

the training of future masters of computer science involves mastering fundamental theoretical knowledge and skills from the mandatory components of professional training in combination with the formation of professional skills to effectively apply professional competencies in practical activities. It is found that an important component of modern higher education for the training of future masters of computer science in the field of information technology is the development of the ability to work on real projects that model or directly reproduce the conditions of future professional activity. It is determined that the educational process of the second (master's) level of higher education should be aimed at training highly qualified future specialists capable of innovative activity, critical and systematic thinking, analytical evaluation of information and making effective decisions in difficult conditions of professional activity; capable of solving professional tasks and creating innovative products and services for the strategic sustainability of the information society and the state's innovation infrastructure. It is outlined that the professional training of future computer science specialists in the field of information technologies at the second (master's) level of higher education is focused on: the formation of professional competencies, deepening of theoretical and practical skills and abilities, strengthening of the integrated system of knowledge, skills and abilities for innovative activity and effective solution of complex professional tasks, development of a high level of professional competencies of education seekers, improvement of analytical thinking and communication culture, integration of theoretical base with practical activity in real projects, acquisition of the ability for continuous professional self-development and self-correction, formation of professional skills of scientific research and project work, improvement of mastery of modern software tools, methodologies and technologies of information systems management, strengthening of fundamental and practical training of individuals in the field of information technologies. The main problems and prospects of training future computer science specialists are substantiated and characterized. It has been established that a key aspect of modern training of future masters of computer science is the formation of the ability to continuous professional development and self-education, which ensures readiness for the rapid integration of new technologies into professional activities.

Key words: *higher education institution, educational process, information technology industry, training of computer science specialists, information technology, professional competence, future computer science specialists.*

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PROSPECTS FOR IMPLEMENTING EUROPEAN MODELS OF DUAL EDUCATION IN THE UKRAINIAN CONTEXT

The article outlines the prospects for implementing the positive European experience of dual education in the Ukrainian context. It conducts a review of recommendations developed on the basis of the pilot project on the introduction of dual education in Ukraine, which address such target groups as education institutions, employers, employers' associations, students, and student self-government. The study

identifies the key factors that may facilitate the successful implementation of dual education at the national level. Furthermore, the paper highlights the core European practices in the field of dual education that can be adapted to the Ukrainian system.

Key words: *dual education, vocational training, vocational education and training, positive achievements of the European experience of dual education.*

Introduction. Dual education, as an innovative form of combining theoretical learning with practical training in real workplace environments, has proven highly effective across many European Union countries. It ensures closer alignment between education systems and labor market needs, enhances the employability of graduates, and fosters stronger cooperation between education institutions and employers. In the Ukrainian context, where the modernization of vocational and higher education is a national priority, adopting and adapting European models of dual education presents significant opportunities. By drawing on the best practices of countries such as Germany, Austria, Denmark, etc., Ukraine can strengthen the quality of professional training, reduce skills mismatches, and support youth employment, while simultaneously building a sustainable framework for collaboration between the state, business, and educational stakeholders.

Analysis of relevant research. European and world experience of dual education (its history, legal framework, content and procedural foundations) attracts attention of many Ukrainian scientists, among which M. Boichenko, V. Boichenko, S. Cherkashyn, O. Kravchenko, O. Kucher, O. Lakomova, O. Lavrentieva, L. Rybalko, A. Sbruieva, L. Slipchyshyn, O. Sytnyk, O. Yakovchuk, A. Zinchenko, S. Zinchenko and others.

Our article is **aimed** at defining the prospects for implementing European models of dual education in the Ukrainian context.

Research methods. To achieve the purpose of this scholarly inquiry, a range of general theoretical methods was employed, including analysis, synthesis, comparison, generalization, and extrapolation. These methods made it possible to ensure a comprehensive examination of the phenomenon under study.

Research results. The implementation of positive European experience in the development of dual education in Ukraine is an important factor in the modernization of the national system of professional pre-higher, professional (vocational and technical) and higher education, since the countries of the European Union have already developed effective mechanisms for combining theoretical training with practical training directly in production. The use of proven models of organizing the educational

process, forms of cooperation between education institutions and employers, as well as flexible approaches to forming the content of programs will allow to improve the quality of training of specialists, make it more focused on the needs of the labor market and reduce the gap between academic knowledge and professional skills. Such an approach will contribute not only to increasing the competitiveness of graduates, but also to the development of partnership relations between education and business, which corresponds to the strategic course of Ukraine for integration into the European educational space.

At the same time, given the availability of the results of the pilot project on the implementation of dual education in Ukraine, it is worth paying attention to the recommendations formulated in the relevant report (Lylyk, 2023).

