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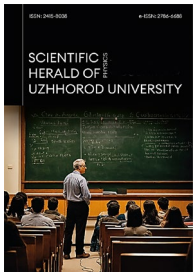

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Role and place of the Innovative Economy course in the structure of educational programmes of universities

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Abstract

Relevance. Higher education and relevant training programmes play a crucial role in the training of specialists who are capable of change and innovation, as well as have in-demand professional and behavioural competencies.

Purpose. The course is focused on baccalaureate educational programmes.

Methodology. The Innovative Economy Course was structured as part of a study, based on the analysis and generalisation of curricula related to the development and importance of innovative processes as well as entrepreneurship in higher education. When studying the course, different methods of innovative pedagogy were used, such as team training, project training, practical classes, which involved modern information technologies.

Results. The programme was tested in the form of a pilot project at the University of Dulaty for students of the school of economics. The course was also held as part of the CASCADE project for agricultural students.

Conclusions. The effectiveness of the course was evaluated based on an analysis of students' progress who formed their innovative competencies using the FINCODA Barometer. The programme can be recommended as an elective training course for engineering, technical and technological specialists.

Keywords: innovation; innovative economy; innovative competencies; entrepreneurship; curriculum design technology; group design method.

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Introduction

The transition to mainly intensive growth factors characterises the current stage of society's development based on innovative technologies. This implies a high level of intellectualisation of society, which can produce, assimilate and apply new knowledge. In the modern sense, the economy must be based on knowledge because it becomes a value capable of producing high-tech innovative products. Human capital is transformed into innovations, which, in turn, become the main source of development [1, 2].

At the same time, the role of the education system strengthens as a generator of innovative knowledge and ideas. The higher education system faces challenges related to the need to ensure that the educational sector meets, first, the innovative model of economic development; second, the social needs of young people to live in new industrial and innovative conditions; third, the requirements of global competition that the labour market puts forward [3-6]. The higher education system should provide training of specialists capable of innovation, adaptation to social and economic changes, as well as with relevant professional and behavioral competencies. Nowadays, both professional knowledge and the ability to generate and introduce new ideas are the decisive factors in the development of society [7-9]. Here, special attention is paid primarily to high-tech education, because modern challenges can be solved only with the help of modern technologies and non-standard approaches. Nowadays every university undergoes a complex process of innovative transformation. Unfortunately, not all universities are yet ready for social and economic shifts, demand for personalised training, individualised development, flexible completion and constant upgrade.

The focus is shifted to students in discussions about higher education, universities are busy at work ensuring the success of each student through the formation of their self-sufficiency. The success criteria include not only the objective educational results, but also well-being and employability [10, 11]. Nowadays the concept of "student experience" oversteps the boundaries of a classroom session, it is time to understand the importance of gaining experience in terms of infrastructure, the need to create an innovative ecosystem in higher education institutions.

As we go forward, universities become the places where students both get knowledge and can really try their hand. This can be done through participation in skills contests, competitions, research, and business communities as well. Therewith, these programmes can cover a small percentage of students who already have in-demand skills or leadership qualities (according to experts, this is no more than 10%). Insufficient funding, the inability to earn money for development, the overwork of teachers and much more are the problems of universities.

In this regard, innovative development strategies, partnerships for collaboration, exclusive educational tracks and other ways are relevant to universities to identify and develop students' in-demand skills and abilities.

Materials and Methods

Despite a large number of papers that consider the role and place of the Innovative Economy course in the structure of educational programmes of universities, the issues have not been sufficiently studied concerning the management of the innovative economy in universities. Thus, research is clearly not enough on the development of a conceptual model of the innovative economy that reflects its essence, place and role in the innovative development of universities. In addition, diagnostics, forecasting and evaluation of the dynamics of economic innovative development have not yet been dug into in institutions of higher professional education.

In the preparation of the article, well-known research methods were used such as content analysis of modern sources, data systematisation, comparative and logical analysis, generalisation, trend data statistical analysis and interviewing empirical research. There are no practical sociological studies on the development of technology for managing the economy of innovative development in institutions of higher professional education of our country.

When designing the academic content, the best practices were evaluated based on the analysis of scientific publications, seminar materials, training programmes and syllabi. To select the training technology, control and achieve high learning efficiency, a comparative analysis was carried out of teaching methods and approaches to the formation of learning outcomes. To assess the progress of students, a special assessment questionnaire – the FINCODA Barometer – was adapted, translated into Russian, built into the automated INDIGO platform and used [12].

