



## Dual Education Models in Modern Educational Institutions

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**Abstract:** The aim of the research is to verify the effectiveness of the dual education in modern educational institutions. The research involved the following methods: testing method (Self-Attitude Test) and methods of studying self-assessment through the ranking procedure; the peer-review method; Human Volitional Qualities Questionnaire; Student's t-test and the Kolmogorov-Smirnov test; Spearman's Rank correlation coefficient; Survey Response Rate calculation. Students expressed the greatest satisfaction with such aspects as the relationship with the tutor (0.84), tutor's objectivity in work evaluation (0.91), safe working environment (0.92), individual workplace (0.89). There were 58% of respondents who favoured dual education compared to traditional education. A group of experts who studied academic performance noted the advantage of the flipped classroom-based model. The level of special competencies in the control group was 4.5 units, while it was 4.9 units in the experimental group. The results of the study showed the high efficiency of dual education based on the flipped classroom model. The research identified a more effective implementation model. This model shows significant positive results, both in the context of higher education and vocational education. Future research should be aimed at finding an effective model for implementing the dual system in vocational education. Also, it is necessary to study the effectiveness of such innovations in modern realities.

**Keywords:** Skills training, vocational, professional, work-related, technical training

### 1. Introduction

The relevance of the research topic is determined by the need to prepare future specialists to fulfil real operation tasks. Business representatives currently request HEIs to train specialists and educate specialists who can perform their functions competently. The state's economy needs highly professional specialists capable of quickly adapting to changing working environments and market conditions. They must be able to perform their professional duties efficiently and responsibly. Modern education is characterized by modernization, which also affected changes in the training of

personnel in the relationship between an educational institution and an institution where a future specialist will work. This process was called dual education.

The role of high-level educational and professional training specialists as the main resource of development is growing in the context of the need for technological modernization of the economy of the entire state. It is the main factor in the assimilation of modern technologies, which are necessary to improve the quality of products and increase their competitiveness in the world. Universities play a key role in training professionals, high-level specialists, and research scientists who can generate knowledge and create national innovation systems (Bolli et al., 2021).

The dual system of education is the most widespread and recognized form of personnel training, which combines theoretical training in HEIs and on-the-job training. The Federal Republic of Germany is the motherland of dual education. Its experience demonstrates the high productivity and efficiency of such interaction of on-the-job practice with HEIs. However, in most countries, this training is not provided by law at all. The dual form is mostly effectively used in additional professional education or vocational training (Castro et al., 2022).

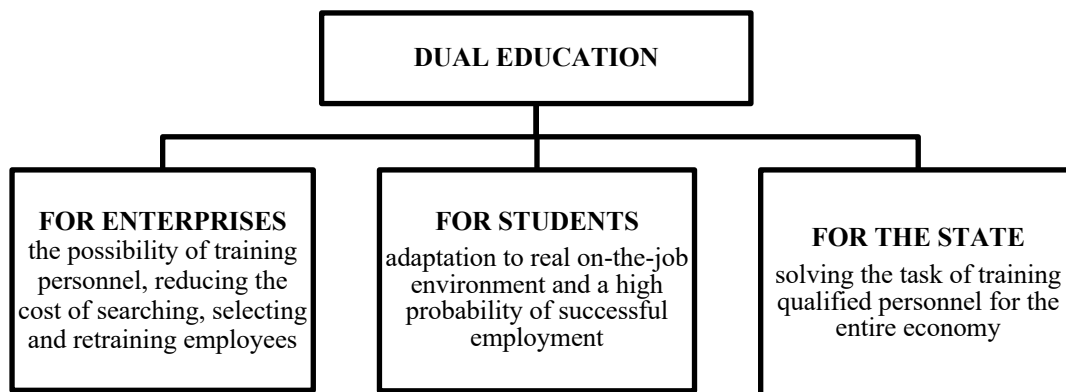
Dual training in the context of vocational education is an essential and effective model that combines theoretical training in an educational institution with practical training in real working conditions. This approach allows students to acquire theoretical knowledge and practical skills that they can apply directly in their professional activities.

As mentioned, one key aspect of dual education is cooperation between educational institutions and enterprises. Students conduct practical training in real working conditions under the guidance of experienced specialists. This allows them to gain valuable work experience relevant to their chosen profession and understand the requirements and specifics of a specific industry.

