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COMPARATIVE REPORT

Intellectual Output 1:

BENCHMARCK SURVEY ON INTEGRATING DIGITAL, CODING AND ROBOTICS SKILLS IN VET SCHOOLS: FROM THEORY TO PRACTICE

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Content

1. Introduction

The project „Bridging the Skills Gap: Strategies for the Promotion of Digital, Coding and Robotic Skills for Social Inclusion, Equality and Access (Robot4All)“ is an Erasmus+ project coordinated by the *Leibniz University* of Hanover/Germany. The consortium consists of the VET-school *2EK Peraia* from Athens/Greece, the IT educational centres *Emphasys* and *Cyprus Computer Society* from Nicosia/Cyprus, the IT service centre *Civic* from Edinbourgh/UK, the NGO *CDIMM* from Baia Mare/Romania, the NGO *Women in Digital Initiatives* from Luxembourg and the VET-school *IES Maria Moliner* from Segovia/Spain.

Robot4All started in 2018 to introduce coding and robotics to schools for vocational education and training (VET-schools) as an innovative way to address deficits, social exclusion, prejudice and learning disparities. The project aims to create a complete toolkit and an educational pack for VET-teachers to support them in developing, implementing and monitoring various strategies to promote coding/robotics skills in VET schools. Robotics is an effective, fascinating and motivating way to introduce students to coding which integrates all STEM fields. At the same time it promotes other employability skills such as: problem solving, group work, leadership, creativity and initiative.

Robot4All addresses country-specific objectives as well as it aims at establishing common standards for training measures in the countries of the European Union.

This comparative benchmark report examines the framework for VET-Education of ICT and Robotics and the needs of the labour market in Germany, Greece, Cyprus, UK, Romania, Luxembourg and Spain in chapter 2. In addition to that this reports presents the results of an empirical research among students and teachers in the above-mentioned countries in chapter 3. For more detailed information on the country-specific situation all national reports, including empirical data and further sources, are available at: http://robovet.eu/

The findings of the benchmark report are essential for the design of the upcoming working steps of the project. The particular situation in each participating country and the particular needs of the labour market will define the competence framework for the creation of the toolkit and the educational pack for VET-teachers.

2. Country-specific situation

This chapter sums up the findings of the national reports regarding the situation of VET-education in the field of ICT and robotics, the needs of labour market and the demand for further training among teachers and students.

2.1 Germany

Political and educational framework: For the German VET-system it is a central challenge to offer attractive training oppor-tunities in the field of digital competences. VET-education in Germany is mainly organized in the Dual-VET-System that is char-acterized by a cooperation between companies, on the one hand, and public VET-schools, on the other based on a binding legal framework. On average 52% of the population enters the Dual-VET-system and 42% achieve a graduation that is linked with a high employment security. Digital competences are neccessary troughout all branches and the demographic change leads to a trend of automatization in the industry. Regarding this, the term industry 4.0 refers to the concept of working with robotic equipment. This trend will not only affect the workplaces located directly in the industry but will have a deep impact on the general working environment in the future.

Labour market: Troughout Germany 428,000 out of a total 2 million companies provide VET-training. In addition to the above mentioned challenge of finding enough young people who are willing to go into VET-education, many trainees don't possess the required skills to work in a digitalized working environment. Digital competences and skills in coding and robotics are especially required in all branches in the industry that are developing towards fully automated working processes. In the VET-system this mainly is connected with trainings-sections for industrial mechanics, industrial clerks and industrial managers. But also other sectors like trade, retail business, management, office communication, healthcare, marketing or freight forwarding are affected by a fundamental change towards the implementation of digital tools into the working environment. To handle information, to organize data, to communicate with costumers it will become essential to possess particular digital competences and basic skills in coding. In these fields a training in robotics can increase the motivation to deal with coding and ICT.

Demand for further training (teachers): Among the group of teachers the demand for further training of robotics is relatively low, besides the wish of a few participants to be introduced to basic aspects of robotics. They express higher demand for training in digital skills in general. Several participants explain the missing interest in this type of training with the lack of benefit for their everyday work. In addition to that, the teachers state that VET-schools don't possess the required technical infrastructure to offer courses for robotics.

Demand for further training (students): Among the group of students the interest in training with robotics is much higher. Those who haven't work with robots yet are willing

to be introduced to this field on the basis of personal interest. The students who already worked with simple robots report that it was a good experience and express their wish to increase their skills. German students show high demand for training of coding skills since they see it as a huge benefit for their career opportunities. Robotics is seen as a motivating way to be introduced to coding. Therefore they show high demand for training of robotic skills connected to coding.