State support and development programmes of entrepreneurship and small and medium-sized enterprises (SMEs) were the methodological basis of the study, as well as the Education System Development Programme of the Republic of Kazakhstan. The authors obtained materials and knowledge during their participation in the Erasmus+ 573965EPP project-1-2016-1-SE-EPPKA2-CBHE-JP InnoCENS: Enhancing Innovation Competencies and Entrepreneurial Skills in Engineering Education (2017-2019), which played a significant role.

The programme and tools of this study can be used to diagnose innovative processes in the education system. The research materials can be used for training courses in sociology, sociology of management, economics, management, sociology of education in higher and secondary educational institutions. The empirical materials and conclusions of the study can be useful to improve the socio-technological culture of higher professional education institutions during their innovative development, as well as to improve university managers' skills.

Results and Discussion

Overview of entrepreneurship training technologies

When building technologies for teaching innovative economics and entrepreneurship skills, universities study the experience of leading foreign and domestic universities and develop their own models. The Russian Startup as a Diploma Programme was launched in 2017 and has become an interesting initiative. The Programme involves a graduation paper presentation as a startup. As a result of the implementation, the first experience has already been

obtained (40 Russian universities plan to participate in the Programme, starting from 2021), the results are presented at various venues, general cases and regulations have been developed, the scientific and pedagogical community and business actively discuss the current approaches, methods and solutions. The following solutions stand out among them [13-14]:

- Far Eastern Federal University came up with its idea of creating two conditional platforms: "product" and "marketing" when building a training technology. These two components are not offered to students immediately, but various options are practised for the "habituation" and this is the peculiarity of the training. For this purpose, various courses are implemented, for example, the Project Activity Course;
- Tomsk Polytechnic University launched its Entrepreneurship in Innovation Course for masters, and then for bachelors (including for engineering training) within the framework of the Programme;
- Tyumen State University also designs its own "technology track" (minor programme), while its uniqueness is in its duration of about two years. Every student can join it at any stage. This approach allows testing entrepreneurial hypotheses within the framework of an individual curriculum and with good mentoring. As a result, the output is not a graduation paper, but a finished product that can be the basis for further business.

The TechnoSpark startup studio (Russia) presents a different approach to teaching innovative thinking and entrepreneurship [15-17]. TechnoSpark makes a special path: students are not required to have ideas, considering that the development of a student's hypothesis is a long and complex process. Students are given a ready-made idea, synthesised and tested by specialists of TechnoSpark laboratories. Students develop a startup by immersing themselves in a real economic environment. The presence of a senior partner in the startup team is another advantage of such a model, he or she is the one who builds and develops this business, and at the same time is not a mentor, but a member of the team. The main task of this technology is to identify unique students with the makings of entrepreneurship based on the use of special techniques and their subsequent unification into teams together with different specialists. To this end, TechnoSpark uses its own methodology to assess entrepreneurial competencies, consisting of a game package and a detailed digital footprint analysis [18-21].

Representatives of the scientific and educational community believe that a special environment and comprehensive support for students is the main task of universities to formulate adequate hypotheses and develop teams of innovators.

The experience of AlmaU is of interest as one of the leading entrepreneurial universities in Kazakhstan. In 2017, the Student Entrepreneurial Ecosystem Project was launched in Kazakhstan on the initiative of the ERG (the Eurasian Group) in partnership with the Association of Friends of Tel Aviv University [22]. The Project is aimed at developing entrepreneurial education, improving the business climate and developing regional economies. By participating in the Project, students get the opportunity to unlock their entrepreneurial potential, establish connections and acquire knowledge and skills that will be useful regardless of their further professional path. During the three years of the project implementation, students presented about 617 different business ideas and about 264 solved business cases. Within the framework of this initiative, the Tumar Student Business Challenge Competition is also held for those student startups and businesses that have already been launched by Kazakh students earlier; this event provides students with the opportunity to join the project residents and its knowledge base.

Dulaty University also supports and develops such tracks. As part of the activities of the Centre for Innovation and Entrepreneurship, the University emphasises the peculiarity and necessity of teaching entrepreneurship based on innovative pedagogy. The methods and technologies of innovative pedagogy at Dulaty University are implemented through the creation of a "technological transition" – an innovative infrastructure of the University to improve the professional level and readiness for the implementation of pedagogical innovations, primarily of university teachers. As part of the improvement of the level of entrepreneurial education, two new courses - Innovative Systems and Entrepreneurship for Engineers - have been successfully introduced into the master's programmes of Dulaty University. The existing experience served as an initiative to include a specialised module on innovation and entrepreneurship for all areas of bachelor's and master's degree programmes. When designing the content of the module, we used the best practices based on the results of the participation of employees and teachers of the university in international projects. In the first stage, the module includes the courses such as Fundamentals of Research and commercialisation, Technological Entrepreneurship and Startups, Skills Management, Innovative Economy and others.

