



DESIGNING AN EFFECTIVE EDUCATIONAL PRODUCTION ENVIRONMENT IN VOCATIONAL SCHOOLS UNDER DUAL VOCATIONAL EDUCATION

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Abstract

Relevance: The issue of introducing dual education, in particular the design of a quality educational and production environment of a professional education institution under such conditions, is becoming more and more relevant. At the same time, it is important to take into account both objective and subjective factors affecting the specified process, as well as to determine the directions and prospects for the development of a high-quality educational and production environment of a professional education institution.

The article *aims* to discover how to design an effective educational production environment in vocational schools in the conditions of dual vocational education, create it in the schools involved in the experiment, assess its quality under appropriate parameters and provide relevant recommendations.

Methods: analysis of scientific and pedagogical sources and regulatory framework; study of the work practice of vocational education institutions according to research issues; SWOT analysis of the introduction of elements of a dual form of education in the professional training of future specialists, surveys of vocational education applicants, pedagogical workers of vocational education institutions and representatives of enterprises; modeling, analysis, synthesis and generalization of scientific material for the development and implementation of methodological tools; systematization and generalization of research results.

The results. As part of this research, an effective educational production environment in the conditions of dual vocational education was designed in vocational schools involved in the experiment after introducing the authors' methodical tools. The quality of the designed environment was assessed at the beginning and at the end of the formative experiment (the training course for vocational education teachers was organized; the authors' methodical tools were implemented) with the help of such parameters as modality, extension, intensity, awareness, generalization, dominance, social activity, mobility. A detailed analysis of the obtained results shows a significant increase in the quality of the specified parameters of an educational production environment in vocational schools with some elements of dual vocational education at a high level.

Conclusions. It is essential to support various innovations and initiatives of all the actors in the educational process to strengthen a creative atmosphere in vocational schools and, thus, prepare creative specialists who should act as proactive and free citizens of their country. It is crucial to build a constructive dialogue between all the actors in dual vocational education based on the principles of partnership and consensus to boost their motivation for joint productive activity and responsibility for its results and make their actions more coordinated. It is important to regularly update technological equipment in vocational schools and enterprises providing their production sites for practical training and promote continuing professional development of vocational education teachers and mentors at the enterprises to ensure high-quality vocational training of future specialists in the conditions of dual vocational education. Finally, it is advisable to improve educational programmes and curricula following the needs of enterprises (employers), as well as the fast-moving requirements of the labour market, to support the flexibility of the educational process.

Introduction. Recently, much emphasis has been placed on dual education, especially on designing an effective educational production environment in vocational schools. In this case, it is crucial to consider both objective and subjective factors influencing the specified process. It is also essential to determine the necessary areas and prospects for developing such an environment. It is primarily associated with a comprehensive approach that employs design thinking to solve the research problem.

In Ukraine, dual vocational education has been implemented in vocational training of future specialists since 2017 (Kulalaieva, & Leu, 2020). Its characteristic form is being shaped within the system of vocational education. One of these characteristics is the creation of an innovative educational production environment in vocational schools. Nevertheless, the issue of the quality of such an environment remains.

Sources. Quite noteworthy are studies by German scholars on a systematic organization of vocational education based on the methodological principle of duality (Bauman, Greinert, Kerschensneider, Lipsmaier, Petzold, Scholten, Stratmann, Stegmann et al.). They claim that dual vocational education seeks to overcome a) an imbalance between the demand for qualified workers and their presence in the labour market and b) the inconsistency of educational training with employers' requirements. At the same time, it implies gaining professional experience as a prerequisite for employment.

The question of the functioning of dual education in Germany and the ways of its effective introduction in Ukraine were studied by I. Boichevska and L. Veremyuk (Boichevska, I., & Veremiuk, L., 2020). The authors of the article studied the European experience of ensuring the quality of professional training of future skilled workers in the conditions of a dual form of education (Kulalaieva, N., & Haiduk, O., 2022). The expediency of using the methodology based on the quality cycle (PDCA Cycle) was determined.

Also, emphasis should be placed on research on a dual vocational education system in the EU countries, especially regarding a harmonious combination of education and work in production. As noted by the authors (Kyndt et al., 2021), vocational

schools cannot work in isolation, so learning becomes an integral aspect of professional activity. Meanwhile, many scholars are introducing theoretical models focused on the organization and support of learning, which involves the links between school-based training and work in production (Bosch, G. et al., 2010; Schaap, H., et al., 2012; Good Practice Studie, 2021). Each model illustrates how one can combine them and focuses, on the one hand, on facilitating these links within integrative learning processes and, on the other hand, on the development of curricula and programmes.