In particular, the report provides recommendations for education institutions, employers, professional associations of employers, education seekers and student self-government. Recommendations for education institutions concern:

- the need to create a separate structural unit in the education institution responsible for the implementation of dual education;
- creation of a network of employers (partner enterprises);
- development of transparent criteria for the selection of partner enterprises;
- expanding the list of specialties and study programs in which the dual form of education can be implemented;
- attracting additional financial resources to provide support to education seekers studying in the dual form;
- development of a transparent and non-discriminatory selection procedure for students studying in the dual form of education;
- clear delineation of the rights and obligations of all parties in the relevant bilateral and tripartite agreements;
- increasing the amount of on-the-job training in senior years of study;
- involving partner enterprises in adjusting study programs, curricula, work training programs, etc., in terms of program learning outcomes;
- ensuring a share of on-the-job training in the amount of 25-60% of the total volume of the study program;
- choosing a model for organizing dual education based on the specifics of the specialty and the capabilities of employers;

- involving employers in assessing learning outcomes;
- involving employers in developing educational and methodological support for the educational process in the dual form, as well as in the project activities of education seekers;
- maintaining an academic or social scholarship for an education seeker studying in the dual form;
- publishing information on the organization of dual education on the official website of the education institution;
- establishing a procedure for systematically receiving feedback from employers;
- tracking graduates' career path;
- conducting information campaigns to popularize the dual form of education (Lylyk, 2023, pp. 131-133).

Recommendations for employers include the following aspects:

- ensuring appropriate conditions for training of education seekers in the workplace;
- developing a transparent and non-discriminatory selection procedure for training seekers in the dual form of education;
- mandatory conclusion of agreements with education seekers and education institutions with a clear definition of all conditions for organizing training in the dual form;
- active participation in the development of study programs, coordination of curricula, etc.;
- development of mentoring at the enterprise;
- introduction of rotation (opportunities to change jobs) at large enterprises for education seekers who can try themselves in different roles;
- creation by partner enterprises of conditions for internships and advanced training of teaching staff of the education institutions that organize training in the dual form;
- regular analysis of the enterprise's needs for specialists (both short-term and long-term) in order to train the appropriate personnel;
- development of procedures for monitoring the quality of workplace training and key indicators of the effectiveness of the organization of training for education seekers at the enterprise;
- tracking graduates' career path;
- active participation in career guidance work and information campaigns to popularize dual education (Lylyk, 2023, p. 134).

Professional associations of employers are recommended to:

- encourage their representatives to cooperate with education institutions;
- create and develop a network of employers – providers of dual education;
- active participation in career guidance work and information campaigns to popularize dual education (ibid.).

It is recommended that students: make an informed and responsible decision on the transition to a dual form of education, carefully familiarize themselves with the contract with the education institution and the employer, and provide feedback on various aspects of dual education. Accordingly, student self-government is assigned the role of organizers of information campaigns on dual education opportunities and establishing cooperation between higher education institutions and employers.

Therefore, the proposed recommendations are quite realistic and can serve as a guide to action. At the same time, considering the positive European experience, it is worth paying attention to factors that can contribute to the successful implementation of dual education on the national ground. In identifying the aforementioned factors, we relied on the research of G. Weber, T. Fasel, F. Hess and R. Meyer (2020). Let us consider these factors in more detail.

Competent professional trainers. In the recommendations analyzed above (Lylyk, 2023), this issue is not given sufficient attention, while one of the important factors for the effectiveness of workplace learning as a component of dual education is the availability of qualified and experienced trainers who understand their craft and can individually respond to students' needs. At the same time, trainers must have pedagogical skills and appropriate methodological techniques to make the learning process productive.

Contractual relations and cooperation. Cooperation at all levels (local authorities, private sector, non-governmental organizations, social partners and multilateral organizations) is important for the successful transfer of components of the vocational education system.

Penetration. The system to be implemented must be integrated into the local vocational education system. It is extremely important that there are opportunities for communication to be able to offer learners opportunities for long-term development.

Effective marketing. The system to be implemented should be promoted locally through public events or social media. In addition, the image and history of the company are important factors that can determine the success or failure of the implementation.

Acceptance in society. Potential “clients” must be aware of the added value of dual education in order to achieve a certain level of acceptance in society.

Innovative educational and methodological support. When developing educational and methodological support, it is worth being guided by existing achievements and best practices of the European partners, the exchange of which, for example, can take place in the process of implementing joint projects ERASMUS+ Key Action 2 (KA2).

Considering local needs. The dual education system should be oriented both to the demand of the local labor market and to solving local problems. Based on this, the dual education system can be used as a means of meeting this demand or solving these problems.

Creating associations. It is necessary to join efforts with other local companies, institutions or organizations in order to be able to achieve a better negotiating position, for example, in terms of interaction with state and local authorities.

Plurality of knowledge. The knowledge that is transferred should be reusable. Manual skills are easier to implement than commercial knowledge. This is mainly due to barriers in communication.

Participation of private business. The participation of private business is important for the system to have an adequate source of financing, as well as a management function.

Low level of corruption. Any education concept, no matter how successful, will fail due to the high level of corruption in the country, since cooperation with local authorities is usually inevitable. It is undeniable that the Ukrainian state is making efforts to reduce the level of corruption in the country, which is a necessary step on the path to European integration.

