

Vocational Practices in Engineering Education in the Russian Far East

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Abstract— The research describes the historical experience in organization of students' vocational practices which are considered an important part of higher engineering education in the Russian Far East. Since 1918, when the Far Eastern engineering higher school sprang up, the discussion about how future engineers must be taught hasn't terminated till now. The mission of engineering education having been interpreted in different ways in various historical periods, according to the existing system of values, made teaching approaches different as well. As a result, engineering education in Russia featured a number of reforms that gave the priority in teaching to either an ideological aspect with a lot of political disciplines in a curriculum (the early 1920s) or a branch approach when highly specialized teaching was introduced to the detriment of theoretical knowledge (the early 1930s). Though the significance of vocational practices was realized at all historical stages of engineering education in the Russian Far East, their forms and methods varied in different time. The conclusion is made about the highest level of their organization in the 1980s. The local higher schools had strong connections with the industry getting the opportunity to send students to leading enterprises throughout the USSR. The author analyses also some new trends in organizing students' vocational practices using the examples of the Vladivostok University of Economics and Services. The paper is based on the unpublished archival documents on the Far Eastern higher school activity in 1920–1980s.

Keywords—*engineering education; higher school; vocational practice; Russian Far East; Far Eastern Polytechnic Institute; practice-oriented education.*

I. INTRODUCTION

None of education types is possible without vocational practices that contribute both to strengthening general scientific knowledge and acquiring special professional skills, let alone personal development of future specialists. It is a link that connects theories and their practical application. That's why vocational practices are considered one of the most significant parts of the higher education process in Russia. This educational form is especially important for engineering training. Whatever industry young engineers are going to be engaged, they have to know the entire production chain, starting with its initial segments. Their acquaintance with a wide range of job functions is among basic qualification requirements. The only opportunity for a future engineer to acquire these skills and knowledge is to be personally involved into the production process, seeing everything with

his/her own eyes and participating, when possible, in all technologic operations.

This has been underlined by many scholars and practitioners, including those in the Russian Far East, who made researches on higher engineering education [1, 9, 10, 11, 14, 18, 19]. Analyzing basic elements of the educational process in different historical periods and at various higher schools the authors underline the importance of vocational practice considering it an integral part of any education, let alone engineering one.

"You can't teach a student to be an engineer without teaching him to be a worker at first. When he is able to make this or that detail by himself he will see the result of the production process much better" [1].

II. STRONG TRADITIONS

The desire to combine theoretical studies with practices has long been a feature of engineering education in Russia. In the XIX century, the Mining Institute (now the Mining University) in St. Petersburg (opened in 1774 as the Mining College), had an „exemplary mine“ on its territory with all equipment necessary to train mine-workers. The Moscow Technical School (now the Moscow State Technical University named after N.E. Bauman) had an experimental plant with the latest equipment for that time. Thanks to practical skills acquired during schooling a "learned master" was formed, a specialist able to perform any technical assignment and teach others how to do it.

The principles of linking future engineers' theoretical studies with their practical training were supported wholeheartedly by the Russian Technical Society. At the turn of the XIX–XX centuries, its members discussed the possibility of introducing vocational practices for senior students at all engineering higher schools in Russia. Afterwards this approach to engineering education was reflected in the curriculum of the Vladivostok Polytechnic Institute (1918–1922) which provided *„project drawing and practical classes in the Institute's class-rooms and also outside - in factories, plants, mines, railways, construction sites, government and public institutions, banks, cooperatives, and other business enterprises"* [15]. The mining department, for example, adopting the experience of the Mining Institute in St. Petersburg, constructed an experimental mine in the early years of its existence. It's true, the vocational practices were

not regulated during that period, their extent and content largely depended on the personal initiative of teachers and students.

In 1923, after establishing the State Far Eastern University (GDU) where all Far Eastern higher schools had been merged, vocational practices became one of the main forms of education for future engineers. The Council of People's Commissars issued a special decree, *Vocational Practice Procedure for Higher School Students and Graduates*, in May 1923. The decree introduced the special summer semester, when all students had to gain vocational skills at workplaces.