In the context of this research, considerable attention is paid to the «das Erfahrungsraum Model» which is a pedagogical model for designing educational technologies in dual vocational systems. The founder of this model is the Swiss Federal Council which promoted a funding strategy to support research on dual vocational education. For this purpose, some leading projects have been launched, one of which, since 2006, has been focused on exploring the role of technologies in vocational education. This project was named «Dual-T» and aimed to discover how learning technologies can help bridge the gap between vocational schools and workplace learning. The Erfahrungsraum model was developed within the framework of the «Dual-T» project for the effective use of learning technologies in dual vocational education. Its main idea lies in using learning technologies as the bridges between the vocational school, the workplace and their participants (Schwendimann et al., 2015). The term «Raum» (space) can refer to physical, digital or cognitive space associated with learning. At the same time, «Erfahrung» (experience) is related to experiencing something actual that leads to knowledge through further reflection. This term makes it clear that a raw experience alone does not lead to knowledge (Herzog & von Felten, 2015).

Thus, the mentioned studies serve as the basis for designing an effective educational production environment in vocational schools, where future specialists can obtain professional experience and, accordingly, high-quality training. Creating such an environment will ensure the productive employment of young people and reduce their unemployment rates, cultivate their most important qualities (dignity, freedom, equality, solidarity, tolerance, social

responsibility), promote entrepreneurship activity and establish a balance in the relations of all the actors in the vocational education system. Besides, this is a way to accelerate the implementation of the Strategy for Sustainable (Balanced) Development of Society. This, in turn, will enable a fruitful interaction between education and production, which should be built on the principles of systematicity, expediency, rationality, constructiveness, cooperation, mutual benefit and responsibility (Stratehiia staloho rozvytku Ukrainy, 2017).

The article **aims** to discover how to design an effective educational production environment in vocational schools in the conditions of dual vocational education, create it in the schools involved in the experiment, assess its quality under appropriate parameters and provide relevant recommendations.

To achieve this aim, the following **objectives** were formulated:

- to discover general and specific features of organizing dual vocational education in vocational schools in Ukraine;
- to illustrate an educational production environment in vocational schools under dual vocational education and the organization of the educational process within it;
- to reveal the content of the authors' methodical tools, which were introduced in vocational schools involved in the experiment, by holding training sessions and other events together with the academic staff and by their studying relevant methodical recommendations at the formative stage of the experiment;
- to describe the stages of an algorithm for designing an effective educational production environment in vocational schools in the conditions of dual vocational education;
- to assess how developed are the components of an educational production environment under dual vocational education in the schools involved in the experiment, namely, at the early formative stage and after the implementation of the authors' methodical tools;
- to formulate recommendations on how to design an effective educational production environment in vocational schools in the conditions of dual vocational education.

Methods: analysis of scientific and pedagogical sources and regulatory framework; study of the work practice of vocational education institutions according to research issues; SWOT analysis of the introduction of elements of a dual form of education in the professional training of

future specialists, surveys of vocational education applicants, pedagogical workers of vocational education institutions and representatives of enterprises; modeling, analysis, synthesis and generalization of scientific material for the development and implementation of methodological tools; systematization and generalization of research results.

Results and discussion. Between 2019 and 2021, research officers of the Professional Career Laboratory of the Institute of Vocational Education (VET) of the NAES of Ukraine were carrying out applied research on methodical principles of introducing the elements of dual vocational education into vocational training of future specialists in construction, machine-building, the service sector and public catering. It involved seventeen vocational schools from seven regions of Ukraine (Dnipro, Donetsk, Zaporizhzhia, Luhansk, Odesa, Poltava and Khmelnytskyi) that participated in the experiment.

This research consisted of three stages (ascertaining, formative and generalizing). At the ascertainment stage, elements of the dual form of education were analyzed, which, according to German scientists, should be imported into the professional training of future specialists of other countries (Euler, D., 2015). At the ascertainment stage, research officers of the Professional Career Laboratory of the Institute of VET of the NAES of Ukraine conducted a SWOT analysis of introducing the elements of dual vocational education in vocational training of future specialists. Subsequently, they identified a) the main benefits (compliance of vocational training with employers' requirements; the opportunity for students to gain valuable professional experience); b) weaknesses (an inadequate legal framework; insufficient communication between social partners); c) opportunities (updating the educational process and corresponding facilities of vocational schools; reducing unemployment rates among young people); d) threats (high risk of disappearance of training in certain professions; the loss of motivation among employers) (Kulalaieva, N., (2018)).

