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Motivation system of students and teaching staff of higher educational institutions for research work accomplishment

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Abstract

This paper considers the main directions in the field of scientific and research work activation of students, young scientists and teaching staff. In the first part of this paper the main types of students' scientific and research work (SSRW) are enumerated. The recommendations are given on motivation of students for scientific and research work accomplishment. The system of scientific and research work organization developed for teachers and students in Tomsk Polytechnic University is presented. A new technology of efficient research work arrangement is a scoring system of teachers' activity assessment. Every faculty member gets points for personal scientific and research activity. Teaching load for the next term is spread among the teachers of the department following the results of obtained points.

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1. Introduction

Nowadays, one of the important components in establishing the process of specialists training is the involvement of these specialists in scientific and research activity. Participation in investigations develops creativeness in various forms of professional activity, inspires to deepen knowledge, forms analytical, prognostic and communicative skills as well as personal and professional characteristics.

Students' scientific and research work (SSRW) is one of the most important forms of the educational process. Research laboratories and project groups, student scientific societies and conferences, all these forms allow students starting serious research, finding fellow-thinkers, with whom it is possible to discuss the problem and share the results of the investigation. Anyway, all students of higher school institutions take part in research work. Writing reports, course papers, graduation works is impossible without conducting research, even very simple ones. But more serious scientific work, which is not required according to the curriculum, involves only a small part of students. A student, taking part in the scientific research, is responsible only for himself; the research issue, terms of work and the result of work depend only on him. Spending his personal time a student develops such very important qualities as creative thinking, responsibility, and the skill to take a stand.

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2. Motivation of students for research activity

Development and improvement of students' scientific and research work as a compulsory component of specialist training system is one of the most important pedagogical and psychological problems of the higher school. The analysis of statistics for 1999-2003 shows that at general students' growth in the institutions of Russia, their participation in research work is constantly decreasing. In 1999 the proportion of students taking part in paid activities reached 6,3%, and in 2003 – only 1, 4% from the total number of students, ie. decreased more than 4,5 times [1].

The following tasks are set in front of the department dealing with the establishing of students' and young scientists' scientific and research work:

- Young people involvement in scientific and research work at early stages of study;
- Human resources formation and effective academic advising support;
- Motivation for scientific and research work based on young people need satisfaction at each stage of a scientific and educational career;
- Development of the system of scientific events for youth;
- Implementation of informational, financial and methodological support for students and young scientists;
- Arrangement of individual guiding directed to the development of professional competences for young scientists.

The following classification of student's scientific and research work is available:

1. SSRW involved in the educational process, ie. taking place at study time in accordance with curriculum (educational and research work of students). It includes writing reports and abstracts, course and graduation papers, conducting laboratory works, investigation tasks in the practice period. Carrying out this work, students familiarize analytical, search and synthesizing elements of research. As a result, they obtain general and special scientific skills of conducting the research and synthesizing the results, elements of critical thinking and creativeness.
2. SSRW implemented at extracurricular time (extracurricular scientific work). SSRW at extracurricular time is the work of students in project groups and seminars, in the activity connected with commercial contracts and state tasks, participation of students in international investigations on contracts with foreign scientists and scientific organizations, in competitions for taking grants, the work at scientific and research departments, etc. Scientific supervisors administer students' scientific activity. Participation in scientific and research work helps students to understand the basis of their specialty, to apply knowledge for practical problems solution, and develops the skills of work in the scientific and industrial teams.
3. Public events, stimulating the development of SSRW. Here we can attribute competitions, subject olympiads, conferences, workshops.

A contest is the competition of several persons in the particular field of science aimed at the most prominent competitor identification. The arrangement of competitions is pointed at the increase of future specialist training quality, revelation and development of their creativeness as well as human resource formation for investigations and teaching activity [2,3].

A subject olympiad is the competition for the students of postsecondary institutions, which requires from participants to demonstrate knowledge and skills in the area of one or several studied disciplines. Olympiad arrangement is pointed at the quality improvement of future specialist training, their creative abilities development and successful talent pool formation.

A conference is a form of scientific activity arrangement, where scientists present and discuss the results of their research.

Research workshops demonstrate SSRW achievements and facilitate their propagation and promotion. In universities workshops are organized, as a rule, in the time of students' scientific and training conferences. Also, students may take part in regional and Russian national workshops for scientific and technical creative youth. In the workshops students present the exhibit items with novelty elements recommended for adoption in the national economy and in the educational process [2,3].

During the participation in public scientific events students demonstrate the skills obtained at the first two stages (SSRW involved in the educational process and extracurricular SSRW). The higher the results presented

at conferences, workshops and in competitions are, the more qualitative the skills become. For their fixing it is necessary to encourage students.

Moral, financial and organizational forms can be used to motivate students for research activity. The students, who are the authors of the best works, and their scientific supervisors are awarded with diplomas, presents, and they get the acknowledgement of the faculty or institute by order. The works marked by conference awards are recommended for presentation at regional and Russian national competitions. According to the recommendation of an organizing committee and relevant departments it is possible to stimulate the winners of subject Olympiads in the frame of the educational process.

Among the moral stimulation methods it is necessary to use acknowledgements by orders through the university, certificates, diplomas, recommendations for Master's and post-graduate course entering. The used benefits are personal scholarships, incentive payments, payrise, business trips for scientific events in other cities and abroad, putting on such projects as "University human resources". As organizational forms of encouragement it is possible to use as follows: introduction the most active students and young scientists in organizing committees of conferences and competitions, making them monitors, deputy heads of departments, etc. Stable stimulation of SRW members facilitates the creative approach to scientific work and gives the SRW participants career promotion.

