The students will be able to identify and solve problems in an innovative way, and gradually develop their own creative abilities. The students will also be able to develop their own creative abilities [1].

The creative personality is the psychological basis for one's innovation and invention, and is a necessary, good and lasting personality quality for creators. The results of a long-term study of a large number of children by the American psychologist Puseymon show that most people with a strong innovative spirit are confident, motivated and have strong perseverance. Therefore, in order to cultivate a good innovative personality in students, we should focus on cultivating self-confidence, positive optimism, practicality, rigorous learning and indomitable character and rigorous, indefatigable and hard-working. The students should be confident, positive and optimistic, practical, rigorous, indefatigable and hardworking.

Science education creates the right atmosphere for students to exercise their will and develop good qualities. Science is a very difficult activity in itself and many scientific achievements cannot be made overnight, but often require a long process to achieve. Similarly, in science education, the process of experimentation to observation to analysis to conclusion is not always smooth and students often encounter setbacks or failures. Students need a positive attitude to face them, a rational mind to analyze them, and a strong will to persevere. It is this experience in research that develops the strong will necessary for innovation, and students learn to observe, analyze and deal with problems in the right way. The students learn to observe, analyze and deal with problems with the right attitude [2].

In science education can develop scientific habits of mind, establish a rigorous and rational scientific attitude, develop students' vision fields, generate a spirit of innovation and develop good creative skills. Thus, gaining a better understanding of the world and gradually developing the innovative this will lead to a better understanding of the world and the development of the character and qualities needed for innovation. Science education provides the necessary ground for the formation and development of an innovative spirit. Science education provides the necessary soil and sufficient nutrients for the formation and development of an innovative spirit. It also paves the way for innovation to move forward.

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**U. A. Beizerau, V. N. Dvorak**

## INTERNATIONALIZATION OF HIGHER EDUCATION: TRENDS AND QUALITY

*The article is devoted to the analysis of the key quality indicators in the activity of institutions of higher education in the conditions of internationalization of the higher education. Quality indicators of activity of institutions of higher education are considered through a prism of institutional approach. The results received in the analysis of cases in a number of the European countries are described. The article discussed the development of international higher education, the analysis of factors influencing institutions of higher education as drivers for the development of the economies of countries. The dynamics of growth in the number of students in countries and regions of the world has been studied.*

Governments of countries are increasingly considering education as one of the main factors contributing to the economic development of countries. In addition, increasing competition requires continuous improvement in the quality assurance standards of their education systems.

Another factor that increasingly determines the international importance of countries is the impact of the state of their research base. This work confirms the strong empirical evidence that internationally produced research is of great value (citation of studies was used as a measure of quality) – not least because it provides solutions to global problems and benefits to more than one country. Nobel Prizes are increasingly being awarded to researchers working in a country other than their country of birth. More than 60 percent of the laureates received education or research abroad. Particular importance is attached to the role of countries with emerging market economies. In parallel with their growing importance to world trade, they have become increasingly popular research destinations for scientists and have witnessed a significant growth in the scientific industry, the pace of international scientific cooperation and the registration of international patents. To maintain a high level of teaching and research, to meet the needs of the domestic and international student audience, on the one hand, and to meet global research challenges, on the other hand, significant and continuous investments in education are needed.

The current state of affairs speaks of an opportunity to better apply research excellence to commercial activities, which is an underutilized resource for generating domestic investment and research revenue from local and multinational corporations.

The internationalization of education and science is a critical goal for most higher education institutions for many reasons. These are raising quality standards and rankings, attracting the best students and faculty, generating revenue, pushing the frontiers of knowledge through research, and promoting internal diversity.

Over the past 20 years, the rapid growth in the number of students in institutions of higher education and the international mobility of students in the world has followed the growth of world trade and has outpaced the growth rate of world GDP by many times [6].

This growth is increasingly seen by national governments as a means to achieve national priorities and promote economic growth.

This study examines four major trends in international higher education: international student mobility flows and the demographic and economic factors that influence them; the emergence of new models of global partnerships in the field of higher education, including partnerships in the field of training and awarding academic degrees abroad; internationalization of the research sphere; commercial research activities undertaken by higher education institutions in various countries in response to declining investment in higher education in a growing number of countries.