Besides, research officers of the Laboratory described the system of dual vocational education in Ukraine. The general features are as follows: reinforcing the practical component of vocational training under dual vocational education; promoting intellectualization and individualization of vocational training; arranging vocational training in the conditions of real production; developing social partnership in vocational schools; ensuring compliance of

vocational training with regional infrastructure; introducing mentorship; designing an innovative educational production environment in vocational schools (Herliand, T. et al, 2019).

The specific features of dual vocational training in construction, machine-building, the service sector and public catering include a) the need to transform theoretical training in terms of workload redistribution (30% – theory, 70% – practice); b) the observance of existing standards for study and working hours; c) the coordination of theoretical and practical training; c) the impossibility of ensuring the curriculum requirements by one enterprise;

d) the need to organize psycho-pedagogical training for mentors from enterprises; e) age restrictions (no younger than 18 years old) for admission of vocational students to complex technology professions and the workplace with high risks (Herliand, T. et al, 2019).

In Ukraine, the organization of the educational process within an educational production environment of vocational schools under dual vocational education is regulated by “The Provision on Dual Vocational Education” (Ministerstvo osvity i nauky Ukrainy (MON), 2019) (see Fig. 1).

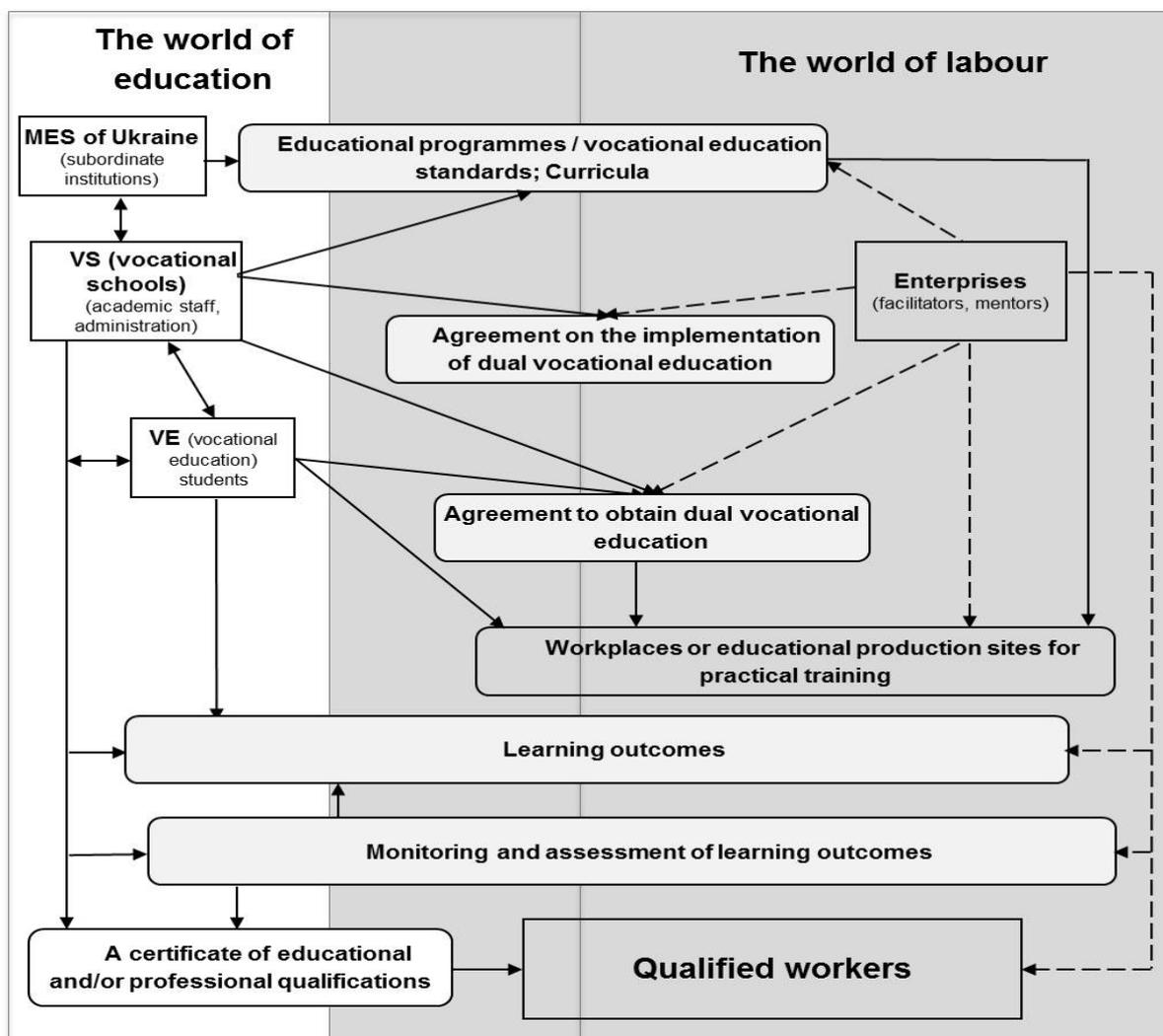


Figure 1. The organization of the educational process within an educational production environment of vocational schools under dual vocational education

Fig. 1 shows that the «world» of education involves the following actors: the Ministry of Education and Science of Ukraine and its subordinate institutions and organizations; vocational schools and their heads, administration, academic staff, and vocational students. At the same time, the «world» of

labour is represented by business entities (enterprises, establishments, organizations) together with their management, administration, qualified workers, facilitators and mentors who provide dual vocational education.

Dual vocational education follows educational programmes (vocational education standards) on specific professions/qualifications and curricula. They are developed by the academic staff of vocational schools together with the enterprises and are approved by relevant institutions subordinate to the Ministry of Education and Science of Ukraine in agreement with these enterprises. Vocational schools conclude agreements with enterprises regarding the implementation of dual vocational education so they can form a list of enterprises providing vocational students with workplaces or educational production sites for practical training. Importantly, vocational students can choose where they wish to obtain such training among the specified enterprises and conclude corresponding agreements with them. Subsequently, the enterprise specifies which workplaces or educational production sites are suitable for vocational students following this agreement, as well as the requirements and needs of the educational programme or the vocational education standard. In their turn, vocational schools send vocational students to the enterprise and appoint supervisors (masters of vocational training) for them.

