VET in the Marine Higher Education – Some Challenges and Outcomes

Galina ILIEVA
Technical University of Varna, Varna, Bulgaria
galina.ilievai@tu-varna.bg

ABSTRACT

Vocational Education Training (VET) programs offer much more than just training and a vision to the future career path of young people. It is a serious step to broaden professional horizons, competitiveness and personal development. VET systems in Europe are based on a well-developed network of various governmental structures, industrial employers and trade unions, supported by strong system of laws, rules and legislations. VET system was introduced in Bulgaria in 2016, pilot projects are being implemented in cooperation with Switzerland, Germany and Austria. Since October 2017 the Technical University of Varna (TUV) is a key partner in project DYNAMIC. It aims at development, implementation, test and validation of programs for VET for students from the TUV.

Keywords: European Union, marine higher education, project DYNAMIC, VET

INTRODUCTION

The Role of VET

Vocational education programs date back from the early 1900’s, however, both the idea and principles of VET had been in a process of development in earlier years of the XX century, (http://mbit.org).
Principles and rules that lay down the foundations of contemporary vocational training are discussed in details in (Wollschläger, Guggenheim, 2004). Centuries ago, in many European countries after the establishment of the guilds, the work of artisans and their vocational education and training were very well structured and organized, see (Wollschläger, Guggenheim, 2004). Guilds were associations in which, from the 12th century, people who worked in the same trade or craft joined together and were led by their own laws and rules. How vocational education and training in the guild system were organized? The hierarchy in the guild system was apprentice, journeyman, master.
Nowadays, the labor market has changed a lot and goes in agreement with the progress in industry and education. It requires higher level of skills, strong scientific background and interdisciplinary. What does it means VET? What is hidden behind?
As stated in (http://cedefop.europa.eu), VET is very important part of the so called “lifelong learning systems”, it provides people with skills, knowledge and various competences, all needed on the labor market. In addition, VET contributes to enterprise performance, to strengthen competitiveness, to research and innovation practices and important to society. VET is organized in agreement with the economy of each country.
VET programs offer much more than just training and a vision to the future career path. It is a serious step to broaden professional horizons, competitiveness and personal development, http://www.cedefop.europa.eu. VET contributes to research and innovation in many areas and is important to future’s economy. Also, the vocational education training is of huge importance for students, especially from the universities. VET could set students on the right track to a profitable and enjoyable future, http://mbit.org).

When a person could gain an exceptional background, practical experience and technical skills, when likes the chosen career path, this person is going to do a tremendous job, leading to more profit both for the company and for the person. Last mentioned means that benefits of VET could be economic and social – for individual persons, for industry and for the society, (http://cedefop.europa.eu).

VET systems in Europe are based on a well-developed network of VET providers - they are government structures, employers and trade unions and include the so called initial and continuing VET. Initial vocational education and training (I-VET) is related to the upper secondary level; it is organized and carried out in schools, training centres or companies, with apprenticeships schemes.

The other type of VET – the so called continuing VET (C-VET) aims young people to improve their knowledge and scientific background, also to acquire new skills and to continue their personal development. The continuing VET takes place after the initial education and training or after the person has started its career, (https://ec.europa.eu).

In the European Union, education and training are organized by the Member States. The EU is responsible to support the Member states via funding and policy cooperation. For instance, funding instruments are the European Structural and Investment Funds and Erasmus+ program. The Education and Training monitor ensures evaluation of education and training systems; it also aims to strengthen the mobility of young people for learning and their educational results. The EU Publications Office website provides information to many other useful EU resources, (https://ec.europa.eu).

The EU priorities for vocational education and training up to 2020 were discussed on various forums and described in two main and very important documents - Bruges Communiqué in 2010 and the Riga Conclusions 2015.

The main tasks of the European VET systems for the period 2015-2020 are as follows:
- to provide more flexible ways to enhance the access to VET;
- to provide more effective opportunities to development of key competences and skills through I-VET and C-VET;
- to promote work-based learning, to gather commercial chambers, partners, companies to contribute in the best way to development through innovation and entrepreneurship;
- to introduce and develop innovative approaches and opportunities for continuous professional development of VET trainers and mentors.