Characteristics of the Innovative Economy course

As can be seen, the development of relevant courses on innovations and innovative systems, economics and entrepreneurship is one of the ways to solve the problems of training specialists of a new format in the system of higher and postgraduate education. At the same time, it is also important to include these courses in master's and bachelor's educational programmes, not so much economic, but technical, technological and other areas of training.

The idea of the Innovative Economy course is a long time coming, some issues were considered and worked out when studying other disciplines (for example, the Innovation course has been studied since 2011), but it is necessary to introduce a holistic, logically and methodically interrelated discipline aimed at developing the innovative competencies of future specialists into the educational process. The innovative economy should be considered primarily in close connection with technological changes in social development. These are not only economic processes, but, first of all, objectively determined changes in production technologies that require engineering and design solutions, and this also results from the analysis of global trends in the cyclical development of the world economy.

The stage is large in the field of innovative development associated with the need to build new types

of production and sales activities and it has been lit in many scientific articles and works of domestic and foreign scientists. In the aspect of the problems of this study, we pay attention to the works of M. P. Swann [23] on the principles of integration of new technologies and industries into the economic system, J. Lerner [24], considering the architecture of innovations with a fundamental infrastructure [25]. For a more complete description of the issue under consideration, we have meticulously scrutinised the works of J. Sengupta, offering a new model of a growing business community [26], Nobel laureate E. S Phelps, who studied public policy as the main mechanism for creating and promoting innovations on the mass market [27], etc. In fact, most researchers [28-30] are sure that the innovative economy ensures the global economic superiority of a country in the modern world.

The above studies have made a serious contribution to the study of innovation as a science, but the problem is still relevant to train engineering personnel with appropriate competencies. The need to study this course is due to the modernisation of Kazakhstan's education, caused by the need for innovative development of the Republic of Kazakhstan.

The design of effective training programmes is among the most important aspects when choosing approaches to the development of skills and abilities. A retrospective analysis of the educational product practice shows that the systematic teaching of innovative economy was started at the beginning of the 21st century and was intended for masters in the leading universities of the world, first. Gradually, the focus begins to shift to the inclusion of such courses in the educational cycle of the bachelor's degree, which results from the changing requirements for the content of education of specialists and their competencies, both from the modern labour market and employers.

In the process of drawing up curricula in disciplines that reflect the essence of the innovative economy, various universities use new interactive training technologies aimed primarily at personality-oriented education [31-34]. In order to compare and analyse the programmes offered by various universities, they were studied and systematised (Table 1). As you can see, almost all of the above programmes are focused primarily on teaching students of economic specialties. While supporting the need to train future economists in this way, we would like to note that engineering personnel are practically not covered by training in innovative economics, despite they are first to create innovative products. [35]

Table 1. List of training programmes used to design the Innovative Economy course

University	Name of training courses	Level of training	Direction of training / educational programme	Year of publication
Karaganda State Technical University (Kazakhstan)	Planning and management of scientific and innovative activities	master's degree	Life safety and environmental protection	2014
Novosibirsk National Research State University (Russia)	Economy of Innovation	bachelor's degree	Management	2014
AO RVK together with St. Petersburg National Research University of Information Technologies, Mechanics and Optics and the Lomonosov Moscow State University	Innovative Economy and Technological Entrepreneurship	bachelor's degree	Technical and technological specialities	2017
Lomonosov Moscow State University	Innovative Economy	master's degree	State and municipal administration	2018
International University of Kyrgyzstan (Kyrgyzstan)	Economy of Investment	master's degree	Accounting in the Real Sector of Economy	2018
Dulaty University (Kazakhstan)	Innovative systems	bachelor's degree	Technical and technological specialities	2018

As a result, the structure of the elective Innovative Economy course was designed for bachelors of non-economic training based on a comparative analysis of the above papers so that it includes three modules divided according to the principle of importance for the formation of innovative competencies.

The first Innovation Strategies module considers the main concepts and characteristics of innovations, describes the classification of the innovative economy, analyses development strategies and issues of conducting innovative activities, with an emphasis on the features of the formation and development of the innovative economy. The successful innovative economies of the world are considered on the basis of comparing the data of the international indices of innovative states, as well as comparative estimates are given. Student group projects, which analyse strategies of different countries, result from the module.

