

# Training of Specialists in Chemistry at Classical Universities in the Context of Higher Education Reformation in Ukraine

Yu. V. Kholin and O. N. Kalugin

*V.N. Karazin Kharkiv National University, Svoboda Sq. 4, Kharkiv, 61022 Ukraine  
e-mail: kholin@univer.kharkov.ua*

Received September 3, 2011

**Abstract**—The authors consider crisis phenomena in higher education of Ukraine of the last two decades and discuss necessary measures for improving the existing situation. It is stated that the role of chemical education in classical universities is to provide integrity, quality, and fundamental character of education. Information about Ukrainian higher education institutions training specialists in chemistry is given; distinguishing features of the existing two-level system of higher chemical education are described. The authors note that admission of students on the basis of external independent evaluation (testing) has a contradictory influence on the quality of education. Activities implemented by classical universities in order to select gifted and well prepared students are described.

**DOI:** 10.1134/S1070363213030316

## INTRODUCTION

Classical universities play a special, very important role in the system of education. It is these institutions which during the entire two-century history of Ukrainian higher education, even in the hardest of times, have ensured integrity of the national educational system and fundamental character of education, have preserved traditions and ideals of academic freedom, and have organized education on the basis of scientific research. That is the reason why “classical universities, and they alone, can train people who not only know how to do something but can also think responsibly and strategically and care about the future” [1].

Today it is important to understand how social, economic, and political transformations have influenced the Ukrainian educational system and, first of all, classical university education. What is and what should be done by universities in order to accomplish their mission properly? These are difficult and diversified questions, which are impossible to answer in one article. As the authors of this article, we set a much more modest objective: to analyze at least some of the challenges faced by university education and, in the first place, chemical education, which is most familiar to us, and, not going beyond the boundaries of our

experience, to try and describe certain modern trends in this field.

## Twenty Years of Reforms: Prospects and Results

During 20 years of independence of Ukraine the state has repeatedly reformed the system of education. V.F. Yanukovich, President of Ukraine, found proper words, saying that “for several years now, Ukraine has been in a fever of various experiments and innovations in this area” [2].

The objectives and ideology of reformation of the educational system in our country are specified in the National Doctrine for Development of Education approved in 2002 [3]. The authors of this document declared priority of the quality and general availability of education; integration of education with advanced science; and importance of continuous education. They considered reformation of education as a factor of civil society formation. The objectives set in the Doctrine were to increase education expenditure to the average European level; to introduce information and communication technologies at advanced rates; and to enhance cooperation with international organizations and educational foundations. The Doctrine specially emphasized that “education is based on cultural and historic values of the Ukrainian people, their traditions and spiritual wealth, ...asserts the national idea, fosters

**Table 1.** Breakdown of students admitted to the first year at higher educational institutions of Ukraine in 2007 [6]

Branch of knowledge	Total number of admitted students		Number of contractual students	
	absolute, person	share, %	absolute, person	share, %
Social sciences, business, and law	181048	45.2	142267	78.6
Engineering	73461	18.3	33583	45.7
Humanities and arts	48150	12.0	27035	56.2
Education	29921	7.5	17024	56.9
Natural sciences	22840	5.7	8489	37.2
Construction and architecture	15344	3.8	9264	60.4
Transport	14064	3.5	9520	67.7
Agriculture, forestry, fishery, and processing of their products	7062	1.8	2180	30.9
Military science and security	4311	1.1	1704	39.5
Geology and land management	2429	0.6	1250	51.5
Healthcare and veterinary science	2030	0.5	713	35.1

national self-identification, development of the Ukrainian culture, and assimilation of the world culture and universal moral values.” It was expected that the outcome of the Doctrine implementation would be represented by “a transition to a new type of humanistic-innovative education, which will foster substantial growth of intellectual, cultural, spiritual, and moral potential of individuals and society. As a result, powerful positive changes will take place in the system of material production and spiritual revival, in the structure of political relations, everyday life, and culture. Independence and self-sufficiency of a person will increase, as well as their creative activity, which will strengthen the democratic foundations of the civil society and accelerate its development.”

In compliance with the National Doctrine for Development of Education numerous innovations have been introduced into the Ukrainian educational system, including: transition of general education schools to a twelve-year education period (soon cancelled); accession to the Bologna Process; organization of the selection of applicants to higher educational institutions based on external testing (analogous to the Unified State Exam); transition to a two-level system for training of specialists with higher education; introduction of a twelve-point scale for evaluation of knowledge at school and a hundred-point scale (pre-

serving the existing system as well) in higher educational institutions; and categorization of universities into state, national, and research (though, without differentiating their financial support and academic freedoms).

