

Preparation and Conduct of WorldSkills Competitions as an Innovative Method of Technical Student Training in Vocational Education System

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The paper examines the issues concerning preparation and holding of professional skill competitions between experts in automotive repair. It also provides the assessment of auto mechanic training in terms of its conformity with the global requirements to technical specialists of the automotive service industry.

Key words: WSI; technical training; innovations in education, professional skill competition, vocational education.

The design of cars is constantly becoming more complicated that demands improved training of car service professionals – mechanics. Development of car design is possible to trace by the example of VAZ cars: from VAZ-2101 model of 1970 (Fig. 1) to Lada Kalina II of 2014 (Fig. 2).

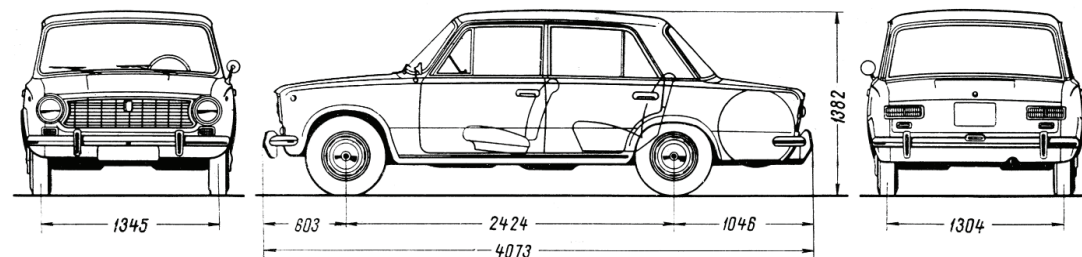
While analyzing the design of these cars, it may be noted how configuration, engine, fuel system, transmission, and suspender have changed. Besides, the esthetic side of expectations and requirements of the car owner has increased. The electronics was used in all systems of the car; compactness of units and mounts has increased. However, meanwhile the

system of mechanics training has not changed, which is obviously connected with the 'left-over principle' of financing educational institutions of the vocational education (SPE).

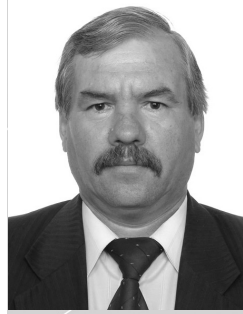
In the system of AVTOVAZ technical support service which preceded a modern dealer network of the Volga automobile factory, the level of training could be estimated by results of the professional skill competition. Now traditional professional skill competitions were changed by the competitions under the auspices of the movement WorldSkills.

WorldSkills International (WSI) – an international noncommercial association aimed at increasing the status and standards

Fig. 1. VAZ-2101, 1970



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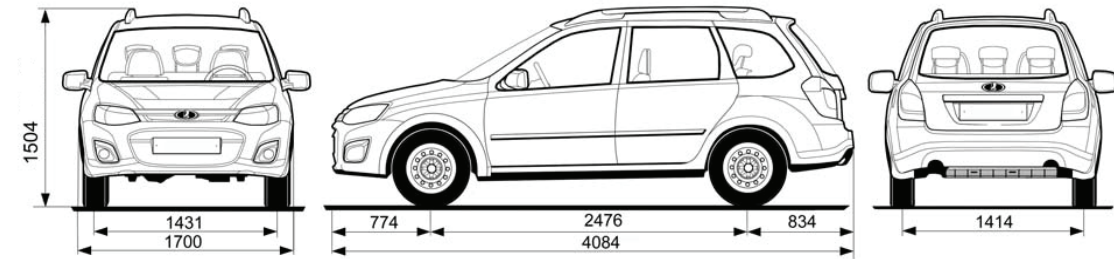


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Fig. 2. VAZ-2194 Kalina II, 2014



of vocational training and promoting working jobs through international competitions. The association was created in 1946, the first championship was held in 1947 between Spain and Portugal. Now WorldSkills is the world's largest competition of professional skills. The primary activity of WSI is holding the Skill World Cups WorldSkills for young people aged from 16 till 25 years; it happens every two years. These competitions are figuratively called «The Olympic Games among those who can work with hands».

