ISSN: 2053-3578 I.F. 12.34

UDC: 378:331.108.45

ORGANIZING AND PILOTING DUAL EDUCATION AT THE "SECTOR-ENTERPRISE-UNIVERSITY" LEVEL IN THE TRAINING OF ENGINEERING PERSONNEL

Ismoil Norkobilovich Kodirov
Karshi State Technical University
Department of "Energy Engineering"
Professor, Candidate of Physical and Mathematical Sciences
E-mail: godirovissiqlik@gmail.com

Annotation. This article presents the results of piloting dual education in cooperation between higher educational institutions and industrial enterprises at the "Sector-Enterprise-University" level. It discusses the identification of the most important principles for implementing dual education. In addition, information is provided on engaging graduates in self-assessment to develop general competencies, and the outcomes obtained from this process.

Keywords: methodological principles, competencies, "Sector-Enterprise-University", dual education, self-assessment, dual education model.

Introduction. On January 28, 2024, President Shavkat Mirziyoyev held a meeting regarding measures to develop the electric power sector from 2025 to 2035. According to the information shared at the meeting, it is planned that by 2030, the share of "green" energy in total generation will exceed 50%. In particular, it is planned to commission 164 megawatts of capacity from 3,000 micro-hydroelectric power stations and 750 megawatts from solar and wind installations. Additionally, directives and programs were issued to cover at least 50% of the rooftops of households and business entities with solar panels. Moreover, during the same meeting, the President announced the establishment of an Energy Institute under the Ministry of Energy, with branches in all regions.

On March 29, 2021, the Cabinet of Ministers of the Republic of Uzbekistan issued Resolution No. 163 "On measures to organize dual education in the system of vocational education." Along with this, the regulation on the implementation of dual education in the professional education system was also approved. In order to address the abovementioned issues, it is considered essential to train qualified engineering personnel in higher educational institutions (HEIs) by introducing dual education, which is regarded as an innovative approach

ISSN: 2053-3578 I.F. 12.34

in the HEI education system. This is seen as a critical step in preparing modern, highly qualified engineering specialists [1,6,10–11].

It is known that the dual education format cannot always be organized everywhere and at all times, and in many cases, it does not operate effectively [3]. The lack of a newly developed and well-structured curriculum for dual education, as well as insufficient data on its effectiveness during piloting stages, remain urgent issues that need to be addressed.

In order to introduce dual education in Uzbekistan, the Cabinet of Ministers of the Republic of Uzbekistan adopted and enacted Resolution No. 14 on January 16, 2025, titled "On measures to organize dual education in the higher education system."

This resolution includes key components such as:

- The goals and objectives of dual education;
- Procedures for organizing dual education;
- The implementation of the “Kasb egasi” (Master of Profession) dual education system;
- The responsibilities, rights, and obligations of enterprises, higher education institutions, and students regarding the dual education system.

These provisions clearly demonstrate the state’s significant attention to this sphere, highlighting its strategic importance [1].

Moreover, the resolution stipulates the following:

- The theoretical and practical segments of dual education must be determined by the higher education institution in agreement with partner enterprises and organizations;
- The participation of students in the theoretical part of the education process is to be supervised by appropriate academic staff from the university, while the practical part, linked to production activities, is to be coordinated by a supervisor (mentor) assigned by the enterprise;
- The procedures for organizing the “Kasb egasi” dual education model within higher education are clearly defined.

Additionally, for students directly involved in dual education within enterprises, the resolution states that up to 2 million UZS of the salary paid by the enterprise (based on a referral) will be reimbursed monthly from the State Employment Promotion Fund.

Analysis of Relevant Literature. Currently, the dual education system is widely used in the training of qualified personnel in a number of countries such as Germany, France, China, the USA, South Korea, Russia, Switzerland, Austria, as well as in many Asian nations. Research shows that the integration of theory and practice in the dual education model provides a strong

ISSN: 2053-3578 I.F. 12.34

foundation for the development of highly skilled professionals across various sectors of the manufacturing industry [5].

If we analyze the term “dual,” it originates from the Latin word *dualis*, meaning “twofold” or “dual-sided.” The concept of dualism was first introduced into science by the German philosopher Christian Wolff (1679–1754) [2].

L.V. Sidakova defined the dual education system as “an educational system that envisages the combination of academic activities of educational institutions with the operational processes of industrial enterprises” [3]. Similarly, in their scholarly works, D.A. Rastegayeva and L.A. Filimonyuk described the dual education model as “a coordinated system between higher professional education institutions and employers in production enterprises aimed at preparing specialists with the required qualifications in specific vocational fields” [4].