For the last two decades, especially in the crisis 1990s, the system of higher education and science has experienced chronic underfunding; there has been a drastic decrease in the prestige of higher education and the social status of the scientist and the teacher. According to D.V. Tabachnik, Ukrainian Minister of Education and Science, Youth and Sports, “generations of independence have been given an injection of cynicism, indifference, and disrespect for intellectual work and its producer: a teacher, a scientist, and an educator” [4]. Against the background of the declining birth rate in the 1990s there was an increase in the university admission figures and the total number of students and postgraduate students; the number of applicants admitted to institutions of higher education was almost equal to the number of general education schools graduates.

Another trend of that period was a growth in the number of higher educational institutions. Many of them established new branches and consulting centers, which opened even in regional centers. At the same time, higher educational institutions tried to improve

**Table 2.** Number of publications referring to universities of Ukraine in SCOPUS system (as of December 22, 2010) [6]

University	Number of publications in SCOPUS	Number of citations in SCOPUS	h-index
Taras Shevchenko National University of Kiev	8483	21960	48
V. N. Karazin National University of Kharkov	5093	15200	39
Ivan Franko National University of Lvov	3541	10965	31
National Technical University of Ukraine "Kiev Polytechnic Institute"	3268	4692	27
Oles Gonchar Dnepropetrovsk National University	2119	3945	23
Lvov Polytechnic National University	1961	2511	18
I.I. Mechnikov Odessa National University	1959	5277	30

their formal status, leaving a group of pedagogical or technical institutes in order to become classical universities.<sup>1</sup>

Under crisis conditions the Ministry of Education and Science has frozen the volume of the government order on training specialists in engineering, whereas for natural sciences it has been even a little increased. At the same time, there has been a significant growth in the share of training in such educational areas as law, business, and humanities. As a result, the structure of specialists training as compared to the beginning of the 1990s has undergone significant changes (Table 1) [5].

The government order for training of specialists was distributed among all institutions of higher education, without taking into account their reputation, material resources, academic teaching staff quality, and place in national rankings. As rightly pointed out by D.V. Tabachnik, "scattering of the government order among several hundred institutions of higher education characterized by different quality of teaching, scientific, material, and technical base leads to system-wide profanation of the educational process and regrettable devaluation of the state-recognized diploma" [4].

The quality of education was adversely affected by several factors including but not limited to: an increase in the number of phantom universities and a weak policy of the government order formation. University education is based on the achievements of modern science; and a higher educational institution teacher, performing no scientific research, cannot provide students with quality education. The existing Ukrainian system of scientific research organization and funding in higher educational institutions is not effective. In order to make sure of this, it is sufficient to compare educational indicators of the leading Ukrainian universities, given in SCOPUS scientometric and bibliographic system, with indicators of higher educational institutions of the neighboring countries (Tables 2 and 3) [6, 7].

A lot has been said about the problem of higher educational institutions staff (see, e.g. E.V. Astakhova's monograph [8]). The average age of the university professor exceeds 60; whereas the number of scientists aged 30–40 (the most fruitful age for science) is extremely limited. According to V.A. Marchenko, a member of the Russian Academy of Sciences and the National Academy of Sciences of Ukraine, "we still have those who can teach and those, though few, who can be taught, but we are severely lacking in those who can work actively and fruitfully" [9].

Another source of concern with regard to the Ukrainian educational system is the conditions of secondary and higher education in mathematics and natural sciences. The crisis in this sphere was caused not only by objective reasons, which had an adverse effect on the system of education in general, but also by the position of those leaders who chose history,

<sup>1</sup> In 1991 in the Ukrainian Soviet Socialist Republic there were 10 universities located in Dnepropetrovsk, Donetsk, Zaporozhe, Kiev, Lvov, Odessa, Simferopol, Uzhgorod, Kharkov, and Chernovtsy. Today 27 state Ukrainian universities are referred to as classical (in addition to the 10 "old" universities there are universities in Zhitomir, Ivano-Frankovsk, Kamenets-Podolskii, Kiev (two universities), Lugansk (two universities), Lutsk, Nezhin, Nikolaev, Ostrog (Rovno region), Sumy, Uzhgorod (two universities), Kherson, Khmel'nitskii, and Cherkassy).