**VET in Bulgaria**

Bulgaria has strong educational traditions for many years. In last three decades, demographic changes have affected the educational system a lot, (Popova, 2018).

Instead of all problems, in last years, Bulgaria is implementing reforms at all levels of education. There is an increased focus on the problems such as early school leaving, teacher salaries, lack of introduced dual learning. There is a huge need to solve so mentioned problems and also to improve digital skills and strengthen learning system and the educational outcomes. Bulgaria typically does not invest too much in the pre-primary and primary education, areas which are key areas for an equal start in life and for preventing income inequalities later in life. However, after a revision and changes in the funding models for education, additional resources to disadvantaged schools were allocated. Students’ knowledge has increased. However, still the skills of graduates in higher education and vocational education and training, insufficiently match the labour market needs. Participation in adult learning remains very low.
Dual VET was introduced in Bulgaria in 2016, confirming apprenticeship as a form of practical training. Pilot projects are being implemented in cooperation with Switzerland, Germany and Austria. In 2017 around one per cent of all students were involved in the VET. Educational programs were updated in agreement with business partners as well as in agreement with actual government requirements and legislations.

Training institutions within the VET system are vocational schools and vocational gimnasiums – for students aged 14 and above; art schools and sport schools – for 4 years of study after completed basic education; vocational colleges – 2-3 years of study after secondary education; vocational training centers and vocational guidance centers – career guidance for people aged 16+, for students and adults, (http://slideplayer.com).

Responsible institutions for VET in Bulgaria are as follows, (http://slideplayer.com):
- Ministry of Labour and Social Policy – analyses trends in the labour market; provides and controls requirements for acquiring qualifications in professions; controls conditions for healthy and safety work; participates in the coordination of the List of Professions for VET;
- National Agency for Vocational Education and Training: responsible for licensing of activities in VET system; to issue and suspend permits for provision of vocational training and guidance services; controls the activities of licensed training centers; issues the List of Professions for VET and the State Educational Requirements for acquisition of qualification by professions, etc
- Ministry of Education and Science: provides and regulates national programs for secondary and higher education; provides communication and information technologies; controls and regulates qualification and career development of teachers in schools and academic staff in universities; regulates national education and examination programs, state educational requirements and programs with their supporting materials; assists, coordinates and inspects all activities, related to education.

The state educational standards that have been imposed, by professions regarding the VET education, include, (http://navet.government.bg):
- minimum entry level qualification and specific education requirements according to the profession;
- requirements for theoretical and practical training facilities, as well as requirements for trainers;
- description of needed learning objectives and learning outcomes – knowledge, skills, competences, etc.;
- description of the specific work responsibilities, personal specifics and qualities, characteristics of working conditions, equipment and tools;
- validation of professional knowledge, skills and competences;
- provided opportunities for professional development according to the National Classificator of Professions;
- provided various opportunities for continuing VET training.

State educational requirements to acquire needed qualifications provide the necessary information regarding: development of required curricula and syllabus in cooperation with business; individual career planning; human resources planning; training and competences assessment; selection of personnel and its employment.

**PROJECT DYNAMIC**

Project DYNAMIC aims at addressing the need for more flexible routes for acquiring current industry-related skills necessary to boost and sustain innovation in the sectors identified by the national strategies of Smart Specialization and regional innovation in the new member states, see (DYNAMIC Documentation). For this purpose, regular practical phases in enterprises will be integrated in the ongoing engineering curricula to accelerate the update of knowledge traditionally provided by higher education institutions.
The aim of the DYNAMIC project is to develop, implement, test and validate undergraduate programs in the specialties of “Naval Architecture and Marine Technology” and “Marine engineering” at the Technical university of Varna (TUV), as well as in the field of Mechatronics and Robotics at Lucian Blaga University in Sibiu, Romania and in the area of Mechanical Engineering and Production at Politechnica Pula, Croatia.