The second module considers the issues of management of the innovative economy. For this purpose, a separate section is intended to study risks and risk management. The innovation strategy block merits special mention: the features of the innovative technologies market are considered as a set of economic relations that form the demand and supply of innovative technologies, their transfer, use and distribution. The role is studied of the state innovation policy in improving the competitiveness of the country. As a result of studying the module, students can

successfully analyse the state of innovation activity of enterprises in the region in the format of cases.

The third Innovation System and Innovation Infrastructure module examines modern models of innovative systems: OECD Landscape of Innovation Policy [36], The National Diamond by M. Porter [37], the Triple Helix Theory [38], as well as analyses the main trends in the formation and development of innovation infrastructure. As a result, students develop a stable concept of the importance of innovation for economic growth and development, and the training results the ability to put forward business ideas. The content of such economics courses on innovation always includes an analysis of national and regional models of innovation systems. The formation of innovation policy retrospectively analysed as well in the course under consideration as a result of combining individual tools and mechanisms of scientific and technological, educational, industrial and regional policies into a single complex on the example of the Republic of Kazakhstan.

The study of the experience of advanced countries is a separate block in the structure of the course: the United States, Japan, Germany, Great Britain, Sweden and others, where stimulating the development of innovative entrepreneurship has a common basis i.e. the active participation of the state in the formation and implementation of state innovation policy. In this regard, special emphasis was placed on the study of the experience of Sweden and Spain following the results of the participation of Dulaty University in the Erasmus+ 573965EPP-1-2016-1-SE-EPPKA2-CBHE-JP InnoCENS: Enhancing Innovation Competencies and Entrepreneurial Skills in Engineering Education. When designing the content, the experience was used gained by the teachers during the project and working trips to the laboratories and business incubators of KTH Royal Institute of Technology and the Polytechnic University of Valencia, which are the leading universities in the field of innovation. An entrepreneurship workshop of the project team on innovative pedagogy (Turku University of Applied Sciences, Finland) and the joint work on the master's programmes such as Innovative Systems and Entrepreneurship for Engineers allowed using advanced teaching and evaluation methods.

The adapted Innovative Economy course was held within the framework of an international project initiated by the Central Asia and South Caucasus Consortium of Agricultural Universities for Development (CASCADE) in the autumn semester of 2020. The classes were organised in a remote format using the ZOOM platform, common interactive whiteboards, shared Google documents and forms, as well as the Kahoot! mobile application for quick knowledge testing.

Cases and method of group projects were used in practical classes for greater efficiency of the course [39, 42]. The project method allows developing individual cognitive interests and creative abilities of both each student individually and a team as well as seeing progress in relation to others. The project method allowed us to get another positive effect in the process of teaching the discipline within the framework of CASCADE: it contributed to the collaboration of students from different countries, an in-depth study of country and regional features of innovative development.

The methodology of developing and presenting business ideas is based on the team solution of a certain task, which involves the integration of knowledge and skills from various fields, as well as determining one's personal role based on psychophysical characteristics. For this purpose, the "3h" method was used within the team, when students claimed the mantle of a "Hacker", " Hipster "and "Hustler". Mastering the technology of effective presentation or an Elevator Pitch is another important acquired skill from the course.

Evaluating the effectiveness of the course

Today, a long list can be formed from the preferred competencies of university graduates, but most often it distinguishes such as: critical thinking, creativity, decision-making, personnel management, emotional intelligence, the ability to negotiate and cognitive flexibility. Higher educational institutions develop training programmes based on innovative pedagogy approaches in order to develop such innovative competencies among students. However, there are still significant problems in this area. They are related to the definition of approaches both to the correct understanding and to the methods of evaluating these attributes. In addition, not all teachers have enough knowledge about effective pedagogical methods to develop these skills. It is also difficult to establish discernible links between specific skills and innovations, but a properly designed training course will make it possible to develop skills that will inspire, encourage and eventually provide innovation.

According to the authors, the results of the FINCODA project is one of the successful steps in this direction. The project resulted in the development of a tool to assess innovative competencies which was named the FINCODA Barometer. The FINCODA Barometer is a psychometric tool that measures people's ability to innovate. It includes an assessment of innovations according to five main criteria. At the same time, it allows assessing the potential of a person in each of these areas separately based on a special questionnaire. The partners of the FINCODA project carried out the research underlying the creation of this tool, as a result, they collectively combined both academic and industry innovative experience of Europe.

