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New challenges in education processes at technical faculties in Asian countries of the former Soviet Union

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Abstract

The developing countries of Asia, are faced with rapid changes as far as the economic, political, socio-cultural factors are concerned. These changes require greater investment in basic and higher education, as well as development of skills, in order to support the transition to a high-tech, service-oriented economy. Today, most Asian countries are trying to solve these problems by restructuring or reforming their education systems. The following article discusses the state of educational processes in the technical fields of higher educational institutions of the countries of the Commonwealth of Independent States. The results of the study show a high level of development of government strategies to maintain technological modernization of the country.

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1. Introduction

The enormous pace of technical and technological progress generates new needs in the area of engineering education. These needs change the current values important in education, which are relevant to a given direction. These needs are a departure from the Deming standard: plan, do, check, act. New situations force the introduction of unconventional issues, unusual for engineering fields, such as: creativity, to some extent prediction, i.e. educating students with the ability to thoroughly analyze technological and technical changes as well as social and economic conditions. This analysis is to be a source of synthesis of the aforementioned factors, which will help to keep up with or even prepare for upcoming changes or generate these changes.

2. Literature review

The digitization and automation of labor is considered by many to be the most important social and economic trend in the world, which will fundamentally change the nature of work, education, business and society in the upcoming decades. (Arntz et al., 2016; Brynjolfsson and McAfee, 2014; Ford, 2015; Frey and Osborne, 2013). Argyris and Senge (2009) ascertain that learning is increasingly seen as the key to adapting organizations to new challenges and securing their

future. The focus here is on how universities, as complex and unique entities, learn, and what barriers and driving forces arise during forced external change processes. Furman and Seamans (2018) show that numerous studies have recently documented a strong negative association between high-risk jobs and income and education, which raises concerns about the inequality caused by automation. Becher and Trawler (2001) confirm that highly professional faculties, such as engineering and architecture, are a dynamic conglomerate of different socio-epistemic communities, each of which has its own cognitive and cultural styles, whose differences must be regulated if they are not to crash continuously into one another. Suleiman et al. (2004) summarize this problem by arguing that current young engineering graduates face greater challenges and competition than before. It is claimed that this may be due to the globalization of the global economy, which forces organizations to be competitive on several grounds, whether in technical areas or non-technical areas, such as management. Thus, Fugate et al. (2004) claims it is not enough for enterprises to hire technically competent engineers, but they also need engineers who are able to manage and adapt to change. Griffin, McGaw and Care, (2012) emphasize that the increasing importance of non-routine and interactive tasks has resulted in widespread efforts to identify concomitant shifts in requirements and skill sets and to simplify skills summarized

under the umbrella of the so-called 21st century skills. Muller and Young (2014) refer to this as “Skills through knowledge.” Farr and Brazil (2009) maintain that in an era of increased outsourcing and global competition, companies intending to maintain a competitive advantage call on educators to create engineers capable of leading multidisciplinary teams, combine technical ingenuity with business acumen, and graduate graduates with a passion for continuous learning. Industry also challenges universities to expand their curriculum beyond intellectual efforts in design and research, in professional leadership and entrepreneurship.

H1. It is assumed that technological progress in significant respects changes the process of education of higher educational institutions.

H2. Adaptation to new changes in higher education institutions has a significant impact on the level of education in the country.

H3. New approaches to the education process have a positive effect on the competitiveness and qualifications of young professionals.

Today, Kazakhstan has begun the process of modernizing the system of technical and vocational education, so that the country receives effective and competitive specialists. Indeed, under the conditions of the fourth industrial revolution undergoing, fundamentally new approaches to training issues with a new technological order are required. According to analytical data, it is not difficult to notice that Kazakhstan pays great attention to the training of technical specialties. Figure 1 shows that almost half of the state educational grants is allocated specifically to technical specialties. Over the past 5 years, the educational sector of Kazakhstan has been actively changing its teaching approaches. Particular attention is paid to innovative approaches in the preparation of technical specialties. In connection with these processes in the country there is a constant reconstruction in the academic policies of universities.

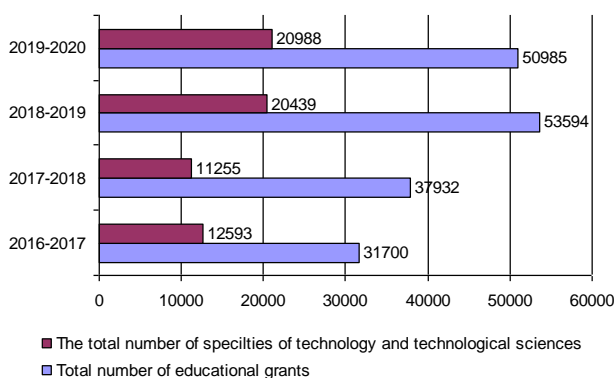


Fig. 1. State order for training of Kazakhstan

All countries are faced with the need to radically improve approaches to education, primarily in terms of its content.