2.2 Greece

Political and educational framework: Greece is suffering from a very high unemployment rate, especially in younger ages.There are stil job opportunities, especially in the ICT Sector, but need qualified personnel. Coding and Algorithmics are always a needed qualification in the ICT labor market. VET Schools have ICT Section, which interests many students each year. So it is an important help to introduce educational material and methods in the area of Robotics, which will be a valuable addon in the educational process.Over the past years, many qualified people (with bachelor degree and higher level of education) departed Greece for countries mostly in Europe (Germany, Great Britain etc.), but also Australia and America, in seek for better job opportunities and a higher living status.This lead to a connection of the greek workers to the european labour market. So graduates from the Greek educational system address in the labor market to both local and European level.

Labour market: The unemployment Rate in Greece is estimated at 20.7% (October 2017). The highest rate was in 2013 (over 26%). Since then is seems to be decreasing, but this is due to part-time-work, and work-based-emigration of former unemployed people. The most upsetting issue is that the unemployment rate in the case of younger people (aged under 25), is increasing to 43,3%. In this difficult situation of the Greek labor market, it is a pleasant detection that the Greek ICT Market was not affected by the crisis for the past 5 years. In some areas, especially Services and Software, the market budget had a increase since 2014. The Communications sector had also a steady course these years. This has the result that there are needs for specialized personnel. Areas like programming, web development and communications have demands above the labour average.

Demand for further training (teachers): All teachers agreed that the demand of the ICT Sector on improving the coding skills of the students is a very important factor. Identifying their training needs, teachers prefer subjects in their area, like Internet and networks, algorithms and logical frames and programming languages. They also ask for training in the robotics field, especially in robots structure and coding, targeting the creation of robotic-clubs at school.

Demand for further training (students): In general, students express that they need more training in the subjects of their specialty (especially programming and internet). And almost everybody is enthousiastc about robotics training. However, most students either completely ignore the possibilities offered by coding skills, and the education system in many countries (as in Greece) does not integrate IT training into teaching practice in an appropriate way. Though Algorithmics and Coding is considered an important subject for both VET and general education, there is no official training policy in these issues. Seminars organized by school councelors and other individual initiatives try to fill the the lack of training in this areas.

2.3 Cyprus

Political and educational framework: Since 2005 the Republic of Cyprus has initiated an ambitious Educational Reform Programme with a view to turning the vision of a better and more modern educational system that will meet the needs and challenges of the 21st century and turn them into reality. ICT has been promoted greatly in public schools through the use of European funding. The Ministry of Education and Culture has been implementing in the last 5 years an ICT integration plan (Ministry of Education and Culture Cyprus). The aim of this program is to effectively use Information and Communication Technologies (ICTs) in the educational process and to enhance the digital literacy of students and teachers. Another notable fact is that it is expected that the C++ language will be used as the new programming language environment according to the new reformed curriculum (Ministry of Education and Culture).

Labour market: An important aspect is, that IT graduates do not have all the necessary skill set required by companies. Employers state that graduates are only partially ready to enter the workforce since they are having difficulties in finding solutions for problems related to the company, or communicate efficiently. The latest trend followed by companies is the demand of specific professional certificates additional to the University degree (Grow Digital, Cyprus). Most companies value all additional certificates and take them in to consideration when a candidate is interviewed for a position.

It is obvious that the range of professional skills required by companies is not covered efficiently by higher academic institutions, however the root of the problem can be found at the early school years of a student. It is highly considered here that the lack of ICT skills of the trainers do not allow them to efficiently inspire students to pursue a career in IT professions, therefore students who are more career oriented follow professions like doctors and lawyers, splaying this way the gap between IT professionals and the workforce.

The National Action Plan of the Grand Coalition for Digital Jobs of Cyprus aims at the following goals regarding education and training:

1. Strengthening ICT in education.

2. Identify the skills of professionals in the field of Information Technology and Communications in accordance with market requirements.

3. Creating more flexible digital skills education systems adapted to European standards.

4. Offer training programs to unemployed, professionals and vulnerable groups.

5. Improving educational programs and vocational training programs.

Demand for further training (teachers): Teachers mainly refer to a missing curriculum that provides specific robotic training opportunities. Anyone interested on the subject has to the spent their own time and resources in order to gain knowledge and skills on robotics. Therefore a general interest exists but can not be transferred into practice.