That is why the relevance of the topic is obvious, as HEIs urgently need reform and modernization in accordance with global educational trends. The implementation of foreign experience based on dual education mechanisms is the main vector that can open up significant prospects in making specialist training more effective (Flek & Ugnich, 2019).

A dual form of education is one of the possible forms of organizing the educational process in practice-oriented professional education. There are also other forms of practically oriented professional education that are used both in Ukraine and abroad. This is the organization of in-the-job practice as part of the educational program, training at specially equipped workplaces in the structural divisions of educational organizations. As a rule, these forms are combined or used separately because of the specifics of the areas of training (Krymchak, 2019).

Dual education is a product of close cooperation between educational institutions and employers regarding the successful professional and social adaptation of future specialists. The student is involved in the production process as an employee of the enterprise who performs a production function at the early stages of education. Consider the main principle of the dual education system — it is the equal responsibility of educational institutions and enterprises for the quality of personnel training. A dual system serves the interests of all stakeholders as Figure 1 shows.



**Fig. 1 - Principles of dual education**

**Source:** made up by the authors of the article from Romanyshyna and Dunduk (2021)

It is important to attract young, qualified personnel in order to stimulate the growth of the economy. This requires involving students in the production process during their studies. The experience of using a dual education system showed the following advantages of this system compared to the traditional one:

Dual education is an approach to training professional and technical workers that combines training in an educational institution (for example, a vocational school) and training in the workplace (production, enterprise, or organization). As the main features of dual education in the training of professional and technical workers, the following can be singled out. In dual education, PTU cooperates with employers and enterprises, allowing them to create curricula that meet the labour market requirements. Employers are actively involved in the learning process and enable students to gain practical skills and work experience in real conditions. VET students spend a certain part of their studies directly at the workplace. They get practical experience, observe the work of professionals and carry out practical tasks related to the chosen profession. This allows students to familiarize themselves with real working conditions and learn practical skills.

In some cases, dual-degree students may be paid for their work in the workplace. This stimulates them to be more responsible and put more effort into studying and working. Great attention is paid to an individual approach to students. Each student can choose a specific profession and field of study that corresponds to their interests and abilities. Dual education allows students to develop their professional skills and deepen their knowledge in a specific area. In the process of dual education, students have mentors both at the educational institution and at the workplace. These mentors provide students with support, advice, and assistance in their professional development. They monitor student progress and promote their success (Pominchuk, 2019).

This is a combination of theoretical and practical training, during which the student must learn the theoretical principles of professional activity in class, and receive on-the-job practical training. Dual education is an innovative form of organization of education that has integrative foundations reflecting the commonality of goals, values, content, and activities implemented under a dual education system. When learning the main educational programme in dual education, the student gradually goes through the process of professional adaptation and becomes accustomed to the on-the-job regime with minimal emotional and psychological discomfort. The on-the-job practice provides for interaction with the team within the professional space, where social competence and responsibility for the overall result are formed (Ramírez, 2022).

### 1.1. Unexplored Issues

The analysis of psychological and pedagogical literature and educational practice revealed several contradictions between the government order and the poorly developed dual education system. The issues of the need to use the potential of dual education in HEIs and the poorly developed pedagogical conditions for the organization of such an education system is also unexplored. The problem of professional growth of HEI graduates and the lack of the necessary practical skills for this purpose requires special attention.

The aim of the article is to study the effectiveness of pedagogical conditions of dual education in building professional and general competencies of students of HEIs. Specifically, 1) to study the peculiarities of the pedagogical conditions of dual education in HEIs, 2) to analyse the effectiveness of using different models of dual education in building future specialists' professional competencies.

## 2. Related works

Heffernan (2022) dealt with the principles and mechanisms of training professional education specialists. The study covers pedagogical approaches to the training of specialists in modern HEIs. The author notes the need for significant modernization of modern professional education approaches. The paper raises the issue of inconsistency between the theoretical knowledge obtained during studies and the realities of practical on-the-job application. According to the author, this problem is one of the most difficult ones, its solution is dictated not only by time but also by the urgent need for productive resources. That is why the author proposes a proven solution to this pressing issue, namely implementing the principles of dual education.