In particular, Azerbaijan has approved new programs and state strategies for the development of the technological level of universities. Alongside with this, in the republic today, as a technological response to existing specific challenges,

including the military, including technologically-innovative zones, venture funds, technology parks, institutions and tools such as technology platforms etc., must be developed. One of the main conditions for the development of the system of higher professional education is the involvement of students and teachers in basic and applied research. It should be noted that there are certain achievements in this direction in the republic, including the experience of creating, on the basis of the Azerbaijan State Economic University, an Innovative Business Incubator, a Technology Transfer Center and other similar structures. A few years ago, education in Azerbaijan shifted to a fundamentally new structure of educational standards. The novelty of these standards is that, firstly, the standards do not fix the content, but the requirements for the results. This gives wide academic freedom for flexible program formation depending on the specific needs of the economy. Secondly, the standards are based on a competency-based approach. Thirdly, the standard establishes requirements for the conditions for the implementation of the educational process, which must be created in order to achieve the expected results.

Figure 2 displays the total number of students entering a higher education institution and the total number of students communicating in the technical specialties of Azerbaijan.

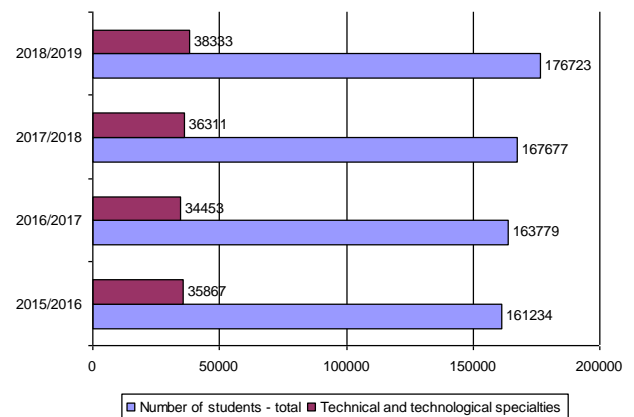


Fig. 2. The total number of students and the number of students studying in technical specialties of Azerbaijan

Uzbekistan launched the One Million Uzbek Coders project to train a million domestic programmers, since in this country more than 60% of the population are young people under the age of 29. The implementation of the One Million Uzbek Coders project will allow to involve wide sections of the population in the development of new ICT professions, and to employ young people, including people with disabilities. One Million Uzbek Coders is an analogue of the version of the One Million Arab Coders program, which was launched in the UAE in 2017. The project provides distance learning of programming for a wide section of the population through a special portal UzbekCoders.uz in order to train a new generation of specialists in digital technologies. At the first stage, the Uzbek language program will cover the four most demanded specialties in the global labor market - Data Analysis, Android Programming, Full-Stack Development and Frontend Development.

3. Methods

This study used a survey using a questionnaire. At the first stage, a questionnaire was created for employers to determine the most popular specialties, and at the second stage, a questionnaire was created for students of technical and economic specialties taking into account the results of the first stage to determine students' attitude to new changes in the labor market. The Likert scale was used to identify preferences. When responding to a Likert item, respondents specify their level of agreement or disagreement on a symmetric agree - disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item (Burns, Burns Ronald 2008). The Mann-Whitney U test was used to compare significance across groups. This test can be used to investigate whether two independent samples were selected from populations having the same distribution. Additionally, one can use the Kruskal-Wallis test designed to verify the equality of the medians of several samples. This criterion is a multidimensional generalization of the Wilcoxon – Mann – Whitney criterion. The Kruskal-Wallis criterion is ranked, therefore it is invariant with respect to any monotonic transformation of the measurement scale. However, the Mann Whitney U test determines whether the area of intersecting values between two rows is sufficiently small (the ranked series of parameter values in the first sample and the same in the second sample). Data analysis procedures appropriate for the elements of the interval scale include checking for the ANOVA criterion. This analysis reveals the significance of the survey results, and also reveals differences with the control group. The questionnaire was sent to employers from September 2019 - October 2019, to students of economic and technical specialties from November - December 2019.

4. Results

The total number of questioned representatives of the company is 210. Of these, by fields of activity: Production - 6.6%, Telecommunications 4.2%, Finance - 10%, Legal services - 5.7%, Industry 9.5%, Information technology - 17, 5%, Construction - 4.2%, Transport 3.8%, Trade - 20%, Services - 11.9%, Other - 6.6%. In the second stage of the survey:

The number of students is 130 - from Kazakhstan, 84 - from Russia, 30 - from Uzbekistan. 53% of respondents are men and 47% are women. The number of students is 4 courses - 40%, 3rd year students - 30%, graduates - 23%, students of other courses- 7%.

The survey participants are students of the Kazakh-British Technical University - 23%, al - Farabi Kazakh National University – 39%, RUDN University - 27%, other universities - 11%. Technical specialties - 42%, economic specialties - 43%, other specialties - 15%.

According to the results of the survey, the company's presenters indicate the demand for technical and economic specialties: technical specialties – 37%, economic specialties – 32%, on the Likert scale, technical and creative activities

show "very important" skills necessary for employees to fulfill their tasks.