Both vocational schools and enterprises are responsible for the assessment and monitoring of learning outcomes. Based on the results of state qualification attestation, vocational students are awarded certificates of educational and/or professional qualifications.

At the formative stage, a detailed analysis of relevant scientific sources, regulatory documents and practice of dual vocational education in vocational schools has made it possible to develop and implement the following: methods of organizing dual vocational education in such fields as construction, machine-building, the service sector and public catering; a technology for developing social partnership in vocational schools in the conditions of dual vocational education; a road map for employers on the introduction of dual vocational education under production conditions of economic entities; an algorithm for designing an effective educational production environment in vocational schools under dual vocational education.

Their nature and specifics of the application are disclosed in the training course offered by the

employees of the vocational training technology laboratory to the academic staff of vocational schools involved in the experiment. The course is named «Organizing Vocational Training for Future Qualified Workers under Dual Vocational Education» (Kulalaieva & Haiduk, 2021). It includes the following series of trainings: «The Legal and Pedagogical Documentation that Regulates the Planning, Organization, Implementation and Monitoring of Training under Dual Vocational Education»; «Methods of Organizing Dual Vocational Education for Qualified Workers»; «Methods of Organizing Dual Vocational Education at Production Site»; «The Technology of Developing Social Partnership in Vocational Schools under Dual Vocational Education: A Roadmap for Employers»; «The Foreign Experience of Dual Vocational Education»; «Current Models of Self-Government in Vocational Training of Future Qualified Workers under Dual Vocational Education»; «Fundamentals of Vocational Pedagogy»; «A Methodical System of Vocational Training for Future Qualified Workers with the Elements of Dual Vocational Education»; «Creating an Educational Production Environment in Vocational Schools under Dual Vocational Education».

In this article, an educational production environment in vocational schools under dual vocational education is understood as a multidimensional notion that consistently evolves and influences the development of professional competence. Besides, it is focused on personality development, thus ensuring one's readiness for professional activity and/or continuing education. Finally, such an environment is an integrated part of an educational production environment in vocational schools.