Hodges et al. (2020) studied the problems of improving the quality of educational services, the issues of building activity models of specialists involved in production, development of qualification characteristics of a specialist. The author suggests taking the following measures in dual education and optimizing the mechanism of interaction between all participants to improve students' training. Mentor teachers should have the opportunity to express their suggestions for improving the efficiency of working with students in dual education. Mentor teachers should be able to individually adjust the educational trajectories for their students. Integration of educational content is one of the key issues of modern didactics.

In their work, Flek and Ugnich (2020) present the methodology of integration processes in pedagogical systems. According to the authors, pedagogical integration is considered a many-sided process with a variety of kinds, types, levels and directions. Collazos et al. (2021) dealt with issues of the development of knowledge integration for the development of professional self-awareness. The theoretical and methodological foundations of integration in the system of continuous education, as well as the psychological and pedagogical foundations of the integration of the content of general and professional education, were adequately studied. Ikromovna (2022) considered the concept and essence of social partnership, the features of interaction between social partners and educational organizations. Zinchenko, S. M. and Zinchenko, A. L. (2021) studied dual education in terms of social partnership and social interaction. The authors of the article analyse the foreign experience of the functioning of the dual education system. Based on the data obtained, the authors propose a mechanism for introducing elements of dual education in modern HEIs in Ukraine.

Romanyshyna and Dundiuk (2021) considered the basic principles of practice-oriented learning. It is built based on modular competence-based, system-activity and project-target approaches, and is focused on the development of the pupil's-student's-specialist's personal qualities and worldview attitudes. An activity approach leads to a change in the general paradigm of education. The main development is the determination of the goal, as the development of the ability to learn, as competence, which provides the acquisition of new competences. Kravchenko (2021) describes the dual system of education as an educational process that combines practical training with part-time employment in production and training in a traditional educational institution. So, the dual system of education, as a system, is a mechanism which

is based on close interaction and cooperation of all parties involved in the training of highly qualified specialists, namely the state, employers, trade unions and various public associations. Mykolaichuk and Khmurova (2021) raise the issue of joint financing of dual education. The authors note that dual education is a platform for social partnership between business and educational institutions spurred by a common interest in the training of specialists.

Dual education provides that the practical part of the education is supposed to be carried out on the job. Moreover, practical training of students is carried out directly on the job, thereby significantly intensifying and ensuring the most successful introduction of students into professional activities. The author notes that both the professional educational institution and the one that provided the opportunity for practical activity as a participant of such training are responsible for the results of dual education. Slipchyshyn (2022) defined dual education as a mechanism for improving the quality of teaching special subjects. The author notes the need to develop and introduce public administration into the professional education system to combat expropriation and bureaucratization. According to the research, public administration is effectively carried out by technical and guardian councils, with the inclusion of future employers in their composition, as well as through various forms of interaction between educational institutions and the regional union of employers. This is how the employers influence the programme and methodical support of the educational process, their involvement in the final certification of graduates as chairmen and members of the certification commission.

Martseniuk and Hruzdiev (2021) studied the synthesis of theoretical and practical aspects of education. Recognizing the indisputable value of the previous studies, it should be noted that they did not cover the system of comprehensive implementation of professional training for HEIs in the context of dual education.

### **3. Methods**

#### **3.1. Research Design**

One of the aspects of the issue under research was the identification of opportunities to improve the quality of practice-oriented education in the higher education system through the implementation of basic departments at enterprises. To solve this problem, experimental work was planned and carried out to test the implementation of the practice of creating basic departments at enterprises based on the developed model of integration of the content of higher education in the context of social partnership. The logic of conducting the experiment involved several stages.

The first — exploratory and theoretical - stage (2020) provided for a theoretical analysis of literature from various scientific areas, as well as for the development of methodological recommendations for the effective implementation of a functional content model of integration of dual education in HEIs.

The second — experimental — stage (2021) (summative, formative and control assessments) involved the selection of methods for the experimental part of the study. Experimental work was carried out. The obtained results were arranged and analysed. The two most popular models of dual education were taken as a basis and as a working hypothesis. Two groups of respondents were formed at this stage: experimental and control. The first model represents a system of theoretical training based on the flipped classroom technique (Experimental group). The second model involves standard lecturing activities (Control group). The respondents' progress was monitored by an expert group throughout the experiment, which drew a conclusion about the effectiveness of one of the models of dual education.

