

IO1 Report

EXECUTIVE SUMMARY

In the process of innovation in the digital ecosystem in VET sector, the collection of good practices represents an essential way to learn from experience, to enhance awareness, to reinforce the engagement in developing innovation and to encourage the networking among professionals.

In this report, the partnership presents and shares the results of the research with the aim of suggesting crucial aspects to pay attention in the implementation of UPDATE activities.

More in general, this report aims at contributing to the debate on how to support digital transition in the VET system and on how to capitalise and exploit results from different experiences across EU countries.

September 2022

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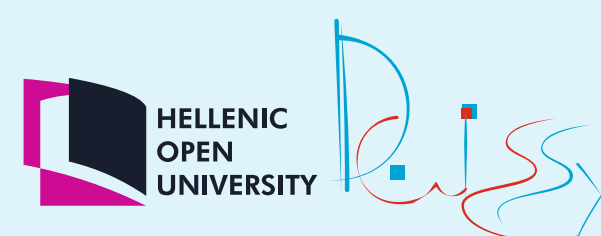


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Introduction

The recent pandemic has had heavy consequences in the EU, especially in the field of education and VET training. This has introduced significant changes in teaching, communication, collaboration and learning. Furthermore, it has highlighted several critical aspects needing to be addressed by partner organisations and the VET system in general. The VET system, which already experienced delays in the modernisation and digitalisation process, came face to face with an unexpected situation. The sudden digital transition (EEK, 2022) has been, in many cases, an emergency response, often not planned and unprepared. Despite the involvement and the efforts made to adapt the system, its effectiveness and quality have been in some way compromised (OECD, 2020); and distance learning has only partially fulfilled teaching needs. Teachers and trainers were unprepared. The activities were implemented in an improvised way and in a confused context. The lack of digital skills (pedagogical and technological) exacerbates the difficulty to transfer a practice-based learning – founded on practical contexts and abilities – into a virtual environment, activated in emergency, and through underdeveloped and ineffective technological solutions.

In general, the VET system pays the price for the lack of a strategic vision and structural investments aimed at searching for adequate pedagogical and technological solutions adoptable and adaptable to practical and manual training contexts. In line with the European Framework on digital skills of educational organisations, the project partners are aware that digital technologies represent a key potential to respond to the educational mission and implement a high quality and inclusive training. The aim of UPDATE project is, therefore, to intervene on the digital ecosystem by building resilient and digitally skilled organisations; redefine organisational strategies; improve innovation abilities; and fully exploit the potential offered by technology.

The first step of our project is to develop a common and shared knowledge among teachers, trainers, tutors and VET organizations in general on the existing practices and digital solutions applied to the VET system and to practical activities. Therefore, through research (Intellectual Output 1, a.k.a IO1), partners have:

- collected PRACTICES/ACTIVITIES/PROJECTS in which digital methodologies and animation techniques are applied to practical activities in VET systems in partners' countries
- compared INNOVATIVE DIGITAL SOLUTIONS (desktop/mobile apps, web platforms, educational video games, virtual-augmented-mixed reality environments, etc.) suitable to practical-manual teaching in the VET field.

Regarding the first task we looked for [good] practices where methodologies and animation techniques are applied to practical activities – in the VET sectors and in the partners' respective countries – but also in other educational sectors (school education, higher education, continuing vocational training...) as needed. Additionally, we included practices in which methodologies and animation techniques were applied to theoretical activities in the VET field, but with high scalability towards practical and manual activities. After a first map of interesting practices, each of them was analysed following a template.

Regarding the second task, we identified groups of digital solutions applied to teaching and learning aimed at supporting engagement and participation among students. Each of them was analysed and compared to the others.

The research activity took place from March–June 2022.

This report will present:

- the state of art in each partner country regarding the digital transition in the VET system.
- the collected practices and their lessons learnt
- a comparative analysis of the most common digital solutions applied to teaching and training.

In the conclusion, we give some suggestions for the implementation of the future IOs foreseen by the project.

The state of the art in partner countries

Digital learning in the Italian VET system

The Italian VET system suffers from a strong delay in the development of digital solutions for teaching, especially in the field of manual and practical activities. The lack of experience in digital teaching and training in vocational education – already known before the pandemic period – has been exacerbated during the activation of distance learning with heavy repercussions on the quality and effectiveness of training.

IRES Piemonte – in collaboration with the Regional Education Office and the Order of psychologists – in March–June 2021 developed a quantitative and qualitative research on wellbeing at school, focussing on: difficulties in distance learning; early leaving from education and training; and other critical aspects with the aim to collect the Piedmont students' point of view*. Despite the sudden acceleration of the need for intensive use of technology for VET institutions due to the pandemic, the research highlighted critical aspects of distance learning:

- 80% of students said they use a smartphone as a device for distance learning
- 3 out of 4 respondents said they had connection problems
- 78% of students perceived an increase of emotional and relational problems linked to the distance learning setting, such as a lack of dialogue and interaction between peers and with teachers during distance learning
- 68% of VET learners perceived a lower effectiveness of training via distance learning
- 72% of students consider the distance lessons more boring
- 42% of the students consider the lessons easier
- 60% declared greater ease in obtaining positive results.
- only 12.3% of those who attend a vocational training course say they are very satisfied with the distance learning.
- 69.9% of the students keep the webcam off even though they are aware it affects their level of participation.

Faced with a persistent lack of attention that students enrolled in VET courses often suffer, the pandemic effects and the teaching methods used in the emergency period have exacerbated the lack of engagement and participation during the lessons (full participation of the whole class is reported by only 10% of students enrolled in the vocational courses). Students perceive a sort of abandonment (to which they contribute with a self-exclusion from participation in the virtual class even though they are aware of this) only partially balanced and reduced by the trainers and teachers' support, more evident in VET than those of other schools (66% of the students feel "very / enough" supported by teachers).

VET students require specific attention and innovative teaching, while in the VET field critical aspects still persist from a cultural, organizational, and methodological point of view. The idea that approaches, methods, and solutions for digital learning do not adapt well to the type of users and the professional and practical contents of the curricula is still widespread. The lack of knowledge in methods and tools for digital learning, along with a lack of activation in their effectiveness and transferability in the VET field persists. The difficulty in developing practice-based learning centred on content and practical skills in a virtual environment has so far limited investments in the VET digital ecosystem**.

The online learning courses/modules are in most cases not specific to vocational education and training, and virtual environments and digital solutions have often been used to support the learning of theoretical knowledge. In addition, during the distance learning experience, the "face-to-face" and synchronous methods have not been integrated enough with digital solutions that allow to stimulate participation and interaction. VET students were disadvantaged compared to students from other schools, as less effort was made on professional and practical contexts. The lack of digital skills (pedagogical and technological) of VET trainers and teachers on the one hand, and the absence of digital solutions applied to professional and practical activities explain the difficulties in making the digital learning experience effective.

In the last two years, to tackle these shortcomings, and following the evidence from the distance learning experience in the pandemic, various initiatives have been developed aimed at strengthening the digital ecosystem in the VET field, financed independently by the schools or through the presentation of innovative projects using national and EU resources. For example, the Erasmus+ Programme promoted a specific call to support innovation in digital ecosystem in VET (October 2020) and included priorities in other calls. Among the funded projects, in the last call (Cooperation partnerships KA220 2021) at least 15 projects out of a total of 65 recall in the title the issue of digital teaching and learning in the VET field. Of these, 2 lead partners are based in Piedmont (including UPDATE).

* I livelli di istruzione tra progressi e disparità (sisform.piemonte.it). 11,3% of piemontese students – enrolled in the first and second class of an high school. On 8.361 students: 54% are female and 46% male. 56% is enrolled in the second class and 44% in the first class. 45,7% attend a school in the metropolitan area of Turin, 18,8% in Cuneo, 12,5% in Asti, 5,6% in Novara, 5,5% in VCO, 5,3% in Alessandria, 5,2% in Biella and 1,4% in Vercelli. 51,4% attend a Liceo, 27,8% a Technical High School and 20,8% a professional school.

** In line with the Action Plan for education 2021–2027 to build an effective digital ecosystem it is necessary to move toward 4 directions: technology (infrastructure, connectivity and digital solutions), organization (develop and plan digital organizational capacity), methodology (trainers and teachers with high digital competences) and contents/subjects (high quality learning contents and digital tools easy to use)

Digital learning in the Estonian VET system

Digital competence is described in the teachers professional standards as one of the required competences. This means that the implementation of digital technology is part of the teacher's daily work. The implementation of digital technology is included in the descriptions of mandatory competencies of the professional standards, and the professional teacher is required to evaluate and develop their digital competence according to the digital competence model in the field of education. On the order of the Ministry of Education and Research, experts developed a digital competence model for evaluating the digital competence of students and teachers. The digital competence model describes the basic digital competence skills of teachers and students. The digital competence model outlines the basic skills that students must know at the end of vocational school (The Education and Youth Board, a). The Estonian digital competence model is based on and adapted from the digital competence model of DigCompEdu.

The goal of the digital revolution in education is outlined in the Estonian lifelong learning strategy 2020, which consists of learning and teaching the use of modern digital technology; improving the digital skills of the entire population; and ensuring access to the digital infrastructure for the new generation. The digital revolution had three goals:

- developing students digital competence;
- supporting the implementation of the changing learning approach using digital technology;
- popularization of information technology education (Ministry of Education and Research, 2019).

One of the goals of the Education Development Plan 2035 is digital pedagogy, which means that teachers, lecturers and trainers are aware of the development trends, opportunities, dangers and uses of new digital technologies and apply technology in education (Education strategy 2021–2035). A diverse learning environment and supporting the learning process based on the learner is the goal of the Estonian Educational Development Plan 2021–2035. Based on this, a framework for supporting the effective learning process, or "Learning Framework", was created. Instructional materials were created on five important topics to think about when planning a lesson:

1. Effective learning and motivation;
2. Mental health;
3. Physical health;
4. Digital competence;
5. Copyright law and GDPR (The Education and Youth Board, b).

