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NATIONAL REPORT ROMANIA

Intellectual Output 1:

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

February 2017

Partner Organisation THE DEVELOPMENT CENTRE FOR SME's MARAMURES (P5)



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1. Introduction

- **Description of the project**

The project pioneers to design a COMPLETE TOOL KIT and an EDUCATIONAL PACK for developing, implementing and monitoring various INCLUSIVE strategies for promoting coding and robotics skills in VET schools aiming to bridge the digital gap based on the creation of PARTNERSHIPS/SYNERGIES between the schools, stakeholders and the labour market (policy maker, ICT experts, providers and enterprises).

- **Importance of the project in Romania**

The ROBOVET4ALL project will offer the opportunity to have access to a dual educational pack . The teachers and the students will have access to a platform aimed to improve their skills on coding and robotics.

All of them will can enter into an Open-badge eco system based on the ROBOVET4ALLmethodology.

- **Connection between national situation and EU-level regarding to the topic of the project (mobility of workers, need for european standards)**

It is known that there is a demand on the local market for the robotics field in the industrial and production area (factories with assembly lines, quality control, etc.), where they are used more often, and have want to know if this program will help the students for a future job in this field.

- **Description/Purpose of IO1 BENCHMARK SURVEY ON INTEGRATING DIGITAL, CODING AND ROBOTICS SKILLS IN VET SCHOOLS: FROM THEORY TO PRACTICE**

Further to the preliminary research partners conducted before the proposal, the 1st Intellectual Output (I.O.) to be produced is a Comparative Benchmark Report highly useful for the development of the project's aims in compliance with the 2015 E&T 2020 Report on the new priorities and the urge for MS to explore further the results in the digital era.

The Comparative Report presenting the current practice in partner countries in relation to digital, coding and robotic skills in relation to relevant EU Recommendations and the needs of both the VET schools (initial VET and continuing VET, the students and the labour market based on a survey to be conducted using triangular methods (quantitative and quantitative methods). The survey will focus on identifying the digital needs of the VET schools, the teachers and the students in comparison to the digital gap as presented by the labour market, so that the setting up the CODING/ROBOTICS CLUBS is targeted to specific needs.

2. VET-Education of ICT and Robotics in Romania

2.1 Political and educational framework

ICT in Education

The education landscape is experiencing radical change which is redesign of the existing infrastructure of future learning environments. Technology is a high spend consideration for most schools yet smarter spending on the right equipment and infrastructure ensures that learners are engaged and motivated and that every pupil reaches their potential.

In recent years, ICT skills have become essential in the learning process, once with the development of technology and thus of e-learning products. Romania is part of the group of 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.

National context

ICT in Education Approach in Romania

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, in conformity to the specificity of learning process:

- 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

Strategic Lines of Development for ICT in Education in Romania (extract)

Strategic Lines of Development	Lines of Actions	Description
Providing ICT infrastructure in schools	Provide equipment and relevant infrastructure in schools	Providing schools with ICT equipment and systems The existence of an ICT network in each school The implementation of an ICT infrastructure, complemented by the installation of educational software (for teaching, testing)
Developing pupils', students', and teachers' digital competencies	Educate teachers on ICT technologies	Teachers should be trained on a regular basis on updates of the ICT-assisted educational sector
	Provide ICT specific training courses, directly related to the improvement of the quality of the learning	Through the thorough preparation of teachers, pupils and students will gain a competitive advantage that will be useful when engaging, facilitating their entry into

	process and digital skills.	the work environment.
Using ICT (OER and Web 2.0) in the learning process and in the Life Long Learning process – LLL	OER implementation	Access to resources such as OER - Open Educational Resources. OER is both an open source of digital content, as well as an opportunity to develop digital interaction with the pupil / university
	Include Web 2.0 platforms in the learning processes	Web 2.0 platforms are currently used for professional development as well as for enhancing training within the classroom. By using Web 2.0 tools pupils and students can prepare both complex inter/trans-disciplinary curriculum projects and extracurricular projects to develop social and entrepreneurial skills.
	Stimulate students to become more involved in the learning process	Interactive visual materials and additional sources of information provided by the Internet will increase student engagement.
	Encourage the Life Long Learning process	Regarding lifelong learning, online learning platforms and the existing materials in digital format will encourage the distance learning, allowing adults of any age to gain knowledge in a particular field.

