



Assessment Methodology of Knowledge and Skills in the Competence Approach

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<http://dx.doi.org/10.18415/ijmmu.v9i5.3748>

Abstract

The article reveals the expertise criteria for assessing the mastery of skills, personal and professional qualities, as well as general engineering disciplines in the didactic combination of theory and practice, aimed at ensuring the unity of “Knowledge-skill-qualification-competency”.

Keywords: *Competence Approach; Knowledge; Practical Skills and Basic Skills; Signs of Competence; Communicativeness; Creativity; Cognitive Flexibility; Renais-Sance; Personal Ability; Personal and Professional Qualities*

Introduction

In recent years, in the training of qualified, competitive, competent personnel, the golden triangle rule that connects the transfer of knowledge with education, priority is given to improving the mechanism of full elimination of shortcomings in the education system in the framework of “Science-education and production collaboration” while ensuring coordination between higher education (higher education institution), science (Institutes of the Academy of Sciences) and industry (enterprise) [1,2,3,4].

In the educational process, it is necessary to adapt the triplet - the unit of “Knowledge-skill-qualification-competency” (KSQC) to the activities of the individual, to dynamically improve his knowledge, from simple to complex, from specific to general, to systematically form practical skills and competencies. As a result of the gradual development of personal qualities, man strives for perfection.

In fact, pedagogical and psychological “knowledge” in the scientific and practical spheres has been in a gnostic position as the main direction in the educational process for centuries. In this approach, the main task of education is to refer to the formation of systematized knowledge in students.

The reflection of the elements of true reality in the mind of the subject is called the process of communication with the environment, as well as the accumulation of life experience during social practice.

By the way, the way of knowing is recognized in the form of the formula “from living observation to theory, and from theory to practice”.

The processes of formation and development of theoretical and practical knowledge are such dynamically changing complex processes that are closely interrelated, firstly, the perception (understanding) of educational materials by the individual through memory, comprehension, comprehension and differentiation, memorization, systematizing, identifying, and synthesizing what has been accepted, and thirdly, applying the knowledge gained from life experience or practice.

After all, in today’s market economy, where technology is flexible and changing, the educational process: teaching and learning technologies must adapt to it. In addition, the goals and objectives of education must be updated, changed and improved without “hardening”. Even the new generation of textbooks needs to be improved in form and content, to become a source that meets the requirements of the principle of flexibility, which can combine the achievements of modern innovative science and practice.

Nowadays, modern educational processes should not only be a means of acquiring ready-made, universally recognized knowledge, but also serve the active and purposeful exchange of information in harmony with the environment - life throughout a person’s life. Only then, in accordance with the requirements of the competency approach, the combination of theory and practice is ensured in accordance with the requirements of educational standards, students develop the signs of competence- the ability in their chosen fields. In fact, this is one of the target goals of the educational process.

It follows that in the current era, when the unity of modern teaching and learning processes is considered as a rigorous technological process from a pedagogical point of view, the application of new pedagogical technologies in accordance with modern requirements for person-centered educational processes is a very urgent problem.

Therefore, the European Credit Transfer and Accumulation System (ECTS) pays special attention to the continuity of the Prerequisites and Postrequisites doctrines.

Skill is a set of actions aimed at the initial and guaranteed results, accumulated on the basis of certain theoretical and practical knowledge. Skill is the ability to automate operations or processes to the extent that they do not require “supposed” continuous control by the mind; in which case the operation is performed automatically at the level of mental actions, without the constant control of the mind. The skill is formed as a result of exercises.

Qualification is such an important level of professional training of a specialist (employee) that it is a product of knowledge, skills that are necessary to perform a particular job or scope of work, automatically and sustainably (somehow firmly) acquired.

The formation and development of basic skills unique to professionals is a key form of person-centered education and plays an important role in solving the problems of engineering practice, which plays a leading role in the economic growth of any country.

Clearly, engineering practice requires personal abilities to perform certain professional activities qualitatively and effectively. In particular, research on the experience of training centers in Germany Dresden-Bank, Mercedes, Opel, Volkswagen and others confirms the need for skills such as independence, flexibility, specialized knowledge, communication skills, efficiency, punctuality, creativity [5,6].