„Vocational training during the summer semester must help a student to understand the environment and conditions in which he will have to work after graduation. At industrial higher schools, students are supposed to understand workers' labor, their lifestyle and daily schedule, be able to correctly assess the economic situation at the enterprise and its perspectives so that be able, in future, to select the most appropriate methods for increasing labor productivity“ [18].

The GDU benefited from the experience of the Technical Department (former the Vladivostok Polytechnic Institute) and could include summer vocational practices in the curriculum of the nearest 1923–24 academic year. Initially, training facilities of the University were not strong enough. The students could acquire working skills only in a number of small University workshops. Some months later, the Technical Department organized a machinal educational and experimental plant on the territory of the Dal'zavod, the largest shipyard in the Russian Far East. It was possible thanks to close cooperation with the enterprise which became a partner of the University. The equipment of the new workshops – of metal and wood working, locksmith service, modeling, foundry work – included about 50 metal cutting machines, forging hammers, cupolas, etc. They allowed students to gain working skills and fulfill production orders which gave the University additional finance for upgrading its training base [15].

In 1924–1925, some new training units were organized, e.g. a metallographic laboratory, laboratories of steam boilers and electric and gas welding. In 1926 a radio engineering workshop was opened which played a great role in developing radio broadcasting in Vladivostok, much earlier than in other Russian regions. All University departments had got their own facilities for vocational practices by the late 1920s. Students of the Department of Forestry Engineering worked at the Maikha training and forestry. They also practiced in some forest management companies, timber cutting and wood-processing enterprises all around Primorye and the Priamur region [7].

Various documents coming to the GDU from Moscow repeatedly emphasized the importance of strong connections with local economic structures according to the resolution of the Communist Party Central Committee *On Immediate Tasks in Connecting Higher Education and Industry* (January 12, 1925). It was easy for the University to fulfill these requirements. Close cooperation with the Far Eastern industry had been established since the early 20s when the University researchers provided technical and scientific assistance to local enterprises. They, in their turn, willingly employed the

University students for summer. Thus, in 1925, the GDU students' vocational training covered *„all corners of the Russian Far East: factories around the lake of Baikal, gold mines in the Zeya District, the experimental agricultural stations in the Amursky District, the Amur River watershed and the Pacific coast, the forests in Kamchatka and Sakhalin, rich deposits of the Sikhote-Alin mountains, rice fields in Primorye“* [2]. Those years featured also special contracts when, needing engineers, some industries provided students with training places and scholarships in exchange for their obligation to work there during three years after their graduation.

III. SPECIALIZATION OF HIGHER EDUCATION

The predominance of practical training over theoretical studies was observed especially clear in the early 1930s when the industrialization of the national economy, proclaimed by I.V. Stalin, required a large number of engineers. It was a period of specialization in higher education in Russia. All multi-department higher schools were being divided into separate institutes, with the goal of supplying engineers for all branches of growing Russian industry. Quite a number of industrial institutes were organized as well on the basis of the GDU departments, e.g. polytechnic, forestry, mining, and fishery ones. They were assigned to the relevant People's Commissariats for funding and other assistance in the organization of the educational process. The Far-Eastern Polytechnic Institute (FEPI), for example, belonged initially (1930–1938) to the People's Commissariat of Heavy Industry [8].

Up to 50% of all academic time was allocated to vocational practices during this period. According to the instruction from Moscow, all higher schools were required to link theoretical courses with practical work in laboratories and workshops. Most often, this requirement could not be met by higher schools in Vladivostok. The division of the GDU into several institutes has significantly weakened the educational and laboratory base of the new institutes. Most of their laboratories and class-rooms occupied quite small premises and could accommodate only a part of a student group. Young people had to take a turn to enter there and have some training.

Officials from the Far Eastern Forestry Institute (FEFI) informed, *„The Institute is put in a position that cannot provide normal development, actually, it is difficult to exist and perform the task of training engineers for the local industry“* [3]. The Far Eastern Mining Institute (FEMI) had only 50% of classrooms needed, the degree of equipping its educational and auxiliary units was only 20% [4]. Even the FEPI, having the strongest positions among the newly organized institutes, suffered from lack of equipment. In 1931, the Institute's interests came into conflict with the ones of the Dal'zavod, as a result, the Institute lost its training and experimental workshops, part of the equipment and laboratories. Other enterprises, much smaller than the Dal'zavod, could not provide permanent jobs to all students and ensure the full scale vocational practices [15].