SWOT for ICT In Education

Strengths	Weaknesses
<p>Increase in the internet use within the rural environment</p> <p>The computerisation of the pre-academic system, by means of governmental programmes and several other means</p> <p>The majority of the pupils in the urban environment have a satisfactory level of digital alphabetisation</p> <p>A great number of universities have already been equipped with e-learning platforms (more than 70%)</p> <p>The achievement of basic ICT competences by the students and the improvement of the access to technology irrespective of the provisions of the academic environment</p> <p>The computerisation of the libraries and the formation of digital competencies in the rural environment leading towards</p>	<p>The decrease of the scholastic population in the pre-university teaching system</p> <p>Low level of scholastic competencies, including digital competencies, compared to the European averages</p> <p>Contents which are based on memorising, by volume of notions, concepts, and reduced capacities to adapt to the exterior world</p> <p>The use of e-learning instruments is reduced as a result of their insufficient number and of the difficult use due to the lack of flexibility in the generation and the use of the content</p> <p>Insufficient materials which are available in digital format (books, thesis, articles, magazines, etc.)</p> <p>The existence of very few e-learning projects dedicated to the adult population</p> <p>The lack of a coherent approach for the continuous formation also during the adult life</p>
Opportunities	Threats and constraints
<p>National and international financing programmes in the field of education, of ICT utilisation, research, development and culture</p>	<p>The lack of collaboration between the business environment and the educational institutions</p> <p>The lack of correlation between the e-learning</p>

<p>The development of the infrastructure for internet access in Romania</p> <p>The utilisation of the OER and Web 2.0 technologies for educational purposes, providing flexibility to the educational process</p> <p>The intensification of the trans-national collaboration between universities</p> <p>The students and the teachers' mobility</p>	<p>programmes included in the Sectoral Operational Programme "Increase of economic competitiveness" (SOP IEC) with the e-learning programmes included in the Sectoral Operational Programme "Human resources development" (SOP HRD)</p> <p>The lack of clarity with respect to the manner in which the initial and the continuous training of the teachers is performed</p> <p>The difficulty to include the rural areas in the activity of digital competencies development in a natural manner, non-targeted – Digital division</p>
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- What courses are offered related to digital skills? (acquisition of which concrete e-skills)

The Romanian Education Law stated that the digital skills are subject of the course/training named **Information Science and Information Technology** (Information and ICT). This is a bit different from the other EU countries. The teachers/trainers have to prove the following skills to enter into the education system at this discipline¹ (Selection methodology for Information Science and Information Technology):

- Algorithms and logical frames
- Programming language Pascal or C/C++
- Programming methods
- Dynamic memory allocation
- Theory of combinations and graphs
- Data bases
- General architecture of computing systems
- Operating systems
- Elements of office automation: Text Processing, Spreadsheets, Data bases, Presentations
- Internet and Networks

Politics in robotics²

In Romania there are no official politics to introduce robotics in the VET schools neither as compulsory classes nor as optional classes.

There are few private initiatives to introduce in private High-schools robotics and robotics clubs (see The International College on Informatics in Bucharest).

¹ Maramures School Inspectorate RO. Informatica si tehnologia informatiei programa titularizare P. Baia Mare. Oct. 2015, pag. 3-6. <http://www.isjmm.ro/> Last access: 08.03.2016

² Based on an interview done with the Ministry of Education (in function in 2016), prof.dr. Adrian Curaj

2.2 Needs of the Labour Market in the Sector of ICT and Robotics
 CDIMM Maramures made an interview with the General Manager of the Maramures County Labour Office aimed to identify the requested skills of employees needed by employers.

The summary data are presented below.

No.	Action	Skill
1	Data processing	File management, Text Processing, Spreadsheets
2	Computers and networks	Computer hardware and environment
3	NCC machine-tools	NCC programming, NCC using, NCC program checking
4	Detection systems	Set-up and using detection systems
5	Production programming	Using software for programming production
6	Searching on Internet	Using the internet
7	Searching on a specific platform	Using the internet
8	Download digital documents	Using the internet
9	Preparing digital documents	File management, Text Processing, Spreadsheets
10	Using digital signature	File management
11	Upload digital documents	Using the internet
12	Messages on e-domain	E-mail
13	Data security	Internet Security
14	Web design	Webpage Design, Graphics
15	Robots operating	Programming, verifying, using robots
16	CAD design	Using design software, Graphics
17	Sound operating	Sound editing
18	Image/TV operating	Image editing, Animations, Presentation

- Note: We identified the specific skills requested by employers existing in the current job offers sent to the Maramures County Labour Office, not all digital skills included on all jobs in Romania.