Its components are as follows: *personal* (the actors in the educational process; the links and relations between them that are manifested in their professional activity); *information- and content-related* (the main and supporting educational programmes, normative documents guiding the activity and interaction among the actors in the educational process); *organizational-operational* (forms, methods, means, technologies, ways of communication); *material* (material and technical resources, funds, equipment). Fig. 2 shows the structure of an educational production environment in vocational schools under dual vocational education.

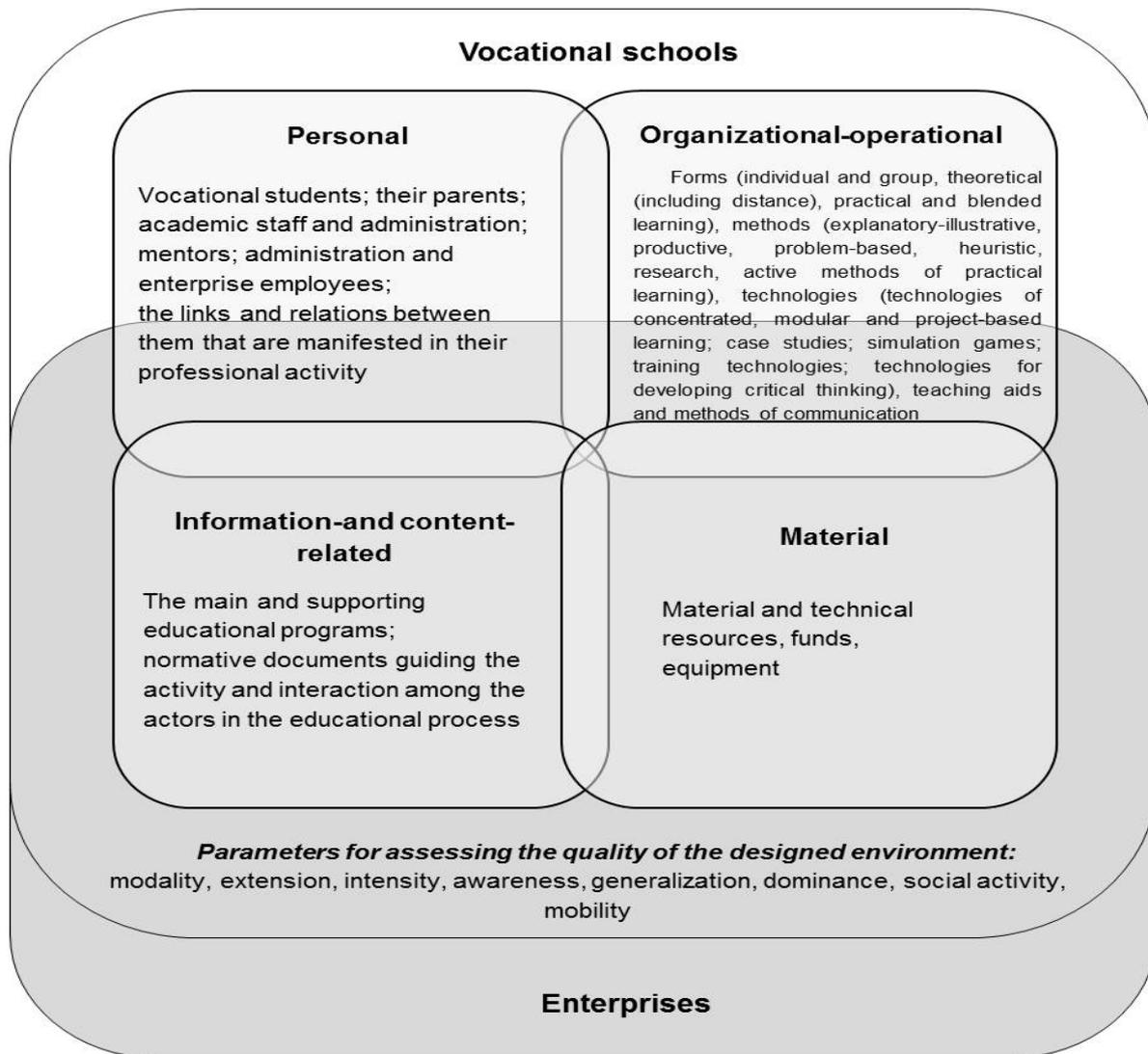


Figure 2. The structure of an educational production environment in vocational schools under dual vocational education

An algorithm for designing an effective educational production environment in vocational schools under dual vocational education involves the following stages (Kulalaieva, 2020):

