3D2ACT:

FOSTERING INDUSTRY 4.0 AND 3D TECHNOLOGIES THROUGH SOCIAL ENTREPRENEURSHIP: AN INNOVATIVE PROGRAMME FOR A SUSTAINABLE FUTURE

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CYPRIOT NATIONAL MONITORING REPORT

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CONTENTS

1. State of the Art of the Education and Training on Digitalisation, Industry 4.0, Entrepreneurship and 3D Technologies in VET Schools

1.1 Digitalisation in VET schools

Cyprus is one of the last countries in the EU concerning Digitalisation. The 2020 edition of the European Commission's Digital Economy and Society Index (DESI) places Cyprus at 24th place out of the 28 Member States.

Although Cyprus has improved its results on all DESI dimensions from previous years, it still lacks the EU average. The most significant improvement Cyprus has made is in connectivity and the use of the Internet.

The same study indicates that Cyprus ranks above the EU average on mobile broadband take-up by consumers but well below the EU average on the take-up of fast broadband.

Around one in eight Cypriots have never used the Internet, and around 50% lack basic digital skills. There is also a shortage of Technology specialists in Cyprus despite the increasing demand, which results in Cypriot companies searching for a specialized workforce from abroad.

Cyprus launched its own digital strategy named "Digital Strategy for Cyprus" in 2012 and has seen updates in 2015 and 2018 to correlate with the "Digital Agenda for Europe". Its main objective lies in improving digital literacy for all unemployed workforce and businesses. In addition, invest in lifelong learning programmes with emphasis on digital literacy and digital entrepreneurship.

The Secondary Technical and Vocational Education (STVE) in Cyprus is offered in two directions the Theoretical and the Practical. The duration of studies in both directions is three years.

In the first year, the students independently of direction choose their sector and specialty, which they preserve until the last year.

Both direction programs aim through the offer of a balanced schedule of general education, technological specialization, and lab practice in preparing the students so they will be able after their graduation to:

1. Be employed in the industry
2. Continue their academic studies at the University

During their registration to the first year of studies, the students select their direction, sector, and specialization they wish to follow.

By doing this, the students can focus on the essential subjects of their field and specialty they chose, resulting in connecting the field's basic knowledge with their specialization.

The beginning of the academic year 2001-2002 saw essential changes in the STVE curriculum and instructional methodologies. By introducing technical and lab-based courses for each field, the students can develop more knowledge and skills and capabilities and better understand the importance and application of General Knowledge courses such as Mathematics and Physics. The new curriculum is adapted with examples and exercise that have to do with their sector and specialty.

As a result, the students are given the opportunity to have a deep background, which will help them gain access to Universities and have a smooth adaptation and adequate performance for their further studies.

The selection of specialization from year one allows the students to get to experience and make sure that it fits their personality and skills and based on that to build their future professional career.

The practical training allows the students to have a better perception of the industry and the specialization they chose.

Concerning digitalisation in VET schools starting from 2005, the Ministry of Education and Culture (MoEC) in the Republic of Cyprus has initiated an ambitious Educational Reform Programme intending to turn the vision of an efficient and more modernized educational system that will match today's world's needs and challenges. Funding by Europe has promoted ICT dramatically in the public-school sector in recent years.

Under the Ministry of Education and Culture's coat, an ICT integration plan has been implementing in the last seven years. This program aims to efficiently use Information and Communication Technologies (ICTs) in the educational process and improve students and teachers' digital literacy. The focus objectives of this program involve:

A. Equipping schools with advanced ICT infrastructure and facilities
B. Enhancing the teaching and learning support while exploiting ICT affordances according to the current curricula reform and pedagogical methods. For this goal, the MoEC has initiated two key projects:
    a. The e-Content and educational software procurement
    b. Creating an educational portal and Learning Management System (LMS) named Schoolnet DIA.S.
C. Educating teachers to acquire the necessary skills for using ICT tools in the educational process and keep up with the current technological developments.

The Ministry has revised the National Curriculum of all subjects and all education sectors' timetable (primary, secondary and VET) as part of the Education Reform Programme. The focus of the new curriculum is to meet society's needs. This focus, in effect, influenced the Curriculum of ICT heavily.

According to the current VET curriculum, both Theoretical and Practical direction, students of all subjects have the opportunity of selecting an ICT course for two hours per week for the first year of their studies. This course includes Applications in Informatics such as Word Processing, Presentations, Spreadsheets, Desktop publishing and multimedia tools.

Concerning the Theoretical direction, students who choose the sector of Electronics and Electronic Applications have the most significant exposure to ICT related topics with "Computers, Networks and Communications" and "Digital Technology and Programming" specialisations covering the most courses in ICT.

For the Practical direction, students in the Electronics and Electronic Applications with a specialisation in "Computers, Networks and Communications" will have the most exposure in ICT courses from the technician point of view.

1.2 Industry 4.0 in VET Schools

Industry 4.0 is currently at a very initial stage in Cyprus. Specifically, concerning Industry 4.0 in VET schools, there is no direct course that involves this sector per se.

The MoEC has made some initial actions and has been involved in European Funded projects such as the RoboVet Project (www.robovetproject.com), which aimed in introducing the notion of Industry 4.0 in VET schools.

New specializations associated to ICT skills and Industry 4.0 have been added in VET education in the last decade. In the theoretical direction, these include Computer Science, Networks and Communications, Digital Technology and Programming, Industrial Design and 3D printing, Renewable Energy Sources. In the practical direction there was the introduction of the Computer Networks & Communications technician specialization.

Additionally, the post-secondary institutes of VET in Cyprus, which have been approved as a public school of higher VET, offer accredited programmes which last for two years, leading to a Diploma. Some of the programmes of study, include subjects which aim at qualifying students for respective labor market needs and are a stepping stone for Industry 4.0 evolvement. These specializations are:

i.   CNC technology – Woodworking industry

ii.   Computer and Communication Networks

iii.   Industrial and Residential Automation

1.3 Entrepreneurship in VET schools

According to the Entrepreneurship in Vocational Education and Training Final report of the Expert Group (2009) by the European Commission, the Cypriot counterpart of the Ministry of Education and Culture, Mr. Andreas Eleftheriou, states that:

"Entrepreneurship is included in the national curriculum for all schools of Technical and Vocational Education. No specialist entrepreneurship programmes or activities are offered, but all subjects include entrepreneurial components according to need (a cross-curricular approach). The National Strategy on Entrepreneurship in Education to 2010 aims to provide entrepreneurship training for all technical and vocational education teachers."

Additionally, it is also stated in the abovementioned report that initial training for teachers on how to teach entrepreneurship in vocational education is compulsory. Moreover, all vocational education teachers must attend in-service seminars on this topic organized by the Cyprus Pedagogical Institute.

The ENTREPRENEURSHIP IN CYPRUS NATIONAL REPORT 2018/19 mentions that the Ministry of Education has enhanced teachers' training concerning entrepreneurship from the school-level education perspective. The training for entrepreneurship in education as a topic in the compulsory course of an in-service training program for school leaders and educators, training through workshops and offering entrepreneurship in education as a topic in the primary and secondary Teachers' Day of Empowerment, and other related actions.

Concerning students' direct entrepreneurship training, this is done through active participation in entrepreneurial competitions such as the Digital Championship organized by the Digital Champion for Cyprus, the Junior Achievement, and other competitions.

Such actions are reflected in the 2018/2019 Gin (Global Entrepreneurship Monitor) results, showing an improvement in entrepreneurial training at the post-school level, which is now considered a strength of Cyprus' entrepreneurial ecosystem.

Other activities regarding the enhancement of education from an entrepreneurial perspective which the Ministry of Education supports are activities that promote entrepreneurial activities and competition at school and university levels. These activities aim to raise awareness on entrepreneurship, build creativity, critical thinking and other related skills and competencies to students of all ages (e.g., "Digital Entrepreneurship Competition", "Student Enterprise", "Spending Smart" etc.).