3. Empirical Research

3.1 Sampling and Method

- Description of the questionnaires

The questionnaires were personalised for students and for teachers. The questions were related to the past trainings linked to coding and robotics and related to the training needs, as well.

The questionnaires were designed as simple as possible aimed to be easy to fill-on and easy to be understuded.

- Participants

CDIMM Maramures selected 13 teachers for this activity. The details are presented below.

a) Gender	Male	8	Female	5	other			
b) Age	under 40	2	41-50	4	51-60	3	60+	4
c) School type								
	VET	9	Lower Secondary School	1	Upper Secondary School	6		
	Other (please specify)	National College						
Position at school								
Principal (1), teacher engineers (2), teachers (10)								

CDIMM Maramures selected 15 students for this activity. The details are presented below.

a) Gender	Male	14	Female	1	other			
b) Age	under 16		16-18	12	18-20	3	20+	
c) School type								
	VET	10	Lower Secondary School		Upper Secondary School	5		

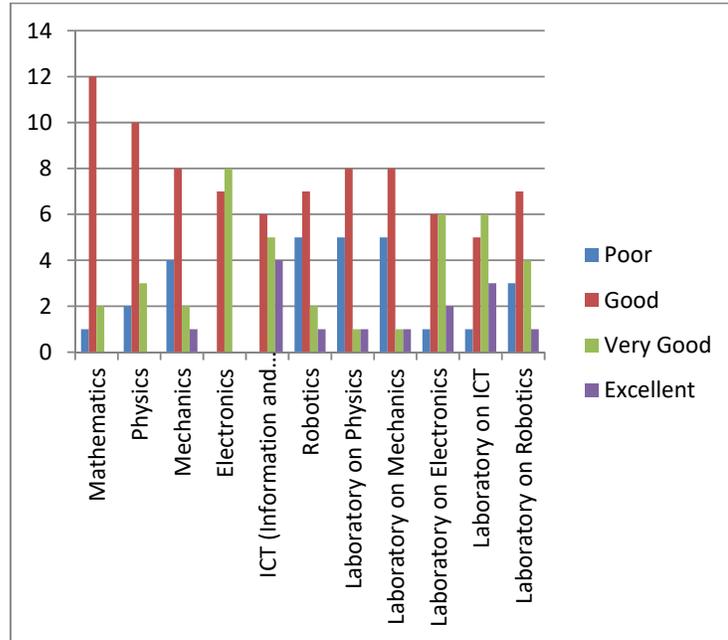
The 28 subjects filled-on the questionnaires and the results are presented in next chapter.

3.2 Results

Students

d) My level of confidence/ experience in following classes is:

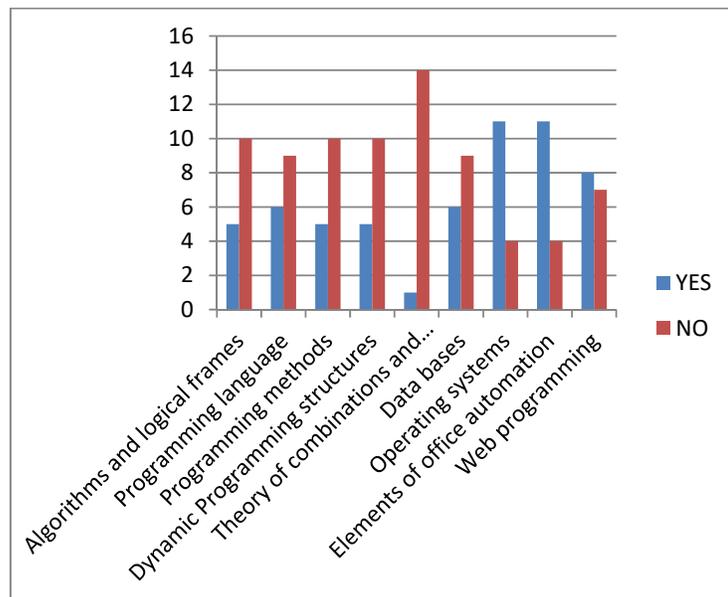
The students seems to be very confident and experienced in Mathematics, physics and electronics.