**Table 3.** Number of publications referring to universities of Ukraine neighbor countries in SCOPUS system (as of July 7, 2010) [8]

University	Number of publications in SCOPUS	Number of citations in SCOPUS	h-index
M.V. Lomonosov Moscow State University	71894	325947	145
University of Warsaw	21236	216160	137
Eotvos Lorand University of Budapest	13920	129675	117
Comenius University in Bratislava	12650	69222	76
University of Bucharest	8471	37161	57
Belarusian State University	6765	31070	66

culture, and humanities as priority components of education. It is indicative that the developers of the National Doctrine for Development of Education did not consider it necessary even to mention the role of mathematics and natural science education. The scope of educational programs in physics and mathematics at Ukrainian institutions of higher education has decreased twice and even more [10]; according to the results of an international comparative study of educational achievements of primary and middle school graduates in mathematics and natural sciences (TIMSS-2007), the Ukrainian schoolchildren were ranked almost the lowest among European countries [11].

Many specialists have talked about problems that have accumulated in the sphere of higher education. However, it was not until recently that the situation in this sphere was sincerely and fully described at the national level. The National Report "Development Objectives of the Millennium: Ukraine-2010" says, "Multiple attempts to reform higher education did not have holistic, systematic character" [12]. It is noted that regulatory documents on reformation of education and organization of the educational process touched upon individual, mostly, purely formal aspects of the Bologna process. There are no long-term forecasts of labor market demands. Excessive centralization of the management system and inefficient mechanisms of state funding of the educational system accompanied by constantly increasing budgetary expenditure on education are still in place. The content of education relying on the competence-based approach and orientation towards future profession is not sufficiently developed. The lists of specialties and areas of specialists' training are imperfect. Educational standards are revised all the time. Institutions of higher education are given a secondary role in execution of

scientific research; there is an established attitude that the system of higher education belongs to the educational sphere, and not innovative or scientific and productive.

It is evident that implementation of the reform policy, planned by V.F. Yanukovich, President of Ukraine, and envisaging modernization of the economy and society and improvement of competitiveness of Ukraine, is impossible without significant changes in the sphere of education and science. The new management of the Ministry of Education and Science, Youth and Sports of Ukraine headed by D.V. Tabachnik has started with regaining order. There have been gradual changes in the approach to the government order formation. A course has been set for merger of small higher educational institutions and establishment of a network of large regional universities with well-developed infrastructure and powerful potential. There has been intensification of activities aimed at equal integration of Ukrainian higher educational institutions into the international science and educational community and transformation of Ukraine into an attractive center of higher education. First successes have been made on this path. Thus, the government has approved the State Target Program for Improving the Quality of School Education in Mathematics and Natural Sciences till 2015. A number of intergovernmental agreements on cooperation with important foreign partners have been concluded. A united university has been established in Krivoi Rog on the basis of four higher educational institutions and two research and development institutions. A procedure for foreign diploma recognition has been facilitated. A governmental resolution on training abroad for students and postgraduate students has been accepted. For the first time ever, four Ukrainian institutions of higher education will take part in the

international university ranking “Thomson Reuters Global Institutional Profiles Project.” Determination of nationwide university rankings has been organized. It is extremely important that active work on development of the National Qualifications Framework has started at last. Without this framework it is possible neither to develop modern standards of higher education nor to identify real prospects for specialists with a bachelor’s degree. It seems that development of a new edition of the Law on Higher Education, performed with extensive involvement of the expert community, management of higher educational institutions, and students, will be soon finalized.

### **Chemical Education at Classical Universities of Ukraine**

Under conditions when the profession of a chemist, in particular, a research chemist is not considered prestigious and the demand for chemists in the innovative sector of the economy (apropos, a very weak sector in Ukraine) is not formed, training specialists in chemistry is for universities one of the forms to accomplish their mission, which is to ensure integrity of the educational system, as well as the quality and fundamental character of education.