E-services used in education (e.g. e-assessment platform, digital learning resource environment, learning information systems, learning management system, etc.) are developed to help improve the efficiency of learning processes and the better flow of information, so that they support the entire learning process, learning organization and the acquisition of education in the best possible way (Ministry of Education and Research, 2019). Vocational schools organize e-learning weeks to keep digital learning on the agenda and to be ready for new challenges in the future.

Educational technologists work in schools to help the school and teachers to be more modern in new directions of digital technology. They train teachers and bring innovations to schools to enhance learning through digital technology. Since digital competence is a mandatory competence in the teachers' professional standard, the teacher has an obligation to develop it, and the school's educational technologist helps to do so.

Vocational schools have suggested e-learning environments where teachers can create their courses. The main ones are Moodle and Google Classroom and they are administered by the school. Of course, the teacher has the free choice to create his/her courses anywhere, e.g. on a personal website, Youtube channel, Facebook, Google Drive.

The Ministry of Education and Research, in cooperation with schools and the Education and Information Technology Foundation, has implemented support measures for the modernization of the digital infrastructure of schools. Also, with the support of various projects, modern equipment for the implementation of digital learning has been purchased for Estonian schools.

During the pandemic, the Estonian state supported teachers with free digital technology-related quick training, and various digital textbooks were made for free use. In general, the readiness of Estonian vocational schools to implement digital learning is very good, the only problem may be teachers who do not have the courage, skills or motivation to integrate them into their teaching.

In Estonia, the year 1996 can be considered the beginning of the preparation for the digital revolution in education, when the national project "Tiger's Leap" was initiated, within the framework of which all Estonian schools were connected to the Internet.

Digital learning in the Greek VET system

Distance education has been applied universally throughout education and with relative success in cases such as VET. In the case of eLearning in the Vocational Schools there was limited experience regarding appropriate educational material (e-books, electronic interactive laboratory exercises - simulation laboratories) and more generally very few digital teaching and learning tools for e-Learning laboratory learning practice.

The situation regarding "digital skills" in Greece was quite good in 2019:

- 47% of 16-24 years old students had basic digital skills (compared to 23% in the EU-28) and
- 45% had more than basic skills (compared to 59% in the EU-28) (Gavroglou, Kotsios, 2020).

The pandemic affected more than 1.5 billion students and youth, with the most vulnerable learners having been hit hardest (UNESCO,2020). In Greece, students in distance learning/apprenticeship faced a lot of difficulties, due to lack of digital tools and skills of trainees and teachers. It was found that the use of digital tools and digital content is not included in the daily practice of VET courses, and when they exist, they are not modernized, updated or used adequately. As a result, VET learners and trainers were not used to distance learning or even to the systematic use of digital material, especially in practical training. Difficulties in accessing the platforms (login failure, long delays in registering users/students) forced many teachers to spend personal time and money in communicating with students and parents.

In the case of Vocational Education and Training (VET), the impact was multi-layered as it affected classroom, laboratory centers, work-based learning (WBL) and apprentices (CEDEFOP,2020), while creating considerable uncertainty about the future employment of graduates of VET schools (National report, 2022). The shift from physical classrooms to e-classrooms and teleconferencing has been described as "violent and abrupt" for VET schools, due to social exclusions and absence of transition of theoretical and laboratory teaching of technical courses into "digital" distance learning.

The Hellenic Ministry of Education has adopted a series of actions related to promoting education, such as:

- distance education platforms and software, encompassing 399 vocational upper secondary schools and public institutes of vocational training.
- In public secondary/non-tertiary VET (IEK), the percentage of courses transformed into non-synchronous education reached up to 97%, with the 81% of trainers and the 96,5% of registered students actively participating in distance education.
- Hybrid models were adopted offering in-person classes for practice-oriented components of the curricula and remote education for the remaining parts.

Three pillars of distance learning have been developed:

1. synchronous teaching methods (live lessons on Webex platforms for all levels of education);
2. non-synchronous (educational material on websites and platforms, available to all teachers and students of all educational levels);
3. educational television programmes for elementary school students.

Platforms with digital educational material, accessible to all (ebooks, digital educational material), digital seminars through the Aesop platform, and other e-tools including WebEx meetings, e-me and e-class. Disadvantaged students were able to borrow electronic equipment donated by the private sector or bought by municipalities to help them study at home when schools were closed. Based on the National Strategic Plan for Vocational Education Training, Lifelong Learning and Youth, the digital transformation of vocational education and training, requires the updating of the curricula related to the development of digital skills by trainers/trainees/apprentices, as well as the development of specialized digital skills for their integration into the labor market of the digital economy. The digital tools would become the main lever for the increase of participation in the provided courses (Strategic Plan for VET, 2021). The Hellenic Support Service for the eTwinning action offered an online course 'Staying home with eTwinning' (Report ET 2020 Working Group, 2020). Greek students and teachers can use the EU Tool called SELFIE to improve their digital literacy.

Pedagogical digital solutions and tools applied in the technical schools were:

- Valid simulations (Photodentro), Virtual laboratories (NOHΣIS);
- Modeling environments (e.g. Modellus, Interactive Physics, SimQuest, Model-It, Explore It, Theory Build);
- Educational Robotics Systems;
- Educational programming environments - Logo-like tools, (Microworlds Pro, Scratch);
- Educational games and game platforms/ Microworlds,
- PhET;
- Hypermedia & Virtual Reality's Applications.

Digital learning in the Danish VET system

Before launching a real strategy on Industry 4.0 and digitization, an action plan for technology in education was introduced, which has two goals:

1. Danish children's, young people's and adults' understanding of technology and digital skills must be strengthened at all levels of education so that they can help to create the society of the future.
2. Denmark's strong position in relation to the use of IT in education must be maintained and continue to be developed. We must take care of the technology's pitfalls as well as possibilities so that everyone becomes as skilled as they can'.

The action plan contains five focus areas for realizing the two goals:

1. Technological understanding should be one of the objectives and part of the content of education
2. Everyone should have the opportunity to relate critically to technology
3. Teachers, managers and educational staff should use IT in teaching and include technological understanding in their teaching
4. The use of ICT in teaching should be qualified by having an educational and didactic focus. Better and more user-friendly forms of digital infrastructure are needed
5. There must be a greater focus on data ethics and the qualified use of data on students' learning.

The main focus in Denmark is on competition, in particular how Danish companies can become more competitive by using new Industry 4.0 technologies and/or how the Danish workforce can be made more competitive by receiving new and more relevant competencies (Key Competences for lifelong learning or 21st-century skills are common terms). Regarding Industry 4.0, the main actors have been the industrial sector [Danish Industry, Technological Institute and several universities). A lot of articles have been written on this, for instance, an article from the Technological Institute and several articles about the fourth industrial revolution. In 2016 the Danish government took the initiative to establish a Production Panel 4.0 to give recommendations to the government about how Danish companies could become more digital. In Denmark there has been a focus on digitization for several years, covering the public as well as private sectors. For fifteen years, the government, municipalities and regions have collaborated on joint public digitization strategies in order to use digitization as a tool for rethinking processes to modernize the service to citizens and businesses and streamline the public sector. The work has focused primarily on how to work effectively and with efficiency in the public sector itself.

Digitization with care and vision: towards a new digitization strategy for the teaching area

In 2019 the then Danish government launched an initiative to set up a new digital strategy for education in Denmark.

Some steps have already been taken:

- (a) 'Introducing a new compulsory subject, digital literacy, in primary school with a new trial program for digital literacy;
- (b) In upper secondary school, students in the ICT subject are taught computer science.
- (c) For the preparatory basic education (FGU), an elective on digital literacy has been developed.'
- (d) Establishment of the Center for the use of ICT in the teaching of vocational education in the spring of 2019. From the summer of 2019, business informatics is being introduced as a new basic subject for vocational education and training.
- (e) Development of courses on digital literacy as an elective in preparatory basic education (FGU) from summer 2019.
- (f) Under the auspices of the tripartite agreement on strengthened and more flexible adult, continuing and further education 2018-2021, a national strategic effort has been agreed upon for digitizing the entire VET area, focusing on E-learning and digital distance learning'.

Report on digitalization:

- 9 out of 10 schools rate their school's WiFi and equipment highly
- 75 % rarely experience problems with the WiFi
- Danish schools employ different strategies regarding the students' use of either tablets or computers:
 - 1:1 – the school provides the students with a device (tablet/computer)
 - 1:2 – the school provides a number of devices, shared between at least 2 students
 - BYOD – the students bring their own devices. Unless a student cannot bring their own.


















Recent political agenda: An action plan for technology in education (Feb. 2018)	The Four Competency Areas
1. Technology understanding for all children, young people and adults 2. Digital skills of teachers, managers and educators 3. Use of IT in education 4. User-friendly digital infrastructure and learning resources 5. Use of data and data ethics	Digital empowerment (possibilities and consequences) Digital design and design processes (Organisation and implementation) Computational thinking (Analysis, modelling and structuring) Technological knowledge and skills "Mastery" of digital technologies (computer systems and networks), associated languages and programming.

Practices and experiences across the EU

The research focuses on the 4 partner countries: Italy, Greek, Estonia and Denmark. The partners selected, first of all, practices (projects, experiences, single activities) developed in the VET field and connected with the application of digital solutions to the learning of practical and manual content. Subsequently, similar practices developed in other educational sectors were included and, finally, practices in which methods linked to the application of digital technologies in teaching and theoretical learning content were selected. Due to their characteristics, these practices have a high potential for transferability to practical-manual contents.

Based on these criteria, 12 practices have been selected (see the table below) that could contribute to the development of the UPDATE project in terms of transferable project results and/or lessons learnt:

- 6 projects (funded by Erasmus+ KA2) developed by partnerships at UE level aimed at designing, developing and testing blended courses addressed to teachers/trainers and/or students;
- 2 national initiatives aimed at creating a repository of digital content and tools;
- 1 repository of digital content and tools developed by a private company;
- 1 repository of digital contents and tools enriched informally and voluntarily by teachers /trainers;
- 2 organizational innovations regarding the integration of digital solutions in teaching.

