

S.A. Ivanova^{1*}, D.B. Tleumbetova¹, N.V. Dokuchaeva¹, S.Yu. Tyurina²

¹Karaganda Technical University, Kazakhstan

²Ivanovo State Power Engineering University named after V.I. Lenin, Ivanovo, Russia

(Corresponding author's E-mail: cvetlana.iv1980@mail.ru*)

ORCID ID: 0000-0002-4838-3499¹, 0000-0001-5933-3983², 0000-0002-7794-3109³, 0000-0002-0565-907X⁴

Development of the potential of research activities of students in a technical university

The article deals with the problem of developing the scientific potential of students at a technical university. We pay particular attention to the role of a higher school teacher in the research activities of students. The specificity of the organization and content of scientific activity at the university, as well as factors influencing motivation of students, are considered. The results of a study on the development of the scientific potential of modern university students, conducted based on the Karaganda Technical University, are presented. The analysis revealed a steady trend towards an increase in student engagement, provided that a favorable environment for scientific research is created. It is noted that an important condition for the effective implementation of the creative potential of students in science is the creation of a system of motivation for scientific work, which will increase the attractiveness of pursuing scientific activities and, in the future, will become a guarantor of the competitiveness of future engineers.

Keywords: scientific potential, university student, competence, research activity, higher school teacher, level of student motivation, a personal-oriented approach, a competent approach, innovative technologies.

Introduction

The era of global changes has adjusted the position of higher education institutions in society. Basal knowledge, previously considered as an unconditional value, at the present stage, is economically conditioned and aimed at a specific result. Higher education should become the basis for communication between society, the economy and the state for the exchange of innovations, a platform for integrating teaching, obtaining knowledge and scientific research.

The new educational standards imply an assessment of the personal achievements of students at the university. This is due to implementing the humanistic paradigm of education and a personality-oriented approach to learning [1]. This characterizes research activities in universities as a priority, aimed at constantly increasing the research power of the university as a generator of ideas and projects that are relevant today.

The transition to a three-level education system, the introduction of new educational standards with currently in-demand professional competencies makes the problem of the formation of professional skills relevant [2].

The leading role in improving the quality of student training towards the development of the creative abilities of future graduates of the university is called upon to do the scientific work of students, since the educational process, merging with the scientific work of students, is increasingly turning into real professional activity, which currently forms the basis of the process the formation of the future teacher [3]. Increasing the scientific potential of students will contribute to economic growth and positive changes in the economic component of the country in an innovative way of development and application of scientific and technological achievements in the industrial sector.

An important condition for the effective implementation of the creative potential of students in the field of science will be the organization of a system of motivation for their scientific work, increasing the attractiveness of engaging in scientific activities, which will allow them to be competitive in the research market.

The relevance of the topic is due to the need to consider the problem of students' participation in research activities. It should be noted that this issue is raised in the works of domestic and foreign researchers [4].

The study is based on the use of a competence-based approach, highlighting the motivational-value elements of the structure of psychological and pedagogical competence of students, as well as a personality-oriented approach, focusing on the continuous personal and professional development of students.

We share the opinion of N.A. Prosolupova that "a student's readiness for research activity is a systemic personal education that ensures successful professional research activity. The formation of readiness for re-

search activities at the university will be more effective if the learning process at the initial stage is filled with tasks with professional content, professional research and creative situations” [5].

It follows from this that it is not enough for a student to have only a standard set of knowledge provided by the curriculum in the conditions of modern realities. The necessary qualities for the effective implementation of research activities are the formation of its motivational basis, the ability to critically comprehend the problem, independently formulate and solve urgent problems in the context of innovative transformations. The combination of these qualities is the research potential of students.

In the course of considering this issue, we adhere to the concept of “potential”, which, in relation to the educational environment, means the creative activity of students, originality.

The research potential of a student is an integral quality of personality, including a set of factors (research, theoretical, cognitive, reflexive, as well as creativity as a personal quality), which are the primary source for the development and improvement of research competencies in the university [1].