In order to obtain an accurate forecast of international student flows, special attention is paid to global higher education enrollment rates and their projected growth in the near future. In addition, out-of-country and out-of-country student mobility rates were studied in order to determine how many students from each country of origin would study abroad and to determine the appropriate areas of study.

In 2019, the number of students in higher education institutions in the world reached more than 210 million people. Only four countries – India, China, USA and Russia – have a combined share of 45% of the total number of students in higher education in the world. Other emerging market countries with significant HEI enrollments include Brazil (over 7 million), Indonesia (over 6 million), Iran (over 5 million), South Korea (over 4 million). ) and Turkey (more than 4 million people) [7].

One of the key features of the global higher education sector is the growth of student mobility at the international level. Their number has risen from 800,000 in the mid-1970s to over 4.5 million in 2017. However, the global average outbound mobility ratio (the number of tertiary students participating in mobility divided by the total number of tertiary students) has remained fairly stable since the early 1990s, at just over two percent per year [7].

The main countries-suppliers of students participating in international mobility are India, China, South Korea, Germany, Turkey and France. However, while China and India together account for 29 percent of the global HEI student population, they only account for 21 percent of the total

international student population, mainly because they have lower outbound mobility rates than the global average.

Outbound mobility rates vary considerably across countries, from 50 percent for Botswana and 30 percent for Trinidad and Tobago and Mauritius to less than one percent for the UK, US, Australia, Russia, Indonesia, Philippines, Egypt and Brazil. Countries such as Hong Kong (China), Singapore, Ireland, Nepal, UAE and South Korea have higher average global outbound mobility rates, as do many European countries due to high mobility within Europe [2].

The main host countries for foreign students are the USA, Great Britain, Australia, France, Germany, Russia, Japan and Canada. Together, these countries host 60 percent of the total number of international students. Other countries are playing important and increasingly significant roles at the regional level: South Africa; Singapore, Hong Kong and Malaysia (Southeast Asia) and South Korea (Northeast Asia).

Countries such as China and Malaysia have much larger incoming student flows than indicated in the UNESCO data. In addition, transnational education programs are becoming increasingly popular around the world among both local and international students; however, data on the number of international students remains incomplete.

Different sources use different methods for determining and counting the number of international students. they take into account various forms of international higher education.

Recognizing the current and growing future role of some Asian countries (as well as the Gulf States) as hubs of education with an increasing influx of higher education students, thereby competing more with traditional destination countries, is critical to understanding how the global landscape of higher education education will look like in the next decade.

Here we define the key concepts and their application to attitude towards higher education. They should be next operationalized and brought into line (adapted) to existing realities, since these concepts and concepts are still quite wide, and only certain elements of them are completely relevant, so this fact must be taken into account in this empirical research. The main regulatory elements in higher education are laws, local regulations, political strategies. In more detail, this is politics and normative regulation in the field of quality assurance, funding and resources. Internationalization, globalization, Europeanization are an integral part of the main legislative and regulatory acts, which are guided in their activities by institutions of higher education. For example, these acts govern the activities of foreign universities in the territory of this state. However, it is not uncommon for specific national policies to apply positive attitude towards internationalization in higher education, which, certainly implies and takes into account the ideas of globalization and Europeanization. The influence of this direction in national politics may be different in intensity and strength in different countries. Especially if the universities have a significant institutional autonomy, and if this policy does not carry such a mandatory character as laws [3].

Moreover, international, European and global development can have an impact on the national legal and regulatory framework, which, therefore, over time changes under the influence of development. Following the line of explanation leading to the first expectations of development of legislation, regulatory framework, it is important to study changes taking place at the supranational level. European Union is one of the main players in the international markets in supranational level. Several aspects and levels need to be taken into account with respect to legal framework and policy. In general, in all states there is national legislation governing higher education. As a rule, these regulations include certain issues related to globalization, Europeanization and internationalization and their application in a particular country. All these documents belong to the so-called “national” level. Legislative and other regulations, policies at the level European Union, CIS and other international associations of countries belong to the so-called "supranational" level. Significant the reservoir for research are documents related to the Bologna process, as well as European cooperation programs in areas of education and science. Quality is a core value and a key indicator in higher education. The quality of higher education is usually controlled by mechanisms for ensuring the quality of education, prescribed in special legislation, rules, regulations, etc. at the national level. For