Contents of application			
	Practical and manual contents in VET field	Practical and manual contents in other educational sectors	Theoretical
Projects in partnership	 WorkVR	 Mu.SA  DELTA PROJECT	 Mu.SA  DELTA PROJECT  Competence +  IRENE
Platform/Repository	 ClassVR	 Class VR	 Class VR  Ekoolikott  Digital School Photodentro  Teaching materials repository
Innovative Projects/experiences in organizations	 Project work experience  IPAD		 IPAD  Communication Laboratory

Confirming the delay of the VET system in the modernization and integration of digital technologies in teaching, most of the practices highlighted are mainly digital teaching experiences applied to theoretical content. On the web, digital contents and tools are available online to teachers/trainers to support them to teach theoretical subjects, IT and/or soft skills, while the experiences related to the practical-manual content developed in a laboratory environment are still underdeveloped.

In this context, the projects and initiatives are innovative and fit in the groove outlined by the European digital education action plan. The results and final outputs become knowledge and learning to support continuous innovation within organizations and/or networks and partnerships.

They are a wealth of knowledge and represent – for UPDATE partners – experiences from which to capitalize and transfer the aspects that have worked best and to anticipate any critical issues related to the development and implementation of technological solutions for teaching; development of didactic-pedagogical and digital methodologies and training of trainers; definition of organizational innovation programs; management and implementation of innovation applied to the digital ecosystem.

Each practice was analyzed and described through the following aspects:

- context of application and development: country, sector, target group, process, activity, objectives, methodological approach;
- digitalization: digital solutions applied to teaching and the necessary equipment;
- results and evidence: results achieved, project output and lessons learnt; strengths/weaknesses; elements of transferability.

Below, is the infographic containing the description of each practice. Also, more thorough annexes are available [here](#).

Competence+

[CLICK ME](#)

About

With Competence+, we want to offer training opportunities for VET students and employees of public transportation in four different areas: Environmental awareness, Conflict Awareness, Moral courage and Stress management. By empowering them to initiate substantial changes, initiate rethinking and optimize their own actions, they will be able to participate directly in their workplace and in the development of their work.

Strengths

The main benefits of a competency-based system include:

- Employees have a well-defined set of behaviours required in their work and are clear about how they are expected to perform their jobs.
- The appraisal and recruitment systems are fairer and more open.
- Recruiters are able to assess transferable skills and identify required behaviours regardless of career background.
- There's a link between effective individual inputs to work and organisational performance.
- Processes are measurable and standardised.

Weakness

- Focus on the past and can't keep up with rapidly-changing environments.
- Fail to deliver on anticipated improvements in performance.
- Are unwieldy and not user-friendly.
- Create clones, as everyone is expected to behave in the same way.

While such criticisms have been levelled justifiably at poorly-developed frameworks, they also show a poor understanding of competencies. The criticisms don't so much detract from the value of competency frameworks, as highlight the need for care and understanding when developing and implementing them.

Digital Solutions

Virtual Reality Moodle Metaverse Powtoon

Target Group

VET and further training educators from the field of public transport.
Those who have an influence on education in the transport sector.
Headteachers of VET institutions
Training managers.

Sector

VOCATIONAL EDUCATION AND TRAINING

VET education

Public Transport

WorkVR

[CLICK ME](#)

About

WORK-VR ADDRESSES THE FOLLOWING

Equip the users better for the labour market through an increased level of linguistic, cultural and digital knowledge. To provide VET students with an innovative learning method. To support and enhance the learning of trade-specific vocabularies within the sectors of health, service and construction. To promote digital use in education, and thus enhance individuals' levels of digital skills

Strengths

- VET education with hands-on experience in Language learning (not necessarily only for foreigners but an explanation of professional jargon).
- Easier pronunciation learning.
- Faster knowledge retainment.

Weakness

- Costly
- Outdated Hardware (HTC VIVE is discontinued)

Digital Solutions

VIFIN Course Creator Virtual Reality

Target Group

VET Education, Immigration incorporation into most common work sectors obtained by immigrants.
Immigrants learning the language in a VET setting.

Sector

VOCATIONAL EDUCATION AND TRAINING

VET education

Language learning

Digital Teaching Through iPad

About

In July 2020 EnAIP Piemonte started a project aimed at introducing innovation in teaching. The project included two activities:

- training for trainers in collaboration with REKORDATA focussed on two aspects: a) technical skills and their application in the classroom: trainers were involved to improve their knowledge and ability to use learning apps; b) digital coaching role: trainers were trained to develop the ability to support colleagues in integrating digital technologies in teaching.
- After the training, 3 trainers became Digital Teaching tutors and mentors for other colleagues who wanted to implement new innovative approaches
- In Sept. 2020/21 the testing phase started in 3 VET schools with the involvement of 5 classes for a total of 70 students (14–18 age). The testing phase lasts 3 years: the first one (2020/21) ended; the second one (2021/22) is closing and the third one (2022/23) will start in September.

Strengths

- The pedagogical idea behind the testing phase: tools to support the integration of digital solutions in the teaching methods. The IPAD and the apple learning APPS must be integrated into the didactics and follow the learning objects. The added value lies in the learning of a process (a way to organise lessons and make teaching methods more dynamic) and not in a tool.
- The voluntary engagement of teachers/trainers and their motivations.
- The empowerment process of students: students selected for the project are taking care of their IPAD, are responsible for their use and feel themselves as protagonists
- The reduction of differences among students and inclusiveness

Weakness

- Some APPS are too complex and time-consuming if you want to personalise and contextualise content.
- Apple environment: despite it being a performing ambient, it is necessary to develop the knowledge and the use of other solutions to make flexible the digital learning environment.
- Lack of engagement and motivation: some trainers during the testing didn't want to apply digital solutions integrating their methods
- Lack of peer-to-peer learning among trainers who teach the same subjects.

Digital Solutions

- APPS for games, quizzes and exercises: KAHOOT, LEARNINGAPPS, WORDWALL, WORD GEOGRAPHY GAME, GENIALLY, GOOGLE FORMS, MICROSOFT FORMS
- APPS for extraction of names or random questions: WHEEL OF NAMES
- APPS for presentations/slides: PPT, GOOGLE PRESENTATION, KEYNOTE, CANVA, PREZI, MIRO
- APPS for mind and conceptual maps: CANVA, PREZI, MIRO, KEYNOTE, PADLET, QUIZLET
- APPS for image research: PEXELS, PIXABAY, UNSPLASH, FREEPIK, FLATICON
- APPS for writing: WORD, GOOGLE DOCS, PAGES, NOTES
- APPS for numbers: EXCELL, GOOGLE SHEETS, NUMBERS
- APPS for databases and sharing documents: ONEDRIVE, GOOGLEDRIVE, ICLOUD.
- APP for basic skills (Mathematics and Physics)
- App to create video (iMovie)
- App for writing and sharing ideas (NOTABILITY)

Sector



Vocational Education

Target Group

22 trainers were trained on the use of teaching apps (Apple world) and on their application in VET courses addressed to young students (14–18 years old)

80 students (belonging to 5 classes) received an IPAD and now they are studying with their trainers who integrate traditional and innovative methodologies of teaching.

Digital School



About

In order to collect, organize, make widely available and efficiently search and use digital educational content in the school community, ITYE DIOPHANTOS has developed and operates on behalf of the Ministry of Education an integrated digital infrastructure, which includes a series of systems and e-services for teachers, students and all interested parties. The services are available through the main page "Digital School - Digital Educational Content" at: dschooledu.gr

Strengths

- Photodentro hosts learning objects (i.e., autonomous and reusable units of digital material that can be used for teaching and learning) such as interactive simulations, visualizations, experiments, investigations, images, educational games, 3D maps, exercises and others.
- Is the official digital space of the Ministry of Education & Religious Affairs (YPAITH) for the availability of digital versions of schoolbooks to all, teachers, students, parents and anyone interested. The provided platforms are modern digital libraries/repositories/ tools which contain OERs and tools for Primary, Secondary, General and Vocational Lyceum (EPAL) in various digital formats.

Weakness

- Some learning objects require the installation of additional software to work. For example, objects developed in Java, Flash, ShockWave, Unity or Imagine Logo require the installation of the corresponding software to function.
- Flash technology is no longer supported by Adobe itself, and as of 12/1/2021, the ability to use the Adobe Flash Player add-on software in browsers was discontinued.

Digital Solutions



E-ME

The creation of collaborative learning environments (hives),
Communication and social networking between students and teachers,
Organising, storing and exchanging files,
The creation of digital educational material and more.

Target Group

For Greek teachers and students of Primary, Secondary, General and Vocational Lyceum (EPAL).
The digital platform(s) and the repository are open to all interested parties under the Creative Commons CC BY-NC-SA license.

Sector



VET Education



School Education



Continuing Vocational Training



Higher Education

ClassVR

CLICK ME 

About

ClassVR is a versatile platform using the power of Virtual and Augmented Reality for education and training from the classroom to the boardroom. Introducing a whole new concept in educational technology: a 'standalone' Virtual Reality headset complete with a unique student-friendly interface, gesture controls, embedded educational resources and simple-to-use teacher controls. ClassVR is a groundbreaking new technology designed to help raise engagement and increase knowledge retention for students of all ages. And it's affordable too, really affordable...

Strengths

- The most obvious is that they do not require the use of any mobile devices, making it more accessible for the younger students who do not have phones. Teachers can also access the devices classroom portal that has a number of pre-uploaded, curriculum-aligned resources.
- From there, they are free to explore the teacher-chosen content. An additional bonus is the use of correlating worksheets that go along with the lessons available through the program.

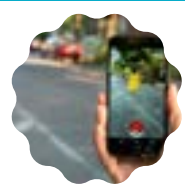
Weakness

- Paid third-party solution.
- There are also some general concerns with VRs that should be taken into account.
- Safety should also be considered, once students put on those headsets, the real world is blocked out, so there is the potential for students to walk into objects and get hurt.

Digital Solutions



Virtual Reality



Augmented Reality

Target Group

All Teachers




Sector



EDUCATION

e-Koolikott (e-School Bag) Sisuloome (Content Creation platform)

CLICK ME 

CLICK ME 

About

E-School Bag is a cross-educational platform for creating, storing and publishing digital learning materials. It is a platform created by the Ministry of Education and Research.