An example where a Vocational school was involved in an entrepreneurial act was the case of Makarios III Technical School in Nicosia. The school joined the municipality in a project to remodel and landscape the riverside. Students surveyed the area, designed the landscape and all details (benches, lighting etc.), and built models to demonstrate their ideas. In the end, the participating students presented the project successfully at the Town Hall.

1.4 3D technologies in VET schools

There are two main subjects in VET schools in Cyprus that involve 3D technologies, and they both fall under the sector of Industrial Design in the Theoretical Direction:

a. 3D Design

b. Industrial Design (Research, Design and Creation of Innovative Products)

The 3D Design subject is offered in most, but not all, VET schools of Cyprus since the academic year 2016-2017. This was decided by relevant authorities in Cyprus, based on data collected on the industry's current conditions and needs. Therefore, a decision was made to introduce the theoretical module of 3D Design in VET schools. This module aims to introduce students to the world of 3D Design and help them develop the necessary skills required to enter the industry. Examples of these skills are critical thinking and problem-solving, which will allow students to better cope with the industry's dynamic environment.

The 3D Design subject combines optical and agronomical studies to apply the appropriate technology for the creation of products. In parallel, during the 3D Design, either of a new product or the improvement of a current product, the student is called to design in 3D beyond the primary product as well as various supportive devices for the production such as molds, supports, etc.

In addition, the module aims to reveal the talent of students and incentivize them to pursue further study around the subject and gain technical/computer knowledge of the subject.

The Industrial Design module shares some similar qualities with 3D Design. It was also introduced in VET schools in the academic year 2016-17. It aims to upgrade students' skills so that they find work in advanced fields such as medical equipment, shipping, airplanes, the invention of new products, and other industrial areas.

The students of Industrial Design learn to produce ideas and evolve their personal expression through the multidimensional approach of Arts and Design, which has; as a result, the Design and construction of experimental and usable builds.

This module was not created to target Industry 4.0 specifically, but its foundation shares many similar qualities which will help VET students cope better with Industry 4.0 related jobs.

2. Open-Source Statistics Available Online: Main Trends in Cyprus

According to the DESI 2020 rankings for EU, Cyprus is ranked in the 24th place out of the 28 EU countries as far as Digital Economy and Society index. The study takes under account the Internet connectivity such as broadband connection, 4G and 5G coverage which Cyprus ranks 27th which is one of the lowest in EU. The Human capital with digital skills and ICT specialisation ranking 23rd well under the EU average. The use of Internet services such as video calls, online banking and shopping and use of social media ranking 16th on pair with the EU average. The Integration of digital technology such as Big Data and electronic information sharing ranking 20th just under the EU average. And the Digital public services such as e-Government users and Open data ranking 18th on pair with the EU average.
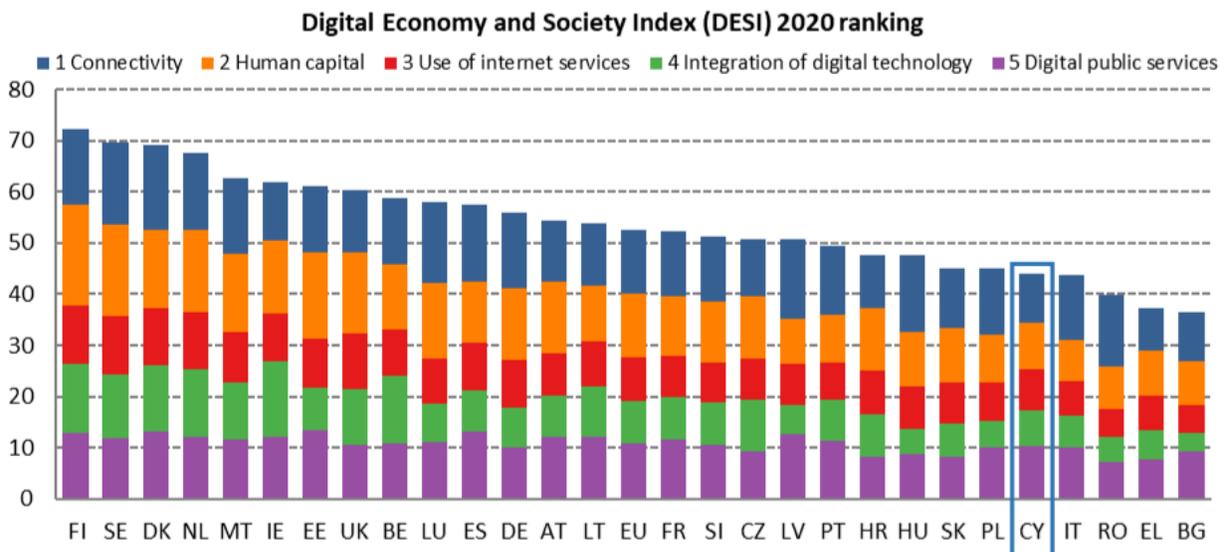
Digital Economy and Society Index (DESI) 2020 ranking

■ 1 Connectivity ■ 2 Human capital ■ 3 Use of internet services ■ 4 Integration of digital technology ■ 5 Digital public services

Figure 1 - Source: https://digital-strategy.ec.europa.eu/en/policies/desi-cyprus

Considering the main factor which holds back the rankings of Cyprus it is crucial to note that

Cyprus is making progress in deploying very high-capacity networks. All the main operators are seeking to deploy fiber networks and the current Covid19 pandemic has speed up the process as more businesses and workforce have shifted from office work to working from home. According to the Cypriot authorities, the incumbent has already connected over 61,000 homes, ahead of its 2019 target, and has increased its offer with speeds up to 300 Mbps. The Cypriot authorities are in the process of updating the national broadband plan for the period 2021-2025 and aim to have it ready by mid-2021.

Additionally, the first 5G network has been deployed in the first quarter of 2021 by one major operator with the rest operators expected to follow by the end of 2021.

According to data gathered by the European Commission about ICT in Cyprus schools in 2012, there seems to be a higher amount of ICT infrastructure in schools than the average EU member state. Such infrastructure includes but is not limited to the number of computers per students, tablets, TVs, interactive boards, cameras, and other ICT hardware, enhancing student learning. In most cases where Cyprus is below average compared to other EU member states, it is only by a relatively small margin. It is important to note that this data refers to all schools of all ages throughout Cyprus and not just VET schools.
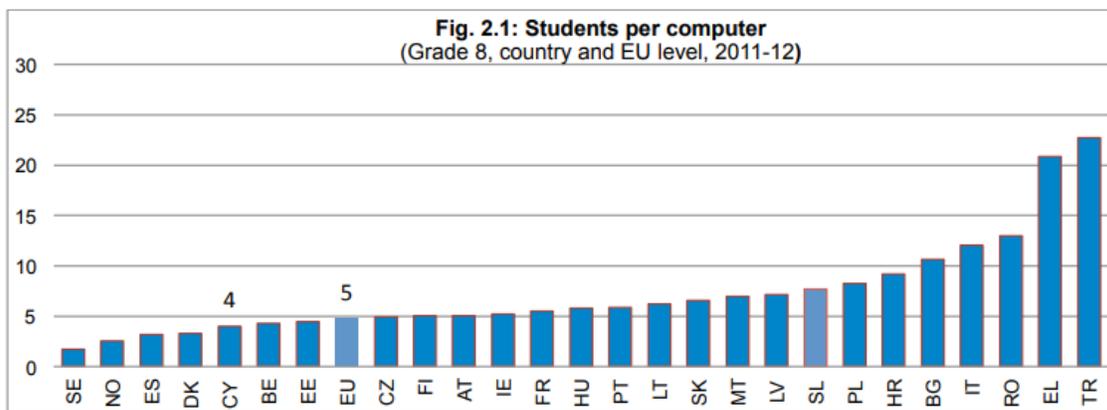

