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INNOVATIVE MODEL OF ENGINEERING PERSONNEL TRAINING ACCORDING TO EPIP INTERNATIONAL STANDARDS

ЕРІР ХАЛЫҚАРАЛЫҚ СТАНДАРТТАРЫНА СӘЙКЕС ИНЖЕНЕРЛІК ҚЫЗМЕТКЕРЛЕРДІ ДАЙЫНДАУДЫҢ ИННОВАЦИЯЛЫҚ ҮЛГІСІ

ИННОВАЦИОННАЯ МОДЕЛЬ ОБУЧЕНИЯ ИНЖЕНЕРНЫХ КАДРОВ ПО МЕЖДУНАРОДНЫМ СТАНДАРТАМ ЕРІР

Abstract. *The training of engineering personnel in the field of road transport requires innovative approaches based on international training standards. The educational process in this area should be carried out in certified centers that have the appropriate material and technical base. "Engineering" is the foundation of the EPIP learning model. "Engineering" is the beginning of "practice-oriented," "innovation-oriented," and "project-oriented" learning, without which EPIP would not be possible. Levels of PIPE application. In terms of application, the EPIP mainly consists of three levels, namely the macro level, the intermediate level and the micro level, which correspond respectively to the EPIP educational theory, the EPIP specialty theory and the EPIP curriculum theory. EPIP is an adapted program that aims to promote the economic and social development of the region, increase the competitiveness of academies, develop basic professional skills and technologies, and promote the dissemination of knowledge and technology. For teachers, the application of EPIP is to find and create appropriate engineering goals and engineering conditions (in the real world and in real life) for students, developing students in "one project after another" according to engineering goals and conditions; implementation of the integration of teaching, learning and practical activities, as well as the integration of knowledge, technology and professional skills. qualities combined; teach students to learn and act. The article discusses the features of the implementation of personnel training on the basis of the Lu Ban Workshop certified center. Attention is paid to the content of engineering competencies and skills in accordance with international EPIP standards.*

Keywords: *EPIP, engineering personnel, transport, engineering competencies, concept.*

Аңдатпа. *Автомобиль көлігі саласында инженерлік кадрларды даярлау халықаралық оқыту стандарттарына негізделген инновациялық тәсілдерді қажет етеді. Бұл бағыттағы оқу процесі тиісті материалдық-техникалық базасы бар сертификатталған орталықтарда жүргізілуі керек. "Инженерлік" - бұл ерір оқыту моделінің негізі. "Инженерлік" -бұл "тәжірибеге бағытталған", "инновациялық бағытталған" және "жобаға бағытталған" оқытудың бастауы, онсыз ЕРІР мүмкін емес еді. PIPE қолдану деңгейлері. Қолдану тұрғысынан ЕРІР негізінен үш деңгейден тұрады, атап айтқанда ерір білім беру теориясына, ерір мамандық теориясына және ерір оқу бағдарламасының теориясына сәйкес келетін макродеңгей, орта деңгей және микро деңгей. ЕРІР-бұл аймақтың экономикалық және әлеуметтік дамуына ықпал етуге,*

академиялардың бәсекеге қабілеттілігін арттыруға, негізгі кәсіби дағдылар мен технологияларды дамытуға, білім мен технологиялардың таралуына ықпал етуге бағытталған бейімделген бағдарлама. Оқытушылар үшін ерір қолдану студенттер үшін тиісті инженерлік мақсаттар мен инженерлік жағдайларды (нақты әлемде және нақты өмірде) табу және құру, инженерлік мақсаттар мен шарттарға сәйкес студенттерді «бір жобадан екіншісіне» дамыту болып табылады; оқытуды, зерттеуді және практикалық қызметті интеграциялауды, сондай-ақ білімді, технологияны және кәсіби дағдыларды интеграциялауды енгізу. қасиеттер біріктірілген; студенттерді үйренуге және әрекет етуге үйрету. Мақалада Лу Бан шеберхана-сының сертификатталған орталығы негізінде кадрларды оқытуды жүзеге асыру ерекшеліктері қарастырылған. EPIP халықаралық стандарттарына сәйкес инженерлік құзыреттер мен дағдылардың мазмұнына назар аударылады

Түйін сөздер: *EPIP, инженерлік кадрлар, көлік, инженерлік құзыреттер, тұжырымдама.*

