Bebe Adrian OLEI
Iulian ȘTEFAN
Mihaela Cecilia FLORESCU
Marius Cătălin CRIVEANU
Ionel Dănuț SAVU
Gabriel Constantin BENGA
Sorin Vasile SAVU

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Education and Training in Digital Reality Environment

Collection of Best Practices

Imagine copertă: Sorin Vasile SAVU

Glossary

Gamification	adding game mechanics into nongame environments, like a website, online community, learning management system or business' intranet to increase participation.
Simulators	devices that provides the imitation of the operation of a real-world process or system over time
Interactive Smartboard	large interactive display board in the form factor of a whiteboard. It can either be a standalone touchscreen computer used independently to perform tasks and operations, or a connectable apparatus used as a touchpad to control computers from a projector. They are used in a variety of settings, including classrooms at all levels of education, in corporate board rooms and work groups, in training rooms for professional sports coaching, in broadcasting studios, and others.
Google Classroom	a free web service developed by Google for schools that aims to simplify the creation, distribution and grading of assignments in a paperless way. The main purpose of Google Classroom is to streamline the file sharing process between teachers and students.
Microsoft Teams	A messaging app for organizations, a workspace for real-time collaboration and communication, meetings, file and app sharing, and even the occasional emoji.
VR Headset	A virtual reality headset (or VR headset) is a head-mounted device that provides virtual reality for the wearer. VR headsets are widely used with VR video games but they are also used in other applications, including simulators and trainers. VR headsets typically include a stereoscopic display (providing separate images for each eye), stereo sound, and sensors like accelerometers and gyroscopes for tracking the pose of the user's head to match the orientation

of the virtual camera with the user's eye positions in the real world

Game Console

A video game console is an electronic device that outputs a video signal or image to display a video game that can be played with a game controller. These may be home consoles, which are generally placed in a permanent location connected to a television or other display devices and controlled with a separate game controller, or handheld consoles, which include their own display unit and controller functions built into the unit and which can be played anywhere. Hybrid consoles combine elements of both home and handheld consoles.

Learning Management Systems

a software application for the administration, documentation, tracking, reporting, automation, and delivery of educational courses, training programs, materials or learning and development programs. The learning management system concept emerged directly from e-Learning. Learning management systems make up the largest segment of the learning system market.

Welding Procedure Specification

a document that serves as a guide for the effective creation of a weld that meets all applicable code requirements and production standards

Abbreviations

WPS   Welding Procedure Specification

IWT   Inland Waterway Transport

PTSD   Post – Traumatic Stress Disorder

LMS   Learning Management System

ILIAS   Integrated Learning, Information and Work Cooperation System

CSI   Crime Scene Investigation

TVET   Technical and Vocational Education and Training

Foreword

This work is focused on development of best practices in education and training covering hybrid and distance education by using modern digital tools and new methodologies.

The elaboration of the book has been supported by the results obtained in Erasmus+ project Digital Reality – the basis of VET training implemented in period 2020-2022.

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1. Introduction

COVID-19 crisis raised an important issue of educational systems. According to OECD (2020) report [1] related to the impact on education systems, the COVID-19 crisis has exposed the many inadequacies and inequities in our education systems – from access to the broadband and computers needed for online education, and the supportive environments needed to focus on learning, up to the misalignment between resources and needs [2]. Previous reports of OECD also outlined that less than 40 % of educators felt ready to use digital technologies in teaching with wide differences across the EU. Moreover, although there are simulators that use technologies based on augmented reality or virtual reality, they can only be accessed by students inside the laboratories of the vocational school. No European country has been prepared for the transition from traditional face-to-face learning to online or blended learning, much less in the case of practical activities absolutely necessary for qualification in special trades such as welding. Therefore, the need to present the best practices in the activity of teaching / theoretical and practical learning is absolutely necessary for the improvement of the educational process in vocational schools that have not used digital tools so far. On the other hand the digital skills of teachers and students are very important for the success of up taking of virtual learning environment in education process. According to JRC Technical Report of EU (2020) [3] related to the impact of COVID-19 on education, the need for professional development in the are of ICT skills for teaching is also higher in schools with high concentration of disadvantaged students [4-7].