E-school bag works with the Content Creation platform (<https://sisuloome.e-koolikott.ee/>). Different H5P templates can be used in the Content Creation platform to create learning materials and create different types of interactive exercises, tasks and learning content. The e-school bag contains the most up-to-date study material for use in both primary and general education as well as vocational education. Each teacher can search for and use the study materials in the E-school bag, add the study materials they have created there, create collections of suitable materials, and direct the materials or collections to their students to solve. The study materials in the e-school bag are related to the national curriculum and are reviewed by subject experts in their field. In addition, the E-school bag contains a large number of study materials published by publishers and much more.

Strengths

- The experts of the e-school bag evaluate the quality of the study materials.
- The platform is free for students and teachers.
- The use of the platform improves digital competencies among teachers and students.
- Students have free access to study materials. Can also be used without logging in.
- Embedded links can be added to the e-school bag.
- You can add likes to the study materials.
- Free digital textbooks are also available through the e-school bag.
- It is constantly being developed.
- Learning materials for learners with special needs.

Weakness

- Teachers do not want to share their materials.
- The content of the materials is of poor quality.
- Only some H5P templates allow the use of a student knowledge control system.
- Teachers are not trained to use the e-school bag and the Content Creation platform. They only have instructions to use.
- Some study materials are outdated.
- Students do not have a computer or internet connection to use an e-school bag at home.

Digital Solutions

H5P is designed to create a variety of interactive learning materials, exercises, and self-assessment tests. The following describes the types of materials that can be created with this content creation tool.

Target Group

Students, teachers, trainers



School Education



VET Education



Higher Education

Project work in distance learning

About

During the pandemic period, VET courses were delivered in distance learning, no laboratory activities were allowed and it was not possible to send the students on internships. In order to obtain the qualification, they had to produce a project work developing a product (tangible or theoretical) to present during the final exams.

Students were divided into 3 groups (4 students per group) and each group were asked to simulate being a company in the field of industrial automation. Students decided their roles and each of them was responsible for a specific task. EnAIP was the customer who asked for a commercial offer based on some specifications. The simulated company could produce an offer as a contract.

Strengths

- Working groups activities facilitate the self-organization and self-engagement but also make more effective learning through a peer-to-peer approach (students with better skills helped those who were more vulnerable).
- Project work represented an effective and engaging methodology to develop professional skills both in a distance learning (when no face-to-face meeting were allowed) and onsite.

Weakness

- Lack of assessment methods to evaluate the engagement and quality of a single student.
- Time consuming (for trainers and tutors)
- Internet connection and equipment of the students (some students hadn't internet connection and EnAIP paid for connection mini-contracts and made PC available on loan for use)
- Lack of digital solutions: in integration to synchro lesson no other digital solutions were applied

Digital Solutions



Microsoft
Teams

Target Group

Young students (14-18 years old) at the end of a qualification course (EQF 3) have to obtain the final certificate.

All the classes in EnAIP took part in this practice.

Sector



Vocational
Education

Museum Sector Alliance – Mu.SA

About

CLICK ME 

The project aimed to address the increasing disconnection between formal education and training and the world of work because of the emergence of new job roles due to the quickening pace of the adoption of ICT in the museum sector. Mu.SA addresses directly the shortage of digital and transferrable skills identified in the museum sector and supports the continuous professional development of museum professionals.

Strengths

- Mu.SA project was a success story and innovative in the sector.
- Attracted 5.500 learners from all over the world (MOOC).
- Mu.SA was promoted and disseminated in several events and Conferences at local, national and International levels (like the 25th ICOM General Conference in Kyoto, Japan/ 10th International Conference in Information, Intelligence, Systems and Applications (IISA2019), University of Patras, Greece/
- Mu.SA has been included in the DigComp User Guide (2018) as one of the 38 existing inspiring practices of DigComp implementations
- Mu.SA has been selected as one of the 9 best cases that use DigComp for employment.

Weakness

- After the end of Mu.SA (in 2020), the partnership has not re-opened the platform to provide the Online course, despite the demand of the professionals to participate in it.
- Not many synergies have been created after the end of the Mu.SA project.

Digital Solutions



Target Group

Project outputs directly benefit museum professionals, unemployed, museum experts, trainers in the cultural sector, as well as the museums themselves.

Indirectly, the project contributes to raising the quality of life of the general public, by enabling museums to offer enhanced cultural experiences.

Sector



Continuing
Vocational
Training

Teaching materials by Mario Metshein

[CLICK ME](#)

About

Mario Metshein is a recognized vocational teacher at the Vocational Education Center of Haapsalu. He has been working there since 2004 as a vocational teacher in the field of computers. His main job is teaching a number of computer subjects, such as scripting tools, multimedia, programming and web technologies.

His website www.metshein.com has been offering free technology courses in Estonian for more than ten years. The goal is to make computer learning as easy as possible. The courses focus on various multimedia options and web programming.

Many Estonian IT vocational teachers use learning materials created by Metshein in their teaching.

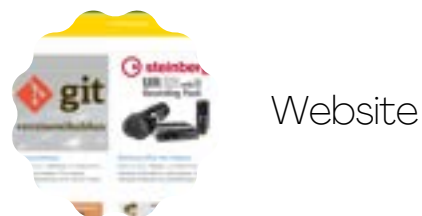
Strengths

- The platform has a forum for students to communicate with each other and ask for help if needed.
- Teachers and students can use the platform for free.
- Detailed instructions for various applications.
- Courses created by metshein.com can be given feedback and evaluation.
- It is allowed to copy and make learning materials more suitable for teaching.
- The instructions are illustrated with pictures.
- The website allows you to keep track of how far you have come through your course.
- Courses are for unlimited use.
- Provides users with information on where to get free applications to pass the course.

Weakness

- The platform is only in Estonian.
- Courses can only be used when logging in.
- Some courses are no longer up-to-date.
- Minimal interactive solutions have been used to create the tasks / courses.
- There is no evaluation system in the course.
- The design of the course (website) is not attractive.

Digital Solutions



Target Group



Teachers, students, self-learners



Sector



VET Education



School Education



Continuing Vocational Training



Higher Education

IRENE

Increase the empowerment of adults and migrants with specific learning disorders

[CLICK ME](#)

About

The IRENE project intends to fill the knowledge gaps through the production of three main outputs:

- Comparative research of existing teaching methodologies in the partner countries.
- Didactic approach introduces a model to develop learning content and guidelines.
- E-learning platform offering playful and stimulating modes for language learning. The platform will be structured in four separate sections: pronunciation; study; exploration and learning together.

Strengths

- A platform that collects, under a common structure, different language courses (basic level) addressed to adults with learning disorders but is easy to use also for different target groups.
- The digital solutions adopted let trainees able to learn a foreign language independently and organise their own learning time.
- The gamification included in the platform increases engagement and keeps the trainees hooked on the course because makes the course more dynamic.
- The high sound quality in the recording materials (in comparison with other projects developed)

Weakness

- The "LEARN TOGETHER" section has been poorly implemented.
- The game environment can be improved (graphic resolutions, attractiveness, and clarity). In comparison with previous projects, a greater innovative push would have been useful and appreciated.
- The development of "EXPLORE SECTION" requires specific skills and tools (i.e. 3D animation) that reduce transferability and customization.
- Regarding the whole project, the pandemic had a major and negative impact on some activities such as the debate with external stakeholders and the dissemination (this led to a certain self-referentiality of the project)

Digital Solutions



Target Group

The project's cohort is adults aged between 18 and 35 years who experience learning difficulties and are therefore discouraged to learn a foreign language. The project will support these adults in undertaking a 'second opportunity' to learn outside the traditional school paths. Language teachers will be provided with didactic and methodological tools and will be trained to improve their skills when working with people with learning difficulties.

Sector



Continuing Vocational Training

DELTA

CLICK ME

Digital Excavation through Learning and Training in Archaeology

About

The project aims at the design and development of an open course through which Students of Archaeology will be able to update their skills and develop new ones, in particular digital and 21st-century skills.

Strengths

- DELTA was promoted and disseminated in several events and Conferences at the local, national and international levels
- The project is innovative since it integrates the excavation site as an instructional tool in the classroom-based instruction of Archaeologists using digital means.
- After the course, selected students from each partner University with their Professor/educator were given the opportunity to be trained and work together in multinational groups in a joint excavation, in the historical place of Marathon, Greece, to benefit from knowledge and skills exchange. Selected students and their professors of Archaeology from Greece, Italy and the Czech Republic took part in the ISP in a five days training programme.

Weakness

The blended course ran from May - August 2021 and some learners as students of archaeology had difficulty successfully finishing the course (due to excavations conducted in the summer period).

Digital Solutions



Target Group

DELTA project benefits University students of Archaeology, professors and researchers in Archaeology, educators, tutors and trainers in Excavation methods, professionals in the field of Archaeology and Heritage management and the Departments of Archaeology themselves.

Sector



Continuing Vocational Training



Higher Education

Communication Laboratory of Haapsalu Schools

About

The communication laboratory has 2 directions:

- 1) development of verbal communication by integrating Estonian language and literature, foreign languages and informatics.
- 2) development of visual communication by integrating art subjects, technology and informatics.

The communication laboratory helps to develop students' various competencies, such as communication competence, digital competence, entrepreneurial competence, and the development of technological literacy competence.

The overall goal of the project is to promote students' communication skills through the use of innovative digital technologies.

CLICK ME

Strengths

- Enhancing the digital competences of students and teachers.
- Students' interest in studying literature, language, art and technology is growing.
- Students' IT and technology knowledge and skills are developed through integrated teaching.
- Students gain more courage to speak and communicate, and students' communication skills increase.
- Learning becomes more practical and more attractive to students.
- Enriches the vocational training of vocational school students and makes them more in line with students' expectations and real life;
- Better cooperation between the vocational school and the general education schools of the city of Haapsalu.
- Popularises vocational training among basic school students.
- Teachers create good teaching materials and share them with other teachers.

Weakness

- Teachers do not use the communication laboratory as intended.
- The communication laboratory is located in the premises of Haapsalu Vocational Education Center. This means that other schools have to go there.
- Equipment and applications are expensive and require constant maintenance.
- Different schools use a communication lab, so teachers must constantly monitor that the equipment is being used correctly and is not being damaged.
- It is too difficult for teachers to use devices and applications.
- The timetable between the schools must be in line with each other.