From the analysis of literature on this topic, it is evident that dual education can be conceptualized as a model in which theoretical training takes place within educational institutions, while practical training is conducted at production enterprises [5].

Research Methodology. In higher education institutions, several challenges arise in the process of training future engineers. One major issue is the lack of alignment and continuity between theoretical and practical training, which often results in students struggling to master both components simultaneously. Another challenge is the disconnect between educational institutions and the labor market. One of the effective ways to address these problems is the implementation of the dual education model (see Figure 1).

ISSN: 2053-3578 I.F. 12.34

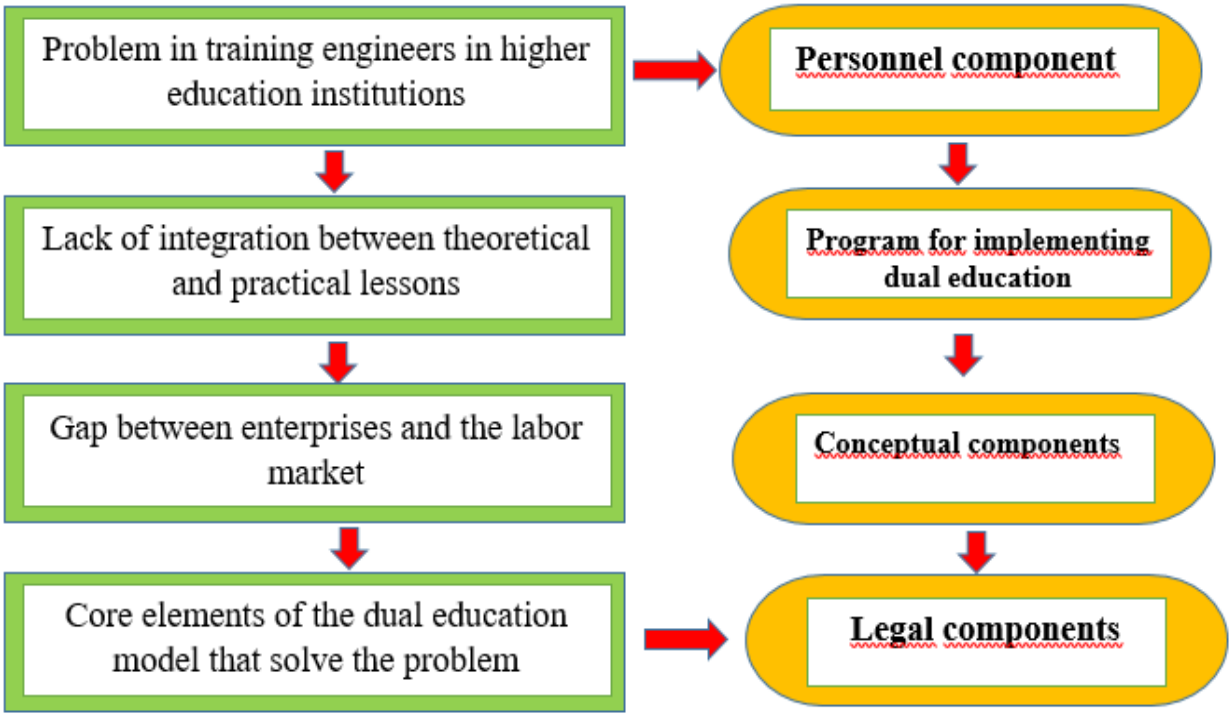

Figure 1. One of the ways to solve problems in higher education institutions is the application of the dual education model.

It is emphasized that the training of future engineering specialists can be effectively implemented using a **dual education model**, which has proven to yield high results [5–11]. In order to implement dual education effectively in higher education institutions (HEIs), it is advisable to develop a model based on the principle of **equal partnership** among all participants in the educational process [5].

The proposed dual education model consists of the following key components:

1. **Legal components**
2. **Conceptual components**
3. **Program for introducing dual education in HEIs**
4. **Human resources (personnel) components**

Each component in this model is interrelated and complements the others in a collaborative framework.

Criteria for implementing dual education in higher education institutions. Based on the conducted research, mechanisms and features of organizing dual education for engineering students in HEIs have been identified, resulting in the definition of the following essential **criteria**:

ISSN: 2053-3578 I.F. 12.34

1. A **new dual education curriculum**, jointly developed by HEIs and partner enterprises, in which the structure, content, and workload fully correspond to the real needs of the industry.
2. **Practical training** is conducted directly in manufacturing enterprises using modern equipment and technologies.
3. Topics for **laboratory work, course projects, and final qualification papers** are aligned with the potential needs of the enterprises.
4. **Training facilities** at the enterprises are equipped with modern analogs of production equipment (actual models and samples).
5. Students are given the opportunity to become familiar with the **specific conditions and corporate culture** of the enterprise and to work as part of its team.
6. **Theoretical training** is the responsibility of the state, while **practical training** is managed by the enterprise, or both may be jointly responsible.
7. Practical training is **supervised by a qualified mentor** appointed by the enterprise.
8. HEI **faculty members are provided with opportunities** to enhance their qualifications in specialized subjects at manufacturing enterprises.