Alongside with that, the students didn't have to complain about the lack of practical work outside their institutes. Very

often, throughout the academic year, they were attracted to the emergency work which happened repeatedly in all industries in the Russian Far East. Future mining engineers were regularly sent to Primorye coal mines, when the miners could not cope with the plan. Students from the Far-Eastern State Fishery Institute (Dalrybvtuz) helped fishery organizations to fulfill plans. As a rule, in 1930–32, auditorium classes at all Dalrybvtuz departments terminated in April when the students were sent to the sea fishery. This work was considered their vocational practice [19]. At the forestry industry, student mobilizations were also reported as *„the vocational practices in the relevant discipline“* [7].

IV. STILL CLOSER TO THE INDUSTRY

With the meager higher school funding throughout the USSR, the situation with the laboratory equipment was approximately the same at all Russian engineering institutes. This fact made the government correct its requirements of practical predominance in teaching. In 1936, the Communist Party and the People's Commissars Council issued the decree *On the Work of Higher Schools and Higher Education Management* which reduced the number of laboratory classes within institutes and transferred this work outside, including plants and factories. The decree also suggested lecturing some courses there, next to working places, for students to feel better the closeness of theory and practice. According to the instruction sent to all higher schools, students had to consistently pass through all positions – a worker, a technician, an assistant engineer, in order to master various skills – technical, organizational, and administrative ones. Students' workplaces should enable them to *„apply theoretical knowledge most fully, activate creative thinking, and research skills“* [15].

It was believed in FEPI that the greatest effect could be achieved if students work at a large enterprise with advanced technology and equipment. Far Eastern plants were too young to have enough experience in organization and technology. They couldn't give much to students, especially undergraduates. The Institute administration considered it expedient to send students to the central part of the USSR for working at industrial enterprises that were outstanding in regard to the equipment and organization. Meanwhile, it was up to the People's Commissariat of Heavy Industry to fix the enterprises for students' practices that did not leave the Institute any maneuver freedom. In 1937, for example, the Commissariat *„forgot“* about a number of FEPI specialties and did not provide any working places for their students. Thus, only 270 young people out of 339 could work during that summer. *„Places for miners“* undergraduate practices did not meet the requirements young engineers would have after their graduation. Exemplary mines of Donbass where young people could really learn a lot were not included in the lists of places for vocational practices², reported from the FEPI Mining Department in 1937 [5].

It was quite often when enterprises used students as a labor force, their training program being pushed into the background. The interest of the industry in additional hands often coincided with the students' desire to earn some money. Thus, the practice was organized formally and turned out to be

inefficient. Besides, in the 1930s–1940s, most enterprises used to have special security programs when the access to their territory was strictly limited. Even Vladivostok suburbs were under control, as the railway was passing by, and students' geophysical work there was restricted. As a result, some students were not allowed to enter the enterprises, and vocational practice organizers had to look for additional places urgently.

The newspaper wrote, *„According to government regulations, students' vocational practices must be organized in a new way (self-financing, new forms of payment for this period, etc.). As for the FEPI, we see a lag. The requirements have not been fulfilled yet. Industrial enterprises do not care of teaching new engineers. Personnel departments are irresponsible about students' training, and our higher schools, the FEPI in particular, have not been prompt enough to have specific agreements with the enterprises about sending their students there“* [6].

Despite great attention paid to students' summer practice, it remained the most vulnerable stage in the educational process. The minutes of the FEPI departments' meetings reveal the most typical difficulties, e.g. the lack of permanent bases for vocational practices, its poor organization at a number of enterprises, students' use as a labor force with mismatch of their work and the future specialty. At the same time, the desire to use the leading enterprises for students' practices was consolidated, becoming, in the following years, the guiding principle for the future engineers' vocational training.

