identification of the essence of processes, recognition of patterns governing objective reality, independent of our consciousness and will.
2. A product of a complex cognitive process, involving the selection of an object and subject of study, the use of various logical techniques and methods, and a specialized language.
3. The highest form of reflecting objective reality; the ability to understand and create new knowledge about the world through theoretical constructions and social experience.
4. A specific type of intellectual activity aimed at acquiring objectively true, well-founded new knowledge about reality, oneself, and one's professional activities.
5. It performs cognitive, practical, cultural, and socio-cultural functions, contributing to the study of life and human activities, often determining ways and methods for applying existing knowledge and skills.

Based on the analysis of theoretical sources and educational practices in this field, we propose the following definition: scientific thinking is a type of intellectual activity, conditioned by specific motivation, and representing both the process and the result of solving a scientific problem by constructing an algorithm for its solution. The development and improvement of scientific thinking require an understanding of its structure and the sequential formation of its components.

A team of authors in an expert-analytical report includes the following components in the structure of scientific thinking:

-Cognitive intention, the orientation toward discovering new things (curiosity);

-The ability to doubt, not take anything on faith (critical thinking), rely on verifiable data, and be able to verify them independently;

-Scientific literacy (possessing basic consistent knowledge about the world's structure and the relationships between them, forming a holistic picture);

-Broad outlook;

-The ability to think in broader temporal and spatial scales compared to "everyday thinking";

-Logical consistency in thinking;

-Predictive ability (the capacity to synthesize conclusions based on knowledge of the world and its properties—laws of nature and societal development - to foresee future situations).

Based on the objectives of the "Improvement of Scientific Thinking" project, we selected the following components that can be fully developed within the available resources and timeframe:

1. Scientific research literacy—knowledge and application of scientific research methodology;
2. Methodological literacy—understanding the methodology of the specific field of science within which graduate students conduct research and applying its methods;
3. Motivation for scientific activity—a set of motives directed toward acquiring new knowledge.

Analysis of scientific research has shown that the subject-activity approach developed by S.L. Rubinstein should be considered the foundational framework for addressing the problem of scientific thinking. According to this approach, thinking simultaneously manifests as both a process and an activity [5]. One of the most critical objectives of graduate education is the formation of students' scientific thinking, which facilitates the writing of a master's thesis and the application of psychological knowledge in their future professional work as psychologists.

Currently, there are several methodologies for structuring the educational process in higher education institutions [2; 9]. In our research, we relied on the theory of V.Ya. Lyaudis, which views the educational process as a joint productive creative activity. The outcomes of this activity include the acquisition of scientific knowledge on one hand and the development of the student’s professional

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identity as a specialist on the other [3]. The formation of scientific thinking begins directly with the assimilation of scientific psychological concepts as the language of science.

“A scientific concept is a qualitative characteristic of an object or phenomenon, reflecting its essential attributes and encompassing cognitive, activity-based, and motivational components. The cognitive component, which has a specific scope and content, includes various attributes of the object and reflects interconnections and relationships between objects. The activity component involves the ability to distinguish essential and non-essential attributes of objects. The motivational component entails operating with objects and phenomena to solve creative tasks” [3]. The process of assimilating scientific concepts occurs through lectures, reading scientific literature, summarizing and annotating scientific texts, collaborative discussions of their content, writing reflective essays, and solving diagnostic tasks using digital learning systems [1]. The second crucial stage in the development of scientific thinking is the emergence of the phenomenon of understanding. One of the most important tasks of graduate education is the development of scientific thinking, which contributes to writing a master’s thesis and applying psychological knowledge in the future work of a psychologist.

Currently, there are various methods for organizing the educational process for students in higher education institutions [2; 9]. In our research, we relied on the theory of V.Ya. Laudis, who views the educational process as a joint productive creative activity, the product of which is the assimilation of scientific knowledge, on one hand, and the development of the student’s personality as a specialist, on the other [3]. The development of scientific thinking begins directly with the work of assimilating scientific psychological concepts as the language of science. "A scientific concept is a qualitative characteristic of an object or phenomenon that reflects its essential features, including cognitive, activity-based, and motivational components.

The cognitive component, which has a certain scope and content, includes various attributes of the object, reflecting the relationships and connections between objects. The activity component includes the ability to identify essential and non-essential features of objects. The motivational component involves operating with objects and phenomena in solving creative tasks" [3]. The process of assimilating scientific concepts takes place during lectures, reading scientific literature, abstracting and summarizing scientific texts, joint discussions of their content, writing reflective essays, and solving diagnostic tasks using digital educational systems [1].