In this regard, it is important to note that the structure of professional activity of persons directly involved in education is combined in 11 algorithms consist of educational, organizational (ability to carry

out educational processes in harmony), communicative, perceptive (ability to find a way into the hearts of students), informational (perfect learning materials), the art of conveying them to the learners at the level of the requirements of the time, didactic (the ability of the learner to feel the heart through his knowledge, sharpness of mind, creativity and to evaluate the process objectively, fairly), directive, mobilization, stimulating, developing, creative (the upper limit is reflected in the acmeological system), gnostic (research) abilities [7].

Activity is classified into positive and negative views, taking into account in which direction a person's ability is assessed. After all, the ability forms, develops, perfects other's ability or vice versa. Therefore, it is necessary to correctly, fairly and objectively address the vital issue of the formation and development of personal abilities in the educational process. It should never be forgotten that people with negative intentions, such as evil, depravity, also have their own "abilities".

Today, when the foundations of the Third Renaissance are being laid in our country, the authors, recognizing the need to focus on a single, great goal, to preserve it, if necessary, put forward the idea of dividing one's abilities into two categories: basic - constructive and auxiliary (additional).

The ability to persuade¹ others, the constructive (basic) ability to persuade, the "innate" ability at the level of high moral art, spiritual courage. Through this ability, a person is able to fully imagine his or her own thoughts, to motivate others, to communicate fluently, to absorb, to persuade, and ultimately to lead with complete persuasion.

In turn, based on the Eastern philosophy of life, it is appropriate to "conditionally" divide the main ability into interdependent, content-based, harmonized educational and pedagogical directions. Which, the quality and effectiveness of education depends on the extent to which the person has acquired knowledge, practical skills and organizational activities.

It is no secret that in most pedagogical and psychological literature, the main - constructive ability is described as pedagogical-psychological-philosophical ability, based on the content, continuity, uniqueness, harmony of educational processes.

Recognizing the formation and sustainable development of constructive abilities on the basis of additional abilities, the authors acknowledge the usefulness of classifying auxiliary abilities in the following ways: communicative, perceptive, information-fast, ICT and mastery of foreign languages, expression of a sense of belonging (full sense of place in the socio-economic and political spheres), didactic, developmental, creative, gnostic (research), determination, ability to make quick and optimal decisions (decisions), professionalism (aspiration to professionalism) and so on.

It should be noted that in the "teacher-student" system, when a student's abilities approach, equalize or exceed the teacher's abilities, there is an increase and a new side of abilities is revealed.

According to the professional approach, the components of basic skills are divided into personal and professional qualities.

In fact, quality is a comprehensive philosophical concept that represents a set of important features specific to an object (the real object being studied). Typically, these characters have a more stable character, giving a description of quality. Features, on the other hand, have a relative character and, in addition to directly expressing aspects of the object itself, also distinguish similarities and differences from other objects. The inner moral qualities that motivate a person to do only positive deeds in life, to be exemplary and beautiful, are called human qualities.

Recognizing the didactic connection between theory and practice, the authors recommend the following algorithm-modeling of personal and professional qualities of participants in the process of

training socially active, qualified, competitive personnel directly involved in the education of a harmoniously developed generation based on these philosophical concepts.

Professional qualities: intelligence; demanding; to be able to cultivate professional self-esteem in order to love the chosen profession, to remain loyal and faithful, and to master its secrets; skill; devotion; creativity; striving for innovation - support for innovation and technological processes in society; to be considerate and responsible and to recognize a sense of responsibility; to be quick to understand life situations and to treat them correctly, objectively and fairly, without giving in to emotions; social activity; self-control with restraint (patience); good organization; competence; capability; smartness; saving; risk if necessary; skill; communicativeness (communicativeness through solidarity); cognitive flexibility; strict adherence to labor legislation, culture and traditions and values inherited from generations; compliance with applicable regulations and procedures in the maintenance, integrity and use of the workplace, tools, devices and equipment; respect, reverence for and adherence to the requirements of “teacher-student” traditions.

Considering that any person is engaged in a unique professional activity corresponding to society, personal and professional qualities include:

- demonstrate the universality of dialectical relationships;
- that both components of quality consist of high human qualities, personal abilities and personal positive qualities, respectively, leading to guaranteed final results aimed at educating a harmoniously developed generation in the educational process;
- we are convinced that human dignity and pride serve regular formation.