the first time formally education quality assurance policy emerged in the early to mid 1980s, although not in all European countries. Europeanization, globalization and internationalization certainly contribute their own adjustments to the national quality control systems of higher education. First of all, internationalization is one of the aspects to be taken into account when evaluating quality, since the default is the statement that currently time high quality education and research require presence of an international component and international orientation. Further, ensuring the quality of education, in addition to the national one, can must have an international or regional component. As examples include the Joint Quality Initiative, which is a derivative document of the Bologna Declaration. Joint Bologna Initiative for Quality Assurance education is an informal system for ensuring control quality and accreditation of undergraduate and graduate programs in Europe. Such initiatives should lead to the formation international standards to be used in systems quality management of universities in Europe and the world [4].

If these changes are international, global and European level will continue to influence systems of quality management and setting international standards in sixteen areas of higher education, it is likely that universities will be under pressure of regulatory and regulatory factors. This will make the HEIs make changes in their quality management systems, respectively, and in the work with applicants, graduates and employers. Universities may (and usually do) have additional funding sources other than the state budget. For most HEIs, the processes of internationalization, globalization and Europeanization is an additional opportunity to receive extrabudgetary funding and other sources of financing. The main way for now was to attract students studying for a fee. In the aspect of internationalization, many universities from different countries compete in the international market of educational services for attracting international students who can make a significant contribution to the budget of the HEI by paying tuition fees. The second source of financial resources for universities are international grants from transnational corporations, foundations, or grants allocated under the European programs of regional and international cooperation. Normative and cultural-cognitive components, as it was mentioned earlier, explain that norms and values in many ways have a serious impact on the activities of institutions of higher education and its members. Some of the institutional elements representing the normative and cultural-cognitive components higher education, closely adjoin and overlap each other, therefore, they are considered in pairs. The main institutional elements in these components are changing norms, values and traditions, influenced by internationalization, Europeanization and globalization. Norms, values and traditions of higher education institutions, according to institutional theory influence the activity of universities and their constituents in certain situations, as well as and traditions formed in these institutions. It is necessary take into account when conducting an empirical study the environment of cases and their history in internationalization, Europeanization and globalization.

There are several logical explanations for internationalization in higher education. They vary by country, region and time. Recent studies show that in general, economic explanation becomes more important, but it is necessary to distinguish between cooperative and competitive approaches used by universities that are forced to respond to the challenges of internationalization, Europeanization and globalization. Cooperation (collaboration) is a counterbalance to competition, at the same time these manifestations are combined – the same universities often are both partners and competitors. Another the most debated question is whether higher education public or private property or product. This discussion related to issues arising in connection with the application of the agreement on free trade. Therefore, this problem is also important take into account in research. Quality, in the sense of achieving academic excellence, has always been a core value of higher education. Nevertheless, defining and measuring quality in higher education is sufficient problem task. Just as in the case of the described phenomena (globalization, Europeanization and internationalization) does not exist a unified definition and approach to quality in higher education. The discussions reflected in the publications on this issue, show that there are several aspects of quality that depend on considering quality as a balance of the contribution of resources received results and processes. Harvey and Green see quality as "the exception perfection, full compliance with the goal, which can be measure with money and transform. It is often perceived that

internationalization has a positive impact on quality higher education. Claims linking internationalization and quality are usually based on the expectation that international cooperation and exchange of students, teachers and researchers, raised to critical mass will contribute to quality change through the exchange of experience, the study of foreign languages, exchange of ideas. On individual, project, institutional and even at the systemic level, international cooperation, according to eighteen researchers, will make a significant positive contribution in the quality of processes and results [5].

However, internationalization can also negatively impact on the quality of higher education. For example, if the teacher forced to conduct classes in a foreign language that he knows insufficiently, the quality of knowledge gained by students from this teacher, will be low. Some researchers have proposed several structures for highlighting differences between different disciplines (fields of knowledge) and grouping of teachers according to the given areas. Braxton and Hargens for example, describe a number of similar structures. Often disciplines are divided into applied and theoretical. The disciplines are also divided into sections knowledge that they study [2].