Figure 2 - Source: https://ec.europa.eu/digital-single-market/en/news/survey-schools-ict-education

Additional evidence from the research suggests that the highest usage of ICT in Cyprus is in grade 11 in vocational training. One in two teachers takes advantage of ICT infrastructure to teach their students in more than 50% of the lessons, which is higher than the rest of the EU.
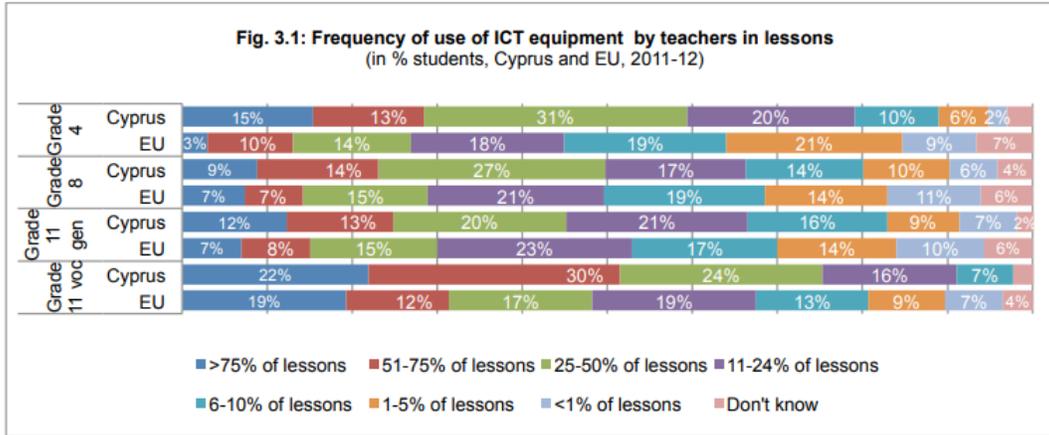
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Fig. 3.1: Frequency of use of ICT equipment by teachers in lessons
(in % students, Cyprus and EU, 2011-12)

		>75%	51-75%	25-50%	11-24%	6-10%	1-5%	<1%	Don't know
Grade 4	Cyprus	15%	13%	31%	20%	10%	6%		2%
	EU	3%	10%	14%	18%	19%	21%	9%	7%
Grade 8	Cyprus	9%	14%	27%	17%	14%	10%	6%	4%
	EU	7%	7%	15%	21%	19%	14%	11%	6%
Grade 11 gen	Cyprus	12%	13%	20%	21%	16%	9%	7%	2%
	EU	7%	8%	15%	23%	17%	14%	10%	6%
Grade 11 voc	Cyprus	22%	30%	24%		16%		7%	
	EU	19%	12%	17%	19%	13%	9%	7%	4%

Legend:
- ■ >75% of lessons
- ■ 51-75% of lessons
- ■ 25-50% of lessons
- ■ 11-24% of lessons
- ■ 6-10% of lessons
- ■ 1-5% of lessons
- ■ <1% of lessons
- ■ Don't know

Figure 3 - Source: https://ec.europa.eu/digital-single-market/en/news/survey-schools-ict-education

3. Main National Policies and Institutional and Legislative Framework Regulating the Fields: The Legal Backbone in Cyprus

Modernizing vocational education and training:

According to the "Education and Training monitor of Cyprus" published in 2018, Moec made efforts to reform the secondary technical and vocational education. Despite these efforts, only 17% of upper secondary students participated in VET in 2016, while the EU average is 49%. Besides, VET graduates' employment rate was the lowest in the EU at only 52%, compared to the EU average of 76.6%. The above statistics emphasize the need to strengthen VET education in Cyprus.

For the strengthening of VET to be achieved, the report mentions that several steps have to be taken. These steps involve things such as updating the curricula and the promotion and improvement of the apprenticeship scheme. Liaison offices were established in all Cypriot Universities to improve the relevance of education to the labour market and help facilitate the student's transition process from education to the labour market. The first steps have been made by offering students placement opportunities in companies. Furthermore, an online platform that will match students with businesses and track placement opportunities will be created. The above efforts aim to improve the University to labour market links and help students get better jobs and succeed. This will consequently help remove Cyprus's social stigma about VET schools and VET students, where people associate VET students as underachievers.

Other more recent measures were put in effect and were expected to strengthen the VET sector of Cyprus. Examples include:

1. Accreditation of post-secondary institutes of VET (PSIVET) in April 2017.
2. Reform of the teacher appointment system for VET teachers who obtain the qualification 'Vocational Trainer — Level 5' as part of the Cyprus Qualifications Framework (CyQF).
3. Stepping up VET teachers' training as part of the new training policy.

Another issue that is mentioned in the report is the issue of skill mismatching, a very common issue among VET schools in Cyprus.

The Director of Training Services of Human Resource Development Authority emphasized additional points during the presentation of the 2018 monitoring report: "Labor market skills and the response of the vocational education and training system". The report states it is essential to strengthen and upgrade VET schools' infrastructure so that students will build much stronger foundations that will help them in their field of study or work. Also, the report mentions that additional modules should be added that will cover the topics of digital competences and entrepreneurship.

Government initiatives

The Cypriot House of Representatives has organized four conferences promoting the fourth industrial revolution in the last five years.

The main issues of analysis concerned Innovation, Artificial Intelligence and Inclusion, the required actions needed to enter the fourth industrial revolution and the future opportunities and threats. There were three-panel discussions: digital economy and society, health and education and culture.

Current and past Members of Parliament, General Directors of Ministries, academics from universities from the state and private sector, trade unions, employer organizations representatives, and other stakeholders partook in the conferences.

In 2018, the Cyprus chamber of commerce and industry and the Cyprus employers and industrialist's federation organized the digital Cyprus conference: "Driving digital transformation in Cyprus". During the meeting, the President of the Republic of Cyprus announced the creation of the Deputy Ministry for Digital Strategy position, aiming at a faster digital transformation of Cyprus.

National Coalition for Digital Jobs

The Digital Champion of Cyprus, together with the Department of Electronic Communications, answered the European Commission's action call for a grand coalition. The purpose is to seek ways to address the lack of new ICT skills and the future mismatch of unfilled ICT-related vacancies over Europe.

The two organizations proceeded to establish a National Coalition for Digital Jobs in 2014. This coalition for digital jobs is a cooperation between Cyprus's digital champion, the Department of Electronic Communications and national public institutions, professional communities, private enterprises and non-profit organizations. The action policy aims to promote and improve digital skills to address the predicted future mismatch between ICT professionals and workforce needs.

The coalition's primary actions for 2016 - 2019 involved introducing the ECDL (European computer driving license) certification to pupils of secondary education both in public and private schools, the training and certification of ECDL to unemployed and soldiers. The Ministry of Education and Culture also offered ICT training programmes to persons with disabilities. A series of awareness activities in ICT in collaboration with the Grand Coalition stakeholders were also conducted. It was considered a breakthrough for Cyprus's education system because it is the first-time students of public schools were offered a specific topic certification.

Digital strategy for Cyprus

In February 2012, the Council of Ministers approved the digital strategy for Cyprus. Cyprus's digital strategy correlates with the digital agenda for Europe and the objectives and actions proposed in it. It aims to contribute substantially to economic growth, productivity increase and job creation. Additionally, the strategy promotes the use of ICT in all sectors of business and society in general. The overall vision of the Digital Strategy for Cyprus is as stated: 'Information and communication technologies to support the development and the competitiveness of the economy, and citizen participation in the social, cultural and political domains'.

The strategy includes six strategic objectives which are the following:
a. Connect Cyprus
b. Modernize public administration and provide public electronic services
c. Inclusion of all (including vulnerable groups) into digital Cyprus
d. Education and learning
e. Digital entrepreneurship
f. ICT for the environment

New industrial strategy 2019-30

The introduction of the fourth industrial revolution brought the need to update the workers' training and education and provide new skills. The new industrial strategy of Cyprus for 2019-30 was announced in May 2019.