Now we are thinking about the professional skills that are now common in our daily lives and have a special place among the important universal professional qualities, which integrate education, science and industry, aimed at training qualified, competitive professionals.

In fact, skill (skill, mastery, meticulousness, intelligence, dexterity) means the ability to perform certain actions on the basis of a set of knowledge and skills acquired during a person’s lifetime. Skills are described as a complex mental structure, encompassing the emotional, intellectual, volitional, creative, emotional qualities of an individual, and are based on knowledge.

The number of exercises that form the skills of the educator (teacher) and the education receiver (student), the duration and volume of performance, the speed of formation of automated actions, the suitability of equipment, the quality of materials, modernity, completeness and quality structuredness, the accuracy of the goal of actions and the presence of motivation to perform them, the speed of the system feedback.

We discuss professional skills in the context of a symbiotic relationship in the form of an “educational triangle” between universities, Academy of Science institutions and industry, which has a special place among the most common and important universal professional qualities in our daily lives.

Like other professionals, the professional skills of educators are formed on the basis of emotional and rational, scientific-practical empirical, abstract or real imaginary concepts and philosophical views, based on previously acquired theoretical and practical knowledge, practical skills, life experiences.

It is appropriate to systematically classify professional and pedagogical skills directly related to technical education into the following groups:

- formation of general and extreme skills - the potential of educators or masters of industrial education in the educational process on the practical determination of sketch, calculation drawing,

internal stresses within the design requirements for engineering structures and their components (rods, shafts, beams, frames, arches, plates or shells) and to inculcate in the minds of students diagrams, empirical connections for the experimental determination of the diagrams, mechanical and technological characteristics of materials, also orientation of students to the appropriate application in practical calculations, as well as the independent performance and presentation of design and calculation work, etc; as well as in the discipline of “Strength of materials” according to the requirements of real sectors of the economy [8]: the need to adapt the problems to be solved in terms of strength, virginity, priority, durability responsibility and ability to explain with the help of beams, etc.) and if necessary, to analyze the economic performance in industry and construction; as well as the ability to act quickly and wisely in emergencies (natural disasters, sudden technological failures or pedagogical conflicts);

- gnostic (cognitive) skills - based on the requirements of the great goal of building the foundations of the Third Renaissance in our country, systematic demonstration of teachers or masters of industrial education their pedagogical, political knowledge and potential, life experience, as well as the ability to apply skills and competencies in the educational process within their priorities for the development of real sectors of the economy;
- didactic skills - the ability of teachers or masters of industrial education to clearly define certain goals and objectives of education, with a complete picture of the guaranteed result, to use published literature (textbooks, manuals, handouts, experimental procedures, technology-oriented maps, video-audio lessons, slides, application of posters, pictures, diagrams, charts, tables, etc.) and equipment (media: slide projector, graphoprojector, film projector, VCR, personal computer, electronic board, etc.), to know the structure and operation of training laboratory and workshop equipment and to demonstrate the mechanism of their use in practice;
- design and technological skills - preparation of design work and design drawings in accordance with the engineering structure and its components, the procedure for conducting experiments to study the mechanical and technological properties of materials and registration of results, as well as qualified formation of technological-oriented maps and reference control tests. Strict adherence to them, responsibility and ability for the organization of experimental (in sample or in-kind) or practical-laboratory training in the laboratory and workshop with the help of measuring equipment, testing machines or mechanisms, equipment such as machinery and technological devices in the laboratory or training area; the ability to apply computer programs (in particular, one of the systems of automated development of drawings related to the structure or its parts- AutoCAD (Compass), automated design and computational work - Mathcad), to prepare students for science Olympiads and competitions; ability to use their scientific and creative potential in laboratory-practical training, practical computational-design, invention-design, as well as in research work;
- special and communicative skills - independent education of students, especially graduate students, on the basis of current educational standards, when there is a need to work in narrow professions or related professions in any sector of the real economy, related to production or not directly related to production, ability to organize classes; the ability of each student to work with individuals according to the nature of the problem or to help develop the skills to work in a group (team); as well as, if necessary, people with disabilities and developmental disabilities - to communicate with students or to teach them knowledge and skills based on our national values and traditions, to be highly cultured, political and legal maturity, professionalism, dedication and most importantly, the ability to demonstrate in practice that inclusive education excludes discrimination, treats all equally and provides rights.