2. Existing training opportunities

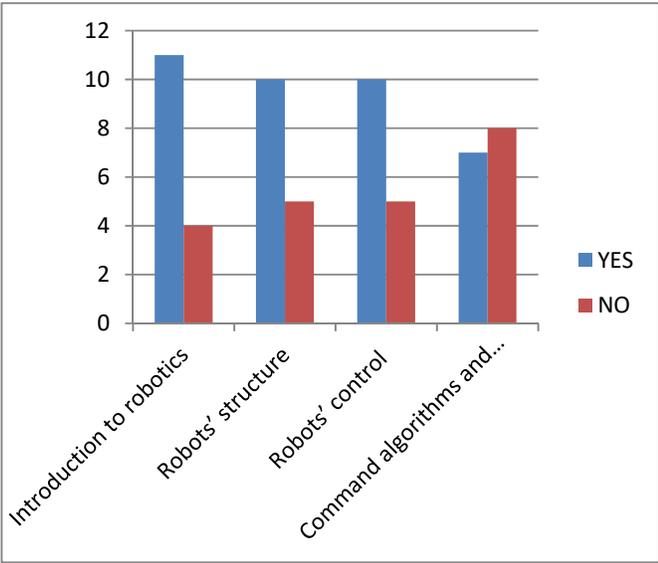
a) Training of coding skills

The best training opportunities are on Operating systems and Elements of office automatisation.



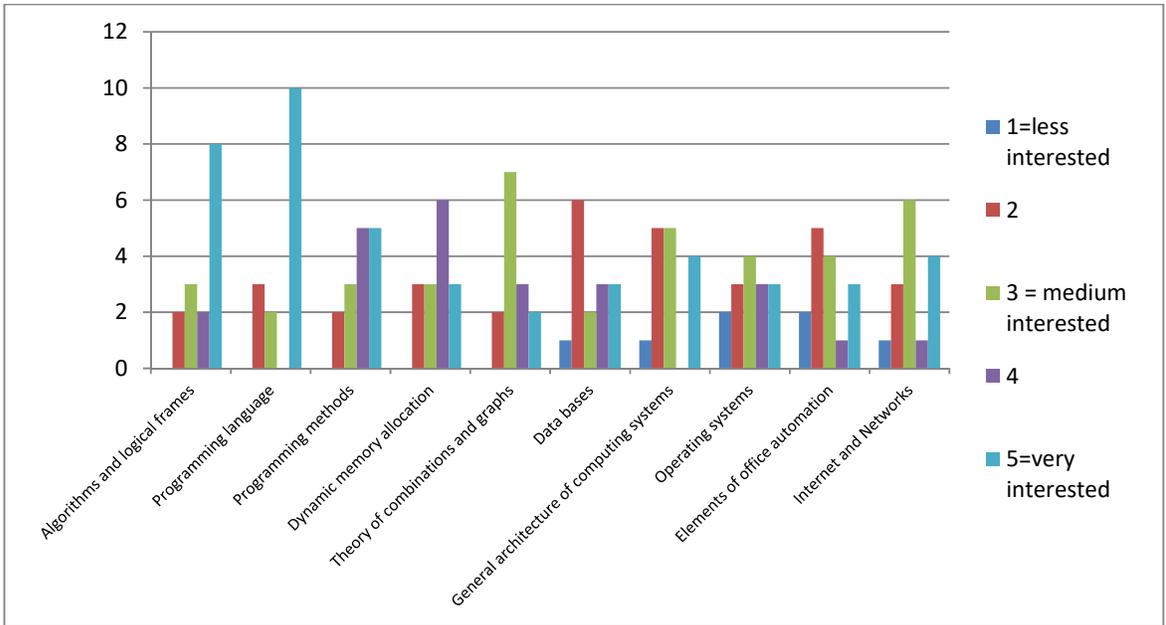
b) Training of robotic skills

It is surprising that the students participated to trainings on Introduction to robotics, Robots' structure, Robots' control and Command algorithms.