The new strategy will help undertake future challenges by embarking to transform its current industrial base with services, focusing on digitalisation and developing essential soft and digital skills. The new industrial strategy introduced a new framework and an action plan for its first phase of implementation, covering 2019-22.

Within six strategic pillars which are:

a.   Sustainable development and production

b.   Improvement of the industrial and business environment

c.   Digitalisation of industry

d.   Development of new and improvement of existing skills for human resources

e.   Enhancement of access to finance

f.   Enhancement of access to markets

The policy aims to upgrade Vocational Education and Training (VET) schools to respond to the skill gaps in the labor market.

National Research and Innovation Strategy and National Chief Scientist

In January 2019, the Republic of Cyprus president appointed the first National Chief Scientist for Research and Innovation. The Chief Scientist's role is to lead and organize all Cyprus efforts to become a progressive and competitive economy, motivated by research, scientific distinction, modernisation, technological development and entrepreneurship, and a regional centre in these vital areas.

This strategy aims at Cyprus's technological, social and economic development based on research and innovative entrepreneurship. It signifies the shift from the existing national economic growth model to a sustainable, technology-driven model and requires a significant national investment increase for research and development.

4. Relevant VET Initiatives and Programmes

Youth Board of Cyprus

The Youth Board of Cyprus is a public legal entity that targets in progress and welfare of all young people in Cyprus. It providing opportunities to young people and their organizations to actively participate and be responsible for the social, economic and cultural development of their community and country and seeks out young people's creative engagement and entertainment dealing with youth-related problems directly and effectively.

The Youth Board of Cyprus has several information centres across Cyprus that provide the following services in relation to VET education:

- Professional career counselling based on market trends and needs.
- Information about training opportunities and studies in Cyprus or abroad.
- Guidance for students to help them select the suitable path that will match their skills and preferred carrier path of choice to avoid skill-profession mismatch.

The Youth Board of Cyprus also created the initiative "Flying with Education" which gave final year Cypriot VET students the opportunity to become familiar with 3D design and 3D printing.

Institutes for Secondary Education Graduate

Furthermore, based on the new industrial strategy 2019-30, the initiative for creating Institutes for Secondary Education Graduates came into fruition. These institutes offer free, high-quality training programmes for key competencies based on the needs of the market to help people gain valuable knowledge and improve their current skills. Therefore, unemployed workers that had trouble finding a job due to having insufficient skills will now be able to apply for better job positions and improve their employability.

RoboVET Erasmus+ Project

The Ministry of Education and Culture has been involved in various European Funded projects such as the RoboVet Project (www.robovetproject.com). The project aimed to introduce the notion of Industry 4.0 and robotics in VET schools with the objectives to increase the employability of VET graduates by matching the market needs to their qualifications and contributing to the development of highly-skilled and qualified personnel. The consortium joined efforts in strengthening the quality of VET in Europe by allowing the transferability and mutual recognition of qualifications, making it more appealing for potential VET students.

5. Feasibility and Requirements Analysis on Current Needs and Gaps in the Teaching and Learning Opportunities Available

Emphasys Centre conducted an online survey to identify the needs and gaps of VET teachers and schools regarding digitalisation and the use of 3D technology in the educational practice to support industry 4.0, entrepreneurship and digital skills.

Emphasys Centre collected twenty-five responses from 4 different VET schools (two did not specify their school) throughout Cyprus. Most of the answers came from the region of Famagusta, and specifically, 11 responses (44%) were given to the questionnaire by the teachers of TESEK Ammochostou and Avgorou.

The participating schools were the following:

SCHOOL NAME	NUMBER OF PARTICIPANTS
A' TESEK LEFKOSIAS	4
LYKIO &TESEK POLEOS CHRISOXOUS	4
TESEK AMMOCHOSTOU/ AVGOROY	11
TESEK LEMESOU	4
DID NOT SPECIFY	2

Of the 25 participants, 18 were men and 7 women.

Gender
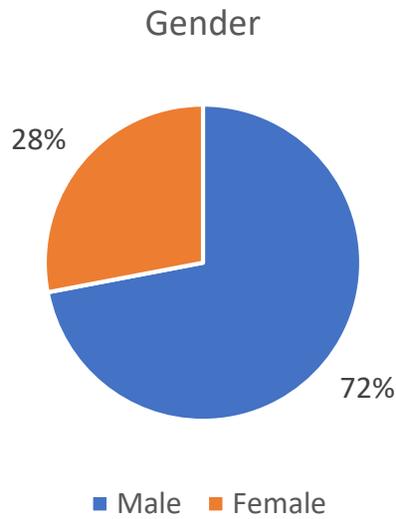
For the country of origin, only one (4%) was not Cypriot.

Country of Origin

The age range of the participants was as follows:

12% belong to the category 20-30, 16% to the category 31-40, 24% to the category 41-50, 48% to the category 51-60 and none in the category over 61.
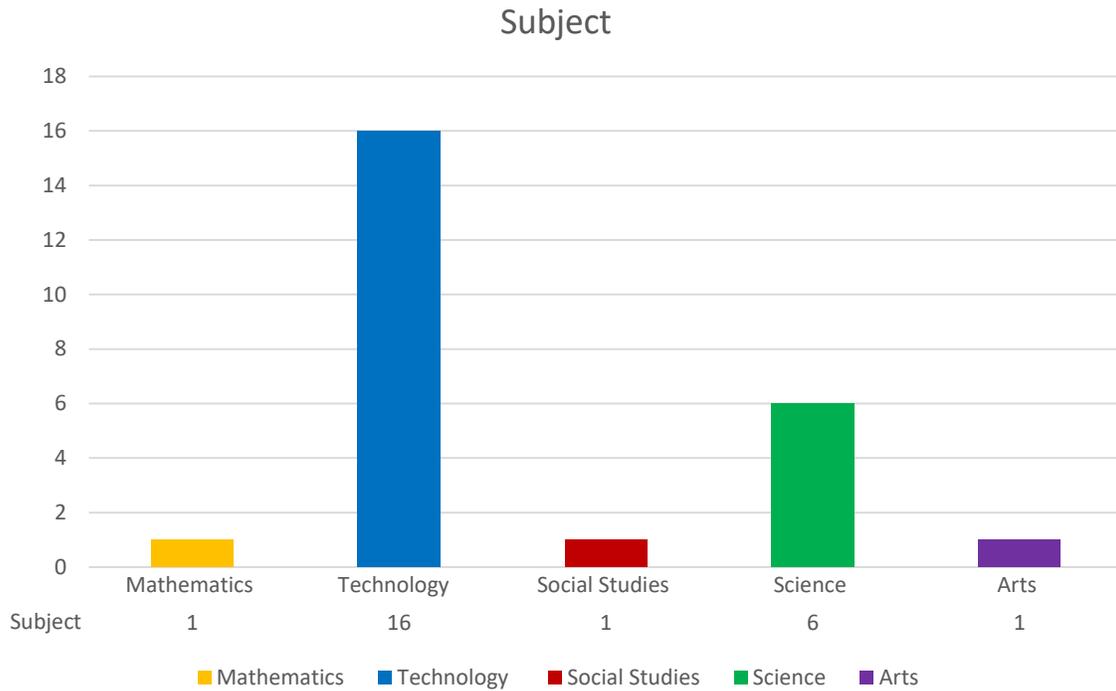
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Age Range

Legend: 20-30, 31-40, 41-50, 51-60, 61+
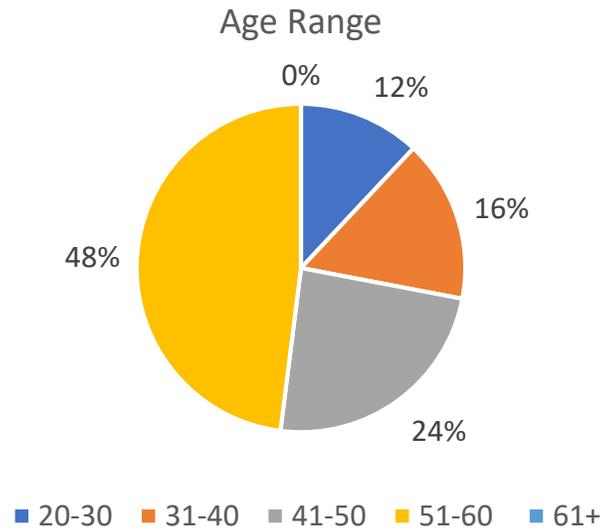
The years of service of the participants was 56% for "10 or fewer years", 40% between "11-20 years" and only 4% for "more than 31 years". Additionally, it was noted that none of the participants was in the 11-20 years range.