Аннотация. *Подготовка инженерных кадров в сфере автомобильного транспорта требует инновационных подходов, основанных на международных стандартах обучения. Образовательный процесс по данному напрвлению должен осуществляться в сертифицированных центрах, которые имеют соотвествующую материально-техническую базу. «Инженерное дело» – это основа модели обучения EPIP. «Инженерное дело» – это начало «практико-ориентированного», «инновационно-ориентированного» и «проектно-ориентированного» обучения, без которого EPIP был бы невозможен. Уровни применения PIPE. С точки зрения применения, EPIP в основном состоит из трех уровней, а именно макроуровня, среднего уровня и микроуровня, которые соответственно соответствуют теории образования EPIP, теории специальности EPIP и теории учебной программы EPIP. EPIP – это адаптированная программа, которая направлена на содействие экономическому и социальному развитию региона, повышение конкурентоспособности академий, развитие основных профессиональных навыков и технологий, содействие распространению знаний и технологий. Для преподавателей применение EPIP заключается в поиске и создании надлежащих инженерных целей и инженерных условий (в реальном мире и в реальной жизни) для студентов, развитии студентов в «одном проекте за другим» в соответствии с инженерными целями и условиями; внедрении интеграции преподавания, изучения и практической деятельности, а также интеграции знаний, технологий и профессиональных навыков. качества вместе взятые; учите студентов учиться и действовать. В статье рассмотрены особенности реализации подготовки кадров на базе сертифицированного центра Мастерской «Лу Бань». Уделено внимание содержанию инженерных компетенций и навыков в соответствии с международными стандартами EPIP.*

Ключевые слова: *EPIP, инженерные кадры, транспорт, инженерные компетенции, концепция.*

Introduction. Current problems of engineering education in the Republic of Kazakhstan include a number of issues that require comprehensive solutions. The main aspect is insufficient representation of national engineering education in international communities. Limited collaboration does not ensure proper integration into the world system, where the USA, Japan, Great Britain and South-East Asia are leading. The national accreditation system is not oriented to international standards such as Engineering Practice Innovation Project (EPIP) teaching method. For example, Kazakhstan lacks a system of certification of professional engineers according to international standards in the field of transport and transport machinery. In order to solve such issues, the “Lu Ban Workshop” project was created. In this center it is planned to jointly train students of D. Serikbayev EKTU on educational programs “Transport, transport machinery and technology” with the application of the Engineering Practice Innovation Project (EPIP) teaching method by using advanced Chinese equipment. In addition, it is planned to train certified personnel in the field of road transport within the framework of specialized industry unions professional qualifications. The “Lu Ban Workshop” project will become a center for training professional specialists under international standards.

The opening ceremony was attended by Ermek Kosherbayev - Head of East Kazakhstan Region, Sayasat Nurbek - Minister of Science and Higher Education, Saule Rakhmetullina - Rector of EKTU, a delegation led by Consul General of the People's Republic of China Jiang Wei (Figure 1).

LuBan Workshop project shares the teaching model, professional standards, technical equipment, materials and resources of Chinese vocational education with the world ‘LuBan Workshop’ was established under the ‘One Belt, One Road’ initiative to build a community of

unified human destiny. “Workshop Lu Ban” is an international education cooperation project to realize the internationalization, branding and systematization of Chinese vocational education. The project is built on the principles of equal cooperation, prioritizing quality, focusing on competence and skill development, integrating industry and education, and adapting to local conditions. The project involves physical institutions outside China to provide academic education and technical training.

Figure 1. The opening ceremony

Note – compiled by the author

On February 26, 2024, President Kassym-Jomart Tokayev visited D. Serikbayev East Kazakhstan Technical University, where he saw all activities of the university and the “Lu Ban Workshop” training center (Figure 2). The project provides for further strengthening of cooperation between Kazakhstan and China in the field of applied technologies and higher technical education, as well as support for the “One Belt, One Road” initiative.

Figure 2. Meeting in “Lu Ban Workshop” training center

Note – compiled by the author

One of the goals of the university is to train highly qualified technical and engineering personnel for the automotive industry of Kazakhstan on the “Lu Ban Workshop” basis.

As part of the workshop opening an agreement was created by EKTU and Tianjin Vocational Institute for the establishment of “Kazakhstan Engineering Center for Application and Improvement of Automotive Intelligent Technologies”.

Methods and materials. The “Lu Ban Workshop” has two laboratories – “Innovative Car Designs” and “SMART Car Technologies” (Figure 3 and Figure 4).