Demand for further training (students): Students are aware that the labour market of Cyprus demands and requires people to have a certain level of ICT skills but a large percentage of the population fails to acquire them. Therefore they show a large interest in programming and robotics

2.4 UK

Political and educational framework: The UK is one of the few countries in the EU with a comprehensive computing curriculum covering compulsory education from the age of 5. It was introduced into schools in September 2014. The UK Cyber Security Strategy, published in November 2016, also outlines that cyber security will be embedded in the school curriculum where needed.The UK is strengthening its vocational education and training system. However, it will become evident from this report that this is not enough and more has to be done to attract attract a younger audience to become interested in computer science. Before looking into the ICT curriculum of the UK, it is important to note that England and Scotland's curriculums differ. The national curriculum was never introduced in Scotland when it was introduced in England by the Thatcher government. But since devolution in 1999, the differences between the Scottish and English school systems have widened and the direction of travel is currently different. Digital technology is already embedded within Scottish education but does not follow the same curriculum as England. It has a place within Curriculum for Excellence, Initial Teacher Education and the Professional Standards set by the General Teaching Council for Scotland (GTCS). Despite the pervasive nature of digital technology, its benefits are not always fully felt within the education establishments. Therefore, a new strategy was implemented in 2016 to improve the current situation by creating the conditions to allow all of Scotland’s educators, learners

and parents to take full advantage of the opportunities offered by digital technology in order to raise attainment, ambition and opportunities for all. Research shows however, that Scotland's CfE curriculum is not as advanced as England's GCSE's

Labour market: The UK suffers from a lack of ICT professionals according to the EDPR country report and we are not keeping up with the demand and graduates in Computer Science have steadily declined from 30,520 in 2011/12 to 26,415 for 2015/1617. There is also a gender divide, with very few women choosing to study ICT and only 19% of Computer science graduated being female. This is prominent in many other EU countries, but the EU is particularly affected. At around 1.5 million, the UK employs the largest number of ICT professionals in the European Union, accounting for around 5% of UK employment. The advance of robotics and 3D printing is boosting the demand for highly-skilled, IT literate workers in the UK's advanced manufacturing sector, according to a new study by the government's skills experts the UK Commission for Employment and Skills. The global advanced manufacturing market is predicted to double in size to £750 billion by 2020, largely driven by developments in new technologies. But the UKCES report 'Skills and performance challenges in the advanced manufacturing sector' warns that the advances achieved through automation are at risk if theright people with the right skills are not available to support them. The sector is already experiencing difficulties in recruiting the right people – with employers in this sectornearly twice as likely to report a hard to fill vacancy than in the economy as a whole.

Demand for further training (teachers): It can be identified that teachers express a high demand for programming languages, programming methods and internet and networks to be taught at school. Databases were also noted as an area of interest in schools in the UK. The demand for training in robotic skills is moderate in comparison with the demand of the students. Difficulties we may face is the lack of knowledge about coding amongst teachers in schools, as well as the lack of facility space.

Demand for further training (students): It can be concluded that from investigative research as well as the questionnaire, there is a real need for the development of a course that will teach students about robotics in the UK because there is an interest in this subject, but it is not commonly taught.

2.5 Romania

Political and educational framework: Romania is one of the countries, where ICT subjects are transversal, specific skills being developed and included into the teaching process of other subjects, thus the assessment not being conducted directly. Based on the priorities set forth by the European Commission and undertaken by Romania, the instructions to be followed related to ICT in education may be organized in 3 categories:

- Education by curricular activity based on ICT
- Education by extracurricular activity based on ICT
- Continuous professional training – Life long learning with the help of ICT

Based on the Romanian Education Law teachers/trainers have to prove a variety of digital skills to teach the subject *Information Science and Information Technology*. The required skills contain general architecture of computing systems, operating systems, office elements, data bases, programming methods and languages, Algorithms and logical frames etc.

But there is is no existent politics to introduce robotics in VET schools neither as compulsory classes nor as optional classes. There are only a few initiatives among private high-schools and open robotic clubs.

Labour market: In addition to the above mentioned ICT-skills the Romanian labour market shows an increasing demand for a combination of ICT-skills and robotic skills in the field of mechincal engineering. This set of skills will become more and more relvevant precondition to work in the industrial sector by using tools like NCC machines, and different types of robots at working places like factory lines or in the quality control. It can be expected that structural changes in powerful branches like the car industry will have a strong impact on the development of the VET-education regarding the training of robotics.