Years of Service

Legend: 10 or less years, 11-20 years, 21-30 years, More than 31 years

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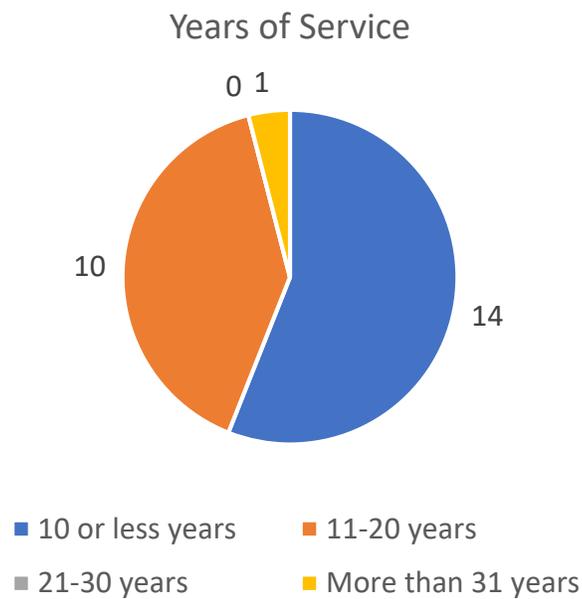
Most of the participants in this research teach Technology related subjects (64%), and the second major group of teachers teach Science related subjects (24%), and just a few teach Maths, Social Studies and Arts.

Subject

Subject	Mathematics	Technology	Social Studies	Science	Arts
Subject	1	16	1	6	1

Legend: ■ Mathematics ■ Technology ■ Social Studies ■ Science ■ Arts

Concerning the participants who teach in the Technology field, their specialisation was mainly in Mechanics (mechanical engineering, electrical engineering and shipping) with 56.3%. Computer Science teachers with 25% and Geoponics teachers with 18.8%.

Specialisation in Technology field

Mechanics ■ Computer Science ■ Geoponics
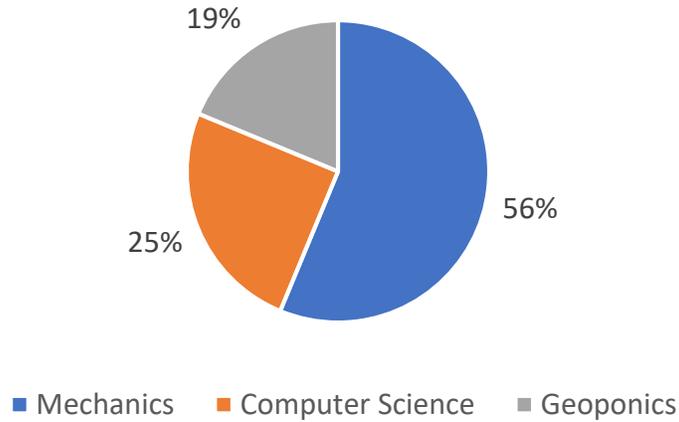
When asked how they evaluate their level of digital tools in schools, only 4 % (1 answer) of the teachers considered the level of digital tools in schools to be "poor", and also only 4% described it as "excellent". More than half of the teachers (56%) answered that they considered the level of digital tools in schools as average (score 3 out of 5). 8% responded that they believe it is "inadequate" (score 2 out of 5), and 28% mentioned that the level is "very good" (score 4 out of 5).

Level of Digital Tools in Schools

Poor ■ Inadequate ■ Average ■ Very Good ■ Excelent
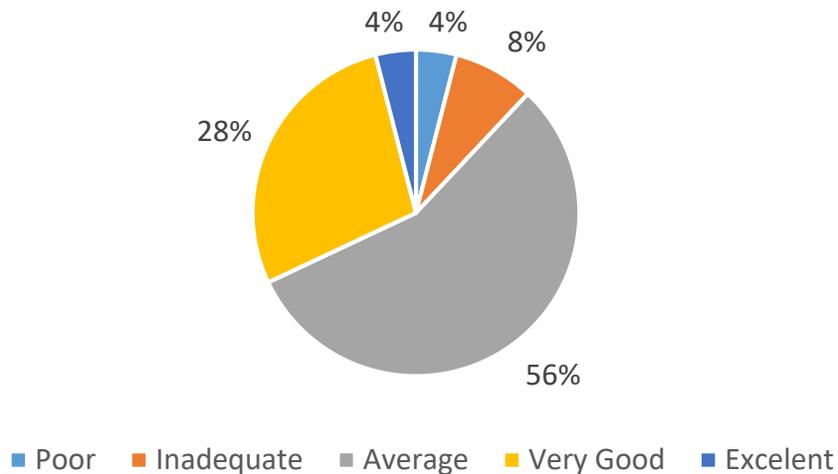
In the question "If the level of digital tools is not efficient, which are the primary causes for this", the majority (44%) answered that it was due to the inconsistent and bad planning of courses curriculum, as well as the lack of personal training (36%):

Causes

Category	Value
Not included in the curriculum	1 (4%)
Inconsistent and bad planning of courses curriculum	11 (44%)
Lack of Personnel Training	9 (36%)
Bad Internet connection	7 (28%)
Inefficient Hardware and Software	7 (28%)
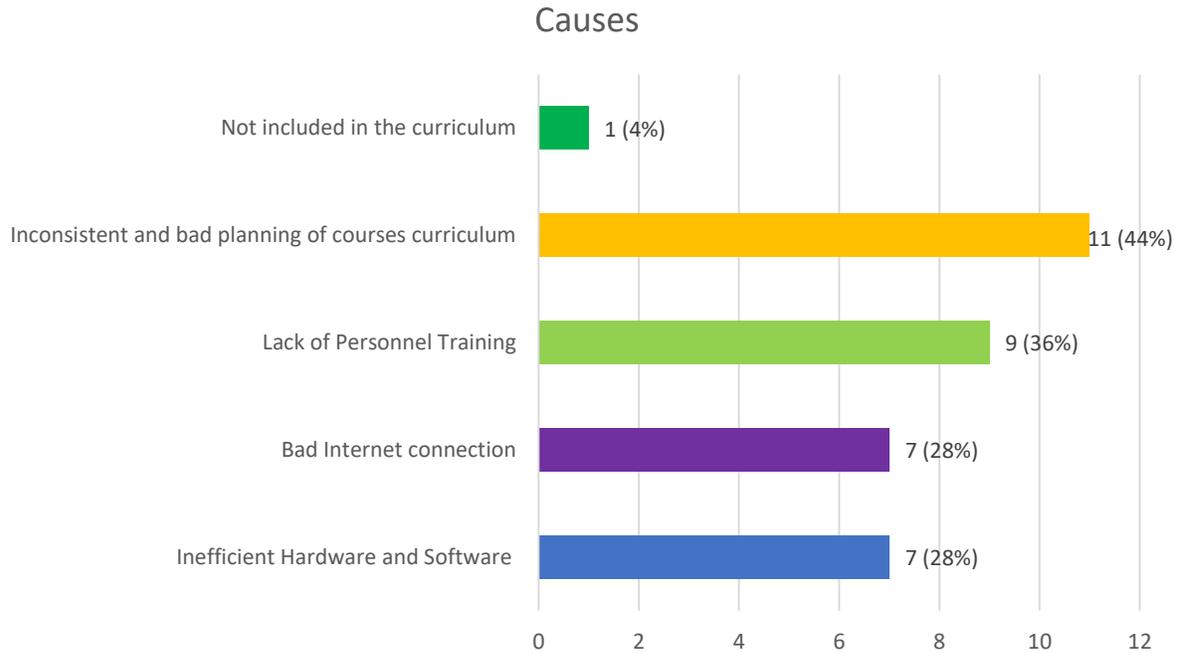
Most teachers believe that Digital tools in their school are a necessary prerequisite (72%). They also describe the level of digital skills of their school's staff as average (72%).