The problems of studying scientific activity, its methodology, significance in the educational process are reflected in the works of E.V. Berezhnova [6], A.V. Khutorsky [7], S.A. Piyavsky [8], V.N. Starshinov [9]. Relevant for the study of the scientific potential of students is the study of professional motivation of students of a pedagogical university in the works of N.V. Bystrova [10], G.A. Bondarev [11].

The research activity of students has its specifics, namely, the use of innovative technologies in practical training, allowing to increase the level of motivation [9].

The purpose of research activities (hereinafter CRA) is to create conditions for the realization of the creative potential of students through involvement in research activities, the formation of the subject and personal qualities of a student as a researcher, and an increase in his professionalization.

The tasks of the CRA include determining the prospects for research developments on the most pressing scientific problems and improving the skills of students’ research work.

Of particular interest in our study is research activity in the context of a personality-oriented approach, as a way to obtain new knowledge acquired under an independently set goal.

Research work is an important element of preparing students for future professional activities and is aimed at developing analytical, practical skills in research and project activities.

Research activities of students include the following stages:

- 1) the state of the research issue;
- 2) theoretical research;
- 3) experimental research;
- 4) analysis and generalization of the results [7].

According to Malakhova O.Yu., when preparing scientific papers, as well as directly in the process of participating in scientific projects, the professional, personal self-development of the student, the development of his reflective skills and building an adequate self-esteem, is effectively carried out, the ability to design his own educational trajectory is formed [12].

The most important component of successfully attracting students to research activities is the fulfillment of the following conditions:

- 1) organization of effective work;
- 2) increasing motivation to participate in scientific research;
- 3) the presence of a permanent scientific topic while studying at the university;
- 4) the presence of a scientific advisor [13].

It should be noted that one of the important tasks of the supervisor is the formation of sustainable research skills and competencies of students.

Undoubtedly, the formation of research competencies requires cognitive and research motivation, stimulation of a value attitude both to the process and to the result of research, and dialogical collaboration between participants in the educational process. The effectiveness of the development of the scientific potential of students at a university largely depends on the ability of teachers to transmit to students their competencies in this area; from the promising interaction of teachers and students.

According to S.V. Begicheva, each teacher needs to develop students’ skills to search for information on the Internet, provide students with information about journals, publications, research communities, the media, where the results of new research are discussed; discuss with students the results of scientific research at the department [14].

Experimental

The work used theoretical methods of studying the problem of developing the research potential of students, as well as empirical methods of pedagogical research (observation of students during educational activities, namely, identifying active students in practical classes, questionnaires; analysis of the results of scientific activities of students with whom scientific research was conducted; work, generalization of pedagogical experience).

Results and Discussion

Our study, which consisted of two stages, was attended by students of Karaganda Technical University. The sample was 225 people aged 17 to 20 years between 2018 and 2020.

The first stage involved the identification of students who are interested in various types of research activities and have the ability to analyze, think critically, and search for new information.

Thus, at the first stage, using the observation method, the most active students were identified, who showed a high level of knowledge in practical classes, through the fulfillment of creative tasks (Case-study, projects, presentations). This category of students was chosen to participate in research activities. Students regularly participated in conferences of international and republican level, olympiads, competitions, webinars, which affected the quality of preparation of scientific reports, articles, presentation of projects.

The second stage, which includes writing joint scientific work under the guidance of a teacher, consisted of the following areas:

- 1) diagnostic (identification of scientific interests of students);
- 2) practical (consideration of the structure of research work, its tasks and forms, writing style, etc.);
- 3) search and provision of information to students about scientific events;
- 4) verification of scientific works, joint analysis;
- 5) encouragement of the best students.

It is important to note pedagogical methods as a means of achieving success in students' research activities. Of all types of interactive methods, the most popular in the educational process of the university are: the method of brainstorming, analysis of problem situations, discussion [9]. To develop the scientific potential of students, we have developed a strategy that includes motivational-value and reflexive components.

