

# DIGITAL AND ONLINE LEARNING IN VOCATIONAL EDUCATION AND TRAINING IN SERBIA

A CASE STUDY



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# **DIGITAL AND ONLINE LEARNING IN VOCATIONAL EDUCATION AND TRAINING IN SERBIA**

## **A CASE STUDY**

**BY ALESSANDRO BROLPITO, MICHAEL LIGHTFOOT, JELENA RADIŠIĆ AND  
DANIJELA ŠĆEPANOVIĆ**



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# EXECUTIVE SUMMARY

This case study aims to identify relevant policies and practices for digital and online learning (DOL) in vocational education and training (VET) in Serbia, with a focus on initial VET (IVET). The study was commissioned by the ETF with the following specific objectives: (i) gather information and analyse DOL provision in VET; and (ii) provide a set of recommendations.

The data-gathering component of this research consisted of field visits to eight secondary VET (SVET) schools in major cities in Serbia selected on the basis of their good practice in respect of DOL. The analysis is structured around the six cross-cutting elements of the European Framework for Digitally-Competent Educational Organisations (DigCompOrg), a European Commission initiative.

The subsequent paragraphs provide key findings, grouped by the cross-cutting elements of the DigCompOrg framework, and a set of recommendations.

## Key findings

### Infrastructure

A reliable and regular funding mechanism for the maintenance, renewal and upgrading of the existing equipment for DOL remains a challenge for all of the institutions visited. Most schools lack capacity and a system for administrative personnel to take care of the equipment. In most cases a single computer science teacher is responsible for maintenance and troubleshooting. Separate systems are provided for the teachers and the administrative personnel. All schools have their own website; the format is not standardised and the sites differ in their functionalities. Private sections of school websites are intended for teachers and students, usually including online learning management platforms such as Moodle. In relation to this, a recent report (OECD, 2015a) revealed that the number of 15-year-old students per computer in Serbian schools is much higher (8.8) than the OECD average (4.7). This contrasts with the situation regarding private access to computers and internet. In Serbia, 95.7% of 15-year-old students have at least one computer at home and 73.5% also have an internet connection. These proportions are higher than the OECD average.

### Leadership and governance practices

All the school principals expressed their strong commitment to DOL, but few had the necessary resources to carry through their ambitions, especially in relation to professional development. However, provision for DOL was absent from school development plans. Consequently, the actions relating specifically to DOL tend to be private endeavours by teachers and principals. Visions for realising innovation in learning and teaching practice are often mentioned retrospectively in school annual reports. The picture that is most often portrayed is one in which DOL practices are derived, for the most part, from external resources.

### Collaboration and networking

All the schools visited have wired and/or Wi-Fi internet connections. The majority of the schools visited also provide this service to students, but the extent of network openness differs. In most schools there are no existing policies in respect of openness and access to the technology platforms in the school. The schools have yet to develop net-safe policies. Current practices include restricting some websites and download speeds, and even closing the network to students. In several cases, schools reported that students do bring their own devices to school, but there is no standardisation of hardware specification. The open-source platform Moodle prevails as the learning management system (LMS) of choice. Moodle is also connected to the continuing professional development (CPD) provisions that all schools have, to different extents, undertaken.

## Content and curriculum

Digital learning is taught across the subjects, although in most cases this is not visible in the curricula documents. For some subjects the use of digital tools is an integral part of the curriculum, while in others it is based on the individual teacher's own initiative. As for the teachers, for those whose subjects 'prescribe' the use of DOL, it represents 50–60% of teaching time, whereas for non-computer science subjects, teachers use DOL only 30% of the time. In terms of open-source resources, teachers report that they are using open repositories with lesson plans such as Kreativna škola<sup>1</sup>, developed by the Institute for Improvement of Education in cooperation with Microsoft, and Digitalna Riznica<sup>2</sup> as part of the Razvionica project<sup>3</sup>.