In order to ensure successful implementation of the dual programs, the project will develop/update syllabus and curricula for definite subjects. Also, a toolkit documentation and assessment of the practical training for academic supervisors are envisaged. To strengthen the training capacities of the enterprises, involved in the dual education for students in agreement with DYNAMIC, the project will develop materials for a presence training of industrial supervisors.

The main intellectual output of the project is “Methodological guidelines for design and implementation of practice-integrated dual higher education programs in Science & Technology Studies” in the context of Bulgaria, Romania and Croatia. The output will satisfy the need for strategic approach in updating engineering curricula implicating the dual education model. The knowledge and experience gained within the project will be synthesized in this methodological document that will describe the different sets of methods employed at the different stages of the process.

The full commitment of 16 partners from Bulgaria, Romania, Croatia, Germany and Austria and the active involvement of key stakeholders will ensure sustainable long-term exploitation of project results beyond the project life-time.

The main fields of Bulgarian maritime sector considering the turnover for 2015 are shown in Figure 1. The maritime industry is concentrated in Varna region (Error! Reference source not found.). These circumstances laid down in the core of the choice which specialties could be included in DYNAMIC project and its activities. Specifically, the specialties of Naval Architecture and Marine Technology and Marine engineering were chosen for the pilot implementation of VET in the area of marine higher education in Varna, Bulgaria. This is in a strong agreement with the project goals, see (DYNAMIC Documentation).

The involvement of TUV will be in all work packages and specifically in the following activities:

• Identification of the training needs and stipulation of the content of the practical phases of pilot undergraduate program to be implemented under the dual concept;
• Participation in the development of the toolkit to be used to facilitate and support the communication between the key stakeholders involved in the delivery of cooperative higher education programs.
• Pilot implementation of the program at TUV following a block-model structure for integrating the practical phases. The first two years are part of the regular engineering study program and will focus on theoretical courses. It also provides the students with the possibility to undergo a competitive selection process and find an industry partner. The students will undergo a selection process coordinated with the companies of the alliance and they can continue their studies from year two onwards as part of the dual study program. During the pilot implementation of the practical phases in Work Package 5 (WP5) an academic tutor from TUV will be in contact with the industrial mentors and will be responsible for the assessment of the students’ results.
• Participation in the regional working groups meetings, periodical regional workshops

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Active participation in all dissemination activities, writing articles for the local media, maintaining the project blog dedicated to student placements, organise/participate in targeted events.

The integration of the practical phases will follow a block model with periodical rotation of theoretical phases in the university and practical phases in the enterprise in terms of fixed and flexible practical hours. This model has been selected because it allows integration of the practical phases without major restructuring of the curricular plan. In this way the partner universities remain politically and legally autonomous in their decision-making and do not have to take any additional binding of teaching capacities. Another advantage of the selected block model is the compatibility with the semester plans and the block model used in Hochschule Wismar (HSW) and Joanneum University of Applied Sciences (FHJ), which allows mobility of staff and students. After the first 3-month practical phase, staff from HSW and FHJ will conduct a study trip at the partner universities to support the assessment process and evaluate the first implementation.

The partnership will test the dual approach and optimise the modules while providing various best practice examples of university-business cooperation for the region. Based on the evaluation results, the partners will improve and further develop the programmes. Know-how and experience gained in the implementation process of pilot actions will be disseminated, (Georgiev, Ilieva, 2018).

Project-based subject-related activities for each of the modules taught during the prior theoretical phase will take place in the enterprises as defined in WP2. All the activities during the pilot VET phase will be fully integrated into the curricula, mapped to the learning outcomes of the updated programs and recognized with ECTS credits. For the assessment of the students’ performance specifically developed tools will be applied. The assessment process will also reflect the generic
capabilities of students acquired by applying problem-based learning in real work environment, see (Report Marine Cluster, 2017).

During the last practical phase, the students will write the final thesis on an industry-related problem assigned by the enterprise. Last mentioned is only relevant to those who have included a diploma thesis in their educational program. At the end of the pilot implementation students will have the opportunity to be employed, if the enterprises are satisfied with their performance during the practical phases.