The rationale for selecting the above-mentioned criteria for implementing dual education. It has been determined that selecting the above-mentioned criteria is appropriate for organizing and implementing dual education. In order to evaluate the effectiveness of the dual education process and to conduct research more productively, scientific and pedagogical literature on the organization of dual education was studied and analyzed. Methods such as content analysis of higher education curricula, surveys, comparisons, and evaluations were employed.

Analysis and Results: Was the trial implementation of dual education effective? What challenges were encountered? In the process of organizing dual education in cooperation at the "Sector–Enterprise–University" level, although the enterprises required qualified specialists, many were reluctant to take on the responsibility of training future personnel or participating as educators. Some of the key challenges identified during the implementation of dual education at the "Sector–Enterprise–University" level included:

- The **lack of legal and regulatory documents**;
- **Difficulties in adapting** newly developed dual education curricula to the operational activities of enterprises.

Moreover, if enterprises cannot forecast their staffing needs for the next 3–5 years, and if they are unable to assess the costs of training personnel versus the expected benefits, it becomes

ISSN: 2053-3578 I.F. 12.34

difficult to involve them in the dual education process. However, if universities assist enterprises in solving forecasting issues, they can more easily overcome these challenges and meet their staffing needs effectively. Self-assessment of graduates' competency development: Analysis of Results. Interesting results were observed from the analysis of self-assessments conducted among university graduates regarding their level of competency development. A list for self-assessment of competency development was provided to the graduates. The results are illustrated in Diagram 2. The assessment used the following scale:

- 0 – Not developed
- 1 – Poorly developed
- 2 – Partially developed
- 3 – Fully developed

According to the research results shown in Diagram 2, **none of the respondents** selected the "Not developed" option for any competency. However, some did indicate that certain competencies were poorly developed. The analysis revealed that building dual education at the "Sector–Enterprise–University" level was **more difficult** than at the "Enterprise–Department (Laboratory)" level.

It was also found that:

- The content of vocational modules needs to be reviewed and aligned with **the requirements of the production enterprises**.
- **Modernization of laboratory equipment** in university departments to match current industrial standards is necessary.

Students were asked to self-assess the development level of **ten selected competencies**. The results showed that:

- No respondent selected "Not developed" for any competency.
- Some selected "Poorly developed" for one or, at most, two competencies.

The **lowest score** was observed for the competency **"Ability to communicate in Russian"** (Diagram 2). Based on the results, it can be concluded that for the successful development of competencies among future engineers, it is necessary **not only to implement the principles of dual education**, but also to **further improve its methodology**.

