

Abstract. The essence of term “globalization” is defined. The effects of globalization on engineering education system in the USA are shown. The leading approaches to learning are highlighted. The most characteristic features of higher engineering education development in the era of globalization in the USA are singled out. The basic tasks of education in engineering institutions are formulated.

Keywords: globalization, engineering education, active learning, distance learning, integrated approach to learning

Relevance of the investigation. The relevance of the research is caused by the rapid development of the higher technical education in the modern world. In almost all countries higher technical education is undergoing some reforms associated with the transition to innovative technologies due to the impact of the process of globalization on the educational aspect. The term "globalization" has been seen almost as a buzzword by all researchers, conceiving different meanings. It is a very broad and ambiguous concept. Consulting the huge literature that has been written, it is really hard to find a unified definition for it. In fact, globalization as a science overlaps and interacts with various disciplines such as economy, sociology and history. Thus, scientists and researchers of each discipline define globalization from their own point of view or from what concerns their disciplines. Despite the differences in the conceptualization, there is a great agreement among researchers that globalization has brought the world to be a small village through interconnectedness of the regions or continents.

Globalization as a concept has been used in both positive and negative way by different people in different situations. Everyone looks at the concept from his or her point of view and interests. However, there is an agreement among all theorists that globalization has had enormous impact on societies at educational level. Regarding the linkages between globalization and education, much has been written in recent years examining how education has been affected. For example, Marginson mentions that education “has become a primary medium of globalization and an incubator of its agents” [6]. In addition, Priestley argues that national education systems have been changed quite noticeably by the processes of globalization and that most changes happening recently in education can be attributed to the effects of and responses to globalization [8]. Correspondingly, Jones states that no educa-

tion system globally can survive and stay unaffected by globalization [5].

University education in the USA has become increasingly global. The USA is one of the countries that are developing rapidly. This rapid technology development and the permanent updating of the techno sphere impose increasingly high demands on engineering education development.

The purpose of this article is to provide a brief discussion of the effects of globalization on the engineering education system in the USA.

The trend of globalization is accelerating as the technological environment is constantly changing. Globalization has resulted in many new challenges to the technical education system. Till recently technologies were mostly imported and the training needed for these technologies were generally carried abroad. Globalization has opened the economy to global players in the industry and service sectors. New products and services are being introduced continuously with improved quality and customer focus. The key input to the success of this new brand of industries and service units is a group of highly motivated and meticulously trained forces. The knowledge and technical skills of this work force have to be regularly updated. The engineers should be capable of meeting the challenges of the modern industry. They should be up-to-date in their technical know-how. They must have a deep sense of quality, work ethics and motivation and be conversant with the skills, interpersonal skills, team work skills, self esteem, goal setting skills, leadership and creative thinking. Development of these skills is a part of curriculum in many universities. Globalization requires a flexible educational environment, which is efficient enough to support technical progress, and provide new career opportunities for technical professionals on a global scale. It is clear that technical progress stimulates economic growth and

the development of modern society is directly related with the quality of a country's educational system. The system of the higher technical education in the USA is characterized by a high level of individuality. It takes into the account the interests of an each student, their intellectual, creative and physical abilities. Some of the strengths of American technical education system are: the USA has got very rich and learned education heritage. Very good primary education which provides a very strong base. American education system moulds the growing minds with huge amount of information and knowledge. American education system gives the greater exposure to the subject knowledge. Americans are rich in theoretical knowledge. America has abundant strength of resources and man power [7].

The basic objective of globalization in the USA is to enhance productivity and to make the educational system an instrument of preparing students, who can compete in the world markets as productive members of the society. Many technical universities find themselves facing a new challenge: how not only to equip students with an adequate education in their field of study, but also to arm them with the skills and knowledge required to use technology effectively in the workplace. To meet the challenges of globalization, it would in fact appear necessary to prepare individuals for a workplace where responsibilities are constantly changing, where vertical management is replaced by networking, where information passes through multiple and informal channels, where initiative-taking is more important than obedience, and where strategies are especially complex because of the expansion of markets beyond national borders. Therefore, education must help individuals to perform tasks for which they were not originally trained, to prepare for a non-linear career path, to improve their team skills, to use information independently, to develop their capacity for improvisation as well as their creativity, and finally to lay the basis of complex thinking linked to the harsh realities of practical life.