Sectors with low digitization and low automation potential must prepare for an evolution. Sectors such as education, healthcare, arts, and finance are not facing a drastic change in the form of a high automation potential [8-11]. Nevertheless, given their low starting point in terms of digitization, they should prepare to adopt more technology and not

underestimate the effort required. According to McKinsey Global Institute [12], only 21 % of these sectors have adopted digitalization. Despite several initiatives to digitalize the education system, the need to improve the acquisition of digital skills remains high. In 2015, Romania adopted a national strategy on the Digital Agenda setting out actions until 2020 [13] in key areas that included the use of information and communication technologies (ICT) in education. However, according to European Commission report in 2020, the degree to which the commitments of the strategy were met is unknown [14]. Although Romania has progressively integrated elements of digital technology in its policies, school curricula and training programmers, and despite some major investments at national level, a lack of monitoring and support mechanisms has resulted in many of these initiatives not being sustainable. To date, the results remain limited. At the same time, the private sector, especially tech companies, has started a number of projects with schools and universities focusing on teacher training and development of digital learning resources1, as well as provision of digital equipment. Overall, only 57 % of young Romanians aged 16-19 have basic or above basic digital skills (EU average: 82 %). The gap with the EU average is particularly evident in problem solving and software skills, which include making decisions about digital tools and using them, purchasing online, creating content and coding. ICT is an optional subject in primary grades and, since 2017, a compulsory subject in lower secondary education. However, schools in rural areas, which provide schooling to 43 % of students, are less able to offer digital education due to having fewer qualified teachers and poorer digital infrastructure. In upper secondary education, students' digital competences are evaluated as part of the baccalaureate exam through a fail/pass practical test, which can be equated with the European Computer Driving Licence.

Several areas of teachers' digital skills require strengthening. Romanian teachers feel confident about certain aspects of their digital skills, in particular about communication and collaboration, but less so when it comes to digital content creation, information and data literacy [14].

Similarly, the OECD's 2018 Teaching and Learning International Survey showed that almost 70 % of lower secondary teachers believe they are well or very well prepared for the use of digital methods in teaching, while 21 % reported a high need for professional development in ICT skills (EU average: 18 %). Despite a large number of training courses being available for digital skills, their quality, coverage and relevance are lower than expected. At the same time, teachers often feel exposed and do not know how to react to the expectations and demands of their students related to the use of technologies for learning. In addition, more than half of the teachers surveyed had insufficiently developed competences for the effective use of online learning platforms. The CRED project (Relevant Curriculum, Open Education for all), co-financed by the European Social Fund, has been supporting the development of teacher competences, including during the COVID-19 school closure.

Digital infrastructure in schools lags behind, especially in rural areas. Compared to the EU average, substantially fewer schools are highly digitally equipped and connected. Only 14 % of Romanian students in primary education (EU average: 35 %), 16% in lower secondary (EU average: 52 %) and 31 % in upper secondary education (EU average: 72 %) study in such schools. Available data shows that, in 2017, 1 in 5 schools was not connected to the internet at all, of which only 5 % in urban areas and 24 % in rural areas (Ministry of Education and Research, 2018). The number of computers per school is 60 % higher in urban areas than in rural areas, illustrating the broader rural-urban gap in education.

However, the latest developments shown investments in digital tools such computers, tablets, software education or simulators. For example, more than 1000 km representing 30% from length of Danube is in Romania. Therefore, inland navigation sector is an important one for economy. Nowadays, due to Ukraine crisis, the cereals are transported on Danube River from Galati Port to Western Europe. In order to meet the increase of demand for crew personnel on board of vessels, education and training institutes started to invest in inland or maritime

simulators. CERONAV Constanta has invested in Full Mission Engine Room Simulator and University of Craiova is implementing a Inland Waterway Simulator.

Fig. 1.1 Full mission bridge inland navigation simulator

The main goal of this work is to create tools in Digital Reality (DR) to help teachers and trainers, who have been struggling to adapt to this new digital environment, in overcoming their difficulties, especially in terms of practical training delivery and assessment. The reason behind this work comes from the current reality we have been facing regarding COVID-19 [15-19]. The aims is to develop best practice examples for VET digital classroom using current digital tools for distance and blended learning such as Microsoft Teams, Google Classroom, Zoom, Webex, [20,21] etc. Learning Management Systems (LMS) have revolutionized the education system in the last decade. LMS is a software application that provides online tools and resources for instructors, administrators, and learners to manage and deliver educational content. The use of LMS has grown rapidly in recent years due to the benefits it provides to