Digital Solutions



Target Group

Teachers and students of Haapsalu schools.
 1.Läänemaa Gymnasium
 2.Vocational Education Centre of Haapsalu
 3.Haapsalu Basic School
 4.Uuemõisa Primary School

Sector



Exploration and exploitation from the experiences: an overview

The analysed practices have in common the experimentation of innovative initiatives aimed at modernising training and education systems. As shown in the previous paragraph, the difficulty of selecting digital didactic practices in VET confirms the strong delay in the integration of new technologies in vocational training in all countries (see VET in a time of crisis: Building foundations for resilient vocational education and training system, 2021).

Furthermore, the difficulty of gathering experiences of digital didactics applied to practical-manual content emerges. This difficulty is, on the one hand, linked to the specific nature of workshop-type training experiences (cf. Teaching and learning in VET: Providing effective practical training in school-based settings, 2021), on the other hand, to the low digital and methodological skills of teachers and trainers and to the characteristics of VET students (fragile students with low digital and citizenship skills).

Most of the practices in VET, schools and universities focused mainly on the digital development of theoretical content. In some cases, projects and initiatives have involved a specific vocational sector and have developed vocational content and teaching materials. These experiences have mainly focused on technical and medium-high qualification professional profiles.

The challenges posed by the digital transition make a priority innovative learning methods and tools and development/adaptation of digital solutions to practical-manual content, in order to build new learning environments from experience. In this sense, an opportunity is offered by advanced technological solutions (Gamification, Augmented Reality and Virtual Reality) that allow an approach to professionalising content. Among the practices analysed, WorkVR and Competence+ in particular, create AR scenarios - related to the professional profiles identified - aimed at the acquisition of work procedures and the understanding of flows and sequences of actions.

In these examples, the use of digital solutions applied to the practical-professional contents required an effective preparation and design activity capable of analysing and understanding: the setting and workplace of a specific profile; the interaction with other professional figures; the work process; the tasks and sequence of actions to be performed; the correctness, propaedeutic value, and exact performance of every single action. Based on this analysis, those actions and tasks that became content to be "set" and "simulated" in a virtual learning environment were identified.

SYNTHESIS TABLE

APPROACHES/METODOLOGIES	DIGITAL SOLUTIONS	CONTENTS
<p>Approaches:</p> <ul style="list-style-type: none"> • Work-based learning approach • Adult education approach • Competency-based system to develop the course • Organizational approaches to integrate digital learning in practice/DigComOrg <p>Methodologies to design a course:</p> <ul style="list-style-type: none"> • Approach to design and development of training methodologies, blended courses and handbooks <p>Methodologies to teach through a blended course:</p> <ul style="list-style-type: none"> • Approaches and methodologies to teach through digital solutions 	<p>E-learning platform/MOOC</p> <p>Mythware classroom Learning APPS Video production interactive quizzes, practical assignment/activities, forum, communication</p> <p>VR scenario Gamification Powtoon – Unity – Steam 3DSMax – 0Maya</p>	<p>Professional content connected with specific “high” profiles (Digital Strategy Manager, Digital collections curator, Digital interactive experience developer, Online community manager, Digital excavation course).</p> <p>Foreign language connected with professional profiles</p> <p>Soft skills development: Environmental awareness, conflict awareness, moral courage, stress management, communication skills, etc.</p> <p>Theoretical subjects: Literature, language, art and technology</p>

How to structure an innovation process within a VET organisation?

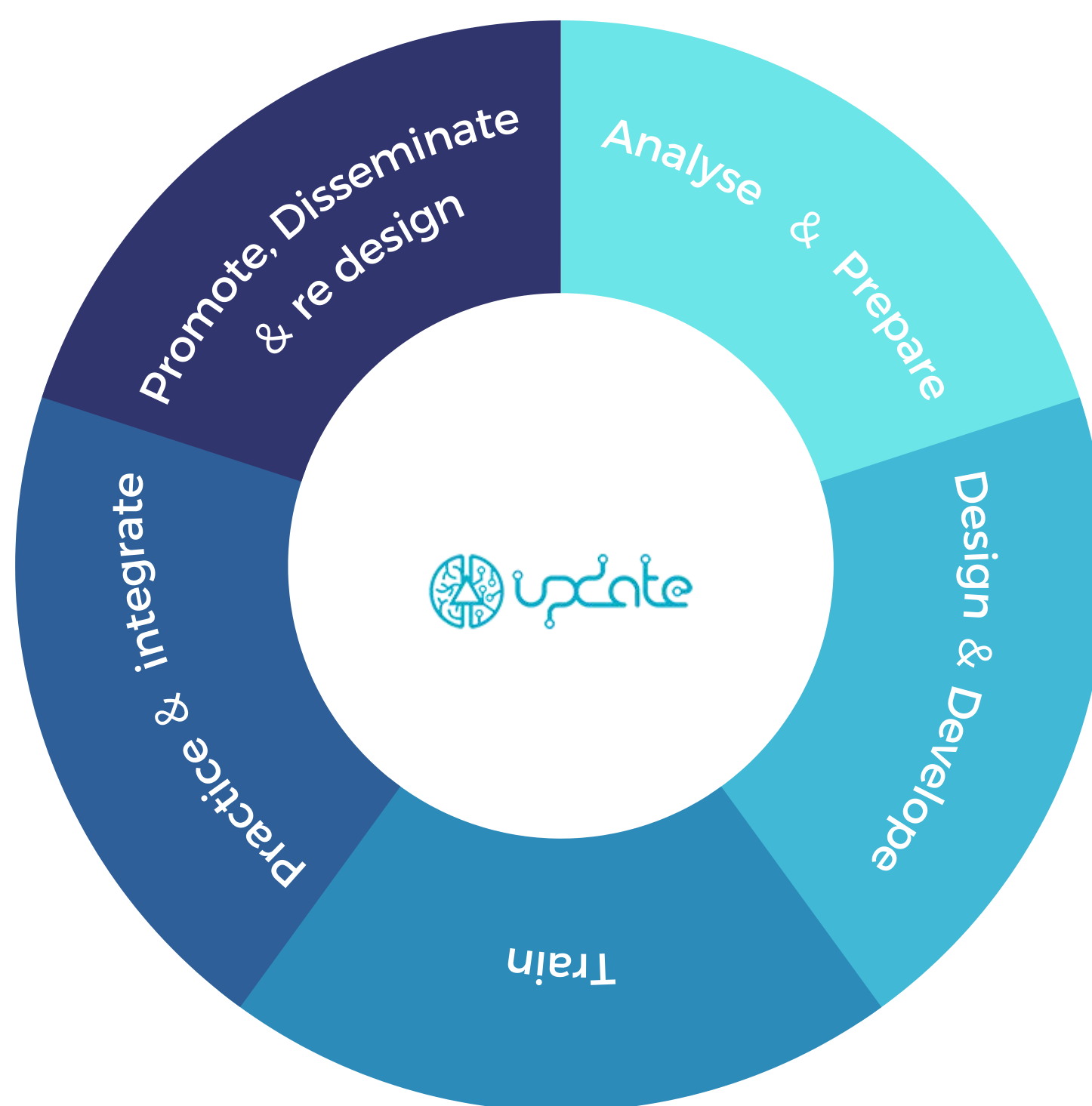
What do the analysed practices teach?

The proposed innovations have in common the structuring of project actions able to foster the creation/strengthening process of the digital ecosystem.

Consistent with what is recalled by the EU (DigComOrg framework for the evaluation of the development and integration of digital technologies for learning in education and training within the organisation), the innovative action is developed on three dimensions:

- a) pedagogical, through the strengthening of the competencies of tutors/trainers and learners (competent actors);
- b) technological through the development of digital tools and content for learning;
- c) organisational through the strengthening of innovation management capacities (digitally competent organisations).

This process of creating/strengthening the digital ecosystem is a process of innovation planning and implementation that envisages - in principle and across most practices - 5 macro-actions (see Figure below) to which specific activities can be attributed.



The macro-action (MA) Analyse and preparation refers to the actions related to the needs analysis phase necessary to design and adapt innovation to the specific characteristics of a context and training needs.

The MA Design and develop refers to the actions necessary to adapt the digital infrastructure of the organisation according to the target groups (teachers/trainers and/or students) i.e., create/implement a platform for blended learning, develop/integrate the platform with learning APPS or innovative digital solutions (AR/VR scenario and learning games), develop content.

The MA Train refers to the actions aimed at strengthening the skills of teachers/trainers (in the use of technological solutions and in the application of innovative teaching methodologies) and of the students (in the access and use of digital solutions and learning platforms).

The MA Practice and Integrate bring together the actions necessary to experiment with digital didactics with students and to integrate them into daily professional practice.

Finally, the MA Promote, disseminate and re-design encompasses the externally oriented actions aimed both at strengthening the debate in VET and at fostering new projects.

The following table shows the macro-actions with related activities in relation to the target group.

