DRONES@STEAM

Fostering digital Transformation in VET schools and creating new job prospects in the labour market

Project Result No: 1

PR1-A4: TRANSNATIONAL PEER REVIEW COMPARATIVE REPORT FOCUS GROUPS

Lead partner(s): N.C.S.R. "Demokritos"

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WEBSITE:

https://dronesteam.eu/

CONSORTIUM: PARTNER LIST

- University of Crete (UoC) - Greece
- ECAM-EPMI (ECAM) - France
- Cyprus Computer Society (CCS) - Cyprus
- Politeknika Ikastegia Txorierri S. Coop (PIT) – Spain
- National Center for Scientific Research “Demokritos” (NCSRD) - Greece
- A & A Emphasys Interactive Solutions Ltd (EMP) – Cyprus
- Regional Directorate of Primary and Secondary Education of Attica (RDPSEA) - Greece

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1 Focus group participants

The focus groups survey involved a total of **41 participants,** including **25 VET trainers/educators** and **26 VET students** from four countries, namely Spain, Greece, Cyprus, and France.

More specifically, five teachers and five students participated from Spain, while in Greece, there were four male and four female teachers, along with four boys and four girls students. In Cyprus, six teachers and seven students were involved in the study, and in France, six teachers and six students participated.

2 Discussion outcomes

2.1 Teachers

Question 1: How (in general) teaching and learning is organized at your school/organisation in the area of Science, Technology, Engineering Arts and Mathematics (STEAM)?

The focus group participants from the four countries France, Cyprus, Greece, and Spain all indicated that teaching and learning in the field of Science, Technology, Engineering Arts, and Mathematics (STEAM) is organized in different ways.

In France, Scientific conferences, tutorials for application exercises, practical work, and internships in companies are some of the ways in which STEAM subjects are taught.

In Cyprus, ICT trainers use computers for students to practice hands on coding and software, while mathematics teachers use traditional approaches by showing equations and solving them on the board.

In Greece, participants reported that they use both unplugged and plugged STEAM approaches in various courses such as Technology, Topography, and specialty courses with emphasis on those of informatics but also in general courses. They also try to participate in competitions and European Programs.

In Spain, the focus group participants reported that all the training cycles of their schools have a STEAM profile and the methodology implemented in the center is the ETHAZI model of high-performance cycles.

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Question 2: How does technology (in particular ICT related) support teaching and learning processes at your school/organization?

Technology, and in particular ICT related technology, plays a crucial role in supporting teaching and learning processes across Greece, Spain, France, and Cyprus.

In Greece, ICT related technology is used to support science lessons, with teachers making use of 3D printers, interactive whiteboards, Arduino, robotics kits, and sensors to link theory with practice. In order to take advantage of these, training activities have been conducted for teachers.

In Spain, the use of drones in the classroom is seen as providing student-centered, technology-driven learning, while the use of digital platforms (such as e-me, e-class, inside teacher, google classroom, Kahoot, and Google Drive) is also widespread.

In France, educators are using hardware such as Arduino and software such as Audacity, as well as partnering with media libraries and digital centres for students to work on different technical and technological projects.

In Cyprus, technology is used for teaching robotics, 3D design, 3D printing, video game design, and programming.

Overall, it can be seen that technology is being used in various forms to support teaching and learning processes across all four countries. From the use of 3D printing, interactive whiteboards, and robotics kits in Greece, to the use of drones and digital platforms in Spain, to the use of hardware and software in France, and to the use of robotics, 3D design, 3D printing, and video game design in Cyprus, technology is playing a key role in modern education.

Question 3: Do you know what technologies contribute to Drone Technology?

In Greece, teachers reported that they had experience with programming, mechanical engineering, aerodynamics, microcontroller programming, and 3D printing.

In Spain, teachers mentioned technologies such as the IMU, infrared cameras, GPS, and lasers.

In France, educators mentioned programming, 3D design/printing, mechanics, and artificial intelligence.

Lastly, in Cyprus, trainers mentioned programming, AI Computer vision, and machine learning.