The second important stage in the development of scientific thinking is the emergence of the phenomenon of understanding. Understanding scientific concepts is considered the starting phenomenon of thinking. To understand means to acquire knowledge that reveals the essence of things, connects something previously known with the unknown, and turns what was once disjointed into a system. Understanding scientific concepts occurs through discussions during lectures, seminars, and practical classes, in the course of academic and production practices, and through the use of electronic support systems for preparing the studied disciplines. Thus, a theoretical analysis of the problem of the development of scientific thinking in graduate students, as well as years of experience in supervising their research activities, allows us to outline an algorithm for the development and improvement of scientific thinking at the student level.

Study of scientific concepts: lectures, seminars, practical classes, reading, abstracting, and summarizing scientific literature.

Understanding scientific concepts: discussions in the educational process, consultations with the scientific advisor, solving situational tasks during the educational process.

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Application of scientific concepts: presentations at conferences, writing abstracts and articles, preparing scientific work, and defending it.

The proposed algorithm will be effective if it is combined with the graduate students' understanding of the essence of scientific thinking and the need for its improvement, motivation for self-development, and the effective use of opportunities provided by the educational process.

Materials and Methods. To conduct a qualitative analysis of graduate students' scientific thinking, a survey was conducted among graduates of the Samarkand State Medical University master's program. A total of 43 graduate students participated, all with high academic achievements (defended theses with "good" and "excellent" grades, indirectly indicating their understanding and application of scientific concepts). The sample consisted of 87% women and 13% men. The questionnaire comprised 15 closed-ended questions divided into three scales:

Table 1

Survey results

(Scale 1 “Understanding the essence of scientific thinking”)

№	Text of the question	Distribution of answers (%)			
		Yes	More likely yes than no	More likely no than yes	№
1.	Have you encountered any difficulties in forming a research plan?	50,0	24,3	7,2	8,5
2.	Have you encountered any difficulties in formulating a research hypothesis?	40,7	41,4	16,7	2,1
3.	Was it difficult for you to select research methods?	31,4	54,6	9,6	4,4
4.	In your opinion, is the formulation of research findings the most striking example of scientific thinking at work?	36,7	50,0	14,2	0,0

Table 2

Survey results (Scale 2 “Attitude towards your scientific thinking”)

№	Text of the question	Distribution of answers (%)			
		Yes	More likely yes than no	More likely no than yes	№
1.	Can you assess the level of development of your scientific thinking?	0	26,3	30,9	42,9

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2.	Do you often feel upset about the way your scientific thinking works?	42,9	28,6	16,3	12,3
3.	Have you ever received praise for your scientific thinking?	46,9	25,6	27,6	0
4.	Do you think you are capable of independently developing your scientific thinking?	9,1	31,4	57,1	2,3
5.	Do you think that in interaction with a supervisor, scientific thinking develops more effectively (better and faster)?	62,3	22,3	6,3	9,1
6.	How do you feel about your scientific thinking?	Positively	Negative	I'm at a loss answer	
		85,7	0	14,3	

Scale 2. Attitude to your scientific thinking contains 6 questions (Table 2).

Discussion of Results. The analysis of the responses of graduate students using Scale 1 showed contradictory results: on the one hand, nearly 100% of respondents agree with the requirement for a high level of intellectual development, are aware of scientific thinking, its application, and development, but, on the other hand, only 15% noted its necessity for conducting scientific research. The positions of the graduate students and scientific advisors are similar regarding the need for scientific thinking, but they differ on the tools for developing scientific concepts. While the graduate students rank the types of academic activities involving direct participation of instructors (lectures, consultations) as most important, the scientific advisors consider independent work of graduate students (reading, summarizing and abstracting, writing abstracts and articles) to be the most effective tool.

In general, graduate students have a positive attitude toward their scientific thinking (85.7%), as shown by the analysis of their responses on Scale 2. However, a certain contradiction can be noted: 71.5% are often upset about their scientific thinking, 73.8% cannot assess its level of development, and 59.4% do not believe it is possible to develop it independently. At the same time, 72.5% of graduate students have confirmation of sufficiently productive work in their scientific thinking in the form of praise from their scientific advisors. The responses from scientific advisors show that their opinion differs from that of the graduate students. From the scientific advisors' point of view, graduate students do not reflect on the level of development of their scientific thinking, and the praise they receive is more of a motivational tool for completing their thesis work (VKR), rather than a real assessment.

The analysis of the responses from graduate students on Scale 3 revealed difficulties in applying scientific thinking: 84.3% have trouble forming the research idea; 82.1% struggle with formulating the research hypothesis; 86% face difficulties in choosing research methods; and 86.7% experience challenges in formulating research conclusions. In fact, difficulties arise in all key stages of working

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on the thesis. These data are confirmed by the scientific advisors, with particular emphasis on the inability to formulate conclusions and relate them to the research idea.

