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Technical Competencies as an Individual Characteristic of the Personality of a Future Specialist

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Abstract
The review of national and international references is provided in article, the need of formation technical competences of students of the technical university in educational process is proved. The personality of a modern highly qualified engineer is objectively promoted in society as one of the key figures of socio-economic development. Crucial to the successful performance of their professional functions by engineers is the present level of technical competence of a specialist. It justifies the creation in the educational process of the conditions under which students can form technical competence, which is one of the priorities of higher education. In this paper, technical competencies are considered as a complex of knowledge, skills and personal qualities that determine the effectiveness of engineering work, based on the application of scientific and technical knowledge, and aimed at developing, researching and improving engineering and technical facilities. As a basis, vocationally-directed training in disclosing a positive attitude towards a future profession is considered based on the training profile, in knowing and understanding the requirements of the profession for personal qualities, and in an adequate self-assessment of their already formed technical competencies.

Keywords
Technical Competences, Educational Process, Future Specialist

Introduction

The solution of pressing social and economic problems is largely determined by the level of the country's scientific and technological potential, the most important component and the main value of which is engineering, scientific and technical personnel. The personality of a modern highly qualified engineer is objectively promoted in society as one of the key figures of socio-economic development (New opportunities, 2018).
The general trends of the current stage of the scientific and technological revolution, which are manifested in the rapid turnover of production technologies in the sphere of material production and communications, the widespread introduction of computer and information technologies, lead to changes in the content of engineering and technical work, its intellectual saturation and strengthening of the creative component. From the point of view of the success of the professional activity of a highly qualified technical specialist, his abilities to continuously update his knowledge and apply it to solve real problems, predict events and act effectively in rapidly changing conditions of professional activity, find creative approaches and sound solutions to emerging problems . In other words, decisive importance for the successful fulfillment by engineers of their professional functions becomes the available level of technical competence of a specialist. In this regard, the modern educational process should ensure the formation of the young generation of such competences that it needs in the information and production space. Therefore, the creation in the educational process of the conditions under which students can form technical competences is one of the priorities of higher education.

Materials and Research Methods

In the course of our research work, we used the works and works of domestic and foreign scientists, applied research methods such as questionnaires, conversation, observation, questioning and testing. In the second semester of the 2018-2019 academic year, a study was conducted on the basis of the Almaty University of Energy and Communications, which provides training for qualified specialists in mainly three areas: electricity, heat and telecommunications.

E–ISSN: 2582 7456

Theoretical Analysis

1. Today, an analysis of modern literature of national pedagogy has shown that this issue is reflected in many works in which competence is defined as the integrity of knowledge, skills and acquired skills, and competence is considered as an element of an ideal entity (Mazhitova L.H., Nauryzbayeva G.K., 2014:14).

According to the pedagogical encyclopedia, the concept of "competence" includes, in addition to purely professional knowledge and skills, such qualities as: initiative, cooperation, the ability to learn, evaluate, think logically, select and use information, while the concept of "competence" includes an aggregate interrelated qualities of the person (knowledge, skills, skills, ways of activity), specified in relation to a certain circle of objects, processes, and necessary in relation to them high-quality productive activity (Great Russian Encyclopedia, 1993-1999).

According to V.A. Arabadzhi, competence determines the quality and level of professional readiness for activities, expressed in the nature of labor, the ability to find a rational solution to the problem in the face of various difficulties (Arabadzhi V.A., 2010: 26).

A number of dissertations are devoted to the development of the pedagogical basis for the formation of competences (FC) of students as an integral system in conjunction with skills in unity with the educational and creative process (Atlyaguzova E.I., 2011: 272).

In the works of foreign authors, there is a difference in the interpretation of the phenomenon under study. So, for example, according to A. Sanchez competence is a term widely used to describe human resources, to assess the productivity of people he defines competences as a set of related knowledge and skills that affect the performance of work and correlate with its effectiveness. In this case, competence can be attributed to the behavior that supports this area of activity, and the ability to attribute to the attributes that underlie the behavior. Thus, in his work, Burgoin D. proposes to link competences readily perform production tasks (Martin L., 2013:70).

In other works, competence is considered as behavior demonstrated by a person in the process of efficiently performing production tasks within a given organization, these are also features that are causally related to the achievement of certain results (successes) through certain actions and thanks to the maintenance of a single line of conduct, order of actions and conditions for the organization of effective work. This means that there is evidence that the possession of certain characteristics of competences predetermines and leads to the efficiency of production activities (Boyatzis L., 1982).