Ability to demonstrate their personal qualities in pedagogical and psychological independent decision-making in the practical activities of engineers, pedagogues, masters of industrial education, psychologists, specialists-employees is considered “Competency”, “Competence symptoms”,

“Competence”. Competence should also be understood as a set of abilities of a future specialist (employee) to independently express their personal qualities in the process of solving vital, especially engineering problems in practice, based on the life experience, values and tendencies acquired in the educational process.

In fact, in the process of human activity, knowledge is dynamically improved from simple to complex, from specific to general, skills, abilities and competencies continue to be formed, and, of course, personal qualities develop in this way.

It is expedient to understand the basic competencies widely used in the theory and practice of education as a set of practical knowledge, practical skills and abilities necessary for a particular professional activity, and to recognize the existence of a dialectical connection between them.

The difference between basic competencies and basic skills is that they are not a personal description of the subjects of activity, but personal qualities manifested in creative abilities such as fluency of thought in life and focus on a guaranteed result, curiosity and ability to offer different options. These considerations confirm that, in practice, core competencies have a distinct character that ranks above the profession.

Now, on the basis of a competency-based approach, we will focus on professional competency, which is directly related to the activities of engineers-educators, practical teachers and psychologists.

The highest component of a person is professional competency. Professional competency is a combination of positive personal qualities of specialists (employee-es), as well as engineers-teachers and masters of industrial education, such as dedication, professionalism, scientific-creative, analytical-critical approach, resourcefulness, entrepreneurship. In general, these qualities unequivocally confirm that a person has the necessary level of knowledge, skills, abilities, and life experiences to perform a particular type of activity related to making stable and result-oriented decisions.

Pedagogical professional competence is manifested in the fact that the main direction of education in humane democratic legal states based on national and universal values is focused on the formation of a highly spiritual, well-educated, confident person with knowledge, skills and competencies related to nature and society.

The components of professional and pedagogical competence directly related to the areas of technical education are systematized in 6 forms (economic and socio-legal, spiritual-educational, special, methodological-psychological, intellectual and scientific-creative and innovative competencies) [6].

The above considerations are reflected in the modern educational process of high scientific and pedagogical, psychological potential, creative, highly cultured and enlightened, qualified for their profession, selfless, fair, organized, hardworking, socially adaptable to work or in a word it shows the role of competent pedagogical psychologists and masters of industrial education is invaluable.

The essence of the conceptual aspect of the competency approach, which plays an important role in the theory and practice of education, is that students work independently in the educational institution or in the future without direct involvement of a teacher or master or in the early years of their professional life. Competence focuses on the ability of learners to demonstrate their personal qualities in practice.

The competent approach in the educational process requires not only pedagogical psychologists and masters of vocational education, but also students to be responsible, reliable, independent, flexible, creative, skillful, agile, innovative ideas for the systematic and effective implementation of activities. application, a number of important professional qualities such as targeted decision-making - skills, real scientific-educational efforts and experience.

Accordingly, the module-credit system recognizes the control of KSQC and the uniqueness of this triplet only to professionals, in order to assess the mastery of the discipline “Technical Mechanics” in combination with theory and practice on the example of the section “Strength of materials” developed a system of “Expertise criteria for assessing the formation of knowledge, skills and competencies” based on a total of 32 interrelated components (Figure 1).