Target group: Trainers	Target group: Students
ANALYSE AND PREPARE	
<ul style="list-style-type: none"> • Context analysis • Training needs analysis 	<ul style="list-style-type: none"> • Training needs analysis • Entry level tests
DESIGN/DEVELOP	
<ul style="list-style-type: none"> • Design the digitalization process • Creation/implementation of a platform to support blended training for trainers • Design and develop training tools and training materials to be used by trainers • Connection with national repositories and online resources • Collection of digital tools and digital content • Design a community of practice 	<ul style="list-style-type: none"> • Development of a curriculum/course • Design and develop an integrated learning process (e-learning platform + f2f lessons + VR scenario) • Design lessons: timetable, playful/theoretical activities • Implementation of a learning platform
TRAIN	
<ul style="list-style-type: none"> • Development of courses to support the acquisition of digital skills and the ability to use specific digital solutions (i.e. AR/VR or learning games or learning APPS) • Development of courses to support the development of approaches and methodologies to teach with different target groups and in onsite/online settings using digital solutions (how to design a lesson, how to animate,..); to monitor and evaluate the learning process (engagement, interest, learning outcomes, the usability of the platform, etc.) • Collection of feedback • Creation/animation of a community of practice and teamworking among trainers 	<ul style="list-style-type: none"> • Develop courses to increase digital skills • Development of courses to support access and use of a specific platform/digital solution • Development of courses to support the activation and the engagement
PRACTICE AND INTEGRATE	
<ul style="list-style-type: none"> • Application of digital didactics in the training process • Monitoring activities addressed to trainers (educational technologists or methodological experts) • Collection of feedback and improvement of strategies and practices • Collection of organizational tips to integrate digital solutions in teaching courses • Modelization and integration of new practices into daily activity 	<ul style="list-style-type: none"> • Tutoring · Activities to support engagement and interests • Collection of feedback • Support and tutoring for specific activities (es. project work) • Evaluation activities
PROMOTE, DISSEMINATE, RE-DESIGN	
<ul style="list-style-type: none"> • Dissemination activities • Sustainability reporting (User experience and learning potential) 	

Educational organisations are undergoing the changes brought about by the digital transition and are being challenged by the emergence of new training and learning needs of those undergoing training. At several levels, digital technology modifies the working and teaching practices of all members of the educational community (teachers/trainers, students, managers). However, despite the changes that can be observed, the mere introduction of technologies in educational contexts is not enough.

The main criticality, which is common to all practices, is in fact linked to the organisational dimension. Experience teaches us that a clear intervention strategy is needed that enhances the potential of digital application to education, assesses the critical elements and risks, and provides for monitoring, evaluation, redesign, and consolidation actions.

The adoption of a systemic approach to the introduction of digital technologies in educational organisations is what is advocated by the DigComOrg framework, which calls for the inclusion of the organisational dimension in the implementation of innovation processes, providing a common conceptual approach – at the EU level – that enables organisations to assess their progress and plan areas of development towards better integration and more effective use of new technologies.

In detail, the DigComOrg consists of 7 thematic elements, each of which interrogates the training organisation for a specific aspect. Each element consists of sub-elements (see table below) and for each sub-element, there are descriptors for self-assessment (<https://www.itd.cnr.it/ricerca/progetti/digcomporg-european-framework-for-digitally-competent-educational-organisations.html>).

Thematic elements	Sub-elements
Leadership & Governance Practices	<ul style="list-style-type: none"> • Integration of Digital-age Learning is part of the overall vision and strategy. • Strategy for digital-age learning is supported by an implementation plan. • A Management and Governance Model is in place.
Teaching and Learning Practices	<ul style="list-style-type: none"> • Digital competence is promoted benchmarked and assessed. • A rethinking of roles and pedagogical approaches.
Professional Development	
Assessment Practices	<ul style="list-style-type: none"> • Assessment Formats are engaging and motivating. • Informal and Non Formal Learning are recognised. • Learning Design is Informed by Analytics.
Content and Curricula	<ul style="list-style-type: none"> • Digital Content and OER are widely promoted and used. • Curricula are redesigned or reinterpreted to reflect the pedagogical possibilities afforded by digital technologies.
Collaboration and Networking	<ul style="list-style-type: none"> • Networking, sharing & collaboration is promoted. • A strategic approach is taken to communication. • Partnership Developed.
Infrastructure	<ul style="list-style-type: none"> • Physical and Virtual Learning Spaces are designed for digital age learning. • The digital infrastructure is planned and managed.

source: DigiComOrg Framework

Taking the framework as a reference, the practices analysed focus, albeit to varying degrees, mainly on certain elements, in particular those related to e-skills training, infrastructure and curriculum and content development. On the other hand, all the aspects related to management remain in the background or are little treated (and promoted).

What emerges is the need to continue the development of project initiatives by reinforcing what has been developed so far but at the same time increasing capacity-building initiatives aimed at strengthening a widespread competence and managerial capacity to support the processes of redesigning the organisation according to the changes experienced.

In other words, it is necessary to orientate projects to grow a leadership that knows how to define the vision and mission of the training organisation capable of responding to the challenges of the digital transition, that knows how to govern processes, communicate with external stakeholders and involve the territory, and that knows how to prepare operational plans capable of supporting innovation and enhancing the available human resources.

Digital solutions: a comparative analysis

The UpDATE project consortium collected and mapped the most suitable digital solutions for the Vocation educational training and teaching, related to practical-manual training activities. Here are the twelve collected digital solutions:

1. Virtual Reality
2. Test/Quiz/Interactive evaluation
3. Multimedia presentations produced by the trainee
4. Conceptual Map
5. Self – producing video
6. Social platform/ forum
7. Interactive presentations
8. Metaverse
9. Synchronous Lessons
10. Interactive Customisable presentations
11. Gamification/ Gaming
12. Augmented Reality

In the following Tables are the descriptions, strengths and weakness, as well as a categorisation of the most prominent type of learning for each of the twelve digital solutions. Also, more thorough annexes are available [here](#).

Virtual Reality

About

Virtual reality, or VR, is taking off in education with an increasing number of schools adopting the technology VR allows students to experience destinations from across the world without ever having to leave the classroom. Imagine students being able to explore the pyramids of Giza whilst sitting at their desks. This is what virtual reality education allows. VR can be applicable for both high-level theory (advanced mathematics) and practical skill training (welding simulators). Limited to the VR environment and scenario which is created, as of now, difficult to customize (there will be a change in a close future) Customizable if the co-creation with the 360 degree camera/video.

Strengths

- The training usefulness of the error: a game is a protected environment in which a student can test errors avoiding consequences. After a failure, he/she can restart without fear to reach the final aim. Immediate feedback provided during the game.
- The competition and the game as a lever for learning.
- An engaging storytelling: the game lies in a developed story in which learning contents are discovered step by step. This stimulates engagement and curiosity to follow the different game steps.
- Through a game you can re-create a real situation (workplace) if no equipped rooms are available.
- Easy access, effectiveness and direct involvement of students.

Weakness

- Bad internet connections can interrupt the creation of a multimedia presentation.
- Outdated software does not support the platform.
- Students do not have the appropriate equipment (computer or tablet, internet connection) at home.
- The teacher does not have the skills and knowledge to use the equipment and the platform.
- Lack of language skills can make it difficult to use the platform.
- The level of students' digital competencies is uneven.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING THROUGH **CREATIVE THINKING**
- LEARNING FROM **PEER INTERACTION**
- LEARNING FROM A **REFLEXIVE PROCESS**
- LEARNING FROM **IMITATION / OBSERVATION**
- LEARNING FROM **"DOING"**

Test/quiz/interactive evaluation

About

Assessment, evaluation, and testing are all used to measure how much of the assigned materials students are mastering, how well students are learning the materials, and how well students are achieving the stated goals. The result is based on a calculation of the user's interactions and the answers they provided for each question. Evaluation is the process of making judgments based on criteria and evidence (tests, quizzes). The evaluation process must be carried out with effective techniques. Interactive tests and quizzes are those that are completed and automatically marked on a computer, tablet or mobile device.

Strengths

- Instant feedback on learning results.
- Immediate evaluation of learning results.
- The use of technology in teaching increases students' motivation and involvement in the learning process. Increases teachers' and students' digital competence.

Weakness

- Students do not have the appropriate equipment at home.
- The teacher does not have the skills and knowledge to use the equipment and create a test using the platform.
- In general, the best platforms are in English. A lack of language skills can make it difficult to use the platform.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING THROUGH **CREATIVE THINKING**
- LEARNING FROM **PEER INTERACTION**
- LEARNING FROM A **REFLEXIVE PROCESS**

Multimedia presentations (trainee)

About

An interactive presentation is the means used to combine and bundle multiple types of interactive content all in one place to present to an audience, often in real time. A multimedia presentation is a type of presentation that uses several different forms of digital content, such as animation, video, audio, or interactive features like forms, popups to enrich your presentations both visually and content-wise.

Strengths

This requires students to cultivate good information-literacy skills, including searching databases, evaluating resources, and creating citations.

- Multimedia presentations challenge students to think creatively.
- Multimedia presentations develop confidence in language skills. Increases teachers' digital competence.
- Increases students' digital competence.
- The use of technology in teaching increases students' motivation and involvement in the learning process.
- The solution is suitable for both group work and individual work.
- Multimedia activities encourage students to work in groups, express their knowledge in multiple ways, solve problems, revise their own work, and construct knowledge.
- The material is better remembered with images and pictures than with text.

Weakness

- Bad internet connections can interrupt creating a multimedia presentation.
- Outdated software does not support the platform.
- Students do not have the appropriate equipment (computer or tablet, internet connection) at home.
- The teacher does not have the skills and knowledge to use the equipment and the platform.
- In general, the best platforms are in English. Lack of language skills can make it difficult to use the platform.
- The level of students' digital competences is uneven.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING FROM A **REFLEXIVE PROCESS**
- LEARNING FROM **PEER INTERACTION**

Conceptual Map

About

Concept maps are a visual way to organize your thoughts and make connections between ideas. They improve our ability to understand and remember concepts, because our brains process visuals better than plain text. Also show others how the ideas or things are connected. Concept maps have three elements: shapes, arrows, and text. The subject is at the top and the related ideas become more specific as you move down the map. In this way, concept maps are different from mind maps that just have information in every direction around a subject.

Strengths

- Increases teachers' digital competence.
- Increases students' digital competence.
- The use of technology in teaching increases students' motivation and involvement in the learning process.
- Active learning takes place as students create a map of their own knowledge or ideas.
- The solution is suitable for both group work and individual work.
- The teacher can explain more difficult topics using a conceptual map.
- The conceptual map can also be created with a pen and paper if technical problems arise.