Demand for further training (teachers): The teachers participating in the survey showed much interest in further training for ICT-skills and robotics. In comparison to the participating students the previous knowledge is mainly based on training of basic ICT-skills. They showed only little experience in robotics.

Demand for further training (students): The participating students showed a similar level of ICT-skills in comparison to the teachers. But their previous knowledge about robotics is much higher, in particular regarding basic aspects of robotics. Based on that they are interested in increasing their knowledge regarding skills of programming languages, also connected to the operation of robots. It became obvious that the motivation to increase robotic skills is connected to the demand of the labour market in the industry sector. To motivate even more students to do robotics they should be made aware that skills in programming and robotics can also be useful in other

branches as it increases skills regarding logical thinking, designing, 3D-orientation, teamwork etc.

2.6 Luxembourg

Political and educational framework: According to DESI (Digital Economy and Sociey Index studies 2017) Luxembourg ranks 5th out of the 28 EU Member States for DESI. On the other hand, it is lagging behind in the integration of digital technologies by companies (22nd rank in 2016). Changes in the financial industry have lead Luxembourg to taking on a new economic strategy. Luxembourg has undertaken an ambitious economic diversification strategy in respect of the digital sector. This strategy is multidimensional, embracing education, economy, public services, and grouped under an umbrella initiative called Digital Lëtzebuerg. Actions have been taken to encourage robotic education in the formal and non-formal education sectors. A number of non-profit organisations and private initiatives are also active in this field, often supported by Ministries and less often by private companies. This includes strategies in the formal sector, like the *B.T.S Informatique* (2 years post secondary school diploma, equivalent to 2 years of University (similar to French B.T.S) in Information Technology and initiatives in the informal sector like *BeeCreative*.

Labour market: Luxembourg is the one the most ICT centric countries in Europe, meaning has a percentage of ICT specialists above EU average, with 4.6%. The ADEM (public employment services) shows that 1400 jobs were declared in ICT field in 2017 which represent the largest job category. Many of these vacancies are reported unfilled and 6 out of 10 are judges hard to fill by employer. However, at the same time the country has one of the lowest percentage of students in STEM compared to other EU countries. Furthermore, an important part of ICT professionals is trained abroad, meaning that the country is not only dependent on residents leaving the country to study but also in need of qualified personnel moving to the country in order to meet the needs of the industry in Luxembourg. Additionally there is a shortage of VET specialists, which creates a problem as the current offer does not meet the increasing demands of the labour market. The demand for high skills is increasing in the industry and science related occupation. There is an important demand for qualified staff “intermediary and specialist in science and industry (22.500 jobs in 2015, 5,7% of total jobs).

The Industry is using robotics more intensively, with companies such as Japanese firm Fanuc which made massive investments in robotics in Luxembourg. The importance of robotics is also increasingly important in the financial sector, especially because of Robotic Process Automation where robot can take over repetitive tasks in the financial / banking sector. In the meantime, space is also a strategic sector. Luxembourg is the home of SES (satellites) and is also the first country to have laws regarding space mining rights.

Demand for further training (teachers): Only a few teachers showed previous experience in robotics, which is no surprise since there are no existing training opportunities for VET-teachers in the catalogue of the national teacher training institute of Luxembourg. Despite this fact the teachers showed moderate interest in further training of basic aspects of robotics.

Demand for further training (students): Even though robotics is offered in various forms of extra-curriculums like robotic clubs the students showed a low interest in training of robotic skills. They showed a combination of a lack of experience with robotics with a low motivation to be trained in this field. The students showed much more interest in training in the field of programming skills.

2.7 Spain

Political and educational framework: The expansion of the robotic work force has totally transformed industry as well as others very important production fields all around Spain. Automated machines have taken over the duties of monotonous, dangerous and repetitive jobs from humans, increasing at the same time the productivity.

In the field of vocational education Spain faces the problem of a Low vocational student rate. In spite of the huge efforts of the administrations vocational studies are not very much appreciated but the rate is slowly rising. In Vocational Education regarding robotics there is a specific upper professional study called “Automatization and Industrial Robotic” specialized in Robotics. It is not widely offered in many communities and towns but it is one of the few opportunities to train Robotics in VET education. Additionally there are other electronic and electricity studies where Robotics is an important subject in different areas. Anyway, there are only a few hundred of students involved in such specialization.