The third — generalizing — stage (2022) involved the analysis of the results of experimental work, drawing conclusions, as well as providing recommendations for further research.

#### **3.2. Sampling**

The general population of the sample consisted of students of Ukrainian HEIs aged 19 to 26 years. Experimental work on verifying the effectiveness of dual education was conducted at the National Pedagogical Dragomanov University (Kyiv). The study involved 192 students of all faculties and general university departments. The respondents were divided into two groups: control (92 people) and experimental (100 people). The sample was chosen by an end-to-end method. The study also involved 15 teachers of the Department of Pedagogy as experts. This sample size allows to cover enough respondents to ensure a high level of validity of the results obtained. The survey participants were selected from among students of 4<sup>th</sup>-5<sup>th</sup> years of study by means of a remote questionnaire survey, which was carried out through Google Forms.

#### **3.3. Data Analysis**

1. A testing method was used to determine the level of professional self-attitude (Self-Assessment Test by V.V. Stolin, S.R. Pantelieiev) and the method of studying self-assessment through ranking procedure (A. A. Rean) (Halian, 2011). This is important for this research because the social adaptation of the individual is directly related to success in future professional activities. The Human Volitional Qualities Questionnaire by M.V. Chumakov was also used (Appendix A). The peer-review method was used to study professional competence.

2. Spearman's Rank correlation coefficient (formula 1):

$$r = 1 - \frac{6 \sum d^2}{n(n^2-1)} \quad (1)$$

where  $n$  is the number of qualities used in ranking,  $d$  is the difference between ranks.

The following null hypothesis  $H_0$  is tested in this study when analysing the results of the experimental work: the level of professional competencies did not change after the implementation of the pedagogical conditions of both dual education models. The alternative  $H_1$  is the following: the level of professional competences changed after the implementation of the pedagogical conditions of one of the dual education models (Singleton & Straits, 2017). So, it is necessary to study whether dual education models have the same effectiveness, and which model will be more effective.

3. Student's t-test (formula 2):

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \quad (2)$$

where  $X_1$  and  $X_2$  designate samples;

$n_1$  - the number of respondents at the input control;

$n_2$  - the number of respondents at the final control;

$s$  means the root-mean-square error (formula 3):

$$s_x = \sqrt{\frac{1}{(n-1)n} \sum_{i=1}^n (x - x_i)^2} \quad (3)$$

4. One-sample Kolmogorov-Smirnov test is based on the maximum difference between the cumulative sampling distribution and the predicted cumulative distribution (formula 4):

$$D_n = \sup_x |F_n(x) - F(x)| \quad (4)$$

where  $F_n(x)$  - cumulative sampling distribution;

$F(x)$  - expected cumulative distribution (with known parameters) (Roldan, 2021).

5. The Survey Response Rate was calculated using the formula 5:

$$x\% = \frac{Ey \cdot 100\%}{660} \quad (5)$$

The research involves reliable research methods and data processing tools. The survey was conducted using Google Forms and the Statistical 6.1 mathematical statistical data processing package.

### 3.4. Ethical Criterion

The research design is based on the principles of respect for the individual, gender equality, anti-discrimination on any grounds, validity, professionalism, and consistency of conclusions. All stages of the pedagogical experiment correspond to generally accepted academic ethical principles of research. All respondents were asked to honestly answer the test questions. The respondents gave their consent for the processing of personal data and the publication of research results.