The impact of engineering on our society is difficult to overstate. Engineering graduates are in demand all over the world. Engineers are needed not only for the practical application of the engineering industry, but also in professional fields including medicine, law, business and government. The specific knowledge of science and technology that engineering graduates provide is important for almost all organizations to remain competitive. The world needs more engineers, but these engineers must be prepared to function effectively in rapidly-changing global and technical environments [4].

Rapid technological change makes skills obsolete very quickly and demands higher levels of initiative and more frequent retraining. Newly emerging high technology jobs often require job seekers to have immediate 'plug-and-play' skills, cross-disciplinary knowledge, better communication and interpersonal skills, and the ability to work in teams. Other attributes such as motivation, creativity, self adjustment, commitment, attention to detail and a sense of responsibility are critical to success and must take equal priority to functional skills in technical education.

Globalization helped to grope new industries to compete in the world market, it also exposed the weakness in their economic fundamentals and resulted in financial cri-

ses, by reducing the value of their currencies, Globalization has increased economic growth in some countries, it has demanded heightened competitions Technical Education system is dynamic in nature, technical education is the component of education most directly concerned with the acquisition of the knowledge and skills required by workers in most manufacturing and service industries, It faces many challenges in responding to societal, technological and economic changes in the local and global environment, Technical education is widely recognized as an important part of the total education and training system.

The main task of higher technical education in the era of globalization is to educate creative and intelligent person. The educational environment prepares students for productive and satisfying careers in the midst of technological changes. The basic principle of higher engineering education in the USA is a synthesis of theory and practice. The main task is to teach the students how to learn and implement new technologies on practice.

As technology has evolved with the rapid growth of the Internet, it is only natural that the standard engineering curriculum must also adapt and change as well. As a result of this new technology and proliferation of Internet access to the general public, there have been strong pushes to disseminate knowledge using these new technologies. Technology development and computing resources are enhancing the computer-based learning. This kind of learning is gaining popularity spurred by a growing need for a life-long education in response to increasingly rapid technological change. Computer technologies are changing the way students learn. Computer networks offer new alternatives for creating, storing, and accessing, distributing, and sharing learning materials. They provide new channels for interaction between teachers and students, teachers and teachers, and students and students. Therefore, what and how to apply these technologies to engineering education is a great challenge for educators. Using modern computer technologies as a tool students can solve complicated problems and to acquire new skills. Technology is rapidly changing the way students learn and how instructors teach. As technology continues to evolve, it brings with it new opportunities and challenges for educators and students. This era of pervasive technology has significant implications for engineering education. The technological innovation made a major impact on teaching methodologies. In other words, old-style pedagogy and rote learning were replaced by more progressive methods. Educators apply new approaches to learning in order to enhance the engineering education:

- active learning;
- distance learning;
- integrated approach to learning [10].

Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing. While this definition could include traditional activities such as homework, in practice active learning refers to activities that are introduced into the classroom. The core elements of active learning are student activity and engagement in the learning process. Active learning is often contrasted to the traditional lecture where students pas-

sively receive information from the instructor. There is a growing trend to encourage students to take a more active role in their own education. The emphasis is more on learning and it requires the instructor to incorporate more active and student-centered learning methods into their courses. It is well established that hands-on experience can significantly improve student active learning and interest level in the course materials. Therefore, the more active the students are in the classroom, the more engaged they are in the learning process, and the more they remember. Rather than giving students the solution to their problems all the time, we can teach them how to search for and construct complete answers and encourage students to pursue active learning activities. Students became more capable of analyzing and evaluating on their own. This will guide them toward becoming independent thinkers and lifetime self-instructors [1].