At present, training of masters and specialists in chemistry is performed at chemical faculties of classical universities located in Dnepropetrovsk, Donetsk, Kiev, Lutsk, Lvov, Odessa, Simferopol, Uzhgorod, Kharkov, Cherkassy, and Chernovtsy. During the twenty years of independence of Ukraine the faculties of chemistry have been formed in only two of dozens of newly established universities: Volyn University (Lutsk) and Cherkassy University, both created on the basis of pedagogical institutes. The chemical faculty of Volyn University has departments of general and inorganic chemistry, analytical chemistry, ecology and environmental protection, organic and biological chemistry, and physical and colloid chemistry; whereas the chemical faculty of Cherkassy University combines teaching of chemistry and fine and applied arts (the faculty has departments of general and inorganic chemistry, organic chemistry, and fine and applied arts). In addition, specialists in chemistry are trained at Universities of Ivano-Frankovsk and Kherson, as well as at University of Kiev-Mogilyanskaya Academy (natural science faculties and institutes have one or two chemical departments).

Since 1992 Ukraine has practiced two-level training in chemistry consisting of a bachelor program (4 years

of study) and a master/specialist course (1 year<sup>2</sup>). Training of bachelors is performed in compliance with the state standard approved in 2003, according to which 67% of 5049 teaching hours are accounted for by the prerequisite (compulsory) subjects, more than 25% of which are humanities and socioeconomic disciplines (Table 4).

Apart from prerequisite subjects university students are offered academic disciplines selected by higher educational institutions themselves (1700 h). Most frequently these subjects include: history and methodology of chemistry, supramolecular chemistry, stereochemistry, coordination chemistry, bioorganic chemistry, fundamentals of materials science, chemistry of isotopes, instrumental methods of analysis, mathematical and statistical methods in chemistry, molecular modeling, environmental chemistry, radiochemistry and radioecology, methods of teaching chemistry, and pedagogics.

Specialized training is usually performed in the fourth and fifth year of study (at University of Kiev – from the middle of the third course to the sixth course). The stronger the faculty, the more is the number of specializations. Thus, at V.N. Karazin National University of Kharkov there are eight specializations to choose from: physical chemistry of solutions, inorganic chemistry, organic chemistry, materials design and chemical informatics, chemical control of the environment, pharmaceutical chemistry, and computer chemistry and molecular design. Such a diversity of specializations increases the graduates’ chances to succeed in the labor market. It should be noted that there is a sufficiently high demand for graduates specializing in theoretical and computer chemistry and molecular modeling from the leading universities of the United States and Europe.

Despite twenty years of training bachelors, this higher educational level has not found recognition. The case is that bachelors in chemistry are given a qualification of “laboratory technician,” which does not allow them to qualify for positions adequate to the obtained education (the highest possible level for them is the position of a senior laboratory specialist without higher education). Therefore, students in chemistry aim to continue education taking master programs.

<sup>2</sup> Taras Shevchenko National University of Kiev is an exception. Since 2010 the University has been offering 2-year master programs.

**Table 4.** Compulsory part of the curriculum of bachelors in chemistry

Subjects	Teaching hours	Credits
<b>Cycle of humanities, social, and educational training</b>	<b>1296</b>	<b>24</b>
Phycology	81	1.5
Physical training	216	4
Sociology	81	1.5
Political science	81	1.5
Ukrainian language	54	1
Foreign language	270	5
Economic theory	108	2
Legal science	81	1.5
History of Ukraine	81	1.5
Philosophy	189	3.5
Cultural studies	54	1
<b>Cycle of natural science training</b>	<b>1080</b>	<b>20</b>
Higher mathematics	432	8
Physics	432	8
Informatics and information technology	162	3
Ecology	54	1
<b>Cycle of professional and practical training</b>	<b>2673</b>	<b>49.5</b>
Life safety	54	1
Inorganic chemistry	486	9
Analytical chemistry	432	8
Crystal chemistry	54	1
Quantum chemistry (structure of matter, chemical bonding)	163	3
Physical methods of material analysis	108	2
Organic chemistry	432	8
Physical chemistry	432	8
Macromolecular chemistry	162	3
Colloid chemistry	132	2.5
Eco-technology	162	3
Occupational safety	54	1

In 2010 the government of Ukraine approved a new list of areas and specializations, in which it is envisaged to train specialists with higher education. It is envisaged to train specialists and masters in chemistry in the following specialties: chemistry, inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry, colloid chemistry and nano-chemistry, applied chemistry, chemistry of high-molecular compounds, and medical and pharma-

ceutical chemistry. There are no state standards for training of specialists in all these specialties, and universities form curricula at their own discretion. Until present not a single institution of higher education has applied for a license allowing it to supplement training of students within the framework of the traditional specialty of chemistry with training of students in new specialties. Training of masters and specialists lasts for one year, the second term of which

is given for preparation of a thesis. As for the first term, there are few general courses; the majority of classes are given at the corresponding departments within the framework of the selected specializations. Kharkov University students of the fifth course are taught the following general subjects: eco-analytical chemistry, pressing problems of physical chemistry, crystal chemistry and X-ray structural analysis of functional materials, methodology and technology of organic synthesis, modern methods of chromatography and electrophoresis, and physiology and pedagogy of higher education; as well as the compulsory subjects of civil defense and occupational safety in industry.