The participation of company representatives in the development and implementation of new educational programs shows a low level of assessment. 75% - company representatives confirmed that they never participated in such events with universities.

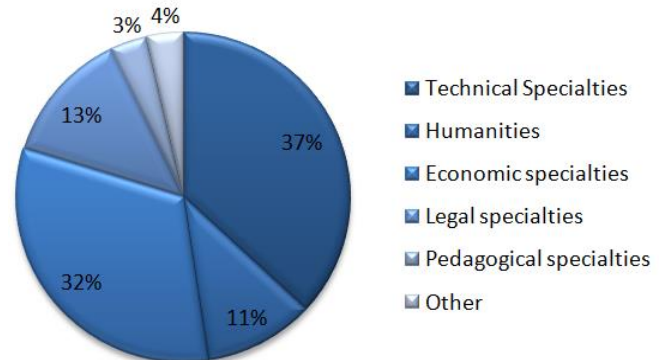


Fig. 3. Required specialties in organizations

Student Survey Results: 50% of respondents indicate that the employer's requirements regarding employee skills and qualifications are important. An employee whose skills and qualifications improve alongside with the introduction of new technologies appears as attractive for both current and prospective employers. For 45% of respondents it is important, for 25% - moderately important, and for 19% - very important.

Assessment of the Mann Whitney U criterion of professional skills of students also show equally the value of $U = 5112$. The z-score is 1.02045. The p-value is 0.30772. The result is not significant at $p < 0.05$.

University policy today, in the training of specialists 29% of students rated the average category, 36% - satisfied with the work of universities, 16% - not satisfied. Regarding their skills, students are 19% satisfied and moderately satisfied.

Students of Kazakhstan and Russia believe that the introduction of innovation in management and in the work of the enterprise is more practiced in the field of technological type of enterprise Figure 4.

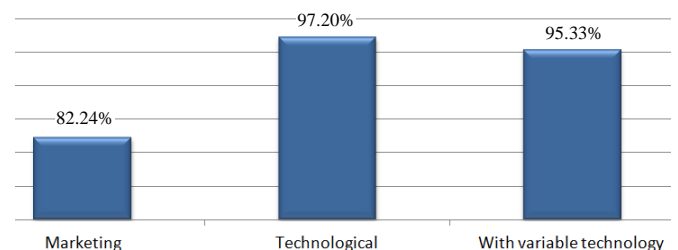


Fig. 4. Technological type of enterprise

Differences among more than two independent groups (e.g. age groups) are analyzed using One Way Analysis of Variance (ANOVA). The Tukey Multiple Comparison Test is used to determine from which group the difference arises from a one-way ANOVA. A level of statistical significance was adopted

as $p < 0.05$, and the analysis was completed with a confidence level of 95%.

The One way ANOVA test reveals statistically significant differences between students in Kazakhstan and students in Russia and Uzbekistan ($p < 0.05$) in relation to readiness for technological progress show students - Table 1.

Table 1. Result Details

№	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inference
Kazakhstan & Russia and Uzbekistan	2.9221	0.0398435	* $p < 0.05$

4. Discussion and conclusion

The study found that the highly valued employers needed technical and economic knowledge and good critical skills. The most important place is the ability to identify problems, apply problem solving, formulate and solve as the most important skills that employers in engineering and students need. This knowledge was identified by Zacharim et al., (2009) who discussed the engineering job skills required by employers in Asia and are listed in Japan, Hong Kong, and Singapore. Shukla (2012) also argued that an employee with the ability to think critically, act logically and evaluate situations to make decisions and solve problems is a valuable asset for the organization. Including if countries with active innovative approaches to development improve the quality of education in the country and this helps in the development of the economy. This study provided some information on job skills related to engineering graduates. Firstly, it should be noted that at that time soft and hard skills became the main part of technical specialties. Secondly, universities must ensure constant interaction with industry so that they can detect changes in the industry quickly. Universities may not be able to make all the changes right away, but they should be able to gradually adapt, thus ensuring that their graduates meet the needs of the industry. The innovative sphere of the countries of the Commonwealth of Independent States will require a new quality of both state and corporate governance in all directions. The state has the primary responsibility for the formation and development of a modern scientific environment, for training personnel, and for financing

promising fundamental and many applied research. The implementation of new approaches will ensure the relevance of the results of domestic scientific research and inventions, will be an impetus for the development and consistent implementation of an innovative breakthrough strategy.

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前苏联亚洲国家技术学院在教育过程中的新挑战

關鍵詞

教育过程
技术学院
亚洲国家
新技能

摘要

就经济, 政治, 社会文化因素而言, 亚洲发展中国家都面临着迅速的变化。这些变化要求在基础和高等教育方面加大投资, 并发展技能, 以支持向高科技, 服务型经济的过渡。今天, 大多数亚洲国家都在尝试通过改组或改革其教育系统来解决这些问题。下面的文章讨论了独立国家联合体国家高等教育机构技术领域教育进程的状况。研究结果表明, 为保持国家的技术现代化, 政府战略正在高度发展。