The usage of an active learning approach engage students in doing and thinking instead of passive listening. The approach of active learning helps students to develop creativity, innovation and other important professional skills. For that, teachers must have social abilities to deal effectively in the world of human interactions, and to create stimulating contexts for exploration and experimentation allowing students to develop their knowledge, abilities and professional attitudes. Although this educational approach is similar to project based learning and problem based learning, the main differences are in that there is no previously acquired knowledge to be applied or previously defined knowledge that students should acquire. Also it is different because of the role of the teacher acting as a coach. Active learning is generally defined as any instructional method that engages students in the learning process. Active learning requires students to do meaningful learning activities and think about what they are doing, particularly in the classroom. In the traditional approach to higher education, the professor dispenses wisdom in the classroom and the students passively absorb it. Research indicates that this mode of instruction can be effective for presenting large bodies of factual information that can be memorized and recalled in the short term. If the objective is to facilitate long-term retention of information, however, or to help the students develop or improve their problem-solving or thinking skills or to stimulate their interest in a subject and motivate them to take a deeper approach to studying it, instruction that involves students actively has consistently been found more effective than straight lecturing. The challenge is to involve most or all of the students in productive activities without sacrificing important course content or losing control of the class.

Active learning methods make classes much more enjoyable for both students and instructors. Even highly gifted lecturers have trouble sustaining attention and interest throughout a 50-minute class. After 10-20 minutes in most classes, the students' attention starts to drift, and by the end of the class boredom is rampant. Even if the instructor asks questions in an effort to spark some interest, nothing much happens except silence and avoidance of eye contact. Tests of information retention support this picture of what happens in terms of recall. Immediately after a full lecture, students were able to recall about 70%

of the content presented in the first ten minutes, but only 20% of the content of the last ten minutes [11].

In the past decade, distance education has become an increasingly popular way for universities to provide access to their programs and for students to learn about topics and get degrees they might not otherwise be able to pursue. Instructors are using the potential of distance learning to teach students from all around the globe and allow them to work collaboratively on projects, degrees-focused content and educational enrichment. Many higher technical schools offer online courses in the USA today. The majority of distance education today takes place using the Internet, now readily accessible for the vast majority of students whether in their own homes or at facilities such as local libraries. These electronic means are used to distribute the learning material, keep students in touch with teachers, and provide access to communication between students. Of course, distance learning can use other technological formats as well including television, DVDs, teleconferencing, and printable material, but the immediacy and functionality of Web learning has made it a first choice for many distance learners. Online programs often take advantage of a number of emerging technologies to make keeping in touch and effectively communicating ideas easier and more efficient than ever before and students may find themselves using interactive videos, e-mail, and discussion boards to complete their lessons. Distance learning makes it much easier for some students to complete a degree or get additional job-training while balancing work and family commitments. Because the hours when class work can be completed are flexible, as most distance learning programs allow students to work at their own pace and on their own time, many students can complete their work during times when they are free, rather than scheduling their lives around a set classroom time. With more flexibility comes more responsibility on the part of the learner. Students must learn to work well independently and without the constant guidance and monitoring of an instructor, making distance learning a challenge for those who are not easily self-motivated. Many engineering institutions consider online learning key to advancing their mission, placing post-graduate education within reach of people who might otherwise not be able to access it. A number of elite institutions, such as Johns Hopkins in Maryland and Stanford University in California, offer highly regarded online courses, and students who complete coursework through Stanford's Educational Program for Gifted Youth (EPGY) and matriculate as undergraduates may use these credits towards their bachelor's degrees [9].