## 4. Results

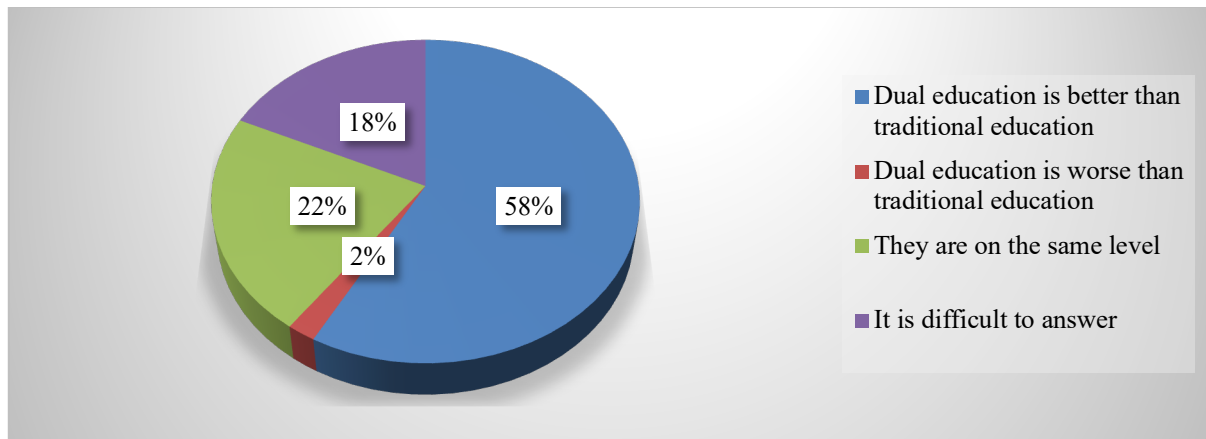
During the survey, students were asked to rate the degree of satisfaction with various aspects of dual education. Table 1 provides the data on the degree of satisfaction with dual education.

When students were evaluating the organization and conditions of study, they showed high satisfaction with the safe working environment, the individual workplace and the practical training schedule. The job description and the scope of work (these aspects received the lowest marks) were criticized. Students expressed the greatest satisfaction with such aspects as the relationship with the tutor, tutor's objectivity in work evaluation, safe working environment, and the individual workplace. The assessment of the quality of dual education in comparison with traditional forms of education is of interest in the context of this study (Figure 2).

**Table 1 - Index of students' satisfaction with various aspects of dual education**

ASPECT	SATISFACTION INDEX
Organization and working conditions at the enterprise	
Work schedule	0.79
Safe working environment	0.92
Individual workplace	0.89
Job description	0.72
Scope of work	0.71
Interaction with a tutor at the enterprise	
The relationship with the tutor	0.84
The value of the experience gained	0.97
Tutor's objectivity in work evaluation	0.91

Source: prepared by the authors based on research results



**Fig. 2 - Students' assessment of the quality of dual education in comparison with traditional forms of education**

Source: prepared by the authors based on research results

Students who marked the option “Dual education is better than traditional education” (58%) gave the following comments to the answer. 1) The opportunity to gain practical work experience (61.5%); 2) The opportunity to try the teacher’s role, to understand the peculiarities of the profession in real professional situations (23.1%); 3) The ability to apply theoretical knowledge acquired in college in practice (7.7%); 4) We get practical experience of interaction with children (7.7%). The percentage ratio of the levels was determined to visually represent the dynamics of the levels of professional self-attitude in the control and experimental groups. Summary Table 2 shows the dynamics of changes in self-attitude in the control and experimental groups at the beginning and at the end of the study.

**Table 2 - Percentage ratio of the total indicators of the levels of professional self-attitude in the control and experimental groups at the beginning and at the end of the experiment**

Control group			
	Low level, %	Medium level, %	High level, %
Beginning of the experiment	21.5	50.6	27.9
End of the experiment	20.9	51.4	27,7
Experimental group			
	Low level, %	Medium level, %	High level, %
Beginning of the experiment	17.9	55.3	26.8
End of the experiment	9.4	54.7	35.9

Source: prepared by the authors based on research results.

The data obtained reflect a slight increase in indicators of the level of professional self-awareness in the summative and control stages of the experiment among the students of the control group. It is also possible to note the dynamics of changes in the levels of professional self-awareness among students of the experimental group at the ascertaining and control stages of the experiment. Among the students of the experimental group, the indicators of the level of professional self-awareness at the control stage of the experiment significantly exceed the indicators obtained at the summative stage, which is explained by a significant increase in the indicators of self-awareness. It is also determined by the increase in indicators on self-interest scales. So, it can be noted that practice-oriented training in dual education contributed to the development of a conscious attitude to future professional activity and the growth of professional self-awareness and self-management.

Table 3 shows the average indicators of the volitional qualities in both groups of students, as well as the results of statistical processing of the test results. It should be noted that the student's t-test for independent samples was used because the indicators correspond to the normal distribution. It was concluded that further interpretation of the results is possible through the parametric methods of mathematical statistics.