The Spanish education system establishes guidelines for the autonomous organisms that must be followed. Computer Sciences teaching is being introduced in Spain at different rates and with different approaches according to the Autonomous Communities. According to the information gathered at the beginning of 2015 both from public bodies and from the plans for the incorporation of Computer Sciences in education announced by some Autonomous Regions are still few cases with a clear integration in the curriculum. In Primary Education, the case of Navarra stands out, which has included elements of the these sciences in the curriculum of the subject of mathematics, and through the program Código21 it provides training for teachers and offers resources for learning and teaching this subject. In Secondary Education, both in the Community of Madrid and in Catalonia have specific programs to integrate the Computer Sciences, including specific actions for teacher training. In Madrid a specific subject has been set up in Secondary Education, Technology, Programming and Robotics, which includes computer programming. Through the Code platform Madrid

provides training to teachers. The region of Castilla y León provides training in this area, both to students and teachers, through different initiatives, like *CyL Digital Educational Robotics*, that aims to initiate children and young people in the development of abilities and basic skills through the resolution of small learning challenges through the use of Robotics and programming, developing the taste and interest in Science and technology.

Despite these efforts, there is a widespread ignorance in Spanish society about what ICT and roboric sciences are, being one of the critical barriers to understanding their importance and the value of their learning from an early age. Studies related to this in Primary and Secondary Education are still in an initial phase, as it has not been adopted by most of the schools in Spain.

Regarding the teachers training Spain occupies the first position in ICT training in recent years as regards the highest number of hours per teacher of this type of training; however, in the surveys, teachers consider themselves their training low and poor for the full integration of technological means. This paradox suggests the need to rethink the effectiveness of ICT training which is a bit oriented generally to digital immersion teachers and educational use of new media. In Spain, the percentage of teachers reporting use of ICT "often" or "all or almost all classes" is slightly lower than the OECD average (37%) and is also lower than the percentage of those who said they need training in new technologies (14%).

Labour market: Nowadays in Spain, the industry has about 29.000 robots, and this figure is increasing every year. Our country occupies the fourth place in Europe in Robotic sector. Likewise, the demand for the jobs in this sector is also on the rise. The Sabadell Robotik in 2010, the second intersectoral Robotics and Automatic fair, is an event that shows the good trajectory of the sector in Spain. Companies are investing in this branch of engineering. In fact, mobile technology is requiring robotic applications. Small and medium-sized enterprises are already offering jobs in artificial programming and Robotics. According to data from the Spanish Robotics Association (AER), the automobile industry occupies about 19,000 robots. Many enterprisers have opened a path to work in these technologies: they require drones for their activity (city vigilance business, image capture or facility maintenance). It is expected to be a growing market, so it means more applications. But Spain is not only a robot consumer but it is also a country where there are many people interested in this technology. The Robotics aimed at consumption and leisure, is the one that has more growth even above the industrial one. There are studies that emphasizes that the demand for robots of consumption could reach the six million units sold in 2019, with a value of more than 1.1 billion euros. These provisions do not include toys, so the figure could reach 2 billion euros. Interview and newspaper articles point out that in 2020 Spain will need 100,000 professionals in information technologies. In Europe between 720,000 and 1.3 million. These data come from a study of the General Council of Professional

Colleges of Computer Engineering (ICCI). It will be necessary in the labor market the training of workers in this field, and a greater specialization in Robotic sectors.

Demand for further training (teachers): The participating teachers show low level of ICT skills, especially in skills-oriented to education. They teachers express a strong demand for further training in robotics. In general they consider that the schools have appropriate materials and rooms for teaching, robotics is onlyis taught through unofficial, voluntary programs, after school programs or clubs.

Demand for further training (students): In general digital skills training is mostly voluntary for the participating students them. They also showed a low usage of technology especially among women, with an apparently increasing gender gap. There is an important group of students very interested in robotics but there are some ones interested in programming, games and web development too. They consider that exist good oportunities to train in programming but hardly nothing in theory of graphs, dynamic programming, algorithms, databases or other types of different training

3. Conclusion and recommendations

2016 Council Resolution on ‘A New Skills Agenda for an Inclusive and Competitive Europe’ reflects a common vision about the role of skills for jobs, growth and competitiveness. Skills can help to secure jobs and enable people to fulfil their potential. They are the key to social cohesion, they ensure access, participation and social inclusion. People need a broad set of skills to fulfil their potential both at work and in society.