Over half a century of researchers and teachers have explored curriculum integration as a way to meet the many demands of 21st century curriculum and to make classroom instruction more manageable and more engaging. The so-called integrated approach is aimed at intellectual fusion. The program represents the convergence of disciplines and has stronger ties to the regional, national, and global communities through program content, distance learning. The defining characteristic of the program is the significant depth across the technical and general subjects. This program is notable for its integration of topics; general studies – humanities, social sciences, management, languages – are integrated with professional

studies. The purpose of this educational program is to promote the acquisition of technical skills and knowledge as well as reasoning and analytical skills. It helps the student get integrated in the knowledge based society, so students have an ability to use their knowledge in practice. The implementation of this program provides great opportunities for the engineering process activities: design, experiment, built, test. It encourages students' interest and stimulates their desire for research work and innovation, promotes the acquisition of the non-science skills required for the new global economy and global job market. It gives students the ability to communicate efficiently in the worldwide community. It helps students to understand the importance of self-development and life-long learning [2].

An integrated approach provides students with a holistic approach to learning that helps them make connections between the different learning areas and with a comprehensive curriculum that develops concepts, processes and skills; gives students a greater sense of purpose in their day to day experiences; assists students to understand and build on their experiences in order to make sense of the world; encourages teachers to utilize effective teaching and learning strategies that will enhance student's performance and learning outcomes; allows students to demonstrate skills, abilities and knowledge in varied contexts; allows for the achievement of many outcomes from some or all learning areas in a single unit of work; makes the curriculum more manageable for teachers by bringing like ideas together and creating time for dedicated teaching in each learning area; allows for the inclusion of students with a wide range of abilities, skills and knowledge within the same classroom.

The integrated curriculum aims to integrate content and skills with process; provide a context for learning content, processes and skills; gives opportunities for interaction and co-operation with others; engage and interest the learner in what he/she is learning; make prior knowledge and experience valued, explicit and built upon; integrate knowledge, skills, values and actions toward a common purpose; recognize and value the individual learner's ways of knowing and learning; build a partnership between the teacher and the learner; make students aware of

the purpose of their learning; empower students to reflect upon how they learn; acknowledge and cater for different learning styles; place some control and responsibility for learning in the hands of students; involve learners in actively gathering and processing information; encourage students to become independent, resourceful and adaptable learners; foster dynamic and divergent approaches to teaching; cater for students with a range of different interests, abilities, skills, and motivation [3].

Conclusions. Globalization has really and truly become a reality within which we have to live and operate. Globalization has an important role as a process in the economical, political, cultural and technological dimensions in the life of the contemporary human being and has been affected by it. Education is also influenced by the latest globalization and modernization process. Now education is available on the doorsteps, rigidity in earlier education became flexibility; the educational degree can be achieved while at work. All these happen due to the globalization effects. Education is one of the prominent domains where advanced technologies are used. Globalization has a great impact on the engineering education development in the USA. It has underlined the need for reforms in the educational system with particular reference to the wider utilization of information technology; giving productivity dimension to the educational system and emphasis on research and development. The main role of engineering education in the era of globalization in the USA is not just to educate creative and intelligent person, but to develop in the students the knowledge and skills necessary for the new kinds of jobs and help students to be prepared of the new global society. The engineering education needs to provide students with some basic skills. These include the usual skills in writing, oral communication, science, math, and technology and to find the balance between the general subjects such as humanities, social sciences, languages and the engineering subjects. Modern knowledge-based society needs professionals who can learn and analyze, dream and innovate. In today's environment, education provides individuals with a better chance of employment, which in turn leads to a better lifestyle, power and status.

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Жук О.И. Влияние глобализации на развитие инженерного образования в США

Аннотация. Уточнено суть понятия “глобализация”. Охарактеризованы влияние процесса глобализации на инженерное образование в США. Определены основные подходы к обучению. Выделены наиболее характерные признаки развития высшего инженерного образования в эпоху глобализации в США. Сформулированы основные задачи образования в инженерных заведениях.

Ключевые слова: *глобализация, инженерное образование, активное обучение, дистанционное обучение, интегрированный подход к обучению*