3. Training needs identification

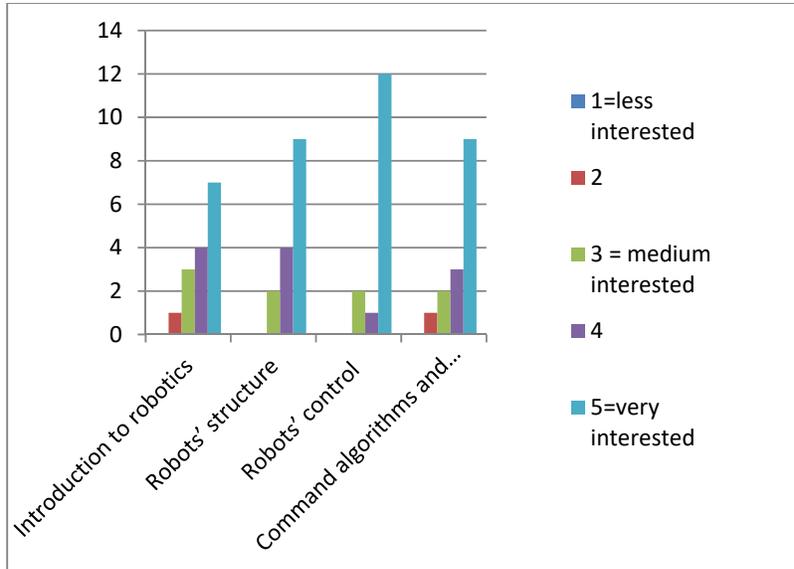
a) Training of coding skills



The greatest interest is aimed to Programming languages and to Algorithms and logical frames.

b) Training of robotic skills

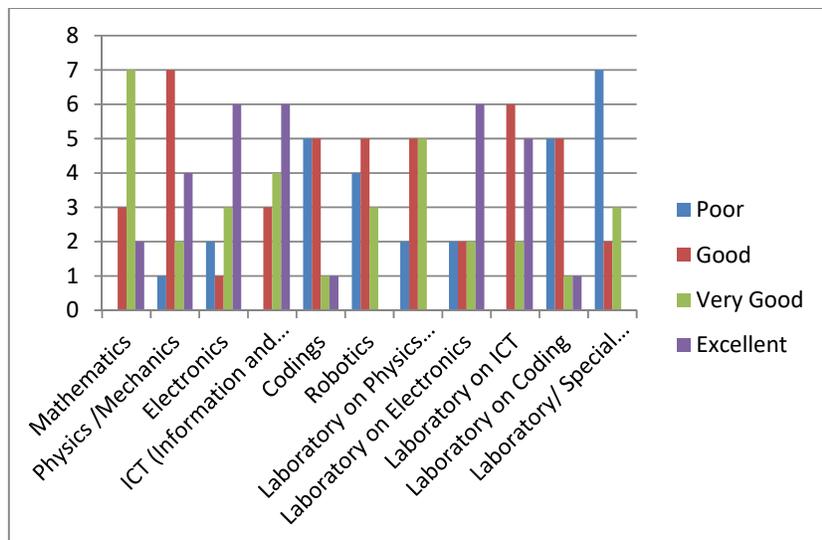
The interest on robotic training is equal for all 4 topics.



Teachers

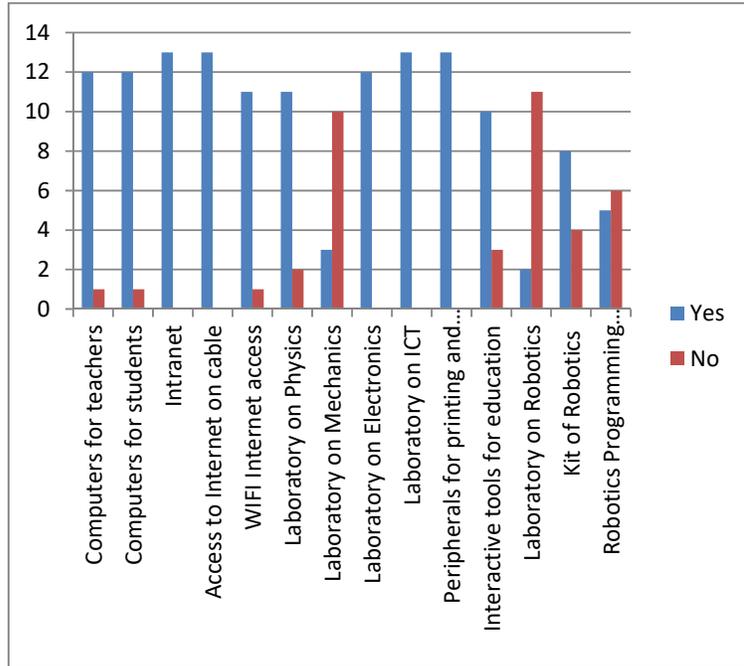
d) My level of confidence/ experience in following topics is:

The teachers are confident in Electronics, ICT Laboratory on electronics..