At the same time, 40% of European employers have difficulty finding people with the skills they need to grow and innovate. VET is valued for fostering job-specific and transversal skills, facilitating the transition into employment and maintaining and updating the skills of the workforce according to sectoral, regional and local needs. The 2016 ‘Digital Skills and Jobs Coalition’ reinforces the need of all to help meet the highdemand for digital skills in Europe which are essential in today's job market and society. Europe is lacking digitally skilled people to fill job vacancies in all sectors, missing out on up to 750,000 Information and Communication Technologies (ICT) professional jobs by 2020. Yet unemployment among young people of 15-24 year olds is at almost 20% in the EU Computer science skills are increasingly required in many different fields, not only in ICT jobs. Programming and computational thinking skills are becoming ever more important in our society and working life. So far schools have been using ICT to focus purely on computer literacy. There is nowadays an ever growing need to teach students computer science and digital literacy: teaching them how to code, and how to create their own programs; not just how to work a computer, but how a computer works and how to make it work for you.

To examine the real needs of both teachers and students in the VET-system the project Robot4All executed a multinational survey using questionnaires with open and closed questions. The aim was to include a heterogenous group of teachers and students regarding age, sex and profession/branch of study.

In general it became clear that the framework for the vocational training for skills of ICT and robotics in the different countries is mainly structured by the following aspects:

A) The status of ICT and robotic training in the educational curriculum: Regarding this, the survey showed a variation of an beginning inclusion of this type of training to a formal curriculum in combination with mandatory training on the one hand and voluntary types regarding extra curricula on the other hand. It has to be concluded that in all participating countries the inclusion of robotics into formal education is still in an initial phase. Training in this field is still mostly dependend on private/individual initiatives and shows a lack of common standards.

B) The status of vocational education in opposite to academical education: Here the survey showed a widespread problem among the participating countries regarding the

discreasing number of young people who are aiming at a VET-education, since universities are reaching for a larger number of students.

C) The technical infrastructure of VET-schools: Here the survey showed that most VET-schools are equipped with basic digital infrastructure but they are not able to offer robotic-training because of a lack of technical infrastructure in this field. In combination with the lack of training opportunities in the formal curriculum students have to rely on initiatives offered by private companies or individual teachers.

D) The structure of the labour market in the field of ICT and robotics: Here the survey showed huge gaps in all countries regarding the ability of the labour market to find qualified personell. Even though the sectoral priorities of the industrial and economical structure of the countries differ all branches are affected from structural changes in the light of digitalization and automatization. This development increases the demand for skills in ICT and robotics and produces gaps where qualified personnel is not available. The main variation occurred between national economies orientated towards industrial engineering and those who tend to develop an economic diversification in respect of the digital sector.

In the light of the above it can be concluded that demand of teachers for training of robotics is dependent on the particular situation at their school. Since there are almost no exisiting trainining opportunities for teachers their experience in this field is relatively low. The participating teachers showed a moderate interest in further training but tend to see only little benefit for their everyday work, since technical infrastructure for robotics in VET-schools is not very common.

In opposite to that the participating students showed much more interest in training for robotics. Here the national situation was mainly affected by the particular career opportunities that the studends connect to training in this field. In cases where students aimed towards jobs in the industrial sector they demanded proufund training in all aspects of robotics. In cases where the aimed towards jobs in the digital sector they orientated more to field like programming.

A programme to introduce training for robotics in VET-schools has to address the main needs for the most relevant target groups in this field: The students, the teachers and the VET-schools in general. Only a holistic approach taking into account all relevant aspects will lead to the conception of a high-quality training strategy.

In the first place it has be noted, that training of robotic skills is demanded by students which aim to work in different sectors. Therefore the training strategy has to focus on the main (digital) skills that can be increased while working with robots and can be useful afterwards in different working places. This encompasses basic skills like teamwork, logical thinking and spatial orientation on the one hand. But also digital skills like programming languages that can be used to command robots but are also useful in other areas like web-programming. To achieve this, is has to made sure that the VET-teachers are able to offer attractive courses using affordable and relatively simple

robotic equipment and a motivating methods of course management, like an open badge system. The outputs to be created by the project Robot4All will directly address this issues by giving VET-schools the opportunity to perform well structured training courses in robotics that will lead to a better equipment of digital skills among VET-students.