In essence, the basis of behavior is, in our opinion, the competences necessary to achieve the desired result. Competence - this is what an individual can demonstrate, shows that it can be determined, evaluated, formed. Some desired competences characteristics are easily defined and measured using criteria and indicators. However, many researchers see this as a difficulty. At the same time, it is obvious that the activities of some specialists are more effective than those of others. By measuring competences, it is possible to analyze the reasons why a specialist's work becomes more efficient and to find all the constituent factors for this. Thus, in foreign sources, the term "competence" is used in many contexts and with different meanings. In the work of U. Biham, technical competences are divided into three categories:

a. Factors that allow individuals to be competitive;

b. The qualities and skills that the specialist must exercise in order to achieve efficiency in the performance of official duties and production tasks;

c. Personal aspects that imply skills, achievements and results of human activity. Thus, the author considers the technical competence as the unity of the individual specialist, his consciousness and activity in conjunction with the processes of activity and communication (W. C. Byham, 2016).

In the work of A.Yu. Slavina, N.A. Shmatko, O.F. Firalova and O.P. Kornienko (Borisova L., 2006) technical competences are interpreted as follows:

a. Mastering the knowledge, skills and abilities necessary for the work in the specialty, while at the same time autonomy and flexibility in solving professional problems; developed collaboration with colleagues and professional interpersonal environment.

b. Designing standards, which are "elements of competence", which include:

- Performance criteria (a measure of quality);
- Application area;
- Required knowledge.

c. Effective use of abilities, allowing you to fruitfully carry out professional activities according to the requirements of the workplace. In this sense, competences go beyond the professional triad: "knowledge-skills-skills" and include informal and informal knowledge and know-how (behavior, fact analysis, decision making, work with information, etc.).

The concept of "technical competence of the student," in the work of L.A. Borisova is defined as a complex integral system of personal and professional qualities of a future specialist, characterizing the degree of development (self-development) of an individual, individuality and reflecting the synthesis of technical knowledge, skills and intellectual abilities, a set of value orientations, motives and needs of a student's professional self-improvement (Borisova L. A., 2006).

E–ISSN: 2582 7456

In turn, N. Ageeva, analyzing the axiological and methodological foundations of engineering, comes to the conclusion that technical competence is the knowledge, skills and abilities necessary for the effective performance by employees of their official duties. These competencies differ from others in that they affect the area of special knowledge and skills. The knowledge that a person has and is necessary for the effective performance of work must be implemented in skills and abilities (Ageeva N.V., 2004).

Meanwhile, in the works of foreign authors (John Zamboni, Laura Bramble and others) technical competences are characterized as follows:

A. Application of knowledge and skills necessary for effective work in a specific role or group of workplaces in an organization. They are closely related to the knowledge and skills necessary to succeed in specialized areas.

B. Use in combination with general or interpersonal competence to create high-priority job profiles that focus on both "soft skills" and "know-how" necessary for successful work.

C. The ability to distinguish jobs in the functional area (Aldous H., 2000).

Thus, the analysis of psychological and pedagogical literature indicates that technical competence is the knowledge, skills and abilities of the individual, contributing to act properly in accordance with the requirements of production activities, to solve the class of professional tasks in the field of technical work in an organized way, questions and problems regardless of others, to self-assess the results of their activities, and readiness for their professional role in a particular area of technical labor. Willingness to professional activity from a psychological point of view is characterized by the presence of specialist knowledge and skills that allow him to carry out his activities at the level of modern requirements of science and technology.

Based on the analysis, we can formulate the following conclusion: technical competence - this is a complex of knowledge, skills and personal qualities that determine the effectiveness of engineering work, based on the application of scientific and technical knowledge, and aimed at the development, research and improvement of engineering objects (technical systems and technological processes). In our opinion, technical competencies allow for goal-setting and organizing collective production and technical activities for their creation and maintenance in order to meet public technical needs (reflecting the right attitude to technology and proper handling of equipment, equipment, tools and materials; compliance with safety measures; maintaining order in the workplace, the manifestation of accuracy in the work with machinery, equipment, tools and materials; resources, creating a comfortable and safe working environment, etc.).

Considerable interest on the part of scientists to the problems of technical competence, manifested in the last decades, can be explained by the fact that due to the growth of the modernization of science and technology, the technological power of man has increased significantly on a global scale. The close connection of technical competences with all other areas of human material and spiritual production leads to the fact that technical progress is becoming a key factor in the socio-economic development of society.