This stimulation is especially necessary as far as scientific research and development is one of the most important directions in the activity of every university, particularly, Tomsk State Pedagogical University. A high level of scientific achievements allows their implementing on commercial contracts with enterprises, increases the prestige of the university and its position in all-Russian rating.

The solution of the problem of interest increase to scientific work among students can be implemented through the following technologies: creation and development of "elite" (or individual) humanitarian education, tutor institution, and specially organized structure, which manages scientific and research work (as it has been done at National Research Tomsk Polytechnic University).

Elite humanitarian education is pointed at individual support of every talented student at all the stages of his study. A scientific supervisor is allocated to each student, who is specially selected for participation in this program. And this supervisor determines the direction of the creative and scientific student's activity. Participation in scientific and research work becomes for these students the integral part of the educational process.

A rather important task is not only informing in time and organizing students' participation in the events, but also engaging new students and scientific advisors to SRW. The solution of this problem may be found with the help of tutor and monitor institution. Each group should have its own tutor from the teaching staff of the institute. The tutor of the group helps the most active and talented students, who are eager to take part in SRW, to choose the topic and a scientific supervisor. The monitor exercises the same function. With the help of monitors' meeting the information about SRW directions is given to course and group monitors, and they transfer this information to students, who are ready for SRW [4].

Therefore, to form stable motivation for scientific and research work among students it is necessary to establish the following conditions:

- To increase the prestige of academic science
- To stimulate the students, participating in SRW
- To engage students in rationalization and inventive activity
- To offer the opportunity for the students to use their skills and knowledge for actual problems solution in various fields of science, economy, technology and culture.

A tutor or a scientific supervisor should demonstrate attention and support, without which a student, especially, a first- or a second-year-student, will not be able to conduct "a boring scientific research" as almost every discipline seems to be at the first stages of its study.

Table 1. Assessment of scientific and research work of teaching staff

Section	Data	Score
1	Publications:	
	in central publishing	50
	abroad	70
	reports at international conferences	20

Section	Data	Score
	reports at Russian conferences	15
	reports at other conferences	10
	theses at international conferences	10
	Theses at Russian conferences	7
	theses at other conferences	5
2	Grants:	
	international grants	150
	Russian grants	100
	university grants	50
3	Awards at conferences	
	diplomas with degree at international conferences	60
	diplomas without degree, honorary certificates, recognition letters at international conferences	30
	diplomas with degree at Russian conferences	45
	diplomas without degree, honorary certificates, recognition letters at regional conferences	15
	awards at university conferences	15

3. Motivation of teaching staff for scientific and research work

Course scheduling (conducting lectures, seminars, laboratory works) for teachers facilitates the increase of motivation among teaching staff for research work. The teachers, who research actively, publish articles, take part in conferences, apply for patents, and participate in grants and commercial contracts, are underworked with teaching. At planning the academic load for the current term the head of a department considers a scientific rating, gained by a person the last term. Each type of teacher's scientific activity has particular score (Table 1). The rating of a teacher is combined from the scores gained by a person for the previous term for all the scientific and research work conducted by him.

At the end of the term the obtained rating is transferred into the teaching load. The teacher, gained the maximum score, gets the teaching load, which is 150 hours lower than the person, whose rating in the minimal in the department.

This system implementation will allow teachers finding the time for scientific work and creating new additional incentives for active research.

Students' scientific and research work (SSRW) is an important part of the system of highly qualified specialist training in the faculty of Technology and Entrepreneurship (TEF) at TSPU.

Main forms of SSRW at the faculty of Technology and Entrepreneurship are:

- Writing reports with a review of new scientific results;
- Conducting laboratory works with elements of scientific research;
- Investigations at practices;
- Writing course and diploma papers with elements of scientific research;
- Home works, tasks with the elements of creative search;
- Participation in SRW competitions, which annually take place in TSPU and other universities, regions and at federal stage;
- Participation in city, regional and international scientific conferences;
- Participation in workshops, student olympiads.

Engagement of students in SRW is practiced from the first year of study. Scientific results gained by the students are published in collected materials of conferences edited by the university and other organizations. Participation in SSRW has become a criterion for students' selection for scholarship awarding.

Annually, the students of Technology and Entrepreneurship faculty take part in the olympiads in disciplines entering the curriculum. According to the results of university olympiads the teams are formed that participate in city, regional and international olympiads.

The results of the scientific research are integrated into the educational process in cycles of specialist disciplines and major-specific disciplines.

The part of the students, taking part in SRW, makes 20% from the number of students, studying at TEF.

All the TEF departments participate actively in SRW arrangement. The faculty has 2 student laboratories, which are developing successfully: the laboratory “Ecological safety” (a supervisor: Fedotov A.S., PhD in pedagogy, the head of the department of Life Safety), the laboratory of traditional technologies and design (a supervisor: Bodrova A.Sh., PhD in philosophy, the ass. professor of the department of Technology and Entrepreneurship), the experimental and technical laboratory (a supervisor: Bandaevsky G.I., PhD in engineering, the ass. professor of the department of applied mechanics), the student design –studio “Wind of change” (a supervisor: Skachkova N.V., the ass. professor of the department of Technology and Entrepreneurship).

4. Conclusion

The faculty of Technology and Entrepreneurship (TSPU) as well as Tomsk Polytechnic University undertakes the following measures for motivating students and teaching staff for active scientific and research work.

For successes, gained in SRW and SSRW organization students are awarded with honorary certificates, presents, bonuses. Also, they are recommended for participation in prestigious workshops, conferences, competitions, and olympiads. The students, combining active scientific and research work with good academic progress, are recommended for taking a post-graduate course. The recommended graduates have the selective advantages at entering a post-graduate training programme with all other conditions being equal.

The teachers may be awarded with honorary certificates, recognition letters, diplomas, presents, bonuses for successes gained at training the students-SRW participants and for organizing SSRW events.

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