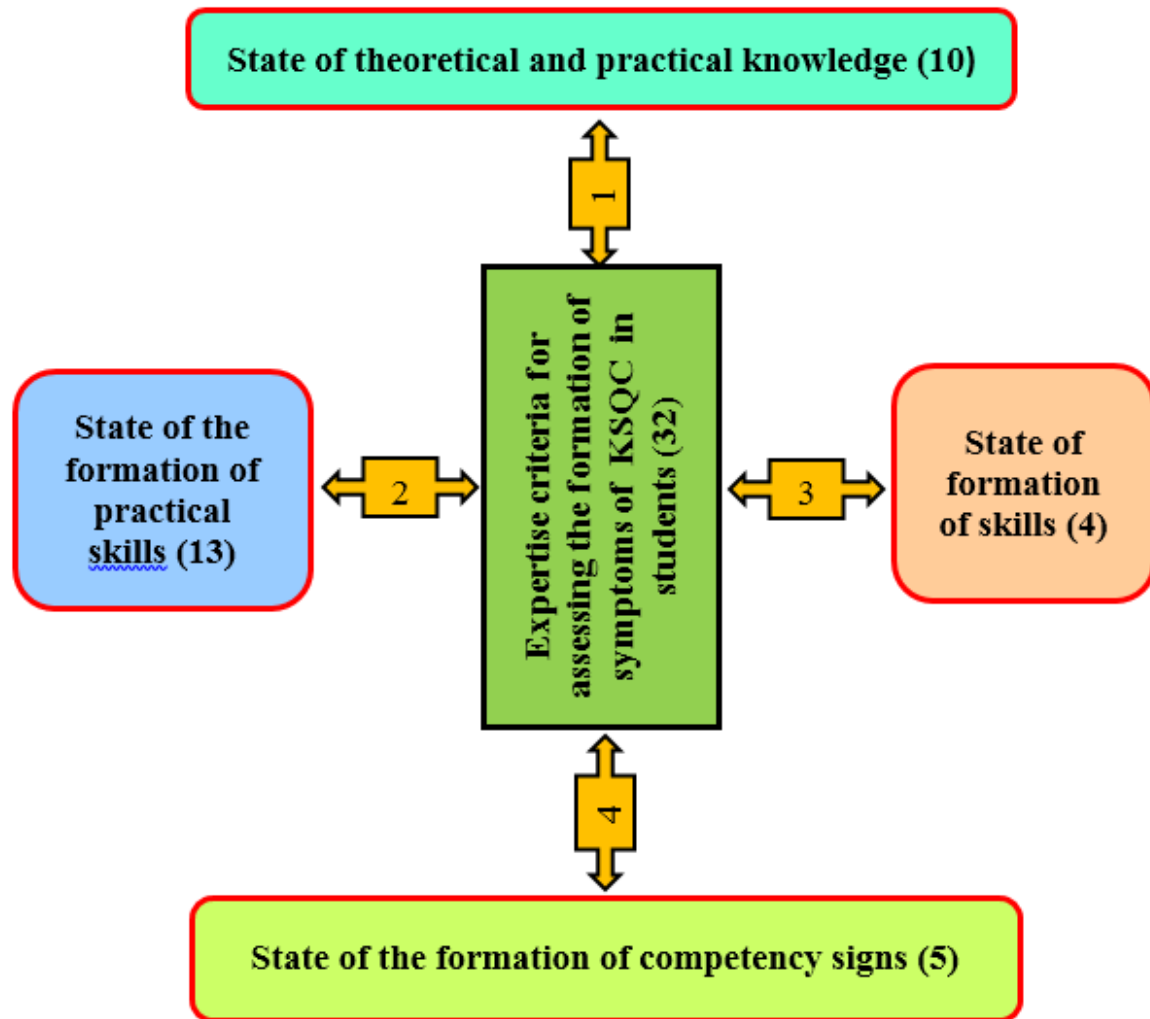


Figure 1. Expertise criteria for assessing the formation of symptoms of KSQC in students

Based on these criteria, pedagogical experiments were conducted, the results of which were analyzed analytically on the basis of “Multiplication method for calculating the sample mean and sample variance” (Figure 2).