In the 1960s and 80s Far Eastern students' industrial practices featured an all-Union character. Local enterprises were used only for the initial vocational training during the first and second academic years. After that the students were sent to the leading enterprises of the relevant industry to have their technological, design, and especially undergraduate practices. Students of electrical engineering, for example, from the FEPI, polytechnic institutes in Khabarovsk and Komsomolsk-on-the-Amur worked at the water-power plants in Angarsk, Surgut, South Kuzbass, and Middle Urals as well as at Kemerovo, Leningrad, and Kharkov enterprises [11]. Future hydraulic engineers used to move to the cities of Nikolaev, Klaipeda, and Petropavlovsk-Kamchatsky in summer. In 1970, the FEPI students visited almost two hundred enterprises, construction sites and mines throughout the USSR. The 1981–85 schedule of the FEPI vocational practice included 160 enterprises and organizations from Magadan to Kaliningrad [16].

The local enterprises accepted about 2300 FEPI students annually, providing working places for whole groups. More than 1400 students were sent outside the region, 5–10 persons for each enterprise. A number of agreements allowed sending student groups as well. The plant of road machines in Cheliabinsk, for example, provided jobs for 45 third-year students. The electromechanical plant in Kemerovo welcomed

annually 20 third-year students and 15 undergraduates. At the same time, only a few FEPI departments had got officially fixed training bases during that period, others had to look for student jobs themselves visiting enterprises and concluding agreements [16].

As a rule, all FEPI departments were satisfied with results of vocational practices, although there were cases of some formality. In 1970s–80s the USSR industry no longer experienced a shortage of hands, so irrational use of students didn't happen often. They, in addition to the main workload, at the workplace for junior courses, as a backup engineer or design engineer later on, could get acquired with the enterprise – the production, equipment, and technological operations. The students also were able to make excursions to neighboring plants. They usually used that time for collecting material for their diploma project. Upon returning to the institute, the students held conferences to discuss the results of their training and make recommendations for the next year.

V. CREATING NEW TRADITIONS

In the 90s, disintegration of the USSR and reorganization of higher education violated the tradition of summer practices for higher school students. A rare university purposefully provided students with places for practical training, and they had to look for the proper enterprise or organization themselves. Only recently, the idea of vocational practices has received a new development, when a lot of educational institutions have been adopting practical-oriented teaching that helps to understand and evaluate the practical importance and relevance of knowledge and skills acquired at classroom.

In the Russian Far East, the Vladivostok State University of Economics and Services (VSUES) was the first to embark upon a new course a decade ago. The educational business environment VSUES-CITY where students are placed in conditions as close to real as possible contributes to upbringing of a new generation of entrepreneurs who have creative and critical thinking, professional mobility, and readiness for independent solutions [12]. Future designers, for example, have got the VSUES cam-pus as an experimental site, and students of transport specialties are managing University parking lots [17]. There is also a business incubator at the University that provides opportunities for implementing business projects of students of different specialties.

Workshops, student enterprises, and practice-oriented areas have been created to-day at various universities in the Russian Far East. They contribute to the formation of practical skills necessary for graduates to assess their knowledge and skills. This will help them to be included into the production process without any problem, effectively using the competencies obtained at higher school.

VI. CONCLUSION

Thus, we see that the significance of students' vocational practices was recognized at all stages of engineering education, having been introduced at the very first engineering

higher schools in Russia. This tradition was successfully followed in the Russian Far East. Nearly all specialties of local engineering school had got their own training units where students could gain vocational skills. Having analyzed the documents on engineering institutions functioning in 1920–80s (the Vladivostok Polytechnic Institute, the GDU Engineering Department, the Far Eastern Polytechnic Institute, etc.) we make the conclusion about the highest level of vocational practices in the 1980s when it featured the all-Union character. The Far Eastern students could visit leading enterprises of the relevant industry all over the USSR to have their technological, design, and undergraduate practices. Presently, after a decade of low attention to students' acquiring vocational skills in the 1990s, some new traditions have been born. These days vocational practices are an important part of practice-oriented education which suggests still more opportunities for students. Along with working skills, they acquire qualities necessary in their future professional activity.

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