**Table 3 - Average indicators of the development of volitional qualities of the personality and the results of statistical processing of the test results using the student's t-test for independent samples**

Sub-scale indicators	Control group		Experimental group		Student's t-test
	<i>M<sub>x</sub></i>	<i>Δ</i>	<i>M<sub>x</sub></i>	<i>δ</i>	
Responsibility	8.2	1.64	2.8	1.72	<b>0.001**</b>
Attentiveness	7.6	1.67	3.6	1.86	<b>0.005**</b>
Decisiveness	2.8	2.94	7.3	1.21	<b>0.007**</b>
Initiative	4.6	2.19	5.5	3.20	0.609
Independence	6.4	2.60	6.0	3.34	0.833
Self-restrain	5.6	3.04	5.1	2.56	0.803
Persistence	4.6	2.88	5.3	2.73	0.675
Vitality	5.2	1.30	5.5	1.76	0.760
Purposefulness	5.4	0.89	4.0	1.54	0.109

**Note:**

\* - differences are significant at  $p \leq 0.05$

\*\* - differences are significant at  $p \leq 0.01$ , *M<sub>x</sub>* - mean, *δ* - standard deviation, t - Student's t-test.

**Source:** prepared by the authors based on research results.

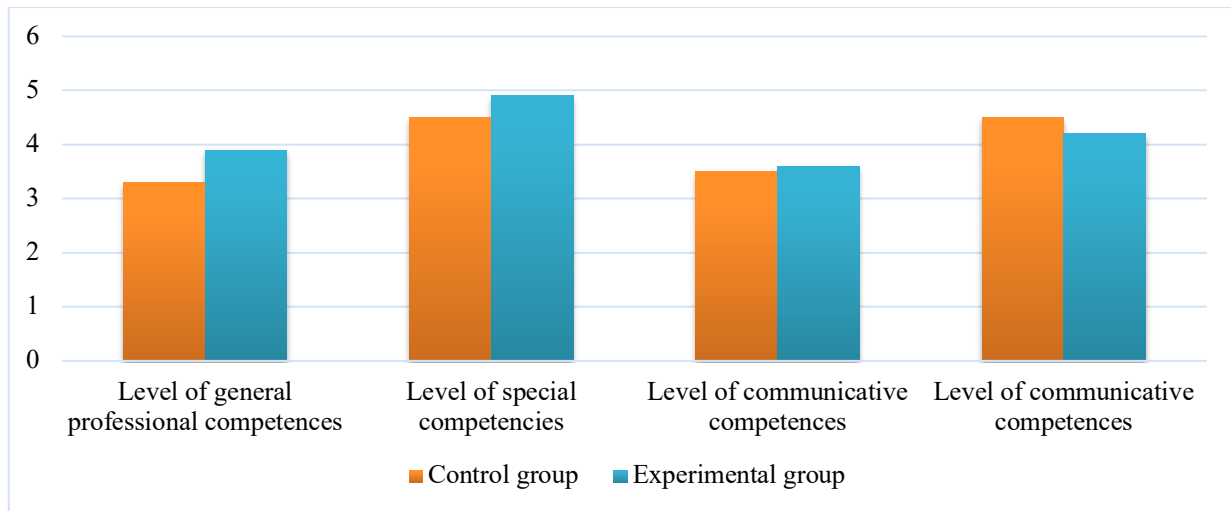
As Table 3 shows, indicators of expression of almost all volitional aspects were distributed within the average values in both groups. The exception was indicators of the responsibility level, being high in the control group. Differences in the individual characteristics of volitional qualities of students of both groups are noticeable. In the control group of students, such volitional qualities as responsibility and attentiveness were most pronounced, while those were decisiveness and independence and in the experimental group. At the same time, the biggest differences were recorded for responsibility, decisiveness and attentiveness. It was confirmed through the student's t-test that these differences are statistically significant. Most often, the control group students feel overcommitted. This leads to anxiety associated with the fear of not being able to do a job well or on time. At the same time, the decision made after long deliberation and hesitation is not sufficiently stable. In such situations, they are characterized by composure and deep immersion in work.

A comparative chart of the results of the experimental and control groups was built based on the results of peer review of students' performance (Figure 3).

Figure 3 demonstrates that one can see the advantage of using a model based on a flipped classroom compared to a model based on traditional in-class lectures. Only the level of communicative competencies among the control group respondents turned out to be higher with a slight excess. This can only indicate that the traditional model of organizing the study of theoretical material is no less effective in building communicative skills than innovative models of learning.