Overall, the combination of programming, mechanical engineering, aerodynamics, microcontroller programming, 3D printing, IMU, infrared cameras, GPS, lasers, artificial intelligence, and machine learning are all technologies that contribute to Drone Technology. Additionally, knowledge of the underlying legislative framework and safety regulations for the use of drones is also important.

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Question 4: Do you know the skills needed for jobs using drone technology?

Based on the teacher's response a comparison of the skills needed for jobs using drone technology in Cyprus, France, Greece, and Spain shows that there are some common skills that all participants agree on. These include programming, engineering and assembling skills, piloting skills, and spatial perception. Additionally, working in groups and critical thinking skills are important for the operation of drones.

In particular, in Cyprus teachers pointed out that, 3D design, 3D printing, coordination and problem solving are also important skills. In France teachers stated that it is important for people to have a strong interest in aviation, strong concentration skills, and the ability to remain calm under pressure. In Greece teachers argued that dexterity and a "gentle touch" are important, as well as the ability to configure the final product and its corresponding control software. And in Spain, it is important for people to have knowledge of IT and maths, as well as the ability to build or customize drones.

Overall, it is clear that a variety of skills are necessary for people to work in this area. It is also important to note that the younger generation needs to be trained in a variety of programming languages to keep up with the development of drone technology.

Question 5: Does your school/organization encourage/support you to use drone technology as part of teaching and learning processes?

In Cyprus, most trainers responded "No" to the question of whether their school/organization encourages/supports the use of drone technology as part of teaching and learning processes.

In France, most educators answered no, even if some of their organizations have some equipment related to these technologies but this equipment is not necessarily used in education.

In Greece, some schools have already purchased drones for use in educational applications and all schools have a positive attitude and support Drone technologies.

In Spain, all of our participants agreed on saying that drone technology is being used by teachers to enhance their class hours and to make them more didactive or attractive to students.

Overall, it appears that the use of drone technology as part of teaching and learning processes is more widely accepted in Spain and Greece than in Cyprus and France. However, it is important to note that the availability of resources and support from organizations and schools is essential in order for drone technology to be adopted and utilized effectively in educational contexts.

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Question 6: What are the skills needed to introduce drone technologies in the schools?

The introduction of drone technologies in schools requires the development of specific skills in order to be successful.

In the case of Cypriot teachers, the focus is on educating the staff in terms of how to use drone technology for educational purposes. French teachers identified engineering, programming, piloting, mechatronics and model making as essential skills for the introduction of drones in schools. Greek teachers also noted the importance of knowledge of the legislation on the use of drones and financial capacity for the supply of materials, as well as the training of teachers. Finally, Spanish teachers highlighted the importance of leadership, communication, coping with failure, and technical skills such as configuring drones and programming them to make them fly.

Overall, all teachers identified a need for training and financial resources in order to introduce drone technologies in schools. Additionally, they highlighted the need for specific skills to be developed, such as engineering, programming, piloting, mechatronics, model making, leadership, communication, and technical skills.

Question 7: Are you convinced that drone technology can empower VET students?

The use of drones in VET education has become increasingly popular in the last few decades. It is seen as a way to empower students by developing general and specific professional skills. Cypriot, French, Greek, and Spanish teachers surveyed are all convinced that drone technology can empower VET students.

In Cyprus, drone technology can cover a range of technologies such as programming and design. Teachers are enthusiastic about the technology but are unsure of how to implement it. In France, the technological progress of drones has had a profound impact on education, and students should be encouraged to work with digital technologies related to drones. Greek teachers focus on general and specific professional skills and problem-solving skills. Spanish teachers are strongly convinced about the benefits that drone technology provides to VET students.

Overall, the use of drones in VET education is seen as a way to empower students by developing general and specific professional skills. It is seen as a tool that can help students acquire knowledge, problem-solving skills, and an understanding of different technologies. Teachers in all countries surveyed expressed enthusiasm for the technology, though they are unsure of how to implement it.

Question 8: From your perspective what are pros and cons of drone technology in education?