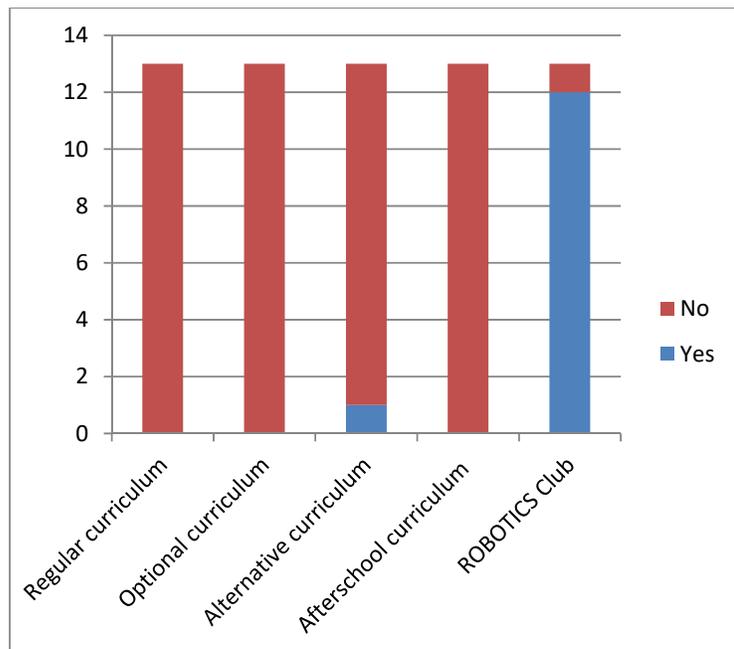
e) Does your school have the following facilities?

The selected school is well equipped and it has reasonable facilities.



f) How are robotics taught through the curriculum in your school?

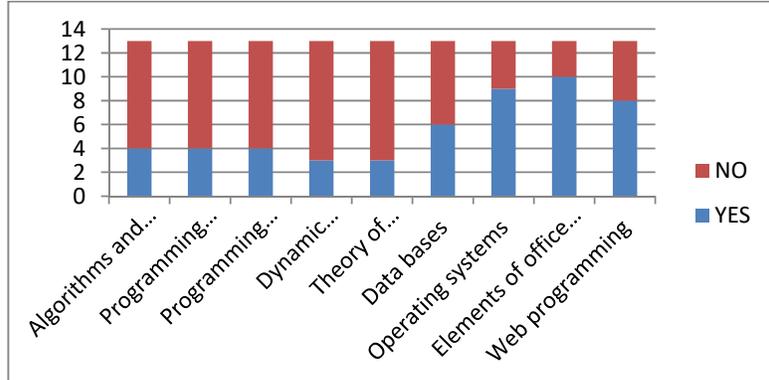
The robotics are taught only on robotic clubs.



2. Existing training opportunities

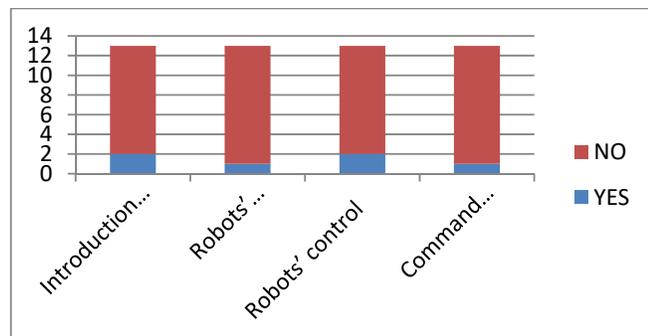
a) Training of coding skills

The best training opportunities are in Office elements, Web programming and Operating systems.