ISSN: 2053-3578 I.F. 12.34

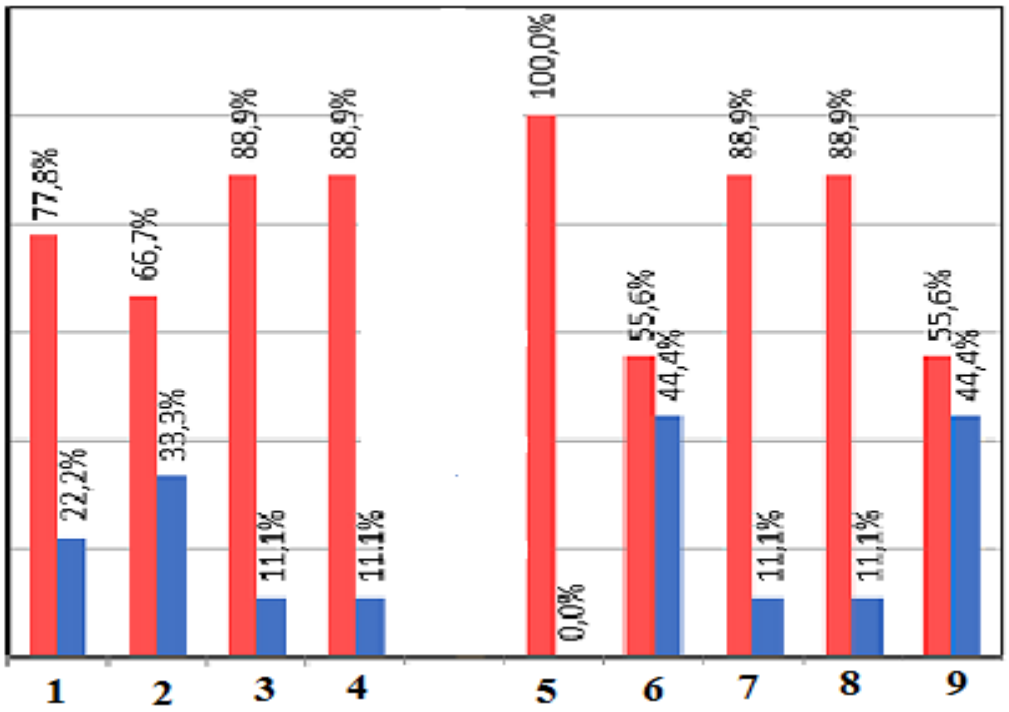

Figure 2. Self-assessment of Graduates on the Formation Level of Competencies

1. Ability for self-learning
2. Ability for self-organization
3. Aspiration for creative self-development
4. Readiness for professional growth
5. Ability to communicate in Russian
6. Readiness to cooperate and ability to work in a team
7. Ability to independently solve professional problems
8. Readiness to take responsibility
9. Ability for systematic thinking

Conclusions:

1. It has been established that eight key criteria of dual education are especially important for organizing dual training of engineers at the "Sector–Enterprise–University" level. It is recognized that relying on the principles of dual education is a distinctive feature in its implementation.
2. Based on a special survey among graduating students, university professors, and production enterprises, it was found that implementing training on the basis of dual education could meet the demands of production enterprises.

3. Organizing dual education at the "Sector–Enterprise–University" level is more challenging than building it at the "Enterprise–Department (Laboratory)" level. However, testing results show that it is significantly more effective.

Suggestions:

1. Since implementing dual education at higher education institutions in cooperation with enterprises at the "Sector–Enterprise–University" level is of great importance, it requires further improvement of the content and methods of teaching students under dual education. Therefore, more scientific research needs to be conducted in this area.
2. The analysis of the practice of implementing dual education at the "Sector–Enterprise–University" level shows that it is necessary to improve the regulatory and legal framework and to continue scientific research in this field.

References:

1. Resolution No. 163 of the Cabinet of Ministers of the Republic of Uzbekistan dated March 29, 2021 “On measures to organize dual education in the system of professional education.” https://lex.uz/ru/docs/5346217
2. Mullaboyeva N. *Professional Pedagogy*. Namangan, 2019, p. 364.
3. Sidakova L.V. Essence and main features of the dual education model. *Education and Upbringing*, 2016; 2: 62–64.
4. Rastegaeva D.A., Filimonyuk L.A. Fundamentals of implementing a dual education system in training students of higher education organizations. *World of Science, Culture, and Education*, 2017; 6(67): 110–112.
5. Tereshchenkova E.V. Dual education system as a basis for specialist training. *Scientific-Methodological E-Journal “Concept”*, 2014; 4: 41–45.
6. Kodirov I.N. *Alternative energy: the role of dual education in training technical personnel.* Web of Teachers: Inderscience Research. Volume 2, Issue 02, February 2024. pp. 169–174.
7. Shumakova O.V., Mozzherina T.G., Komarova S.Yu., Gavrilova N.V. Experience of dual education as a means to increase professional training efficiency // *Electronic Scientific and Methodological Journal of Omsk State Agrarian University*. 2016. No. 4(7). URL: http://e-journal
8. Kodirov I.N. *Integration of exact sciences with other disciplines in the training of alternative energy personnel using dual education in higher education.* International Scientific-Practical Conference, Tashkent, DPU, April 16, 2024, pp. 826–830.

9. Kodirov I.N. *Application of dual education in training engineering personnel in the alternative energy sector.* Proceedings of the International Scientific-Technical Conference "Current Issues in the Energy Complex: Production, Transmission, and Ecology." KarMIIT, April 25–26, 2024, pp. 472–477.
10. Kodirov I.N. *Mechanisms for training qualified alternative energy personnel in higher education using dual education.* International Online Scientific-Practical Conference “Modern Trends in the Development of the Education System: Relevance, Problems, and Prospects.” KarSU, April 26–27, 2024, pp. 383–389.
11. Kodirov I.N. *Introduction of dual education as an innovative method in the training of alternative energy personnel*. International Scientific-Practical Conference “Advanced Methods of Ensuring Education Quality: Problems and Solutions.” Samarkand State Institute of Foreign Languages, Samarkand, May 2–3, 2024, pp. 1006–1009. doi: https://doi.org/10.2024/6zw08e84.