- developing parameters and indicators to examine the designed educational production environment;
- formulating the educational ideology (modality) of this environment, as well as the strategies for its introduction;
- justifying subject-specific goals and objectives of the intended innovative educational process, focused on vocational training of qualified workers;
- selecting and structuring the content of this educational process by taking into consideration the hierarchical complex of needs of all its actors (students, their parents, academic staff, employers, school administration) and designing its project fol-

lowing educational programmes (vocational education standards) on specific fields/qualifications and current curricula;

- developing a project on the technological organization of an educational production environment through planning and organizing educational activities, appropriate incentives and interactions (based on the necessary technological equipment of workplaces for practical training);
- creating a project on the facilities of an educational production environment which comply with the requirements of dual vocational education (practical orientation, intellectualization and individualization of vocational training, development of social partnership, compliance with regional infrastructure);
- designing a project on the social organization of an educational production environment which

contributes to mutual understanding and fruitful cooperation between all the actors in the educational

process, their supervision of the educational process and the creation of a positive socio-psychological climate in student groups during theoretical training in vocational schools and practical training at the enterprise;

- monitoring the effectiveness of the designed educational production environment with the possibility of its improvement at each stage.

The following parameters were applied to assess the effectiveness of the designed educational production environment in vocational schools involved in the experiment: modality, extension, intensity, awareness, generalization, dominance, social activity, and mobility (Yasvin, 2001).

According to Janusz Korczak, modality is a qualitative typological characteristic of an environment that reflects the cultural atmosphere prevailing in it («dogmatic», «creative», «carefree» and «career-related») (Kovalchuk, 2017).

Extension is viewed as a structural and content-specific characteristic of an environment that determines the structural and functional components of the environment, as well as the organizational culture of the vocational school.

Intensity implies a structural-dynamic feature that corresponds to the scope of the provision of material and technical resources in the vocational school and the organizational potential of its management system.

Awareness characterizes motivation of all the actors in the educational process towards joint productive activity and responsibility for its results.

Generalization shows how well coordinated are all the actors in the educational process.

Dominance indicates the importance of an educational production environment as one of the main values for the actors in the educational process.

Social activity implies the levels of socially significant productivity of such an environment for the society.

Mobility is seen as the capacity of an educational production environment for evolutionary changes under the demands of the environment in which the actors in the educational process live and operate.

It was decided to assess the quality of the educational production environment in vocational schools by surveying 186 teachers for each parameter according to a certain rating scale. The latter includes three levels of compliance: a low level – the quality of an educational production environment does not meet the specified criteria; an average level – the quality of an educational production environment meets the specified criteria; a high level – the quality of an educational production environment meets the specified criteria and is of innovative/exemplary nature. The corresponding survey was uploaded on the website of the Institute of VET of the NAES of Ukraine (Anketa dlia vykladachiv, 2019).

At the early formative stage, most of the respondents assessed the levels of the components of the educational production environment at their workplaces as average (see Table 1).

Table 1

The allocation of teachers based on the levels of the components of an educational production environment under dual vocational education

The components of an educational production environment	The allocation of teachers based on the levels of the components of an educational production environment, %		
	High	Average	Low
Personal	24	73	3
Information- and content-related	28	68	4
Organizational-operational	25	70	5
Material	21	73	6

Concerning modality, 69% of the respondents characterized an educational production environment at their workplaces as creative; 22% of them – dogmatic; 6.5% – carefree; 2.5% – career-related. The allocation of teachers based on assessment parameters

(by a high level) of the quality of an educational production environment (extension, intensity, awareness, generalization, dominance, social activity, mobility) before (1) and after the formative stage of the experiment (2) is shown in Fig. 3.

As can be seen from Fig. 3, in the early formative experiment, most respondents assessed parameters, such as social activity, mobility and dominance at the highest possible level. It follows that the teachers recognized: the social significance of an effective educational production environment for the society, which meets the demand for dual vocational education in Ukraine; the considerable capacity of an educational production environment for evolutionary changes, in the context of relations with the living environment, which proves active changes associated with the introduction of some elements of dual vocational education in Ukraine; the significance of the

environment as one of the main values for the actors in the educational process, which confirms their motivation to create such an environment. Importantly, one can observe some effective positive shifts in parameter values after the teachers completed the training course, carefully studied relevant methodical requirements, and the authors introduced their methodical tools in vocational schools involved in the experiment. The teachers noted a significant increase in the quality of relevant parameters of an educational production environment in vocational schools with certain elements of dual vocational education at a high level.