Weakness

- Bad internet connections can interrupt creating a conceptual map.
- Outdated software does not support the platform.
- Students do not have the appropriate equipment (computer or tablet, Internet connection) at home.
- The teacher does not have the skills and knowledge to use the equipment and the platform.
- In general, the best platforms are in English. Lack of language skills can make it difficult to use the platform.
- The teacher does not know how to integrate a conceptual map into their teaching.
- The school does not have the appropriate equipment or computer class for teaching.
- The level of students' digital competences is uneven.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING THROUGH **CREATIVE THINKING**
- LEARNING FROM **PEER INTERACTION**
- LEARNING FROM A **REFLEXIVE PROCESS**

Self-producing video

About

Self-producing video is the video that the trainer can create by own means. The video is an electronic medium for the recording, processing, storing, copying, playback, broadcasting, and display of moving visual media. A video can be processed, inserting comments or subtitles, presentations, sounds etc. Digital video is an electronic representation of moving visual images (video) in the form of encoded digital data (digital media used for the recording, processing, and storing processes). The most common video types, related to educational content, include interviews, conversations, lectures, directed scenarios and screencasts.

Strengths

- Pre-recorded videos do not suffer from delivery problems caused by bandwidth, dropout, lag and other technical issues potentially inherent in live teleconferences.
- Video-based learning helps students understand complex topics by breaking them down into digestible visual cues.
- The lecture video can be loaded directly into Canvas.
- The video can be viewed by students asynchronously. This eliminates issues with students who cannot meet at a certain time for a live teleconference or who do not have personal computers and must access the course on borrowed or public computers.

Weakness

- The quality of a lecture video will be only as good as the equipment to make it.
- Lecture videos can be nerve-wracking to make, and the instructor must be highly organized so that there are no periods of wasted time and waiting in the video.
- If the instructor wishes to share media during the lecture, the lecture video could become a video-editing production project.
- Video editing is a complex and costly process, but might be necessary if there is an error or update to the curriculum. You could add disclaimer captions instead of editing the video, but this might lead to confusion and miscommunication among learners.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING THROUGH **CREATIVE THINKING**
- LEARNING FROM **OBSERVATION**

Social platform/forum

About

Social platform/forum as a collaboration learning object. Social platforms can be a useful tool for learning, bringing advantages such as engaging with your audience and creating a community of learners.

Strengths

- Connect to other people all over the world.
- Easy and Instant Communication.
- Real-Time News and Information Discovery.
- Great Opportunities for Business Owners.
- General Fun and Enjoyment.

Weakness

- The teacher/trainer may need to commit resources to managing the social platform/ forum presence, responding to feedback and producing new content. This can include hiring and training staff, investing in paid advertising and paying for the costs of creating video or image content.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING FROM A **REFLEXIVE PROCESS**
- LEARNING FROM **PEER INTERACTION**

Interactive presentations

About

Interactive presentations are more suitable for practical activity or theory, brainstorming, warmers and energizers, vocabulary and grammar practice, group work & feedback.

Strengths

- There is the option to assign a web quest—each group must research a topic and collect their findings, then be ready to share them with the rest of the class.
- They can post pictures and videos, write text, link to external websites...even create a video themselves and upload it.
- The teacher/ trainer can easily add stars to the best ideas of the day or leave comments while groups are working.
- The teacher/ trainer can copy text blocks and highlight mistakes or can collaboratively correct errors with the group in real time.
- For students, interactive platforms make giving feedback fun.
- One option is to set up a feedback question; another might be to leave an emoji.
- The teacher/tutor ask them to give feedback through a GIF or picture.
- The teacher/trainer can create a project hub and reduce time looking for files.
- The teacher/ trainer can organize references, research, and design files to one place where they can gather feedback and iterate.

Weakness

- The interactive tools are suitable for online learning and environment..

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING THROUGH **CREATIVE THINKING**
- LEARNING FROM **PEER INTERACTION**
- LEARNING FROM **IMITATION/OBSREVATION**

Metaverse

About

The Metaverse (also written as Meta Verse) is a virtual representation of reality. It's an environment where people use their virtual selves to socialize, play games, visit concerts and even travel. Your 3D avatar can look just like you or be customized to whatever look you prefer to have in the Metaverse.

Strengths

- Immersive experience.
- Hands-on practice.
- Gamification prospects.
- Improved learning speed.
- Life-like learning conditions & communication.

Weakness

- Poor accessibility.
- Exposure to an anti-social environment.
- Virtual bullying.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING THROUGH **CREATIVE THINKING**
- LEARNING FROM **PEER INTERACTION**
- LEARNING FROM **IMITATION/OBSREVATION**

Synchronous Lessons

About

It is a lesson delivered digitally, in a virtual environment (online), which takes on the characteristics of the face-to-face classroom, ensuring constant and in real time interaction between learners and teachers.

Strengths

- It gives the possibility to choose where and when.
- It reduces costs.
- Synchronous teaching leads to the search for new solutions and tools to support teaching, stimulating learning (e.g. Mentimeter)..
- There is the presence and direct contact with a teacher who explains.
- It helps to maintain direct contact during mandatory period of distance learning (Pandemic case).

Weakness

- The teacher must try to make the lesson engaging, stimulating the class to interact and learn. If only lecturing from the front of the room is done, the students' attention span is low. The teacher's responsibility is to structure a lesson that is functional to the synchronous medium. Good skills in teaching apps facilitate the management of lesson and the effectiveness of the activity.
- The use of media can be complex and impractical if not well used.
- Lack of familiarity with technology on the part of teachers, trainees, and their families.
- Digital divide among users.
- Lack of live interaction between teacher and student.
- Lack of peer interaction.
- Limited possibilities for peer-to-peer work.
- In a long run it can create disaffection and it is not functional as the only teaching method.
- It must be an addition to the on-site lessons.

Learning Type

- LEARNING **FACE TO FACE**

Interactive customizable presentations

About

Apps and programs that enable interactive and customizable presentations with real-time feedback. The audience or students can enter it by connecting to www.menti.com via their smartphone or tablet so that they can interact and respond.

Strengths

- Allow students to use their mobile phones or tablets as a teaching tool, teaching them about the potential and opportunities;
- Allows students or public members to answer questions anonymously;
- Offers interactive quizzes to formatively test the learning and attention of all pupils simultaneously;
- Offers the possibility of exporting the collected data and discussing or analysing it from both a statistical and interpretative point of view,
- Offers interactive and engaging presentations;
- It is a free and easy-to-use app; It allows real-time interactions;
- It has user-friendly tools; There are pre-defined slides, charts, themes, images, GIFs that can be used; It can be deployed on Cloud, Saas, Web, Android (mobile), Iphone (mobile), Ipad;
- Can be tested without registration;
- Discounted prices for teaching; The premium version allows an unlimited number of students to take the quizzes;
- It offers the open ended function, where participants can add comments and texts that can be seen by the creator and the rest of the members; - it provides users with many tools to create their presentations in an attractive way and customise them with different interaction options: you can even add your company logo.
- All data obtained from people's responses and interactions can be collected and exported for later analysis.

Weakness

- Some apps are not all free and/or the premium version is very limited in functions & tools.
 - Does not integrate well with Power Point;
- Regarding Mentimeter:
- Complicated compared to other similar programmes;
 - It may be slow to load results;
 - Sometimes it is not possible to skip a question;
 - There are problems accessing from a PC;
 - Some credit cards are not accepted for international payments;
 - Weak customer support.

Learning Types

- LEARNING **FACE TO FACE**
- LEARNING FROM **PEER INTERACTION**

Gamification - Gaming

About

Gamification in training is the process of applying gaming designs, rules and concepts to learning or training processes to make them more engaging. Instead of being taught through lesson plans, trainees learn through (interactive) games. This creates a fun and rewarding learning environment.

Strengths

- The training usefulness of the error: a game is a protected environment in which a student can test errors avoiding consequences. After a failure he/she can restart without fear to reach the final aim.
- Immediate feedbacks provided during the game.
- The competition and the game as a lever for learning.
- An engaging storytelling: the game lies in a developed story in which learning contents are discovered step by step. This stimulates engagement and curiosity to follow the different game steps.
- Through a game you can re-create a real situation (work place) if no equipped rooms are available.
- Easy access, effectiveness and direct involvement of students

Weakness

- High costs to develop tailor made games.
- Low opportunities to customize the game in the final release.
- The trainer can contribute to the development only in a pre-development analysis phase.
- Low longevity of the course/program/lesson/game: once the challenges have been completed and overcome, students may not want to repeat the entire path.
- Low quality. some games have low graphical and operational quality.

Learning Types

- LEARNING FROM **EXPERIENCE**
- LEARNING FROM A **REFLEXIVE PROCESS**
- **GAME-BASED** LEARNING

Augmented Reality

About

Augmented Reality (AR) can best be described as a digital input to an expanded view of reality. Here true vision is maintained, but a layer of computer-generated graphics, information, and data is added to the field of view.

Strengths

- The training usefulness of the error: a game is a protected environment in which a student can test errors avoiding consequences.
 - After a failure, he/she can restart without fear to reach the final aim.
 - Immediate feedback provided during the game.
 - The competition and the game as a lever for learning.
 - Through a game you can re-create a real situation (workplace) if no equipped rooms are available.
 - Easy access, effectiveness and direct involvement of students.
 - The hardware is already provided by most students (access to a mobile phone).
 - High level of motivation for the student.
 - Very interactive and user-friendly immersive learning.
 - Higher retention of the knowledge.
- Practical for repetitive skill learning.

Weakness

- Bad internet connections can interrupt the creation of a multimedia presentation.
- Outdated software does not support the platform.
- Students might not have the appropriate equipment (computer or tablet, internet connection) at home.
- The teacher does not have the skills and knowledge to use the equipment and the platform.
- In general, the best platforms are in English.
- A lack of language skills can make it difficult to use the platform.
- The level of students' digital competencies is uneven.
- Outdated phones do not run the applications correctly.
- Big differences between IOS and Android.
- A cracked screen may interfere with the application.

Learning Types

- LEARNING THROUGH **CREATIVE THINKING**
- LEARNING FROM **PEER INTERACTION**
- LEARNING FROM A **REFLEXIVE PROCESS**
- LEARNING THROUGH **INTERACTION**
- **IMMERSIVE** LEARNING

Digital solutions comparison with Harvey Balls method

„Harvey Balls are a type of state indicator commonly used for comparison in presentations and reports. Harvey Balls are small pie charts or round ideograms used to visualize qualitative information. They are commonly used in comparison tables to indicate the degree to which a particular item meets a particular criterion.