This movement is now developed in Russia replacing domestic competitions of professional skill. The first All-Russian competition of professional skill «The national WorldSkills Russia championship – 2013» took place in the spring of 2013 in Togliatti. More than three hundred participants aged from 18 till 22 years – students of vocational education establishments, winners of regional competitions – participated in the championship. At the beginning of 2015, Russia submitted the application for holding the World Cup of 2019 in Kazan.

Three WSI competences on car repairs are actual for domestic specialists of car service:

- «Automobile Technology» (according to the WorldSkills International № 33 classification) [2],
- «Auto body Repair» (№ 13) [1],
- «Car Painting» (№ 36) [3].

The lists of works which these experts

have to be able to do are as follows:

1. Automobile Technology (auto-mechanic) – service, repair of mechanical and electric part of the engine, transmission, and running gear of the car including electronic and hydraulic systems.

2. Auto body Repair (auto body repair technician) – replacement, recovery of the bearing and hinged elements of the car body including preparation for coloring and replacement of electronic security system elements.

3. Car Painting (car painter) – coloring, recovery of the paint coating and drawings on the body details of the car, including plastic ones.

The most widespread and demanded of the listed professions is No. 33 «Automobile Technology». The WorldSkills competitions in competence «Automechanic» involve the following modules:

- A. Diagnostics and repair of the control system of the gasoline or diesel engine.
- B. Diagnostics, repair and adjustment of the steering system and suspender.
- C. Fault tracing and repair of electrical and electronic onboard systems.
- D. Repair of the mechanical systems of the head and engine block.
- E. Diagnostics and repair of the braking systems and road-holding ability.
- G. Repair of the main units and auxiliary systems of transmission.

In the Auto body Repair competitions (auto body repair technician) the participant of the competition has to show a range of

abilities in the field of body repair. The WorldSkills competitions in competence «Auto Body Repair Technician» include the following competitive modules:

A. Check of geometry and repair of the bearing components of the crashed car body.

B. Replacement of the detail of the bearing body framework using welding, deseaming, and preparation for coloring.

C. Replacement of the external detail of the body using welding, deseaming, and preparation for coloring.

D. Repair of the crashed external detail of the body and preparation for coloring.

E. Diagnostics and replacement of the elements of passive safety systems (pillows and safety belts).

In the Car Painting competitions (car painter) the participant of the competition has to show a range of abilities in the field of body repair. The WorldSkills competitions in competence «Car painter» involve the following competitive modules:

A. Preparation and coloring of a new body detail.

B. Fault clearing of the paint coating with local coloring.

C. Repair of the painted detail with masking and coloring inside and outside.

D. Selection of color and color matching including determination of the color code and preparation of the test plate.

E. Preparation and coloring of the nonmetallic (plastic) detail.

F. Drawing on the body details with polishing.

It is interesting to note that in the description of the competitive tasks for competence «Automechanic», there is a list of modules which cannot be included there: such as works with the fuel atomizers and high pressure pumps, conditioner filling up, replacement of oil etc. By the way, the unskilled official translation of the technical specifications into Russian strikes; it causes bewilderment of domestic professionals, and it can provoke some mistakes of competition participants. As an example, it is possible to list new

terms formed by literal translation of phrases «compressionnoe zazhiganie» or «structurnye/nestructurnye elementy» though these concepts are well known and clear for many years in the Russian technical language.

The regulations of the international competitions are rather accurately and scrupulously registered (here the official-English version of the documents is already meant) including the course of the competition, observance of safety requirements, and even the ethical moments [4]. The point-based system using objective and subjective evaluation criteria is applied for assessment of the performed works at the WorldSkills competitions, the subjective criteria are not applied for automechanics among the three considered competences.

The key figures at the WorldSkills competitions are the contestant (participant) and expert. The pupils of initial, average, and highest professional establishments, and also the young working professionals who have achieved good results in work may be contestants according to the regulations of the competitions [5]. The expert is a person possessing experience in any specialty, profession or technology representing the participant at the professional competition. It is necessary to call a problem of expert training who, speaking the language of sports, connect the function of the trainer and judge in the field.

My personal experience of participation as an expert in the regional competitions in competence «Automechanic», allow me to note two moments: first, the contestant's victory is unambiguously defined by his extensive practice (trainings), and secondly, the choice of the representing expert is important for successful performance of the contestant. The requirements to the expert are practical work in this domain, theoretical knowledge, pedagogical (trainer's) abilities, and physical endurance (it is desirable, if the person is young). The simulators for practical skills training [6] are perspective.