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The Digital Tools in Schools are:

28%

72%

- A necessary prerequisite
- A way for improving your teaching
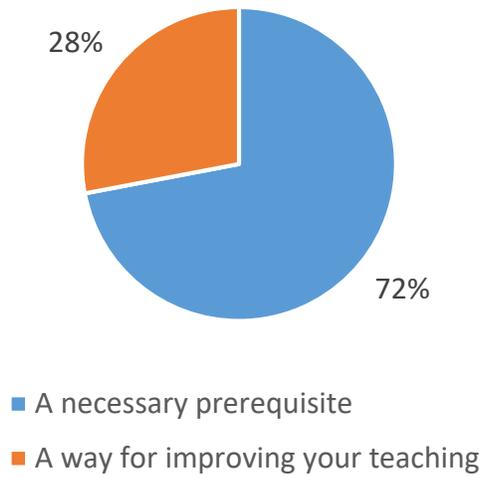
Level of Digital Skills of the school's staff

8% 0%

20%

72%

- Poor ■ Inadequate ■ Average ■ Very Good ■ Excelent
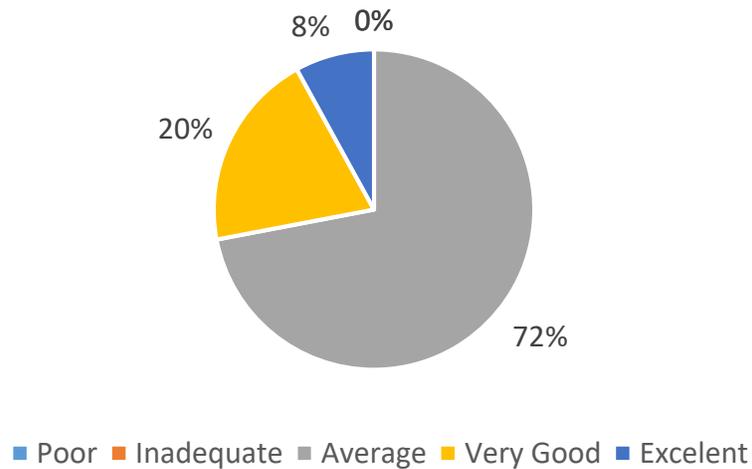
The teachers also commented on the learning process and how it has been affected by the use of digital skills. 60% mentioned that it has improved and 32% that it has dramatically improved. Teachers also believe that their students favour as well the use of technological tools greatly.

Learning process with the use of digital skills
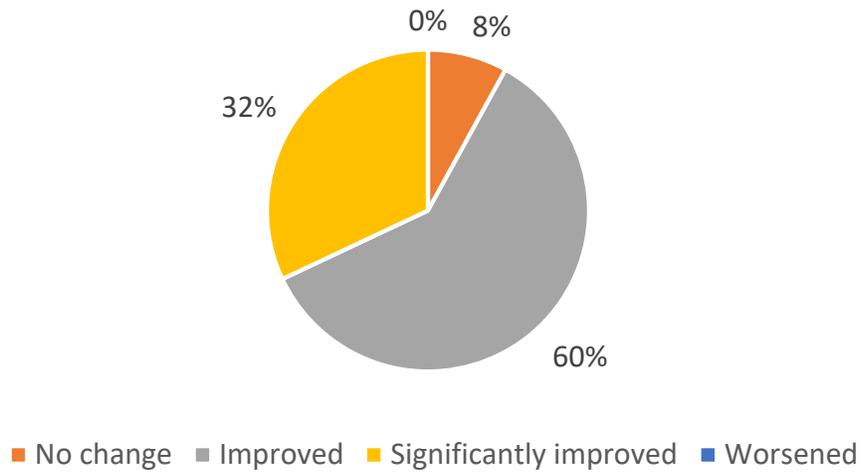
0% 8%

32%

60%

- No change
- Improved
- Significantly improved
- Worsened

Students favor the use of technological tools as part of educational activities

0% 8%

36% 20%

36%

- 1 - Not at all
- 2
- 3
- 4
- 5 - Very much
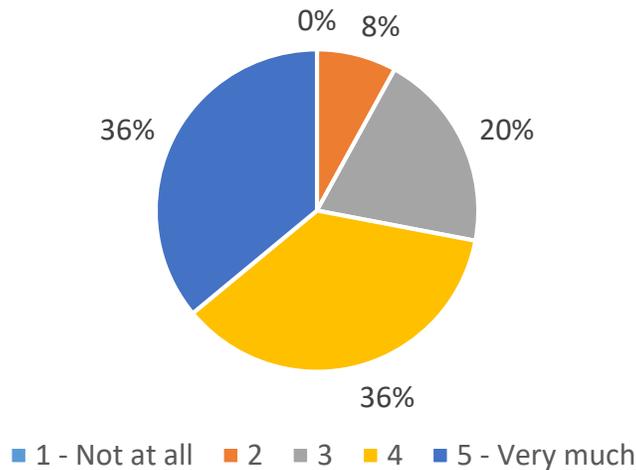
The teachers also indicated that VET schools should be related to Industry 4.0 and most of them feel pretty firm about it (84%). All of the teachers also believe that the teaching of STEAM courses should be increased in their schools and that this will increase the employability of their students.

VET schools should be related to Industry 4.0

0 (0%) 2 (8%)

2 (8%)

21 (84%)

■ 1 - Not at all   ■ 2   ■ 3   ■ 4   ■ 5 - Very much
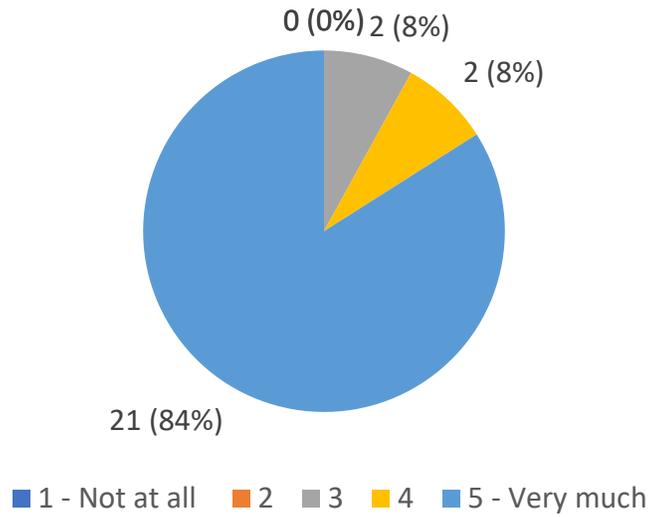
Do you believe the introduction of additional STEAM courses could play an essential role in employability perspectives in the future?

4%

96%

■ Yes   ■ No
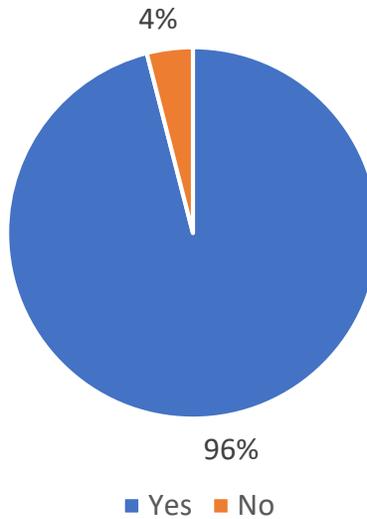
Participants were also asked if businesses or industrial partners contribute to STEAM education in their country or school, with just 24% positive answers. The one's who answered yes indicated that the way this is fulfilled is through student internships to the local businesses of their area related to their studies.