Paying tribute to the scientific and practical value of the results of the above studies, it is necessary, however, to note that so far, despite the substantial interest of scientists and the significance of the results obtained to date, the problem of the formation of technical competencies of students in the learning process is still not solved in a sufficient degree, in the scientific and pedagogical literature there is no experience in the development of the essence and the criterion-level structure of the phenomenon under study, the possibilities of formation technical competency of students, on the object material of natural sciences based on the content types (generalized) tasks of professional work of the future expert.

Meanwhile, the study of the experience of universities showed that the current system of preparing a future specialist in junior courses does not put the formation and development of technical competencies of students a special purpose, and the study of its formation among students shows that spontaneous formation in the context of the educational process does not meet modern requirements.

We believe that there are several reasons for the lack of effective methods for the formation of technical competences:

- The lack of theoretical and pedagogical foundations for the formation of technical competences of students;
- lack of technology for monitoring the quality of professional training of students of a technical university, a general understanding of how a complex phenomenon requires specially organized measures to determine the pedagogical conditions for the formation of technical competences.

According to the analysis, as we can see, there is no unambiguous approach to the definitions of the terms "competence" and "competency" in the literature, as there is no theory and practice of pedagogy of technologies and methods of their formation under the conditions of training technical specialists. Especially it concerns the preparation of students at the undergraduate in the process of teaching natural science disciplines.

2. Each student can be characterized by the presence of his knowledge and skills, by his personal qualities, "sharpened" under the training activities carried out, by his attitude to the institute, his leadership, by his ability to "fit in" with the situation of the university. All these indicators constitute the concept of student competences (Armstrong M., 2004).

At the same time, technical competence is of considerable interest as a technical readiness and ability of a student

E–ISSN: 2582 7456

or specialist to perform tasks and duties not only in daily activities, but also as a combination of certain personality traits with a high level of technical readiness for professional activities to effectively interact with teachers and future colleagues.

3. Thus, technical competence is one of the most important characteristics of a student's personality. Competences include substantive (knowledge) and procedural (skills) components, because A competent student not only understands the nature of the problem, but also knows how to solve it practically (skills). Research materials on innovative technologies of higher education indicate the importance of the TC students as a decisive factor in the success of their training, as well as in the subsequent professional activity (Mazhitova L.H., Nauryzbayeva G.K. 2010:74), therefore, the formation of the TC students must begin at the undergraduate in order to improve efficiency and improve the quality of the educational process.

In this regard, we are developing the technology of effective formation of technical competencies of students at junior courses at a technical university on the basis of professionally-directed education, orienting all the components of training for the future specialist to acquire the competencies necessary to carry out professional activities. In turn, technical competencies include a set of interrelated knowledge, skills, skills, ways of activity and personal qualities that determine the effectiveness of solving problems that arise in the process of productive work. At the same time, competence is a list of standards that clearly describe what a student needs in order to best organize their professional activities in the future.

The use of such technology allows a student who finds himself in a new learning environment to successfully adapt to them, to join the professional knowledge, skills, and skills if his activities at the university contribute to the formation of readiness to meet the requirements of the university, i.e. it should be carried out in a special way created pedagogical conditions for the formation of technical competencies that contribute to this.

The technology of forming technical competences offered by us is based on the use of professionally-directed training with a focus on the object of the future professional activity of a specialist. This technology contributes to the creation of pedagogical conditions for the convergence of educational and cognitive activity of students with their future professional as the basis for the formation of the TC. In this case, the formation of the TC in the conditions of preparation of students of the university can be carried out effectively, provided the content and teaching methods are oriented to the model of the specialist's activity based on the competence-based approach to professional training.

In pedagogy, the competence approach is clearly marked in the works of scientists (Armstrong M., 2004), the use of which to simulate learning processes allows you to create a methodological basis for vocational-directed learning physics, which effectively contributes to the resolution of contradictions caused by the dual position of physics in a technical university. By professional orientation of teaching physics, we understand the content of educational material and the organization of its mastering in such forms and types of activities that correspond to the systematic logic of constructing a physics course and imitate the cognitive and practical tasks of the future professional activity of a specialist.

Results

We propose to use professionally-directed training, which enables the student to form professionally-oriented knowledge, skills, and necessary personal qualities in the context of technical competencies.