There is an urgent need for specialists trained within the framework of interdisciplinary programs at the intersection of professions and sciences. As an example of interdisciplinary subjects, training in which is of great current interest, it is possible to mention chemical power engineering (hydrocarbon, nuclear, and alternative), technology of nanomaterials and composites, biotechnology, biochemistry, and some others. The legislation in force does not contribute to the development of interdisciplinary programs, as organization of training in accordance with such programs is beyond the scope of one area of training. How to overcome these difficulties is successfully exemplified in the Institute of High Technologies, Taras Shevchenko National University of Kiev, which in 2010 opened an experimental two-year department to train masters of high technologies, which is currently in the process of obtaining a license. Masters are trained on the basis of natural sciences bachelor programs. Students who have received basic education in physics and applied chemistry attend chemical and biological courses; students who have been trained in chemistry and biology study physical disciplines and increase their level of knowledge in mathematics and informatics.

A radical reform in the Ukrainian educational system was the introduction of external independent evaluation (testing) (EIE) as the sole criterion for the selection of university applicants. Transition to this system was welcomed by the majority of school graduates and their parents, who believed that it would help to eliminate corruption in university admissions boards. However, a new problem arose. The content of the tests, including tests in chemistry, is such that mostly the knowledge of facts but not the level of systematic knowledge or the ability to think logically can be evaluated. As a result, now for a school

graduate there is no point in studying school subjects systematically, in learning to think and to perform creative tasks; it is sufficient just to study hard with a tutor who will train the applicant to successfully solve the test problems.

In 2010 the EIE average score in chemistry of applicants admitted to the chemical faculty of Kharkov University was as high as 180.2 out of 200 possible. It seemed that students were well prepared to study the university curriculum. However, the testing is organized in such a way that a student's high score is often a poor reflection of his or her real level of knowledge. Thus, entrance control of knowledge in inorganic chemistry held by the University of Kharkov in September, 2010, demonstrated unsatisfactory level of knowledge among the first year students; moreover, the average score (58 out of 100 possible) was just a little above 50 points, which was the minimum required score to get a "three."

It is no wonder that universities have to make great efforts to find and train their prospective students as creative people with a passion for chemistry, who is capable of and eager to study. Work with gifted young people performed during several decades, which includes competitions in school subjects, schoolchildren's research carried out in the Junior Academy of Sciences, and young chemists' competitions, helps to achieve this goal. It may seem that teachers of higher educational institutions are far from working with schoolchildren; however, it is extremely active participation of university teachers, students, and postgraduate students in work with schoolchildren, in development of training and methodological materials, in organization of various activities for schoolchildren and their teachers that ensures the success of this activity. Integration of higher and secondary education in extracurricular work with the youth activates the promotion of studying chemistry, helps to cope with chemophobia, and contributes to increasing the professional level of school teachers. As a result, institutions of higher education make a positive long-term impact on the system of higher and secondary education in the field of natural sciences.

A well-organized system of national competitions in chemistry can serve as an example demonstrating the efficiency of these activities. More than 250.000 participants take part in the first (school) stage of the competition. About 50.000 schoolchildren compete at the district level; whereas the regional stage of the competition is attended by up to 3500 people. The best

of the best, which is up to 180 participants every year, take part in nationwide competitions. Almost all final-year schoolchildren who participate in the final stage of the national competition become students of chemical faculties of the leading universities of the country.

Another, very promising way of career guidance work with schoolchildren in the sphere of natural science education is organization of specialized boarding schools for gifted young people on a regional level and active involvement of universities in training of schoolchildren in these boarding schools. As an example it is possible to mention fruitful cooperation of the chemical faculty of Kharkov University and the 'Odarennost' (Giftedness) Kharkov regional boarding school. Talented schoolchildren selected from the entire Kharkov region are divided according to specializations (starting from grade 9), including specialization in chemistry and biology; moreover, for schoolchildren in this area of specialization classes in chemistry, which take place at the University laboratories, are given by teachers from the chemical faculty with the use of all the available material resources. As shown by the first experience, the efficiency of this method of training in chemistry is several times higher as compared to the training level even in elite general education schools of the city and the region of Kharkov.