Do businesses or industrial partners contribute to STEAM education in your country or school?
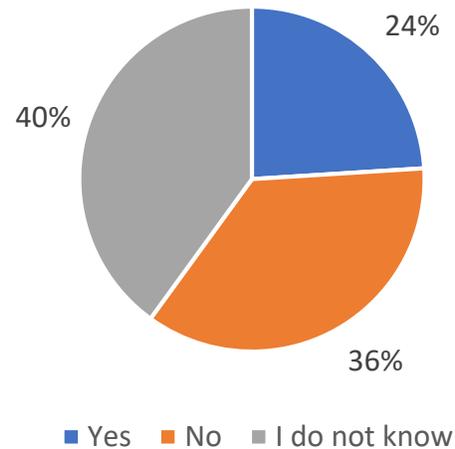
Vocational Schools in the Republic of Cyprus use technology through their STEAM courses as a tool to facilitate research, development and design by 68%, but only 36% dedicate time for entrepreneurship education. The schools that save time for entrepreneurship education do it for 1-2 didactic periods per week. Additionally, 28% mentioned that their school includes programs that focus on entrepreneurial education.

Is technology through your STEAM courses used as a tool to facilitate research, development and design?

32%

68%

■ Yes ■ No
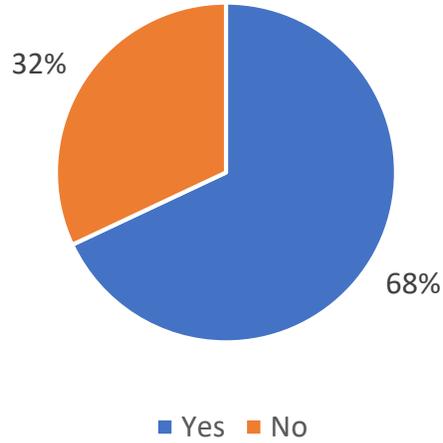
Does your school dedicate time for entrepreneurship education?

36%

64%

■ Yes ■ No
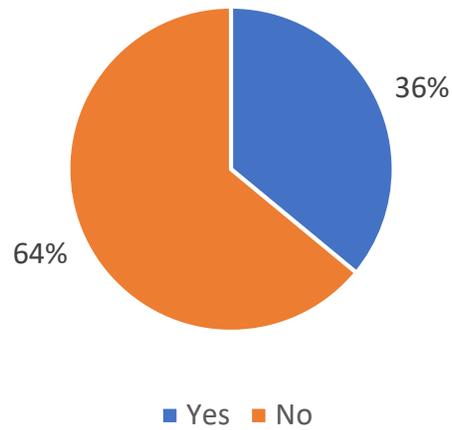
How many didactic hours per week is dedicated to entrepreneurial education?

Legend: ■ 1 ■ 2 ■ More than 2

- 14%
- 43%
- 43%
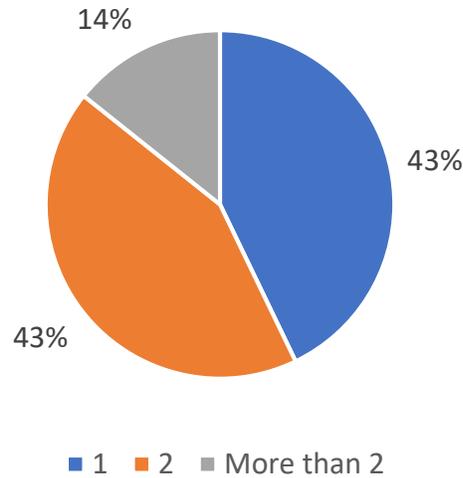
Are there in your school programs that focus on entrepreneurial education?

Legend: ■ Yes ■ No ■ I do not know

- 28%
- 28%
- 44%
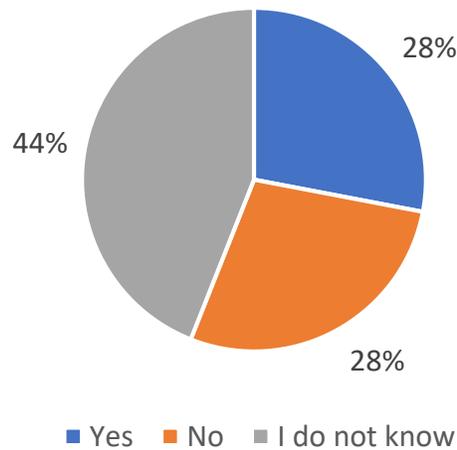
84% of the participants mentioned that they have an available 3D printer in school and of them 60% have used it in their course. The participants which do not have a 3D printer 40% mentioned that their school had plans in purchasing one in the near future.

52% mentioned that they have attended a course/seminar for 3D printing, which included mainly:
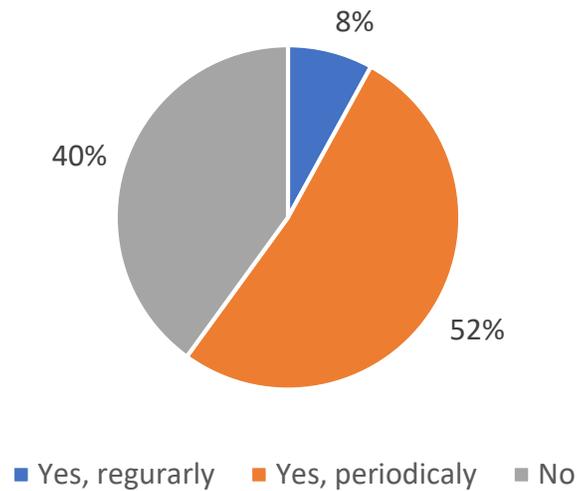
- 3D Printing materials

- Tools for designing 3D models

- Types and uses of3D printers

- 3D printing software

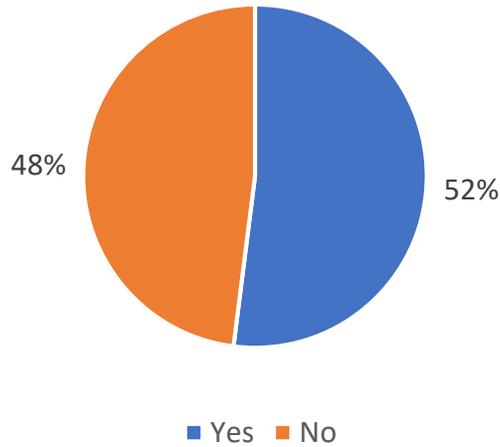### Availability of 3D printer in schools

16%

84%

■ Yes ■ No
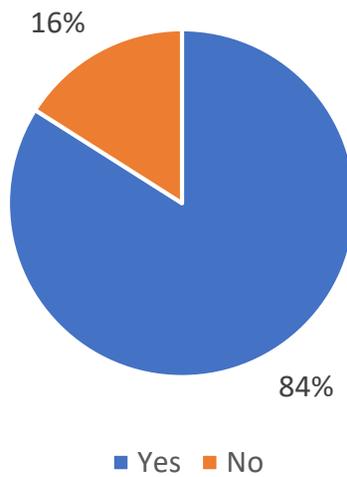
If your school has a 3D printer, have you used the 3D printer as part of your courses?

8%

40%

52%

■ Yes, regurarly ■ Yes, periodicaly ■ No

Have you ever participated in an educational program/seminar for the use of 3D Printing?

48%   52%

■ Yes ■ No

Concerning the use of 3D printers by the students, participants stated that only 32% of their students actually had used a 3D printer. 72% believe that their students favor the use of such technological tools in the classroom.