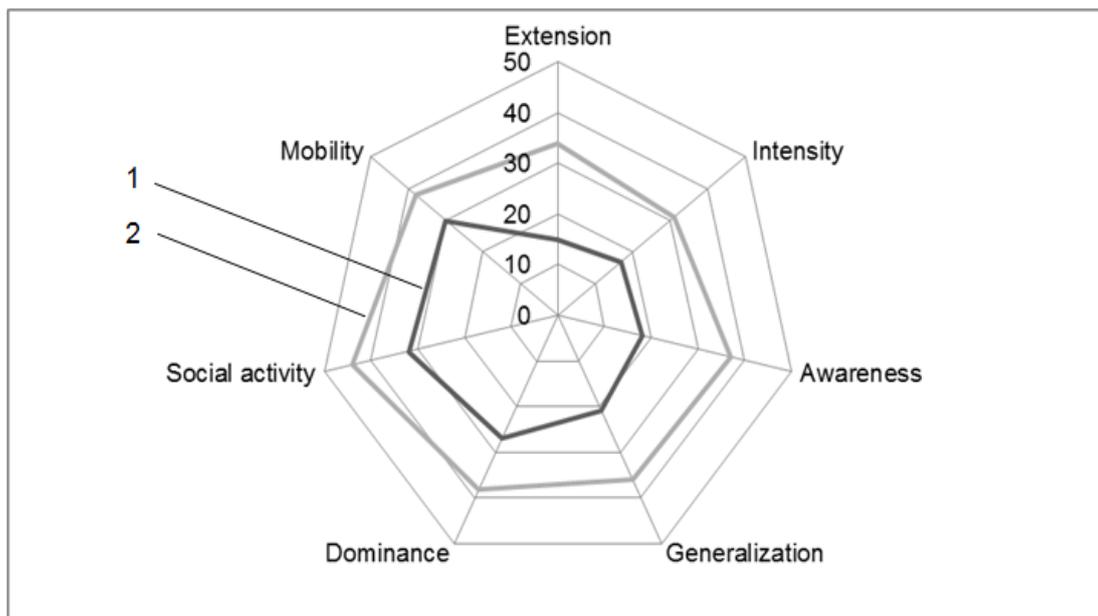


Figure 3. The allocation of teachers based on assessment parameters (by a high level) of the quality of an educational production environment before (1) and after the formative stage of the experiment (2)

On the basis of the received data, the statistical significance of the implementation result of the methodical tools developed by the authors in the vocational schools involved in the experiment was checked. The average score at the beginning and after the formative stage of the experiment was statistically compared. T-testing of 2 samples with evaluations with a total number of respondents of 186 people was used for verification. The basic (null) hypothesis was that there was no difference between the average value of the respondents' assessment. An alternative hypothesis was an increase in marks after completing the training course, to study in detail the relevant methodical recommendations developed on its basis, and to implement the methodical tools developed by the authors. The results showed the statistical significance of the implementation of methodological tools in vocational schools involved

in the experiment (The P-Value indicator is much lower than the critical value of 0.01).

Conclusions. As part of this research, an effective educational production environment in the conditions of dual vocational education was designed in vocational schools involved in the experiment after introducing the authors' methodical tools. The quality of the designed environment was assessed at the beginning and at the end of the formative experiment (the training course for vocational education teachers was organized; the authors' methodical tools were implemented) with the help of such parameters as modality, extension, intensity, awareness, generalization, dominance, social activity, mobility. A detailed analysis of the obtained results shows a significant increase in the quality of the specified parameters of an educational production environment in vocational schools with some

elements of dual vocational education at a high level.

It is essential to support various innovations and initiatives of all the actors in the educational process to strengthen a creative atmosphere in vocational schools and, thus, prepare creative specialists who should act as proactive and free citizens of their country.

It is crucial to build a constructive dialogue between all the actors in dual vocational education based on the principles of partnership and consensus to boost their motivation for joint productive activity and responsibility for its results and make their actions more coordinated.

It is important to regularly update technological equipment in vocational schools and enterprises providing their production sites for practical training and promote continuing professional development of vocational education teachers and mentors at the enterprises to ensure high-quality vocational training of future specialists in the conditions of dual vocational education.

Finally, it is advisable to improve educational programmes and curricula following the needs of enterprises (employers), as well as the fast-moving requirements of the labour market, to support the flexibility of the educational process.