Following the results of the InnoCENS project at Dulaty University, the list of questions of the FINCODA Barometer was translated into Russian and integrated into the automated module "INDIGO" for conducting a survey and automatic data processing. The survey was attended by 40 students of the 3rd year of study of the educational programs "State and local Administration", "Finance", "Management", "Accounting and Audit", who studied the course.

The innovative competencies of the students participating in the pilot project of the Innovative Economy course were evaluated using the FINCODA Barometer before and after the pilot course. Tables 2 and 3 present the data. As can be seen, according to the results of the training, the students better understand the essence of the main competencies "Creativity", "Critical Thinking", "Teamwork", "Initiative", "Networking". They also

showed the ability to critically evaluate themselves and their team members according to these parameters.

At the end of the course, the majority of students rated their level at high marks – "good" and "excellent", and the best results are available in the indicator "ability to work in a team" – 82.5% against 47.5% before the training. According to other indicators, great success is seen in the indicators "creativity" and "initiative" – a 20% increase in the number of high ratings, which can also be proof of the effectiveness of the project team method. However, it is necessary to work out meaningful tasks for projects in terms of developing students' skills to establish connections as well as support and promote their ideas, so the "networking" criterion allows observing a slight increase in the number of those who rated themselves excellent, although a group of students has grown with the "good" rating.

Table 2. Self-assessment results, entrance test (survey results of 40 students)

Grades in points	Percentage of responses by criteria groups				
	Creativity	Critical thinking	Teamwork	Initiative	Networking
0–2	5	20	0	5	15
3	32.5	25	20	20	42.5
4	55	47.5	32.5	50	22.5
5	7.5	7.5	47.5	25	20

Table 3. Self-assessment results, exit test (survey results of 40 students)

Grades in points	Percentage of responses by criteria groups				
	Creativity	Critical thinking	Teamwork	Initiative	Networking
0-2	0	0	0	0	5
3	12.5	22.5	2.5	5	20
4	52.5	45	15	47.5	45
5	35	32.5	82.5	47.5	30

Conclusions

Specialists with innovative thinking and entrepreneurial skills, who have both professional knowledge and are able to generate new ideas and ensure their practical implementation are necessary and decisive in the development of the modern economy. They must have a high level of self-organisation, the ability to innovate, a high degree of adaptation in conditions of uncertainty, the ability to perceive and critically comprehend new information, exchange it, have behavioural competencies and the ability to work in a team. Both the learning process and the external environment acquire all these qualities. At the same time, the role of education is decisive as an institution that ensures the reproduction of the intellectual potential of society.

In this regard, popular educational programmes of universities and relevant training courses play a crucial role. The purpose of this study was to develop and test a course on innovative economy. The results of the paper:

1. We create the content of the course based on the study of best practices.

2. Our training technology includes methods of innovative pedagogy to develop in students the popular competencies such as: team working, initiative, creativity, critical thinking and networking.

3. The course was tested in the structure of bachelor's programmes of various training profiles.

4. The progress was assessed of innovative competencies of the students.

5. The necessity was shown of including this course in the structure of students' educational programmes as an integral part of a specialised block aimed at developing innovative thinking and entrepreneurial skills.

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Conflict of Interest

None.

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Роль і місце курсу "Інноваційна економіка" в структурі освітніх програм університетів

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Анотація

Актуальність. Вища освіта та відповідні навчальні програми відіграють вирішальну роль у підготовці фахівців, здатних до змін та інновацій, а також володіють затребуваними професійними та поведінковими компетенціями.

Мета. Курс орієнтований на освітні програми бакалаврату.

Методологія. Курс "Інноваційна економіка" був структурований як частина дослідження, що ґрунтується на аналізі та узагальненні навчальних програм, пов'язаних з розвитком і значенням інноваційних процесів та підприємництва у вищій освіті. При вивченні курсу використовувалися різні методи інноваційної педагогіки, такі як командне навчання, проектне навчання, практичні заняття із залученням сучасних інформаційних технологій.

Результати. Програма була апробована у вигляді пілотного проекту в Університеті Дулати для студентів економічного факультету. Курс також проводився в рамках проекту CASCADE для студентів-аграріїв.

Висновки. Ефективність курсу була оцінена на основі аналізу прогресу студентів, які формували свої інноваційні компетентності за допомогою барометра FINCODA. Програма може бути рекомендована як факультативний навчальний курс для студентів інженерно-технічних та технологічних спеціальностей.

Ключові слова: інновації; інноваційна економіка; інноваційні компетенції; підприємництво; технологія проектування навчальних програм; метод групового проектування.