b) Training of robotic skills

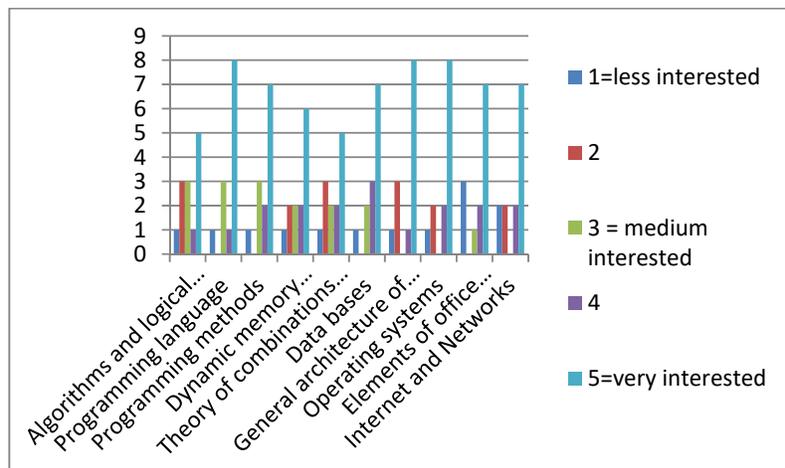
Only few teachers joined trainings on robotics.



3. Training needs identification

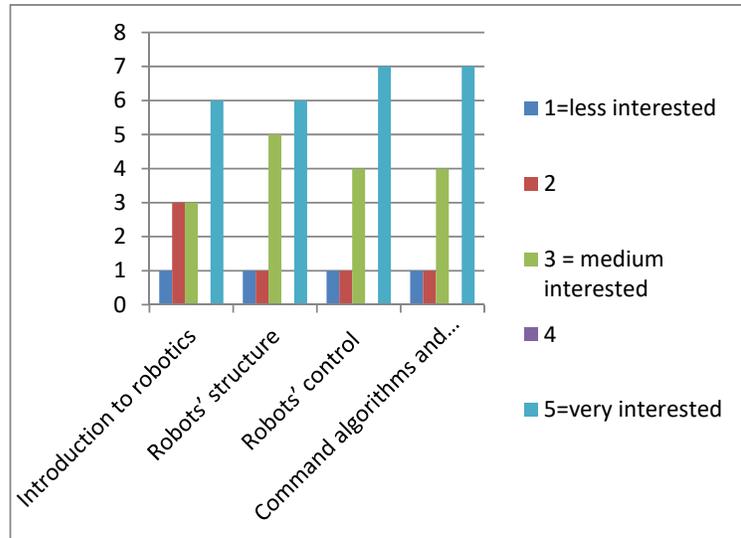
a) Training of coding skills

All topics on coding are very interested for teachers.



b) Training of robotic skills

All topics on robotic are very interested for teachers.



4. Conclusion

The summary of the questionnaires evaluation is showed on the next table.

<u>Students</u>	<u>Teachers</u>
<ul style="list-style-type: none"> • The best training opportunities are on Operating systems and Elements of office automatisation. • It is suprising that the students participated to trainings on Introduction to robotics, Robots' structure, Robots' control and Command algorithms. • The greatest interest in training is aimed to Programming languages and to Algorithms and logical frames. • The interest on robotic skill training is equal for all 4 topics. 	<ul style="list-style-type: none"> • The best training apportunities are in Office elementsm Web programming and Operating systems. • Only few teachers joined trainings on robotics, yet. • All topics on coding are very interested for teachers • All topics on robotic are very interested for teachers.

Some teachers think that one reason why students are not attracted to this area is that they mistakenly associate robotics too much with mechanical or industrial domains. But robotics means much more, and here students should be helped to see there are more components that work together and that makes things more interesting. At the same time, this also encourage teamwork, where everyone can claim the tasks they like or benefit more (some have more practical skills, a better 3D view, and they can help building up the robot and it's mechanics, others can come with functionality / practicability ideas or even design, others are passionate about programming and have a more logical thinking, etc.).

- **Outlook on upcoming trends in the future (based on the round table with teachers)**

Unfortunately, in the public school curriculum there is no robotics as a compulsory or optional subject matter. It is present in few private schools or specific robotics clubs.

The actual trend in VET schools in Romania is to start to open Robotic Clubs aimed to develop robotic skills for students.

The labour market will be the main force that will act on the robotic sciences introducing into the VET schools. There exist companies that producing robots for the car industry on our city and there exist companies that are using more and more robots on the curent production process. These will be strong incentives to introduce Coding and Robotics starting wth VET schools.

It is known that there is a demand on the local market for the robotics field in the industrial and production area (factories with assembly lines, quality control, etc.), where they are used more often, and have want to know if this program will help the students for a future job in this field.