A study was conducted through the method of studying self-assessment through ranking procedure by A.A. Rean to analyse the correspondence of personal values and values assigned to an ideal professional. Table 4 shows the results of calculating the Spearman's rank correlation coefficient.

The results of the study give grounds to conclude that there is an increase in professional self-assessment in the experimental group (which does not exceed the norm). This indicates a positive attitude towards professional activity and sustainable motivation for further professional self-development. So, dual education contributes to qualitative changes in the students' professional self-awareness, builds an image of themselves as future professionals. The results obtained during the experiment proved the growth of students' professional consciousness.



**Fig. 3 - Visualization of peer review of students studying through different of dual education models**  
 Source: prepared by the authors based on research results

**Table 4 - Indicators of Spearman’s rank correlation coefficient in the control and experimental groups at the stages of the experiment**

BEGINNING OF THE EXPERIMENT		END OF THE EXPERIMENT	
CG	EG	CG	EG
$R_{contr.} = 0.43$	$R_{exp.} = 0.45$	$r_{contr.} = 0.45$	$r_{exp.} = 0.56$

Source: prepared by the authors based on research results

## 5. Discussion

Dual education in the system of higher education is improved according to the project principle, thereby enabling the solution of the primary problems — building priorities in the organizational and management activities of the educational process. Afanasieva and Shakhova (2021), Flek and Ugnich (2022) share this point of view. The authors of the studies note that dual education helps to shape management activities in accordance with implemented project models. According to the authors referred to above, it enables monitoring the progress of the fulfilment of the set goal according to the project stages. However, such researchers as Olimovich (2022), Vladu and Popescu (2022) do not consider the traditional model of education as exhausted. The authors insist on the need for fundamental theoretical knowledge and present the results of the effectiveness of traditional education.

Bygstad et al. (2022) studied the process of practical implementation of dual education. The authors emphasize that the implementation of dual education projects in the higher education system is a purposeful process. It is designed to ensure optimal functioning and achievement of goals in a certain time interval with limited resources by clearly defining management goals. For this purpose, it is necessary to develop mechanisms for their implementation, terms and status of intermediate values of the process, building connections between planned goals and resources. Tamarkina (2022) expressed the same opinion in their research. Kocsis (2020) and Pogátsnik (2021) also studied the implementation of dual education in the educational process.

Improvement of the educational process using project methods regarding the introduction of dual education in higher education appears as an innovation. It will enable the application of a new set of tools and methods for the modernization of the higher education system. On the contrary, Potapova and Ivannikov (2021) do not consider dual education as something innovative, but as a return to more traditional education on the job. The results of the study by Matviienko and Oksenyuk (2022) showed that the main problem of dual education in higher education is unified approaches that are applied to the system without considering the specifics of its individual elements. Solving the main problems of the dual system of higher education is possible through the implementation of an organizational project for one year. It is possible to optimize the educational process in HEIs to eliminate key problems that prevent the further development of the dual system without additional financial resources. Thus, we can cite the study of Afanasieva and Shakhova (2021), in which the format of dual education is recognized as not sufficiently effective in the conditions of poorly developed corporate culture and corporate consciousness.

The theoretical significance of the research results is justified by the following facts. The meaning of the concept of “dual education” is revealed and the perspective of its introduction into the system of higher education is substantiated based on generalization. The idea of implementing dual education at HEIs as an educational activity that activates and integrates students directly on the job was developed. This is an essential characteristic of dual education as a process of acquiring professional knowledge, gaining experience in professional activity and a motivational and value attitude



towards it, which is based on the integration of educational practices. The pedagogical conditions for implementing the system of dual education of students in HEIs at the regional level are theoretically substantiated. The practical significance of the study is that pedagogical conditions for implementing dual education of students of HEIs according to various models were developed and implemented. The undoubted effectiveness of dual education in HEIs was practically proven.

The reliability and validity of the research results are ensured by the scientific argumentation of the original theoretical propositions, the adequacy of the applied methods, the aim, and the objectives of the research. The correctness of the research and experiment, the assessment of the results of the experiment by methods of mathematical statistics, and a sufficient duration of the experiment leave no doubt about the objectivity of the research. The theoretical significance of the research results is that they expand and deepen knowledge about the essence of simulation in education, its theoretical and methodological foundations, organization with the use of computer technologies. The practical significance of the research is the focus of its results on improving the professional training of future specialists, which enables increasing the effectiveness of providing educational services in the context of the real educational process in HEIs.