Cypriot teachers pointed out the benefits of using drones in education, such as the familiarization of students with robotics, the use of drones to teach safety and

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responsibility within the aviation industry, and the opportunity to learn about different applications of drone technology. On the other hand, the drawbacks mentioned were expensive equipment, limited resources, limited knowledge, the need for special permits and certifications, and health and safety risks.

French teachers focused on the pedagogical benefits of drone use, such as spreading scientific knowledge related to the ecological and energy transition, awareness raising, and encouraging creativity, innovation, research, and entrepreneurship. The drawbacks mentioned were legislative uncertainty, security, lack of knowledge and skills, and expensive equipment.

Greek teachers, on the other hand, mostly discussed the pedagogical benefits of drone use, such as the cooperation of students and group work, and the increase in students' interest. However, the drawbacks mentioned were difficulties encountered by teachers and schools related to funding, and the lack of time resulting from the obligation to cover the mandatory material.

Finally, Spanish teachers highlighted the benefits of drones in education, such as offering differentiating skills, offering solutions to everyday issues, and being able to reach places where a man cannot reach. The drawbacks mentioned were the difficulty of getting the skills needed to understand, design, and configure a drone, as well as the difficulty of getting even "the lower level" to manage with drones.

Overall, the use of drones in education has the potential to offer a variety of benefits in terms of STEM learning, awareness raising, and creativity. However, there are still some drawbacks that need to be considered, such as the high cost of equipment, limited resources, limited knowledge, the need for special permits and certifications, and health and safety risks.

Question 9: The DRONES@STEAM project will be creating an e-platform. What would you think is the best way to award the students? With levels? Gold, silver, bronze depending on their score?

The teachers from Cyprus, France, Greece, and Spain all agree that awarding the students should be tailored to the level of the student.

The Cypriot teachers suggest avoiding having 1st, 2nd and 3rd place for completing a module and reserve those for competitions only. The French teachers suggest that for the most involved, privileged access to more content will be desirable. The Greek teachers agree with the mild assessment as it is a non-formal education program and the best students will travel and participate in the C1 Blended Mobility for Learners activity. The Spanish teachers suggest organizing a league-type tournament and giving names to each level related to drones.

In conclusion, the teachers agree that the evaluation should be tailored to the student's level and should not be too harsh. More involved students should be rewarded with

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privileged access to content and competitions should be reserved for 1st, 2nd and 3rd place.

2.2 Students

Question 1: How (in general) teaching and learning is organized at your school/organisation in the area of Science, Technology, Engineering Arts and Mathematics (STEAM)?

The organization of teaching and learning in the area of Science, Technology, Engineering Arts and Mathematics (STEAM) differs between different countries and cultures.

In Cyprus, STEAM-related activities focus on coding/computer science, programming, robotics, robotics clubs and competitions, and block coding. French students reported programming, mechatronics, robotics, information technology, Technical project of supervised personal initiative, and workshops at FabLabs. Greek students reported that some classes are held in the workshops/labs and others in the classrooms, and that they apply the taught theory in the laboratories. Spanish students reported that teaching and learning methods are well organized, and that the number of hours dedicated to those subjects are well established or coordinated, though they would like to add more time committed to STEAM-related subjects in their leisure time.

Overall, it can be concluded that STEAM is organized differently in different countries, with varying levels of emphasis on theory and application.

Question 2: How does technology (in particular ICT related) support teaching and learning processes at your school/organization?

Technology (ICT related) supports teaching and learning processes in different ways depending on the school/organization.

In Cyprus, for example, students have access to projectors, tablets, phones, and laptops for grade 7 and above. In France, students have access to electronic kits, 3D software, 3D printers, and robots. In Greece, students reported the use of computers and other digital supervisory/teaching means (e.g. projectors) in the daily teaching of laboratory lessons, as well as the programming of devices like Arduino or Raspberry Pi. In Spain, drones are used for teaching map-making, as tools for learning new languages, graphing mathematical concepts, and much more.

Generally, schools have adopted the use of technology to enhance teaching and learning processes, providing students with more engaging and interactive ways to learn.

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Question 3: Do you know what technologies contribute to Drone Technology?