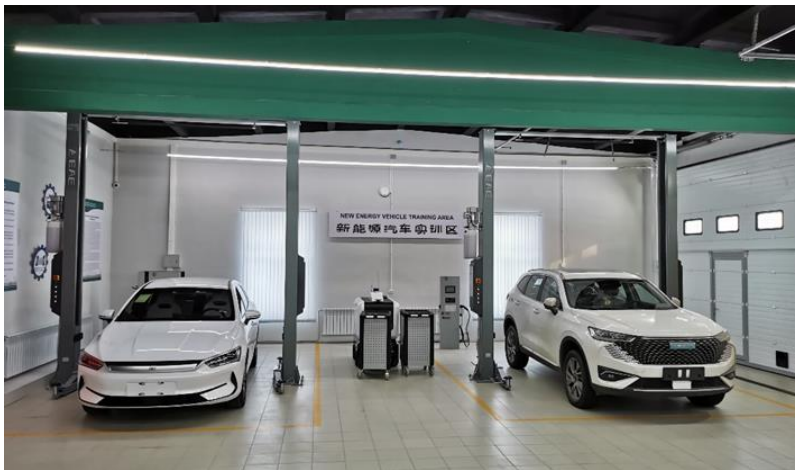

Figure 3. Vehicles in “Lu Ban Workshop” training center
Note – compiled by the author

The uniqueness of the Center lies in the possibility for trainees to obtain practical skills and conduct simulation tests of automotive systems. Special attention is paid to learning the latest technologies for maintenance and diagnostics of electric and hybrid vehicles.

Figure 4. Smart room in “Lu Ban Workshop” training center
Note – compiled by the author

The project is based on China's local vocational education innovation training model, “EPIP”. EPIP is an engineering practice-oriented training model that aims to cultivate competent technical talents through extensive engineering practice based on real or simulated engineering projects (LU J Q, MA Y, YANG Y, et al., 2016; LU J Q, TANG X H, SHI Y X at el., 2017; LU J Q, GENG J. at el., 2020) (Figure 5).

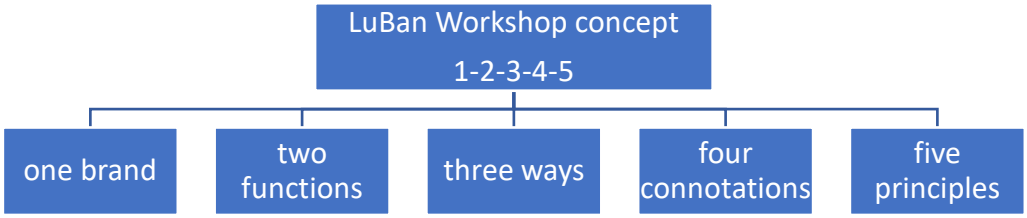

Figure 5. LuBan Workshop concept 1-2-3-4-5

Note – compiled by the author

The logo of the EPIP teaching model is designed with an up-down structure, in which the upper part is an opened book and the lower part is a rotating gear (Figure 6). The book and the gear are intertwisted to each other, symbolizing the integration of theory and practice and the unity of knowledge and action (LU J Q et al., 2020; LU J Q et al., 2021; LU J Q, ZHANG W et al., 2021).

Figure 6. The logo of the EPIP Teaching Model

Note – compiled by the authors on the basis of (LU J Q, 2020)

The four letters of E, P, I, P on the pages of the book "match" the shape of the book, which forms an "opened" book. This implies openness and share. EPIP is the acronym of Engineering, Practice, Innovation and Project. This presents the essential "Four Elements" of EPIP teaching model, namely engineering, practice, innovation, and project. The initial letter "E" adopts the "symbolic shape" of the source of Chinese culture, signifying the development tendency of being newly born and growing upwards and outwards. As an important part of Luban Workshop international development research, this issue comprehensively relates the overall contents of the teaching model applied in Luban Workshop—Engineering Practice Innovation Project (EPIP). It provides an in- depth explanation of the model construction, key elements, application framework, logo configuration and cultural inheritance from the principle level and discourse perspective. It systematically explains the development path and achievements of "engineering" of vocational education, "engineering"' of EPIP and Alliance EPIP International Education. It expands and interprets the four key essentials of EPIP: "engineering-driven", "practice-oriented", "innovation-targeted" and "project- based". EPIP education theory, EPIP specialty theory and EPIP curriculum theory are discussed from macro level, medium level and micro level

respectively. The significance of the application of EPIP teaching model for the adaptive development of vocational education is discussed from the perspective of "life education" (GENG J, at el., 2021; LU J Q, REN X H. at el., 2021; LU J Q at el., 2022).