The main limitations of the study are the difficulty of identifying the results of the study due to the limited sample of students. The difficulty is also in the development and use of modern educational programmes based on the dual education principle. It was difficult to test the research materials in the real educational process because of the quarantine restrictions imposed in connection with the COVID-19 pandemic.

## 6. Conclusions

*The study's relevance* is determined by the need to identify the effectiveness of the dual education model in both the field of vocational and technical training and in the conditions of higher education. *Conclusions based on the obtained results.* It was concluded during the research that a differentiated approach becomes a key factor when implementing the principles of dual education not only in higher education institutions, but also for vocational and technical educational institutions. It should be implemented in relation to the various elements of the system and their adjustment in accordance with the available potential of these elements and the specifics of each specific area. In general, the study showed high levels of professional competences among the respondents. This testifies to the high efficiency of the implementation of the dual education model. At the same time, the model based on the theoretical study of the material using the flipped classroom demonstrated greater effectiveness out the two considered models. *Applications.* The obtained results and conclusions can be helpful for everyone interested in reforming vocational education and bringing it closer to real market conditions. The research data may be of interest to both business representatives and the administration of HEIs, teachers and students. *Prospects for further research.* Further research should focus on finding the most effective models for the implementation of dual education under the current conditions. It is necessary to focus on comparing different educational models with dual education and finding the most effective educational model.

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### Appendix A: Human Volitional Qualities Questionnaire by M. V. Chumakov

A great variety of lists of volitional qualities of a personality given by different authors makes us search for ways of their empirical substantiation. One of them is the selection of volitional qualities based on semantic similarity. This feature was key when creating the questionnaire.

The questionnaire scales were formed empirically with the help of factor analysis of adjectives selected by the semantic similarity method. The description of the scales contains examples of questionnaire items and adjectives that make up the factor (in parentheses, adjectives that are on the positive pole of the scale are given first, and to the right of the dash — on the negative pole).

1. Responsibility (responsible, a person willing to fulfil his/her obligations - irresponsible, unreliable, frivolous).
2. Initiative (head, businesslike, strong, enterprising, active, influential, far-seeing - passive, reluctant, lazy, inactive).
3. Decisiveness (confident, determined — indecisive, uncertain, unstable).
4. Independence (self-reliant, independent — dependent, reliant, controlled).
5. Self-restrain (restrained, patient, prudent, self-controlled — impatient, unrestrained).
6. Persistence (steadfast, smart, stable, persistent — non-persistent, unstable, weak).
7. Vitality (active, vital, energetic, optimistic — powerless, depressed).
8. Attentiveness (attentive, self-disciplined, adamant — inattentive).
9. Purposefulness (purposeful, persistent — non-purposeful).

The questionnaire consists of 78 statements. It is designed to evaluate the level of such volitional qualities as responsibility, initiative, decisiveness, independence, self-restrain, persistence, vitality, attentiveness and purposefulness.

To calculate the results, the questions are divided into direct and reverse questions. In direct questions, “yes” answers are valued at 1 point, and “no” — 0 points; the opposite is the case with the reverse ones.

The calculation is carried out as follows (in parentheses, direct questions are given first, and the reverse ones — after a semicolon):

- Responsibility (11, 14, 27, 53, 72, 74; 61, 69).
- Initiative (1, 15, 28, 41, 48, 60; 8, 20, 33, 62).
- Decisiveness (29, 63; 2, 9, 21, 34, 49, 54).
- Independence (3, 30, 75; 10, 22, 35, 42, 70).
- Self-restrain (55, 64, 71, 73, 76; 4, 36, 43, 68, 77).
- Persistence (23, 31, 50; 16, 37, 44, 56).
- Vitality (12, 17, 32, 38, 57, 65; 5, 24, 45, 51).
- Attentiveness (6, 25, 39, 66; 13, 18, 46, 58).
- Purposefulness (19, 26, 47, 52, 59, 67, 78; 7, 40).

Each scale is evaluated separately. The more points scored, the more developed the quality.