Comparative Analysis. The comparative analysis of the graduate students' responses revealed that, while they understand the necessity of applying scientific thinking in scientific activities, students unjustifiably assess their level of development in scientific thinking as positively high. The unjustified positive assessment is confirmed by the fact that all key stages of working on the thesis (VKR) present difficulties, and there is an acknowledged insufficiency of independent methods for improving their scientific thinking. This contradiction is fully confirmed by the results of interviews with scientific advisors.

CONCLUSION

Modern requirements for the professional activities of graduate students presuppose a higher level of complexity in work tasks and consistent quality of work outcomes. Analysis of employment practices shows that the vacancies offered to graduates typically involve tasks related to studying large groups of respondents, conducting various monitoring and psychodiagnostic measurements, as well as finding solutions to problem situations. The requested work actions align with the current Professional Standards for "Pedagogue-Psychologist (psychologist in the field of education)," "Psychologist in the Social Sphere" and "Psychologist-Consultant," and are reflected in each of these standards. To address such work tasks, a sufficient level of scientific thinking development is required as a specific type of intellectual activity, determined by the individual’s motivation and representing both the process and result of solving a scientific problem, which involves constructing an algorithm for its solution.

By analyzing modern approaches to the structure of scientific thinking, we concluded that it is necessary to include a motivational component in the structure of scientific activity.

In our opinion, this component determines the desire to develop one’s scientific thinking and ensures the stability of functioning in scientific-research methodological literacy. In this study, we analyzed the state of two components of the structure of scientific thinking. The first component is scientific-research literacy in graduate students, understood as knowledge and application of the methodology of scientific inquiry. The results of a survey of graduate students showed that the implementation of all key components of scientific inquiry causes difficulties, which is also confirmed by the responses of scientific advisors.

The second component of the structure of scientific thinking (motivational) was studied in terms of the graduate students' understanding of the essence of scientific thinking and the degree of satisfaction with its development. While graduate students generally have a positive attitude toward the level of development of their scientific thinking, they are often dissatisfied and unable to assess it accurately. The responses from scientific advisors align with the opinions of the graduate students. The greatest issue, in our view, is the discrepancy between the positions of the graduate students and scientific advisors regarding the methods for developing scientific thinking. Graduate students assign themselves a passive role, believing that development can only occur with direct interaction with instructors, while the instructors, in turn, assign the dominant role to self-development. In this regard, the development of an electronic resource appears to be relevant, where a combination of independent work by the graduate student and joint activities with the scientific advisor can be used to improve scientific thinking within the educational process.

LIST OF REFERENCES:

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THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-5, ISSUE-2

1.Ануфриев А.Ф., Ферапонтова М.В. Опыт внедрения в образовательную практику подготовки магистров автоматизированной системы обучающих кейсов по психодиагностике // Коллекция гуманитарных исследований. 2023. № 3 (36). С. 6–12. DOI 10.21626/j-chr/2023-3(36)/1

2. Ismatov F.A. Analysis of the study of dental and general health of university students in Samarkand/ Ismatov F.A. Shodiev S.S., Musurmanov F.I. // Journal of Biomedicine and Practice.2020. – №. 6. – P. 34-39.

3. Ляудис В.Я. Методика преподавания психологии: учебное пособие. 3-е изд., испр. и доп. М., 2000.

4. Плащевая Е.В., Ланина С.Ю., Лушкина С.А. Формирование научного мышления у студентов фармацевтического факультета: итоги педагогического эксперимента // Мир науки. Педагогика и психология. 2023. Т. 11. № 6. URL: https://mir-nauki.com/PDF/65PDMN623.pdf (дата обращения: 01.08.2024).

5. Рубинштейн С.Л. Основы общей психологии. СПб., 2022. [Rubinshtejn S.L. Osnovy obshhej psixologii [Fundamentals of general psychology]. St. Petersburg, 2022.]

6. Сорокоумова Е.А. Психология самопознания в обучении: монография. М., 2010.

7. Старостенкова Т.А., Приходько А.Н., Санакоева Э.Г. Развитие научного мышления врача в ходе профессиональной подготовки // ОРГЗДРАВ: Новости. Мнения. Обучение. Вестник ВШОУЗ. 2023. Т. 9. № 1 (31). С. 102–109.

8. Фархшатова И.А. Феноменологическая характеристика многогранности научно-творческого мышления студента // Школа будущего. 2013. № 6. С. 39–47.

9. Шадиев С.С. Совершенствование процесса подготовки преподавателей технических дисциплин с учётом требований современной системы образования /СС Шадиев //Молодой ученый. 2015.-С.-1075-1078.