Like in all Ukrainian higher educational institutions, chemical education in classical universities is in a difficult situation and has to find solutions to many challenges. It is naive to expect quick positive changes in the Ukrainian educational system, including the sphere of higher education in chemistry, as the period during which problems have only accumulated has been too long. However, the selected direction and ways of action used by the state, the degree of revitalization of public debates concerning fundamental problems of the educational sphere, and, finally, the preserved fundamental character of education at classical universities make it possible to look to the future with optimism. There is every reason to believe that, without losing the best achievements of the past, classical universities of Ukraine will be able to organize the educational process more rationally, to make it more closely integrated with science, truly innovative, and attractive for the youth.

## REFERENCES

1. Bakirov, V.S., *UNIVERSITATES*, 2003, no. 1, pp. 4–7, [http://uni-versitates.univer.kharkov.ua/arhiv/2003\\_1/bakirov/bakirov.html](http://uni-versitates.univer.kharkov.ua/arhiv/2003_1/bakirov/bakirov.html).
2. *Speech of President of Ukraine Viktor Yanukovich during his Annual Address to Verkhovna Rada of Ukraine*, April 7, 2011, <http://www.president.gov.ua/news/19736.html>.
3. *National Doctrine for Development of Education, Approved by Decree of President of Ukraine no. 347/2002* on April 17, 2002.
4. Tabachnik, D.V., *Steps into the Future: Frankly Speaking of Modernization*, *Gazeta* 2000, *Aspekty*, April 15–21, 2011, no. 15 (554), <http://2000.net.ua/2000/as-pek-ty/vzgljad/73033>.
5. Laptev, S.M. and Sharov, O.I., *Scientific Notes to KROK University*, Kiev, 2008, no. 18, vol. 1, pp. 4–15, [http://www.nbu.gov.ua/portal/Soc\\_Gum/Vzuk/2008\\_18/tom\\_1/4\\_15.pdf](http://www.nbu.gov.ua/portal/Soc_Gum/Vzuk/2008_18/tom_1/4_15.pdf).
6. *Rating of Higher Educational Institutions of Ukraine according to Indicators of Scopus Scientometric Database as of 22.12.2010*, [http://www.nbu.gov.ua/rating/ratings\\_uni/index.html](http://www.nbu.gov.ua/rating/ratings_uni/index.html).
7. *Taras Shevchenko National University of Kiev and the Leading Universities of Ukraine's Neighbors in the Mirror of Scopus Scientometric Database*, [http://www.nbu.gov.ua/rating/tsnu\\_rating/index.html](http://www.nbu.gov.ua/rating/tsnu_rating/index.html).
8. Astakhova, E.V., *Kadrovyy Korpus Vysshei Shkoly Ukrainy: Metamorfozy Razvitiya* (Personnel Framework of Higher Educational Institutions of Ukraine: Metamorphoses of Development), Kharkov: Izd. NUA, 2006.
9. Kizilova, N.N., *A Time to Gather Stones Together: Conversations about Physics and Mathematics with Academicians V.A. Marchenko and L.A. Pastur*, *UNIVERSITATES*, 2011, no. 1 (44), pp. 6–14.
10. Krivtsov, V.S., *Ways to Improve Teaching of Physics and Mathematics at Higher Educational Institutions of Kharkov Region, Report of the Rector of M. E. Zhukovskii National Aerospace University at Meeting of Rectors of Higher Educational Institutions of III-IV Levels of Accreditation of Kharkov Region on February 20, 2008*, <http://www-rada.univer.kharkov.ua/files/20.02.08/krivtsov.doc>.
11. Kholin, Yu.V., *UNIVERSITATES*, 2009, no. 1, pp. 9–15, [http://universitates.univer.kharkov.ua/arhiv-2009\\_1/kholin/kholin.html](http://universitates.univer.kharkov.ua/arhiv-2009_1/kholin/kholin.html).
12. *Development Objectives of the Millennium: Ukraine–2010, National Report*, Kiev, 2010, [http://www.mfa.gov.ua/data/upload/publication/uno/ua/47997/mdgs\\_ukraine\\_2010\\_report\\_ukr.pdf](http://www.mfa.gov.ua/data/upload/publication/uno/ua/47997/mdgs_ukraine_2010_report_ukr.pdf).