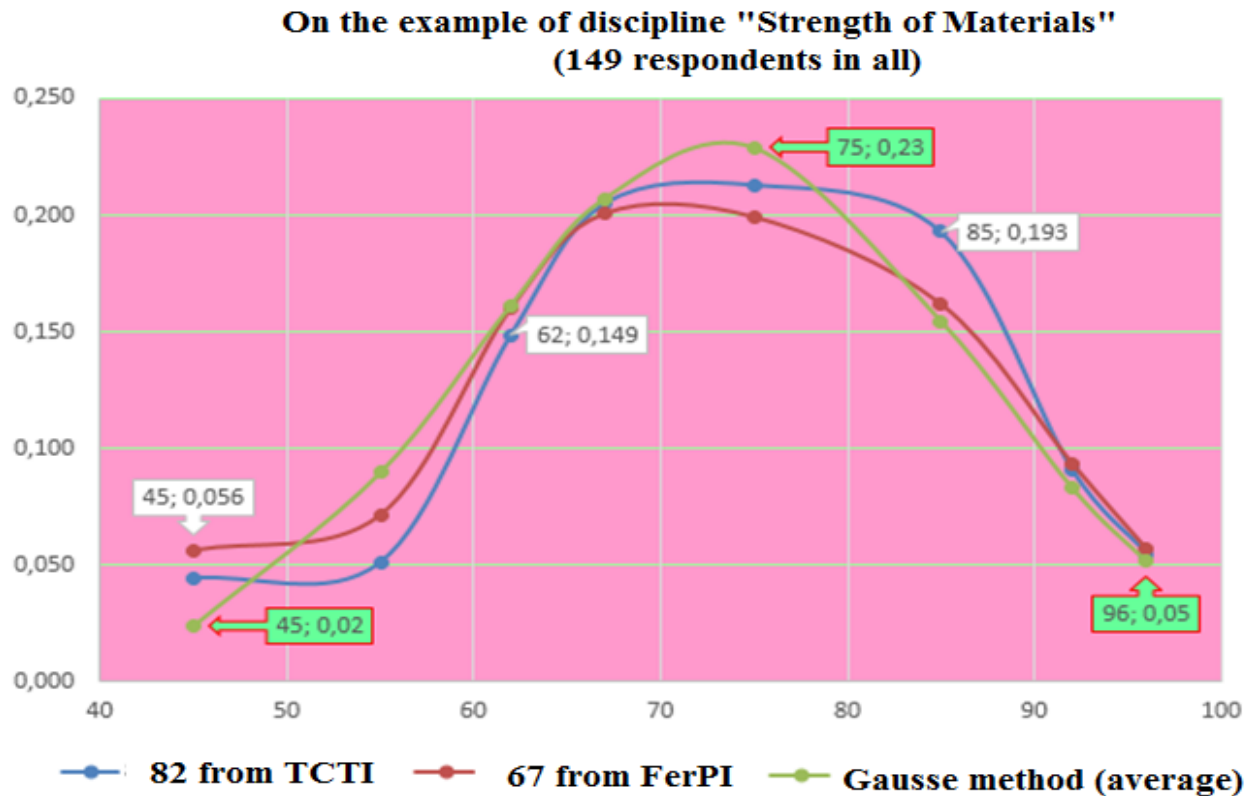


Figure 2. The results of the expertise to assess the mastery of the subject “Strength of materials”

The level of selection of the sample (in terms of variant, rating score) and on the ordinate of the standardization of the sample (frequencies) are placed on the abscissa of the normal curves constructed on the basis of experimental observation.

The fact that the “long part” of the empirical distribution graph is to the right of the mode (usually called the “variant” mode on the distribution score) and that the excise is negative indicates that the upper part of the empirical distribution is significantly “flattened” and the peak is below the normal distribution peak and confirmed that the normal distribution of frequencies observed through questionnaires conducted during the theoretical-practical examination corresponded to the Gaussian curve.

Conclusions And Suggestions

In order to ensure the combination of skills and competencies in a competency-based approach based on this research:

1. To make efforts in this direction through educational reforms Considering the gradual formation and improvement of practical skills and competencies as a complex process that requires special attention in the system of technical, professional-technical, higher education and vocational education;
2. Considering that skills are formed as a result of exercises and that skills are the product of knowledge, automatic and sustainable skills required to perform a particular job or scope of work, of course exercise should be viewed as a key factor in shaping and developing skills and competencies;

3. Systematic implementation of a combination of practical skills and professional skills based on theoretical and practical knowledge;
4. To consider the mechanism of application of new pedagogical technologies in accordance with the requirements of the time as a leading factor in ensuring the unity of modern teaching and learning processes in person-centered educational processes;
5. European credit transfer system pays serious attention to ensuring the continuity of the Prerequisites and their doctrines within the ECTS;
6. Improving the professional profile of the modern teacher on the basis of the recommended personal and professional qualities;
7. In the combination of theory and practice it is necessary to implement the proposed “System of expert criteria for assessing the formation of knowledge, skills, qualification and competencies” aimed at assessing the mastery of general disciplines in the field of technical education (on the example of “Strength of Materials”).

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