The problems which were revealed due to the first participation of the Russian team on WorldSkills International World Cup final are noteworthy. In 2013 the winners of the national championship in Togliatty went to Leipzig. According to the results of the competitions in Leipzig, the Russian team had the 41-st place with Chile, Estonia, Iceland, Kuwait, Oman, and Saudi Arabia.

After the analysis of the results it turned out that our participants have conceded slightly in the quality of works, but they could not compete in the speed as some tasks were performed for the first time. Moreover, even the experts who had arrived with the participants were not familiar with them. Besides, the tools of our participants technologically lagged behind the tools of their competitors. Some long-competing contestants even brought the tools constructed and manufactured by special orders; it allowed them to do work more efficiently.

The teams of experts from other countries, unlike Russia, were mostly specialists of industrial enterprises. It was attributed to the fact that they better knew the equipment and technological processes. The Russian team of the experts for WorldSkills-2013 comprised academic staff of educational institutions, but not specialists from enterprises. The training content of the current vocational education could not ensure the victory in the championship; and it proves again the fact that the production workers should be directly involved in qualified personnel

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training. To compare, there is a system of dual education where study means not only theoretical, but also practical preparation work, and business actively participates in financing such education in the three of the winner countries in the championship of 2013 (Switzerland, Austria, and Germany).

It should be noted that WorldSkills not only develops professional skills and competences, but also determines professional standards in the areas of production presented in the championship. Domestic FGOS SPO in the specialty 23.02.03 «Maintenance and repair of motor transport» fails to meet the international standards of WSI in terms of the requirements for modern car service [7]. The excellent student of our SPE will not be able to perform a half of competitive WorldSkills modules without additional training.

The Ministries of Labor and Social Protection of the Russian Federation published a list of 50 new, perspective, and most demanded jobs in 2015 [8]. There were only two professions of car service in Top-50: «Mechanic» and «Specialist in service and repair of automobile engines». Unfortunately, car painters and auto body repair technicians were not supported by the Ministry of Labor.

Conclusion

Holding the WorldSkills Olympic Games in Russia leads to positive tendencies now; it increases the training quality level of car service technical specialists and stimulates development of the system of vocational education.

Electronic Presentation as a Factor to Improve Learning Outcomes in Mathematics: the Case of Elite Engineering Education

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The paper describes the dependence of the quality of mathematics education on the methods applied at lectures delivered for elite engineering students. Two approaches to giving lectures, conventional and presentation-based, are compared. The academic progress performed by students within the frameworks of these two approaches is assessed. The assessment is based on the comparative analysis of the results achieved by students doing theoretical tasks in different sections of the course.

Key words: electronic presentation, mathematics education, lectures, elite engineering education.

Tomsk Polytechnic University (TPU) is one of the leading higher education institutions in Russia: it ranks fifth among national engineering universities. Since 2008, TPU has had the status of national research university, which implies that the university graduates, besides having a bulk of knowledge, have developed the abilities to analyze and summarize the information obtained, integrate the knowledge acquired through studying different sciences, conduct research, and create new products. Therefore, the most important of university's objectives is to train highly-qualified professionals, who are aware of modern trends in science and manufacturing, have an ability to reflect on their work, and are in demand on the labor market [1]. There should also be graduates with the potential to conduct scientific research.

Starting with the first years of professional activities, the educator should be focused on achieving the major objectives, even if facing challenges. One of the difficulties to be overcome when teaching first year students is different levels of student's

background knowledge. Some students acquired profound knowledge at school while the others failed to obtain sufficient knowledge even in the disciplines which are majors at technical universities (mathematics and physics).

Diverse levels of student's background knowledge result in different numbers of academic hours necessary to study new material: some students comprehend new information quickly and easily, while the others lacking sufficient basic knowledge need much more time. To solve this problem, TPU has implemented the system of three pathways for studying mathematics and physics: basic, adaptive, and profound.

Compared to the basic pathway, the adaptive one implies more academic hours and is designed to fill in the gaps in school knowledge, which hinder comprehension of new material.

The profound pathway for studying mathematics is implemented as elite engineering education (EEE) [2]. One of the EEE project targets is to distinguish students eager to solve original research tasks and to create special conditions for nurturing

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