The motivational-value component involves the determination of internal satisfaction and comfort from the results of one's educational activities. The implementation of this component is aimed at creating a favorable psychological climate, an atmosphere of benevolence, and a positive attitude towards educational activities. The motivational basis of students' research activities includes the motives for creative mastery of the material, the desire for success, the desire to be the first among fellow students, receiving a moral and material reward for their scientific activities; striving for self-education and self-improvement.

The reflexive component as an expression of the social assessment of the student's achievements presupposes the actualization of the ability for self-regulation of behavior and an adequate self-assessment of the result of one's own educational and cognitive activity and the assessment of the perception of this activity by others.

According to the results of the analysis of the research activities of students from 2018 to 2020, there is a positive trend in the growth of the number of students who took part in scientific events of various levels, which made it possible to show research abilities, demonstrate the ability to navigate in the field of the studied specialty, and activate intellectual and creative potential.

We noted that the most active participants in the CRA are students of 1–3 courses of bachelor's degree. To identify the motivation for scientific activities of students during 2018–2020, a survey was conducted. The respondents were asked a number of questions regarding their involvement in CRA, in particular:

1. In what types of CRA do you participate in the university?

- a. student research papers competition
- b. student scientific and practical conference, seminar
- c. student olympiad
- d. writing an article

2. What difficulties did you face in implementing the CRA?

- a. inability to use electronic library resources
- b. lack of skills in working with literary sources and search engines

c. choice of research topic

d. lack of interaction with the supervisor

3. How do you assess the level of your involvement in CRA at the university?

a. high

b. low

c. average

d. find it difficult to answer

4. What does participation in CRA give you?

a. material incentives

b. receiving an increased scholarship, additional points

c. the prospect of getting a prestigious job

d. realization of intellectual abilities

5. How can the motivation to participate in the CRA be increased?

a. material incentives

b. extra points

c. organization of meetings with scientists and practitioners

d. preparation of joint scientific publications

According to the results of the survey, 28 % of students showed a high level of motivation to participate in the CRA, 48 % — an average level of motivation, 24 % of respondents — a low level of motivation.

The results of a questionnaire survey to determine the level of students' motivation for 2018–2020 are presented in Figure 1.

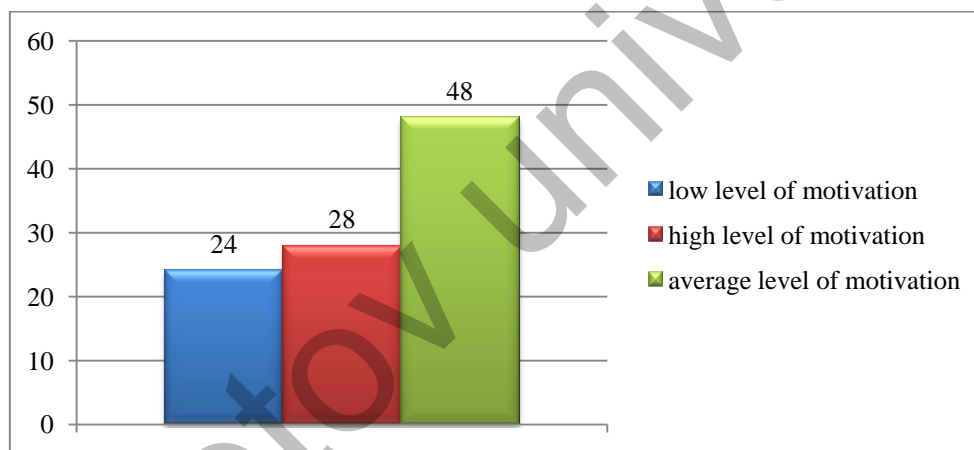


Figure 1. Students' level of motivation for CRA

The main reference point for students at the CRA is such a factor as personal achievements, which includes the acquisition of new knowledge and skills (28 %), scientific interest in the field of the studied specialty (11 %), the desire to realize intellectual abilities (11 %), the prospect of obtaining a prestigious job (20 %). It should be noted that the increased scholarships and additional points are an important incentive for the respondents (26 %). A comparatively small percentage of the respondents consider CRA as a forced necessity (4 %).