Implementing the reform “bottom-up”. The introduction of dual education on a “top-down” initiative, as the analysis of relevant experience shows, is unlikely to be successful. On the other hand, “bottom-up” initiatives in the relevant country, adapted to local conditions, are more effective (Weber et al., 2020, p. 94).

It is also worth paying attention to the best European achievements of the dual education system, which can be creatively implemented in the Ukrainian education system, including:

- training of education seekers in accordance with the qualifications specified in the classifier of professions, which will guarantee the assignment of professional qualifications to schoolchildren and students and provide them with the opportunity for permanent employment. In addition, training is designed to provide entrepreneurs with a qualified workforce in the long term;

- the presence of two training sites: a company and an education institution or center. At the same time, training at the workplace, “training without separation from production”, should have priority over the time of training at an education institution. At the same time, in higher education, the practice of involving not only a higher education institution and a partner enterprise, but also a vocational education and training institution in the organization of dual education is positive;

- active interaction between the company, authorities and social partners (public and private sectors);

- public-private partnership defines the role of stakeholders, their rights and responsibilities;

- broad consensus in society on providing vocational education to all school graduates;

- the presence of a strategic concept for training young employees in cooperation with companies;

- a strategic decision taken by the government and employers from the top down to implement a cooperative system;

- the readiness of the public sector (government, education institutions) to accept the private sector as an equal partner in vocational education and training;

- the readiness of the private sector to accept quality control of its educational and vocational activities as a fundamental Law on Vocational Education, which regulates the roles of stakeholders;

- close cooperation between general secondary education institutions and enterprises;

- pre-vocational orientation in the education system;

- organizational infrastructure through competent authorities: accreditation of training companies, registration of training and work experience contracts, exams and certification;

- the necessary components of vocational training standards, for example, rules on apprenticeship contracts, rules on recognition of prior training, rules on payment of apprenticeships, etc.;
- clear funding rules: enterprises cover their training costs (e.g. tuition fees, instructor costs, materials), the state finances vocational education institutions;
- both in the education institution and in the company, instructors teach and train qualified specialists, and especially in the company, trainers conduct a professional suitability exam.
- conducting research in the field of vocational education and training, as well as introducing training assistance programs.

Conclusions and prospects for further research. So, we can summarize that the dual education system in European countries is a popular and sought-after model for providing educational services. An analysis of scientific literature and reports has convincingly demonstrated that the dual education system is a success story that will continue for a long time. Of course, the challenges mentioned above need to be considered, as in the future the dual education system must be designed in such a way that it can even better meet the needs of the labor market work and respond quickly to flexible adaptation, for example in the STEM sector. It is important to individualize job profiles in such a way that they can provide even better employability.

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АНОТАЦІЯ

Кукса Тетяна. Перспективи впровадження європейських моделей дуальної освіти в українському контексті

У статті визначено перспективи впровадження позитивного європейського досвіду дуальної освіти в українському контексті. Здійнено огляд

рекомендацій, розроблених із урахуванням результатів пілотного проекту з упровадження дуальної освіти в Україні, що охоплюють такі цільові категорії, як заклади освіти, роботодавці, професійні об'єднання роботодавців, здобувачі освіти та студентське самоврядування. Окреслено чинники, що можуть сприяти успішному запровадженню дуальної освіти на національному ґрунті.

Визначено ключові європейські напрацювання у сфері дуальної освіти, які можуть бути адаптовані до української системи. Серед них – підготовка здобувачів відповідно до кваліфікацій, зафіксованих у національних професійних класифікаторах; організація навчання на двох майданчиках – у закладі освіти (або центрі підготовки) та на підприємстві; активна взаємодія між бізнесом, державними структурами та соціальними партнерами. Важливу роль відіграє державно-приватне партнерство, яке визначає права й обов'язки стейкхолдерів, а також забезпечує суспільний консенсус щодо доступності професійно-технічної освіти для всіх випускників. У європейській практиці існує стратегічний підхід до підготовки молодих кадрів: співпраця з компаніями базується на урядових та роботодавчих рішеннях «згори вниз», при цьому державний сектор визнає приватний бізнес рівноправним партнером у сфері ПТО, а підприємства беруть на себе відповідальність за якість освітньої діяльності. До важливих складових належать: тісна співпраця між школами та роботодавцями, рання профорієнтація учнів, акредитація навчальних компаній, реєстрація договорів про стажування, проведення іспитів та сертифікації. Визначальною є наявність чітких стандартів професійної підготовки (зокрема правил щодо договорів учнівства, визнання попереднього навчання, умов оплати праці учнів). Системи фінансування також мають прозорий характер: підприємства покривають витрати на практичне навчання, тоді як держава забезпечує фінансування закладів професійної освіти. Важливим елементом виступають і наукові дослідження у сфері професійної підготовки, а також програми підтримки навчання, що сприяють підвищенню ефективності дуальної системи.

Ключові слова: дуальна освіта, професійна підготовка, професійна освіта та навчання, позитивні здобутки європейського досвіду дуальної освіти.