**PILOT IMPLEMENTATION AT THE TECHNICAL UNIVERSITY OF VARNA**

In months March, April and May, three regional focus group meetings were organized among partners TUV, MTG “Dolphin” and Keppel FELS Baltech Ltd, Figure 3. Main tasks were as follows: to define needs of industry and training needs of our students; to find appropriate models, timetables and organization of VET; determination of syllabus contents; to arrive to agreement on contractual terms between the university and stakeholders; determine how to implement the programs: assessment methods, time schedule, expenses, confidentiality, property rights, labor protection, etc; development of a toolkit to facilitate and support the communication between industry and university; to define topics for training workshops; determination of templates for students’ diary and contracts, etc.

The pilot implementation for students from Technical University of Varna has already started in October 2018 with students from the specialty of “Marine engineering”. Six students from the specialty have passed their practical education and training in “Repair of marine machinery” in workshops of our industrial partner MTG “Dolphin”-Varna, see Figure 4 (a,b).

Next, students from the specialty of “Naval Architecture and Marine Technology” have attended a workshop for introduction to the VET specifics and they were involved in dual training during the summer vacation.

![Figure 3. A moment from the first focus group meeting – 21.03.2018 at the Technical University of Varna](image)

The considered and accepted structure of VET for students from the specialty of “Naval Architecture and Marine Technology” is organized in two phases: workshops during semesters at the University and in partner’s company – during the summer vacation. Students start their dual education after the 6th semester. Student application is approved by industrial companies. As it is
related to the workshops – one is organized at the Technical University and one in each of the both industrial partners. Goals of workshops are to promote the VET among the students as well as presentation and discussion on requirements of the business partners.

Practical phase during the summer vacation is characterized by following: update of syllabus in agreement with needs of industrial partners and where possible; students work on practical tasks provided by the companies; contracts are being signed once between technical university and industrial partner and between company and students; it is mandatory for students to fill-in practical diaries for training periods.

Figure 4 (a,b). Students from the specialty of “Marine engineering” at MTG “Dolphin” (a), students involved in repair operations with mentors, (b).

Since 2012 TU-Varna provides suitable for design work premises and hi-speed Internet, while Kepple FELS Baltech Ltd provides thin clients set as Remote Desktops to access Virtual Machines installed on KFB servers, see Figure 5 (a,b). In regards to the project DYNAMIC, students are able to work at the company KFB on design tasks or in those specially arranged premises at the University.

VET for students from the specialty of “Marine engineering”:
- practical training and gain knowledge in specific subjects, related to the processes of construction, montage, de-montage and repair of marine machinery in workshops of industrial partners;
- work on specific tasks provided by their industrial mentors and professors;
- update of syllabus where needed and possible;
- student’s application is approved again by the industrial companies followed by signed contracts by both parties;
- students filled-up logbooks (diaries for practical training) for their VET hours with detailed explanation of solved tasks.

Logbooks for all students from both specialties are under the control of professors and industrial mentors.

In addition to the project are involved four master students from our new specialty “Design of marine power plants and systems”.
These four students within the first two semesters of their study were involved in VET in the following subjects: “Computer systems for design of ships and marine equipment” - 1st part (15 hours of lectures and 45 hours of exercises) and 2nd part (60 hours exercise) and “Design of systems and devices for ships and marine equipment” - 30 hours of lectures and 15 hours of exercises.
Project DYNAMIC is still running, we work on the development of new programs and explore the possibilities to broaden and implement project outcomes to VET in other specialties.

CONCLUSIONS

It is clear that VET programs offer much more than just training and a vision to the future career path. VET contributes to research and innovation in many areas and is important to future’s economy.
Instead of all problems, in last years, Bulgaria is implementing reforms at all levels of education. There is an increased focus on the problems such as early school leaving, teacher salaries, lack of introduced dual learning. There is a huge need to solve so mentioned problems and also to improve digital skills and strengthen learning system and the educational outcomes.
The project DYNAMIC is targeting young people and students to be introduced to the VET, this project is one the first ones in Bulgaria. It will help young people to do a serious step to broaden professional horizons, competitiveness and personal development.

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