A comparison of the responses from Cypriot, French, Greek and Spanish students indicates that they all have a general understanding of the technologies that contribute to Drone Technology. All four groups of students identified cameras, GPS, VR glasses, 2.4G antennas, WiFi and coding as technologies that contribute to Drone Technology.

The French students also identified 3D design, 3D printing, electronics, programming and sensors as technologies that contribute to Drone Technology. The Greek students additionally identified engineering, programming and 3D printing as technologies that contribute to Drone Technology. Cypriot students identified cameras, GPS, VR glasses, WiFi and coding. Finally, the Spanish students identified a variety of sensors, such as ultrasonic, laser or lidar distance sensors, time-of-flight sensors, chemical sensors and stabilization and orientation sensors.

It is clear that students from all four countries have a general understanding of the technologies that contribute to Drone Technology and are aware of the variety of sensors that can be used to develop Drone Technology.

Question 4: Do you know the skills needed for jobs using drone technology?

The results of the survey indicated a general consensus among students from all four countries in regards to the skills needed for jobs using drone technology. The skills identified include drone piloting/remote control, programming, knowledge of safety regulations, repair and maintenance, and an understanding of the laws and regulations surrounding drone use.

Cypriot students also highlighted the importance of being able to use the controls of a drone, as well as using logic to ensure safe operation. French students emphasized the importance of engineering and assembling skills, as well as piloting and programming skills. Greek students stated that some training is needed for the use of drones, but operation of small drones can be achieved through instructions. Larger drones require more specialized knowledge, and skills related to building, assembling, operating, and navigating a drone were also mentioned. Spanish students noted the development of several roles related to drone technology, such as Drone Technicians, Drone Data Service Executives, Drone Operators, Drone Pilots, and Drone Managers.

Overall, the survey results indicate that there is a need for a variety of skills related to drone technology, ranging from programming to piloting to repair and maintenance. Knowledge of safety regulations and laws concerning drone use is also essential. In addition, students from all four countries highlighted the importance of engineering and assembling skills in the education system.

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Question 5: What are your current digital skills?

The digital skills of the students from Cyprus, France, Greece, and Spain are quite diverse.

Cypriot students have programming skills, video game design skills, 3D printing skills, and Microsoft Office ECDL certificate. French students have Python coding skills, 3D printing, computer-aided design, graphics software, and some have experimented with drone piloting. Greek students are generally familiar with digital technologies, such as basic computer operation, web surfing, electronic circuits, basic programming languages, networks and servers, web design, and robotics. Spanish students have experience with video calls and online meetings, are used to sending emails, are familiar with Excel and Google Spreadsheets, and typically how to find information online.

Overall, the students from the four countries appear to have a wide range of digital skills, with the Cypriots and French students having the most advanced skills. The Greek and Spanish students are not far behind, however, with the Greek students having knowledge of a wide range of digital technologies and the Spanish students being familiar with online communication and spreadsheets.

Question 6: So far did you experience any aspects of drone technology at your school?

The responses from the students from Cyprus, France, Greece, and Spain show that there are varying levels of access to and experience with drone technology in their schools.

In Cyprus, only one student reported having seen a show with drones at their school, while in France, most of the participants reported not having any experience with drones in their schools. In Greece, some students reported that their school has a drone but they have not yet had the opportunity to use it, while others reported not having a drone. Finally, in Spain, some students reported having access to and experience with drones in their schools.

Overall, it appears that Greek and Spanish students have had the most access to and experience with drone technology in their schools, while French students have had the least.

Question 7: What are the skills needed to introduce drone technologies in the schools?

In Cyprus, France, Greece, and Spain, the introduction of drone technologies in schools requires several skills. In all four countries, programming, 3D design, 3D printing, and mechatronics are essential.

In Cyprus, students also mentioned the need for knowledge on the use of drones, patience, organizational skills, and attention to proper use. Additionally, they highlighted the need for a suitable outdoor space for the flight of the drone and appropriate building/laboratory infrastructure for its storage and maintenance. In France, students suggested that technological components and teaching materials are necessary for the introduction of drone technologies in schools. In Greece, students proposed that appropriate teacher

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training is required e.g. through training seminars. They also suggested that in addition to practical engagement, a theoretical part should precede it, as preparation. In Spain, students highlighted the need for leadership, giving and receiving direction, and coping with failure.