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Anketa dlia vykladachiv zakladiv profesiinoi (profesiino-tekhnichnoi) osvity, yaki zdiisnuiut profesiinu pidhotovku maibutnikh kvalifikovanykh robotnykiv za dualnoiu formoiu zdobuttia osvity (2019). [Questionnaire for teachers of professional (vocational and technical) education institutions that provide professional training of future qualified workers according to the dual form of education]. <https://forms.gle/PJzD2jdvdMi5vVkd7>. , [in Ukrainian].

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ПРОЄКТУВАННЯ ЯКІСНОГО ОСВІТНЬО-ВИРОБНИЧОГО СЕРЕДОВИЩА ЗАКЛАДУ ПРОФЕСІЙНОЇ (ПРОФЕСІЙНО-ТЕХНІЧНОЇ) ОСВІТИ В УМОВАХ ДУАЛЬНОГО НАВЧАННЯ

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Реферат:

Актуальність. Останнім часом все більшої актуальності набуває питання запровадження дуального навчання, зокрема проєктування за таких умов якісного освітньо-виробничого середовища закладу професійної освіти. При цьому важливо врахувати як об'єктивні, так і суб'єктивні чинники, що впливають на означений процес, а також визначити напрями та перспективи розвитку якісного освітньо-виробничого середовища закладу професійної освіти.

Мета: підготувати рекомендації щодо проєктування, створення та оцінювання якості функціонування освітньо-виробничого середовища закладів професійної (професійно-технічної) освіти в умовах дуального навчання.

Методи: аналіз науково-педагогічних джерел та нормативно-правової бази – для виявлення ступеня дослідженості проблеми проєктування якісного освітньо-виробничого середовища закладу професійної (професійно-технічної) освіти в умовах дуального навчання; опитування здобувачів освіти, педагогічних працівників закладів професійної (професійно-технічної) освіти і представників підприємств – для вивчення практичного аспекту досліджуваної проблеми; моделювання, аналіз, синтез та узагальнення наукового й емпіричного матеріалу – для розроблення та впровадження методичного інструментарію; SWOT-аналіз упровадження елементів дуальної форми навчання в професійну підготовку майбутніх фахівців, систематизація й узагальнення результатів дослідження – для підготовки рекомендацій щодо проєктування якісного освітньо-виробничого середовища закладу професійної освіти в умовах дуального навчання.

Результати: охарактеризовано алгоритм проєктування якісного освітньо-виробничого середовища закладу професійної (професійно-технічної) освіти в умовах дуального навчання; визначено параметри оцінювання якості створеного середовища (модальність, поширення, інтенсивність, усвідомленість, узагальненість, домінантність, соціальна активність, мобільність), розроблено і впроваджено відповідний тренінг-курс для педагогів; доведено суттєве зростання якості створеного середовища за означеними параметрами; здійснено SWOT-аналіз упровадження елементів дуальної форми навчання в професійну підготовку майбутніх фахівців; сформульовано рекомендації щодо проєктування якісного освітньо-виробничого середовища закладу професійної (професійно-технічної) освіти в умовах дуального навчання.

Висновки: для проєктування якісного освітньо-виробничого середовища закладу професійної (професійно-технічної) освіти в умовах дуального навчання рекомендовано: підтримувати інновації та ініціативи всіх суб'єктів освітнього процесу (для створення творчої атмосфери в закладі професійної освіти, що сприяє вихованню креативних фахівців, які є активними та вільними громадянами своєї країни); будувати конструктивний діалог між усіма суб'єктами системи професійної освіти в умовах дуального навчання на засадах партнерства

та принципу консенсусу (для підсилення їхньої вмотивованості до спільної продуктивної діяльності та відповідальності за її результати, а також більшої координації їхніх дій); здійснювати системне оновлення та модернізацію технологічного обладнання в закладах освіти і в партнерських підприємствах, максимально сприяти постійному професійному розвитку педагогічних працівників і наставників на підприємствах (для забезпечення сучасної та якісної професійної підготовки майбутніх фахівців в умовах дуального навчання); постійно оновлювати й модернізувати освітні програми, коригувати робочі плани відповідно до вимог замовників робітничих кадрів і потреб ринку праці (для підтримки гнучкості освітнього процесу).

Ключові слова: *професійна освіта, заклад професійної (професійно-технічної) освіти, дуальне навчання, освітньо-виробниче середовище, майбутні фахівці.*

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