Among the forms of CRA proposed in the questionnaire, the most preferable for students is group research work (34 %), preparation of articles and participation in conferences of various levels (15 % and 20 %, respectively) and Olympiads (25 %). Students show the least interest in participating in scientific circles (6 %).

According to the respondents, for implementing an effective CRA, first, it is necessary to develop skills in using the electronic resources of the library (25 %). Unfortunately, a large percentage of students note the lack of skills in working with literary sources, search engines, and databases (20 %). Besides, they cite a lack of interaction with their supervisors (9 %), experiencing difficulties in their work. Also, most of the respondents (46 %) were not involved in CRA before studying at the university [2].

The reasons for the low level of motivation of CRA students are illustrated in Figure 2.

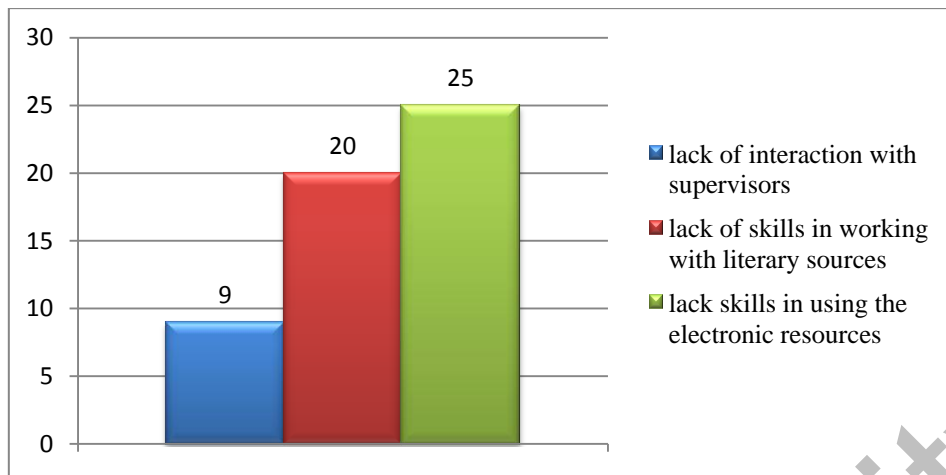


Figure 2. The reasons for the low level of motivation of CRA students

In addition to the questionnaire survey, we analyzed the scientific articles of the 3rd year students who published their works starting from the 1st year. The advantages of these articles include a conscious approach to the choice of the topic of study, the internal logic of the text, due to the careful selection of material and language tools, the ability to reasonably express their point of view and critically understand various aspects of the topic.

In the course of our reflections, we pay attention to the aspect of international cooperation, within the framework of which Department of Russian Language and Culture annually holds a competition of scientific projects among students “Three minutes of abstracts” with the participation of Ivanovo State Power Engineering University (Russia), Belarusian State University (Republic of Belarus).

This event is a form of attracting students to research activities, expanding their general cultural and scientific horizons, acquiring business communication skills and conducting scientific discussions, ensuring high-quality language training.

The objectives of the international competition are to develop a scientific information and communication environment in the student community, stimulate research and educational activities of students and contribute to the formation of the intellectual potential of universities. The task of the participants is to prepare a video. During the presentation of the project, students demonstrate the ability to defend the hypothesis by solving practical problems. The main criteria for evaluating projects are the originality of the topic of research and the completeness of its disclosure, demonstration of analytical skills, compliance with the content with the structure of scientific work.

Thus, our monitoring of the participation of students in the competition of projects in Russian and English designated an increase in the number of people involved in the CRA, which amounted to: in 2018 — 24 students of KTU, in 2019 — 37, in 2020 — 54. It is necessary note that 18 students presented their work annually. An expert commission from among the teaching staff of KTU, ISEU, and BSU evaluated the projects. As a result, 15 students of 2–3 courses, who had not previously won prizes, became winners.

Comparative analysis of the content of scientific projects prepared since 2018 until 2020 showed a steady trend of students mastering the methodology of scientific research, improving their skills in working with scientific literature, electronic resources, and databases; development of analytical thinking and implementation of the intellectual potential of students.