Overall, the introduction of drone technologies in schools requires a variety of skills and materials, such as programming, 3D design, 3D printing, mechatronics, and technological components. Additionally, other skills such as knowledge on the use of drones, patience, organizational skills, and attention to proper use are essential.

Question 8: Are you convinced that drone technology can empower your future? Would it be something useful for you?

Students from Cyprus, Greece, France, and Spain all expressed a strong conviction that drone technology can empower their future and prove useful in various ways.

Cypriot students saw potential in starting their own drone businesses, participating in the delivery system for online shops, and providing drone taxi services. Greek students highlighted the interdisciplinary nature of drone technology, believing it could make lessons more interesting and inspire future generations. They also noted that engaging with drones could be an additional qualification for their resumes, opening up new professional opportunities. French students shared a positive outlook, seeing the growth in drone technology as leading to rewarding professions. Similarly, Spanish students unanimously agreed that drone technology is beneficial for their future careers, considering drones as effective tools that can make tasks like delivery more accessible and efficient.

Overall, students across these countries recognize the vast potential of drone technology in various applications, which could significantly impact their career prospects and future development.

Question 9: The DRONES@STEAM project will be creating an e-platform. How would you like to be awarded? With levels? Gold, silver, bronze depending on your score?

All four countries had a positive response towards the idea of being awarded with levels, gold, silver and bronze depending on the score they have achieved.

The Cypriot students proposed the idea of a point system, where they are rewarded with a free drone for every 100 points they have earned. They also proposed to have activities related to a specific skill each week. The French students all agreed that levels could be a source of motivation. The Greek students agreed that there should be some form of certification or a certificate of attendance. Different opinions were heard on whether there should be an assessment at different levels or a joint certification of participation. The Spanish students agreed that levels could be a source of motivation and proposed a league-type tournament with rewards for participants.

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Overall, the DRONES@STEAM project is perceived as a positive initiative, with students from all four countries proposing ideas for rewards and levels of achievement.

3 Conclusions

Overall, the teachers interviewed in this focus group survey presented a positive attitude towards the use of drone technology in education. They highlighted the potential benefits of using drones in STEM education, such as spreading scientific knowledge related to the ecological and energy transition, awareness raising, and encouraging creativity, innovation, research, and entrepreneurship. They also identified a number of skills that students need to develop in order to use drones in education, such as programming, engineering and assembling skills, piloting skills, and spatial perception. Additionally, all of the teachers highlighted the need for the availability of resources and support from schools and organizations in order for drone technology to be adopted and utilized effectively in educational contexts. Overall, the teachers surveyed showed enthusiasm for the use of drone technology in educational contexts and identified a number of skills and resources that are necessary for its successful integration.

The focus group survey results indicate that students from Cyprus, France, Greece, and Spain have a general understanding of the technologies that contribute to Drone Technology and are aware of the variety of sensors that can be used to develop a drone. They also have a wide range of digital skills, with the Cypriots and French students having the most advanced skills. Greek and Spanish students are not far behind, however, having knowledge of a wide range of digital technologies. There is a need for a variety of skills related to drone technology, ranging from programming to piloting to repair and maintenance. Knowledge of safety regulations and laws concerning drone use is also essential. The DRONES@STEAM project is seen as a positive initiative, with students from all four countries proposing ideas for rewards and levels of achievement.

To sum up, both students and teachers recognize the potential benefits of using drone technology in STEM education, which can encourage creativity, innovation, research, and entrepreneurship. Both groups acknowledge the need for a variety of skills to be developed in order to effectively use drone technology in education, such as programming, engineering and assembling skills, piloting skills, and spatial perception. Both groups highlight the importance of resources and support from schools and organizations for successful implementation of drone technology in educational contexts. Both groups see the DRONES@STEAM project as a positive initiative with great potential.

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