Teaching Model and EPIP include several aspects:

1.Knowledge of the specialty (application of the specialty based on “reality”)

2. Review of courses (application of courses based on "reality")

3.Knowledge and skills (learning content based on “reality”)

4.Real world, real life (engineering)

5.Integration of theory and practice (practice)

6. Based on practice and serving practice (Innovation)

7.Full process and implementation from start to finish (Projects)

8.Flexible mode based on the law of learning (Method)

There is no universally accepted understanding of "teaching model' at home and abroad. In China, there are three kinds of summaries about "teaching model". The first is that teaching model is "a theory of designing and organizing the teaching activities, formed in the teaching practice, which is expressed in simplified form", which can be called "the theory doctrine". The second is that teaching model is "the basic structure or framework of various types of teaching activities established under the guidance of certain teaching ideas or theories", which can be called "the structure doctrine". The third is that teaching model is "a relatively fixed teaching procedure and its implementation strategy system established under the guidance of a certain teaching ideology to complete the proposed teaching tasks ', which can be called "the procedural doctrine" (LU J Q at el., 2019; LU J Q at el., 2021; LU J Q at el., 2022). The practice has proved that any one-sided, isolated, and general investigation and study of foreign vocational education while ignoring the environment, soil, nature, and adaptation of vocational education to introduce and promote foreign vocational education, original absorption and application, may lead to educational errors. In the world, every country is supposed to choose its suitable vocational education mode according to its own national conditions and educational environment, according to its social demand for vocational education and the ^ requirements of the students, rather than blindly copy others. EPIP is an organic integration of Engineering, Practice, Innovation and Project, with capacities of engineering-driven, practice-oriented, innovation-targeted and project-based (Table 1).

Table 1. "Four Elements" of EPIP

Elements	Characteristic
"Engineering"	"Engineering" is the foundation of EPIP. "Engineering" of EPIP means that vocational education needs to teach students to solve the problems in "real" and "practical ' conditions, aims to make students work and live with high proficiency in the real world.
"Practice"	"Practice" refers to the practical activities in the whole process of education and teaching. It is also a real educational practice and teaching practice of | "integration of industry and education, school-enterprise cooperation, combination of work and learning, and integrity of knowledge and action
"Innovation"	Innovation is both a process and a result. In EPIP teaching, the training of innovation ability is very important.Plhfdcndeqnt In the process of teaching, many cases are specific teaching and learning in the environment of high simulation, virtual situations, and conceptual reasoning.
"Project"	The cultivation of key abilities is mainly project based. Every curriculum, every activity and every step requires to reflect the integrity, procedure and entirety. Teachers should guide students (teams) to continuously "finish" the entire thing, "teach" the complete thing and "learn" the complete thing one by one.
Note – compiled by the author	

The "Three Truths" realm of reality, name, and harmony is an important way for us to understand the essence of EPIP. The coupling of name and reality is called harmony. The formation of the realm of "harmony" is not natural. It can only be achieved through the active, positive, and continuous efforts of "teaching" and "learning", and requires the "will" of our subjective motivation and the "action" of our practical action.

The cores of EPIP are "reality" and "integrity". It also enables the integration of industry and education. For teachers, the application of EPIP is to seek and create proper engineering targets and engineering conditions (real world and real life) for students, cultivate students in "one project after another" under the engineering targets and conditions; implement the integration of teaching, learning and doing and integrate knowledge, technology and professional qualities together; teach students to learn and do. For students, it is necessary to know engineering, master engineering technology, develop engineering logic and qualifications; attain the abilities of learning to study, to use and to innovate in "one project after another" in the process of teaching, learning and doing (LU J Q. at el., 2022; LU J Q at el., 2012; LU J Q at el., 2019).

The aim of EPIP is the integrity of knowledge and action. EPIP is the teaching model that emphasizes "building a career with the application", the teaching model in the field of vocational education, which takes serving development as the aim, promotes employment as the orientation, serves production and life; and also the teaching model in the field of training innovative, comprehensive, applied technical and skilled talents. EPIP is a thought, a method, a path, an enlightenment and also the exploration.