Bettcher speaks of the need classify academic disciplines on two grounds: 1) the subject of their research (area of knowledge), and 2) the social structure (operationalization). Thus, there are four categories disciplines: exact / theoretical, humanitarian / theoretical, exact / applied, humanitarian / applied [1].

The goals of the organization are realized through its policies, strategies action and development, mission. It is generally accepted that under the policy is understood as the achievement of certain goals when using certain means and elections over a certain period of time. Previous studies have shown that internationalization in higher education occurs for various reasons and reaches different purposes. Political Approaches Described in Publications Organization for Economic Cooperation and Development (OECD) can be considered the most complete and reliable, because analyzed main factors (economic, political, educational and cultural) in the complex. Therefore, the approaches used by the OECD used for operational purposes. They originally used to describe national policies in approaches to internationalization in cross-border education. However, they can also be useful in describing institutional policy and approaches to internationalization in higher education, and national systems of higher education. Internationalization in the national education system is one of the parties cross-border education. Students coming to study nineteen in a certain state, contribute to the experience of international cooperation of this institution of higher education, its students and teachers. Since both of the above manifestations of internationalization are closely interrelated, it is obvious that and approaches to the study of these manifestations will be similar. Furthermore, it can rightly be said that the national politics has a significant impact on universities. HEIs evaluate internationalization in the same way as government officials, at the same time they have other reasons for internationalization. When it comes to approaches to internationalization, their description includes an analysis of tools to achieve goals. Publications made by the OECD describe four political approaches-goals. This is harmonization (mutual understanding), migration of qualified specialists, increase in profitability, capacity building. All of them have some distinctive traits. These four approaches overlap and, to some extent, can be seen as different ways achieving the same goals.

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**E. A. Dey**

## ABOUT TEACHING NUMERICAL METHODS ON THE SPECIALTY "COMPUTER PHYSICS"

*The article is devoted to actual aspects of the lecture course, methods of organizing and conducting laboratory works and computer testing of knowledge in the framework of teaching the discipline "Numerical Methods in Physics" for students of the specialty "Computer Physics" at the Faculty of Physics and Information Technology.*

Specialty 1-31 04 08 “Computer Physics” with Qualification “Physicist. Programmer” [1] has been operating at the Faculty of Physics and Information Technology since 2016. During this time, a certain experience in organizing the educational process and teaching individual academic disciplines has been accumulated.

The discipline "Numerical Methods in Physics" is studied by second-year students of the specialty "Computer Physics" as part of a component of a higher education institution for two semesters. The purpose of studying the academic discipline "Numerical methods in physics" is the formation of systematized knowledge, skills and competencies in the field of computer methods for solving problems in physics, higher mathematics and mathematical physics [1]. A distinctive feature of the course is the complex nature of the issues studied, since knowledge of physics, mathematics, and programming is used in solving each problem.

Computer physics is characterized by its subject and research method. The defining elements are the construction of a computer model and the conduct of a computer (computational) experiment.

Modeling is the process of establishing a correspondence between the model and the object under study, studying the properties of the model and transferring the results to the real object. A model is an artificial object, the studied properties of which are similar to the properties of a natural object. A mathematical model is a system of mathematical relationships (equations, inequalities, initial and boundary conditions) formulated on the basis of physical laws. In some cases, this system of relationships can be solved analytically and the answer can be obtained in a closed form (as a formula), but in most cases, numerical methods are required to obtain a solution.

Numerical methods are methods for obtaining a result by performing arithmetic operations on numbers. This requirement leads to the need to redefine such operations of mathematical analysis as integration and differentiation. In this case, the numerical analogues of these operations always give a result that differs from the exact one. The result of solving the problem using numerical methods always has an error. It is important to be able to evaluate and control this error.

A computer model is a program that implements numerical methods for solving the equations of a mathematical model using dialog elements for entering data and setting parameters, as well as using graphical tools for displaying results.

A computer model is used to carry out systematic calculations in order to obtain detailed information about the system. In this case all parameters of the problem are fixed, except for one,