Conclusions

In the context of our research, we came to the following conclusions:

1. The most preferred forms of CRA for students are group research work, preparation of articles, and participation in conferences at various levels.
2. Most of the students have an average level of motivation to participate in the CRA.
3. The main reference point in the CRA for students is most often personal achievements, scientific interest in the field of the studied specialty, material incentives.
4. For the implementation of effective scientific activity, skills to use the electronic resources of the library, search engines and databases are required.

Thus, it can be stated that despite the prevalence of the average level of motivation for participation in the CRA, there is a tendency to an increase in the degree of involvement of Karaganda Technical University

students. The reasons that have a negative impact on the effectiveness of the implementation of students' scientific activities are eliminated. There is no doubt that the creation of a favorable environment for research will contribute to integrating the activities of all subjects of the educational process and will increase the real opportunities for the development of the creative potential of students.

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С.А. Иванова, Д.Б. Тілеумбетова, Н.В. Докучаева, С.Ю. Тюрина

Техникалық жоғары оқу орындарындағы студенттердің ғылыми-зерттеу қызметінің әлеуетін дамыту

Мақалада техникалық жоғары оқу орындары студенттерінің ғылыми әлеуетін дамыту мәселесі зерттелген. Студенттердің ғылыми-зерттеу қызметіндегі жоғары мектеп оқытушысының рөліне ерекше назар аударылған. Университетте ғылыми қызметті ұйымдастырудың және мазмұнының ерекшелігі, сонымен қатар студенттердің жаңа білім мен дағдыларды алу мотивациясына әсер ететін факторлар, оқылатын мамандық саласына ғылыми қызығушылық, зияткерлік қабілеттерді жүзеге асыруға ұмтылу және беделді жұмысқа орналасу мүмкіндігі қарастырылған. Қарағанды техникалық университетінің базасында студенттердің ғылыми әлеуетін дамыту бойынша жүргізілген зерттеудің нәтижелері ұсынылған. Талдау барысында ғылыми зерттеулер үшін қолайлы орта құру шартымен студенттерді тартудың тұрақты үрдісі анықталған. Ғылым саласында студенттердің шығармашылық әлеуетін тиімді іске асырудың маңызды шарты ғылыми еңбекті ынталандыру жүйесін құру болып табылатындығы атап өтілген, бұл ғылыми қызметпен айналысудың тартымдылығын арттыруға мүмкіндік береді және болашақ инженерлердің бәсекеге қабілеттілігінің кепілі болады.

Кілт сөздер: ғылыми әлеует, жоо студенті, құзыреттілік, ғылыми-зерттеу қызметі, жоғары мектеп оқытушысы, студенттерді ынталандыру деңгейі, тұлғаға бағдарланған тәсіл, құзыреттілік тәсілі, инновациялық технологиялар.

С.А. Иванова, Д.Б. Глеумбетова, Н.В. Докучаева, С.Ю. Тюрина

Развитие потенциала научно-исследовательской деятельности студентов в техническом вузе

В статье рассмотрена проблема развития научного потенциала студентов технического вуза. Особое внимание уделено роли преподавателя высшей школы в научно-исследовательской деятельности студентов. Изучены специфика организации, содержания научной деятельности в вузе и факторы, влияющие на мотивацию студентов, такие как получение новых знаний и умений, научный интерес в области изучаемой специальности, стремление к реализации интеллектуальных способностей, перспектива получения престижной работы. Представлены результаты исследования по изучению развития научного потенциала студентов, проведенного на базе Карагандинского технического университета. В ходе анализа выявлена устойчивая тенденция к росту вовлеченности студентов при условии создания благоприятной среды для научных исследований. Отмечено, что важным условием для эффективной реализации творческого потенциала студентов в сфере науки является создание системы мотивации научного труда, что позволит повысить привлекательность занятия научной деятельностью и в перспективе станет гарантом конкурентоспособности будущих инженеров.

Ключевые слова: научный потенциал, студент вуза, компетенция, научно-исследовательская деятельность, преподаватель высшей школы, уровень мотивации студентов, личностно-ориентированный подход, компетентностный подход, инновационные технологии.

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