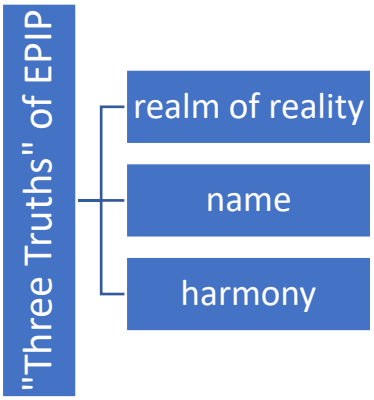

Figure 7. "Three Truths" of EPIP

Note – compiled by the author

Results. As a result of investigation, we may see the bright vision of educational process, based on EPIP standards:

1) Engineering Practice Innovation Project (EPIP) is an exploration of Chinese vocational education in the fields of mode, discourse, identification and system.

2) The core essentials of EPIP are: one Aim, two Cores, three Truths, four Elements and five Levels, summed up as 12345 of EPIP.

- One Aim is the integrity of knowledge and action;
- Two Cores are reality and integrity;
- Three Truths are realms of name, reality and harmony;
- Four Elements are engineering-driven, practice-oriented, innovation-targeted and project-based;
- Five Levels are levels of cosmic, macro, medium, micro and nano.

"Engineering" is the foundation of EPIP teaching model. "Engineering" is the beginning of

"practice-oriented", "innovation-targeted" and "project-based" Without real "engineering", EPIP would not have been possible. Application levels of EPIP. From the perspective of application, EPIP mainly has three levels, namely, macro level, medium level and micro level, which respectively correspond to EPIP education theory, EPIP specialty theory and EPIP curriculum theory.

EPIP is a kind of path that focuses on serving regional economic and social development, constructing the core competitiveness of academies, developing professional core skill and technology, promoting the advancement of knowledge and technology.

EPIP teaching model reflects the new changes of industries by timely using engineering approaches, actively adapts to the new requirements of economic and social development in the new normal for application-oriented technicians, promotes teachers to improve their engineering ability, introduces engineering cases in the syllabus, exhibits engineering properties in the teaching process, and simulates the engineering environment in teaching site to function as a tool to implement the mechanism of industry-education integration and cooperative education at the operational level, and a "new key" to innovate talent training model and build teaching standard system.

EPIP is one of the inherent essentials of Luban Workshops. Luban Workshops should take EPIP as the teaching model which should be reflected in the teaching design, and dedicate themselves to cultivating oversea students' vocational quality, professional and technical skills, comprehensive practical ability and innovative ability.

The EPIP will support and organize members, experts and scholars to carry out practical and theoretical research on cultivating technicians from the perspective of EPIP, explore the path of EPIP curriculum system construction in various professional fields. Based on mechatronics and expanding to e-commerce, economy and trade in general, etc., the research explores the path of building EPIP curriculum structure. Based on the EPIP curriculum structure, teaching theory of professional courses and practice system, an effective system of cultivating applied technical talents should be established, providing theoretical support and duplicable models for cultivating talents with vocational skills in the new economic normal.

EPIP is an organic integration of Engineering, Practice, Innovation and Project, and also a teaching model of training technical talents with practical engineering as the background and foundation, engineering practice as the orientation and penetration, capability cultivation as the target and dependence, intensifying practice and innovation, and engineering project as the guidance.

Conclusion. Vocational centers should focus on the development of regional economy, continue to explore the operational mechanism of specialized (groups) service industries, analyze the developing trend of industries, trades, enterprises and occupations of the region it serves, satisfy the actual needs, optimize the matched-degree of running schools and its demands, explore and construct the mechanism with the core competence of 'service-accumulation -incubation-optimization" so as to improve the ability to serve the society.

EPIP medium specialty theory is the specialty development mode of' integration of core technologies". Schools and enterprises seek, discuss and confirm together the core technical skills of specialties, guarantee that the industries, sectors, enterprises and occupations integrate into specialty development in an all-around way by carrying out "four-integration", and provide cooperative development platforms and shared future carrier for their jointly developing specialties, team teaching, cultivating talents and win- win development. The search, extraction, selection and confirmation of core technology and skills guarantee "building specialty development through its application".

For teachers, the application of EPIP teaching model is to seek and create proper engineering targets and engineering conditions (real world and real life) for students, cultivate students under the engineering targets and conditions with the integration of teaching, learning and practicing;

teach students to learn and do. For students, it f is necessary to know engineering, master engineering technology, structure, tools and crafts, and develop engineering logic and qualifications; attain the abilities of learning to study, to use and to innovate in practice.

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