In the second semester of the academic year 2018-2019, a study was conducted on the basis of the Almaty University of Power Engineering and Telecommunications, which provides training for qualified specialists in mainly three areas: electricity, heat and telecommunications. The necessity of forming TC students among university students is also due to extremely rapid changes taking place in all areas of modern science, engineering and technology. This led to experimental work on the formation of students' TCs in the training groups of the institutes of electric power and electrical engineering, heat and power engineering, control systems and information technology. We studied the possibility of forming the TC of university students in groups of specialties «Electric power industry», «Head power engineering», «Radio electronics and communication», conducting a stating experiment. The tasks of the ascertaining experiment were to identify the levels of students' TC formation, as well as to check the possibilities of using the indicators identified in our model and the corresponding diagnostic tools. In the experiment, a complex technique was used, including questionnaire, observation, testing, and others.

When conducting a survey of students, they were asked exemplary questions:

1) Do you believe in the right choice of profession?
2) Do you believe in the right choice of your specialty?
3) Do you find the positive side of your choice?
4) Are you familiar with the future profession?
5) Do you have an idea about your future profession?

The results obtained in the course of the ascertaining experiment confirmed our assumption that the absence of a specially organized teaching methodology in junior courses affects the formation of students' TCs: for example, 62.3% of Institute of Electric Power and Electrical Engineering students and 54.1% of Institute of Heat Power

E–ISSN: 2582 7456

Engineering students, 51.6 % of Institute of Management Systems and Information Technologies students showed low levels of TC; the average level is 32.4%, 39.7%, 35.6%, respectively. These data led us to the conclusion about the need for special purposeful work in the university environment on the formation of the TC, which we will continue to consider.

In the practice of AUPET, the staff of the registrar's office (RO) twice a year, after the end of the examination session, calculates the so-called total student rating, determining it on the basis of summing up the examination grades set in percent using weighting factors. The value of the weight coefficient depends on the cycle of disciplines and the timeliness of the student passing the settlement and graphic work, exam or defending laboratory work.

As an individual criterion for the overall success of a particular student, we propose using a value equal to the ratio of the total rating of this student to its maximum possible value at the moment. The specified criterion, firstly, fully satisfies the requirements, and secondly, although it does not exhaust all aspects of the student's characteristics, it is at the same time quite informative, as it relies on objective diagnostic methods during all possible types of current, mid-term and final control, the results which are somehow reflected in the examination assessment.

In addition, exam scores take into account the structure of the educational and cognitive activity of the student, his technical activity. Therefore, this criterion can serve as a fairly reliable indicator of the success of an individual student.

Dividing the range of possible values (from 0.4 to 1) into four equal intervals, we get four groups of students whose performance in the range from 0.4 to 0.54 corresponds to critical, from 0.55 to 0.69 to satisfactory, from 0.70 to 0.84 - good, and in the range from 0.85 to 1 - excellent levels of success in learning.

Discussion

Thus, professionally-directed training can be viewed as the basis for revealing a positive attitude towards a future profession in terms of the training profile, in knowing and understanding the requirements of the profession for personal qualities, and in an adequate self-assessment of their already formed technical competencies. Professionally-directed education is a process in which, firstly, conditions are created for arousing interest in a future specialist and his value attitude to his future profession, developing cognitive interest and striving to improve his knowledge and abilities; secondly, future specialists reveal the role and importance that the system of knowledge and methods of this academic discipline has, formed in the course of its study of skills and abilities, as well as qualities for successfully mastering the profession and solving professional tasks in the future; thirdly, students are included in educational, cognitive, educational, research and search activities that are adequate to the learning objectives, thanks to the reflection in the subject-activity content of the studied disciplines of the specific features of the object of future professional activity, its types and generalized (typical) tasks. Thus, the professional orientation of undergraduate education makes it possible to bring together the educational and cognitive activity of students with their future professional activity, which is a necessary condition for the effective formation of their technical competencies.

Conclusions

On the basis of a theoretical analysis of psychological and pedagogical literature, we defined the concept of "technical competences", and a preliminary survey of students showed that technical competences of students can and should be formed at junior university courses in the process of studying natural science disciplines (in our case, using physics as an example). In this regard, we believe to develop a technology for the formation of technical competences in a professionally directed learning environment. Thus, we need to develop a model of future bachelor's activity, which will make it possible to determine the goals of training in the language of professional tasks in production. The objectives of training will be able to determine the content and organizational and methodological support of the educational process for the formation of technical competences, and the criterion-level structure of technical competences, to diagnose their development.

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