Basically, they are small circles filled with color used in comparison tables to rate multiple competitors on certain parameters (see Fig. 1). For UpDATE comparison analysis we will apply the Harvey Ball indicators, so as to create a chart as a type of state indicator for comparison of the findings in the desk research conducted in partnership (EnAIP, HOU, VIKK, VIRSABI).“

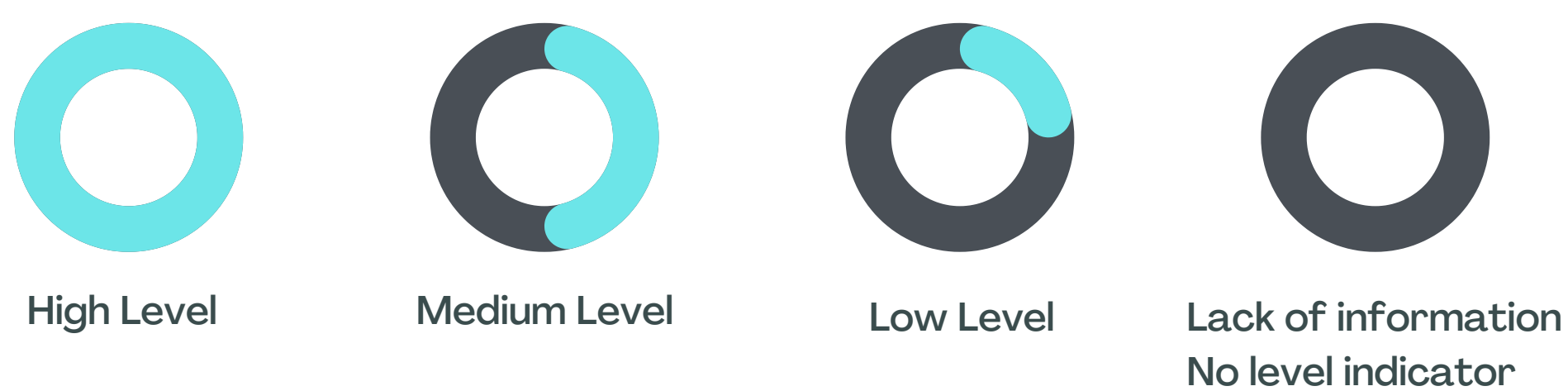


Fig.1 Chart with Harvey Balls (High Level, Medium, Low level, No information/ No level)

The chart will serve as a visual tool, to present the comparative analysis of 12 selected digital solutions [Virtual Reality, Multimedia presentation by trainee, Conceptual map, social platform/ forum, Interactive presentations, Interactive customisable presentations, Test/ quiz/ Interactive evaluation, Self-producing video, Synchro lesson, Gamification - Gaming, Augmented Reality (AR), Metaverse]. On the left column are the twelve different digital solutions mapped by UpDATE partners. On the horizontal row are the different levels/ criteria like interaction among trainees during experience, interaction with the trainers during experience, trainee' autonomy, user friendly for the trainee, user friendly for the trainer, peer to peer collaboration, inclusiveness and engagement.

The following graph shows the results of the comparison based on the identified criteria.

	Interaction among trainees during the experience	Interaction with the trainer during the experience	Trainee Autonomy	User friendly (Trainee)	User friendly (Trainer)	Peer to Peer Collaboration	Inclusiveness	Engagement
Virtual Reality								
Multimedia presentation by trainee								
Conceptual Map								
Social platform / Forum								
Interactive presentation								
Interactive customizable presentation								
Test Quiz Interactive evaluation								
Self producing video								
Synchro lesson								
Gamification / Gaming								
Augmented reality								
Metaverse								

From practices to leaning: remarks for the UPDATE project

The analysis of the practices and the digital solutions collected by the UPDATE partners in the four countries involved (Italy, Estonia, Greece, and Denmark) confirmed the hypothesis that in order to strengthen the digital ecosystem and more generally to modernise training organisations, it is necessary to act on three dimensions: pedagogical, technological and organisational. It also highlighted the importance of leadership in activating, managing, and consolidating the integration of digital technologies in education.

Rethinking projects by focusing on capacity building means, therefore, be aware that change – for being effective and sustainable over time – needs to be thought out and constructed organisationally. Projects and initiatives are the fuses for triggering change, but they need to be brought back into a broader strategy based on a systemic vision of the innovation process.

Going back to the previous section, some recommendations can guide the UPDATE's action:



COLLECT AND MONITOR THE COMPETENCE NEEDS

of the organisation, trainers/trainers, learners.

In implementing an innovative action, it is essential to start from and focus on competence needs, involving, from the very beginning, the actors concerned and the target group. In the beginning, it is necessary to accompany the target group in the identification of needs, analyse gaps, identify objectives and strategies to reinforce competencies and/or training, and hypothesise learning outcomes.

During the implementation, it is necessary to monitor the effects that the actions have on the needs initially identified and, if necessary, modify and correct strategies.

In the end, finally, it is important to evaluate the impacts and learning outcomes achieved.

This process makes any innovative action more effective, as well as providing value and building awareness of the learning processes. From an organisational point of view, it makes it possible to capitalise and systemise a method of intervention based on a continuous process of ideation-design-implementation-evaluation-redesign and rooted in the actual needs of the organisation and the teachers/trainers.

02

TRAIN COMPETENT ACTORS

means acting on a dual level: strengthening the digital and citizenship skills of students and strengthening the methodological, pedagogical, and digital skills of teachers.

Educating students is a condition for inclusion: digitally literate students are able to take advantage of the opportunities provided by technology. The 2030 Agenda for Sustainable Development has among its goals to provide "quality, equitable and inclusive education and learning opportunities for all". The integration of digital technologies in education is an opportunity for inclusion if students are able to access digital resources and exploit their potential.

Technology alone, however, is not the variable that determines the success or quality of education. What makes the difference are the methodologies that are applied and the solutions that teachers/trainers can adopt. What makes a frontal lesson interesting is the teacher's ability to involve the students, use different channels of expression, apply and use dynamic and effective digital solutions (B. Bruschi A. Perissinotto, 2020). The introduction of methodologies, processes and contents needs to be accompanied and trainers/trainers need to be supported to learn, experiment, and systemise inclusive approaches and tools based on needs, to design "distance learning" and to use online and in-presence digital solutions.

Thus, training becomes a way to prepare competent actors, support motivation and guidance towards further education, facilitate innovation and integration processes in digital didactics, stimulate positive guidance towards online didactics and support the interest in experimenting and testing digital didactic tools and modalities also on more difficult contents (practical manual contents) and with more fragile target groups (students of VET organisations).

03

THINKING OF DIGITAL TECHNOLOGIES AS AN ENHANCEMENT FOR TEACHING

This means developing digital didactics designed for the telematic setting that differs from the digital didactics used in the presence. It means questioning the choice and use of the most appropriate didactic mediators and the most effective digital solutions; rethinking the articulation of the lesson by structuring the times in different ways and, lastly, focusing on the objective of fostering active and conscious participation of the students by identifying the strategies and tools that are most effective from time to time in line with the training objectives

It is, therefore, necessary, on the one hand, to develop ad hoc digital solutions and/or implement and contextualise the digital solutions already available and, on the other hand, to strengthen the ability of the teachers/trainers (ability to choose and use digital solutions according to the different target groups and learning objectives and methodological/teaching ability to redefine, construct and structure learning processes by integrating these solutions into daily practice).

04

DESIGNING INNOVATION IN THE ORGANISATIONAL CONTEXT

Training organisations - especially in the VET area - urgently need to invest in technological solutions adapted suitable for the target groups and the curricula. The technological infrastructure can be thought of as a set of technological solutions available to all actors involved: digital platforms for learning, virtual forums, and communities, learning APPS, "resource centres" and repositories with quality content. To be effective, however, innovation needs to take root within the training organisation and in everyday work and teaching practices, in relationships made up of collaboration and conflict.

Every change affects established modes and routines, activates expectations and stimulates initiatives but also generates resistance, fears, feelings of ineffectiveness and inability, frustrations. Designing innovation within the context means, on the one hand, assuming the complexity of organisational contexts and relations within these contexts, and on the other hand, accompanying people to change, respecting learning times and enhancing the resources of each individual.

Designing innovation means accompanying people to visualise change and to give it meaning and sense for themselves and for the organisation with the aim of redefining educational action starting, however, giving value to what has been done and from past experience. From the organisational point of view, it is important to activate processes of change without completely distorting what has been but by experimenting with sustainable actions and solutions that can be accepted and integrated into everyday life. Finally, it is important to act on several levels and to involve both the professionals in direct contact with students and the management and coordination roles.

05

BUILDING AND SHARING LEARNING INSIDE AND OUTSIDE THE ORGANIZATION

Learning is social and takes place in relationships. Educational action is based on cooperation and confrontation between professionals and experts not only within a single organisation but also externally. The sharing of teaching methods and contents is already an established practice within organisations although it is mainly based on individual and informal initiative. Communities of practice, a place, both physical and virtual, for sharing and exchange, for systematising knowledge (learning communities), need to be conceived, supported, animated and nurtured.

Participation in events, conferences, and external projects - even in an EU dimension - is a further opportunity for comparison with other realities, an opportunity for decentralisation, a way of observing problems from afar, sharing them with others and then returning to observe them closely. It is in this continuous movement inside/outside the organisation that a space for professional growth can be opened. From an organisational point of view, strategic partnerships and networks are 'tools' for enhancing the social capital of an area, promoting system actions and research and development initiatives.

06

THINK DIGITAL INNOVATION FROM AN ORGANISATIONAL PERSPECTIVE

means having organisational thinking (sensemaking) about innovation and the digital transition in education that translates into the reformulation of vision, mission, strategies and operational plans. To do this, it is important to have and train innovation-oriented leadership, capable of acting in the modernisation of the educational system, directing projects, financial and technological resources at the service of the integration of digital didactics, governing processes by accompanying staff (trainers and tutors) and stakeholders to take responsibility in the process.

To think organisationally about innovation means, finally, to systematise and consolidate experiences, to make initiatives sustainable over time, to have a time horizon of thought-out and planned change (cf. what the DigCompOrg framework refers to as a process of planning for a change).

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