institutions, educators, and learners. One of the primary benefits of LMS is its ability to enhance the learning experience for learners. It allows learners to access course materials, submit assignments, take quizzes and exams, communicate with instructors and other learners, and collaborate on projects. This means that learners can access the course materials and work on their assignments at any time and from any location, which provides them with flexibility and convenience. In addition to this, LMS allows instructors to monitor learners' progress and provide feedback in a timely and efficient manner. They can track learners' performance, identify areas where learners are struggling, and provide additional resources and support to help them improve. This helps to ensure that learners receive personalized attention and support, which is essential for their success. Moreover, LMS provides several benefits to institutions and educators. It allows institutions to streamline their course delivery process, reduce administrative costs, and manage resources efficiently. LMS also provides educators with a centralized platform to manage and deliver their course materials, which makes their job easier and more efficient. They can create and upload course content, monitor learners' progress, and communicate with learners and other instructors.

Furthermore, LMS provides institutions with the ability to track and analyze learner data. This helps institutions to identify trends and patterns in learner behavior, which can be used to improve course design and delivery. They can use this data to identify areas where learners are struggling, and adjust the course materials and delivery to better meet learners' needs. Another significant benefit of LMS is its ability to support remote learning. With the outbreak of the COVID-19 pandemic, the demand for remote learning increased significantly, and LMS played a vital role in facilitating remote learning. LMS provided learners and educators with a platform to communicate and collaborate, access course materials, and submit assignments from their homes. In conclusion, Learning Management Systems (LMS) have become an essential tool in the education system. They provide learners with

flexibility and convenience, and enable educators to monitor and support learners' progress more effectively. LMS also provides institutions with a centralized platform to manage their course delivery process, reduce administrative costs, and analyze learner data. With the increasing demand for remote learning, LMS has become even more critical in facilitating distance education. Therefore, it is essential for institutions to invest in LMS to improve their course delivery process and enhance the learning experience for learners. However, a weakness of LMS proved to be the lack integration of different DR tools into LMS functionality. In order to improve educational experience both for teachers and students, a collection of best practices has been developed for different areas of topics and specialization. The work performed can be summarized as follows:

- STEP 1: Selection of two best practices that you are using in teaching and assessment activity
- STEP 2: Describing the best practices:
  - Preparation for teaching/learning/assessment: describing the interaction with students in classroom:
    - Is it used specific digital tool like Google Classroom, Microsoft Teams or any other tools for creation the virtual classroom?
    - Is it use blended learning tools like teaching face-to-face and the assessment of practical training is done on a simulator or any other digital tool?
    - Is it used other methods for teaching that include digital tools for theoretical and practical training?
  - Describing in detail the methodology:
    - Teaching methodology (online, blended, etc.)
    - Providing the educational materials to the students
    - Giving assignments to the students

▪ Procedure for assessment of the students

The development of this work has been focused on presenting best practices in teaching, learning and assessment during COVID-19 pandemic. Based on their expertise in the field of education and digital tools for teaching, learning and the assessment, the authors developed documentation for teachers and students. The best practices developed cover various specializations for VET, as follows:

- Inland and maritime navigation
- Electrical and mechanical engineering
- Welding technology
- Judicial and police investigation
- Spray painting
- Photography and virtual tours

2. Selection of best practices

The development of new approaches in the digital era has been focused on presenting best practices in teaching, learning and assessment during COVID-19 pandemic. Based on their expertise in the field of education and digital tools for teaching, learning and the assessment, the contributors developed documentation for teachers and students. The best practices here presented were developed with scope of improving digital education and cover various specializations for VET, as follows:

- Online and Blended Learning using inland navigation simulator and gamification

Table 2.1 Online Learning best practices for inland navigation using gamification

Type	Theory	Practice	Application/Technology
Online	x		Google Classroom
Blended			Ship Simulator 2006
Physically			UCV LMS
Offline@home	x	x	Computer, Laptop
N.A.			
Description	How to use online environment for teaching and assessment		

Table 2.2 Blended Learning for inland navigation using simulators

Type	Theory	Practice	Application/Technology
Online	x		Google Suite Ship Simulator 2006 UCV LMS Computer, Laptop
Blended		x	Google Suite
Physically		x	Ship Simulator 2006
Offline@home		x	UCV LMS