## Have your students ever used 3D printers?
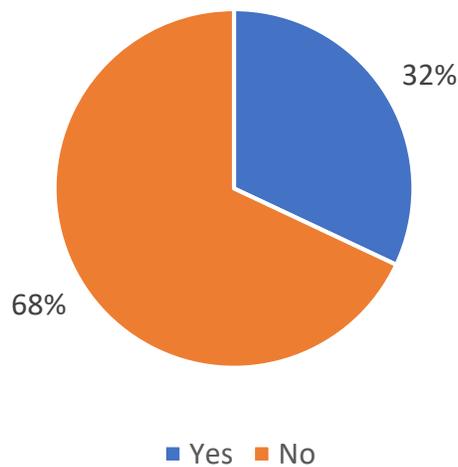
32%

68%

■ Yes ■ No

Students favor the use of technological tools as
part of educational activities

0%   8%

36%   20%

36%

■ 1 - Boring   ■ 2   ■ 3   ■ 4   ■ 5 - Very Interesting
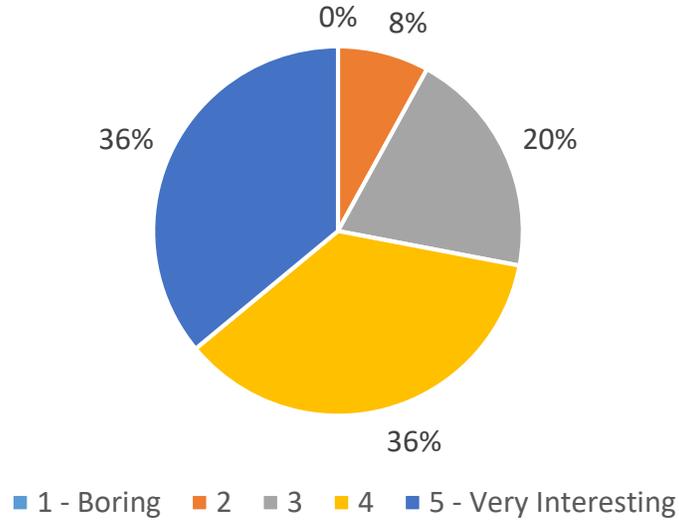
Finally, the survey participants indicated the importance of various aspects such as Creativity, Design, 3D modelling, Problem Solving, Programming, Knowledge of the Production process, Knowledge of Materials in correlation with the usage of 3D printers in school. Teachers feel the strongest about the influence of this technology in the areas of Creativity, Design and 3D modelling.

Importance of the following in correlation with 3D Printing
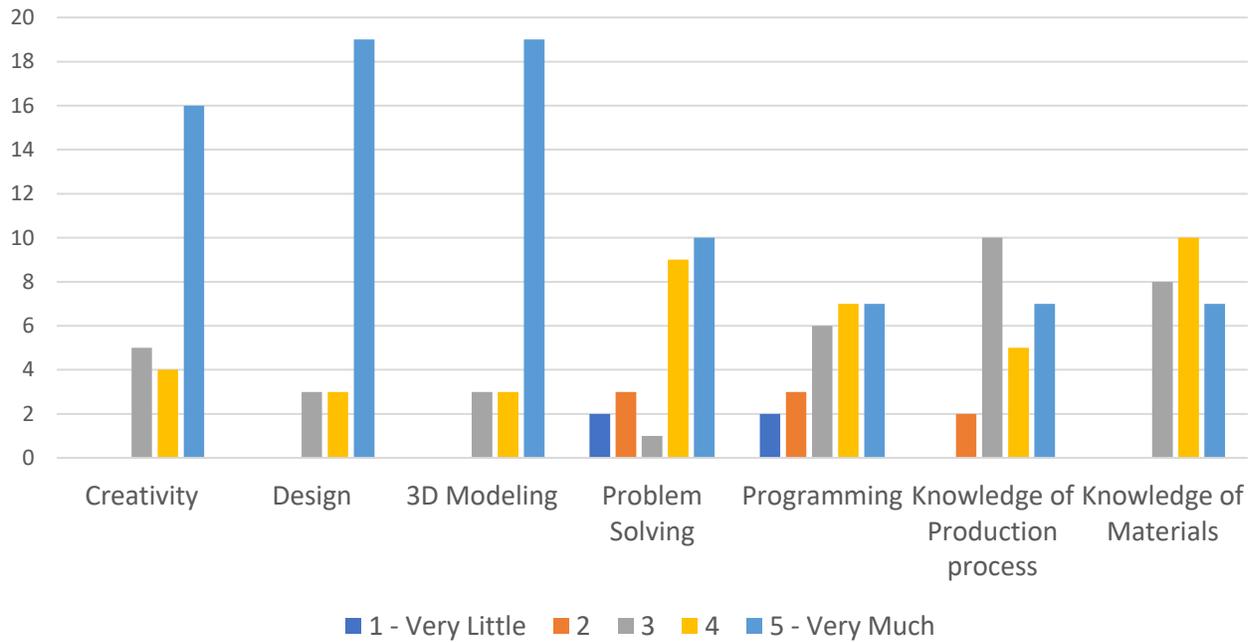
Overall, this survey indicates that vocational school educators in Cyprus are open to new technologies and support their use in VET. Hardware-wise the research shows that most schools in Cyprus are sufficiently equipped, and there are plans for even more enhancement, such as the purchase of 3D printers for the schools which do not currently own one. They also seek further training, which will help them improve and support their students.

The survey also acknowledges the lack of entrepreneurship training in the curriculum. Upscaling the curriculum with creativity and design topics will lead to enhanced future employment for VET graduates. Moreover, educators believe that the introduction of new technologies and modernisation of the current curriculum will lead to high-quality education and increase the professional development of their graduates.

References

The European Commision. (2018). Education and Training MONITOR 2018 Cyprus.

https://ec.europa.eu/education/sites/default/files/document-library-docs/et-monitor-report-2018-cyprus_en.pdf

Mouzourides Giannis. (2018). Δεξιότητες στην αγορά εργασίας και η ανταπόκριση του συστήματος επαγγελματικής εκπαίδευσης και κατάρτισης.

https://ec.europa.eu/cyprus/sites/default/files/monitor_2018_giannismourouzidis.pdf

HDRA. (2019). VoationaL Education Training Future Works.

http://www.anad.org.cy/images/media/assetfile/vocational_education_training_future_work_Cyprus_Cedefop_ReferNet.pdf

CEDEFOP. (2019). Vocational education and training in Europe.

https://www.cedefop.europa.eu/en/tools/vet-in-europe/systems/cyprus

Robovet Project. (2018). Curriculum on Robotics Technician.

https://robovetproject.com/english

CEDEFOP. (2019). Developments in vocational education and training policy in 2015–19 Cyprus.

https://www.cedefop.europa.eu/files/developments_in_vocational_education_and_training_policy_in_2015-19_cyprus.pdf

European Commission. (2019). Monitoring progress in national initiatives on digitising industry.

https://ec.europa.eu/information_society/newsroom/image/document/2019-32/country_report_-_cyprus_-_final_2019_0D322D64-DDF7-AC6E-D1E61A12F0FD2A0D_61231.pdf

HDRA. (2020). VoationaL Education Training Future Works.

http://www.anad.org.cy/images/media/assetfile/vocational_education_training_future_work_Cyprus_Cedefop_ReferNet.pdf

Republic of Cyprus. (2019). Distributed Ledger Technology & Blockchain:A National Strategy For Cyprus.

http://mof.gov.cy/assets/modules/wnp/articles/201907/480/docs/blockchain_strategy_english_final.pdf

Global Entrepreneurship Monitor. (2020). Entrepreneurship in Cyprus – National Report 2018/19.

https://c4e.org.cy/reports/2019/GEM%20Report%202019-Web.pdf

Secondary Technical and Vocational Education. (2020). General Information.

http://www.moec.gov.cy/dmteek/mtee_genikes_plirofories.html