## Teaching and learning practice

In general it is reported that approximately one third of teachers are proficient and continuously use DOL, about one third recognise the importance of DOL but have limited skills, while the remaining third are ambivalent or refuse to try out such practices. In all of the teacher accounts, social media emerged as a frequently used tool. Many students use Facebook, especially when the information needs to be shared quickly between teachers and students. In all of the schools visited it was apparent that a significant part of the CPD practice in recent years has been devoted to ICT skills, from basic computer skills to mastering LMS and other software. The school students interviewed observed that it is clear which teachers are devoted to using DOL, and in these cases the learning process becomes a mutual endeavour in which students learn from the teacher, and vice versa.

## Assessment

One of the main limitations of assessment practices in the education system in Serbia is the dominance of summative assessment. In this context the use of formative assessment – for example, using an e-portfolio, where students are encouraged to bring together examples of their best work – is rare. Impact assessment is usually carried out through self-evaluation reports, which then serve as vehicles for introducing and planning new sets of changes within the school. Although the practice was implemented a decade ago, there seems to be no measures in place to track DOL directly.

Overall, the research and analysis conducted in this case study suggests that, while DOL has been an influential idea (for example in championing some aspects of renewal in teaching and learning), in order to proceed further in a more systematic and coherent fashion it will be necessary to develop well-formulated DOL governance and a reference model against which to evaluate and assess the current stage of development and to provide a signpost regarding future directions.

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<sup>1</sup> [www.kreativnaskola.rs/](http://www.kreativnaskola.rs/)

<sup>2</sup> <http://digitalna.riznica.edu.rs/>

<sup>3</sup> <http://en.razvionica.edu.rs/project-overview/>

## RECOMMENDATIONS

### System-level policy recommendations

- A national DOL strategy should be developed in relation to VET, together with practical guidelines for schools, including a governance model defining clear roles and responsibilities, objectives, support infrastructure and resources.
- A set of minimum digital skills and DOL competences that VET teachers are required to have should be established. Digital competence should be acknowledged as a key competence and systematically supported by CPD.
- Better network administration support and clear network security and integrity policy guidelines need to be given to schools.
- A series of pilot studies should explore the scope for online curriculum delivery for youth and adult learners, thus covering IVET and continuing VET (CVET) from a lifelong learning perspective.

### School-level policy recommendations

- DOL should be embedded in school development plans, and schools should adopt monitoring and self-evaluation measures to review the progress of implementation.
- All teachers should receive more and appropriate support and guidance for developing their own digital skills. CPD programmes should include functional training in basic information and communication technology (ICT) skills and efficient operation of the LMS, and should also include new pedagogy.
- Schools should be responsible for adopting modern network policies aimed at ensuring the safety of learners and data integrity on the internet.



# 1. INTRODUCTION AND BACKGROUND INFORMATION

Today an increasing number of citizens interact, work and trade using digital technologies. Today's learners expect more personalisation and collaboration, and better links between formal and informal learning. Policymakers, experts and practitioners increasingly agree on the need for a major rethink of education and training systems in order to improve the responsiveness of VET systems to labour market and individual needs.

In this context, the ETF<sup>4</sup>, a specialised agency of the European Union (EU) based in Turin (Italy), provides advice and assistance to transition and developing countries to enable them to harness the potential of their human capital through the reform of education, training and labour market systems. For the period 2014–17, the ETF has as one of its strategic objectives the modernisation of VET systems within a lifelong learning perspective.

DOL is perceived as having an important role in increasing the attractiveness of and access to VET, thus contributing to the modernisation of VET systems. As a result, the ETF has launched a case study in Serbia with the following specific objectives: (i) gather information and analyse DOL provision in VET; and (ii) provide a set of recommendations.

## 1.1 Integration of DOL into education and training systems – an overview

More than 12% of public spending<sup>5</sup> across OECD countries is disbursed on education (OECD, 2015b). Raising the levels of achievement, as well as improving the overall attainment rates and the quality and equity of education and training, is of great importance to all stakeholders involved in the process (OECD, 2012).

In the light of this high level of investment and strong commitment from national governments, one third of reform measures in Europe are aimed at better preparing students for their future in the workforce by focusing on improving the quality and relevance of their VET programmes or increasing work-based training and apprenticeship systems. Such reforms are supported by policy frameworks that seek to guarantee that students can find a job or a place in further education (e.g. national strategies, youth guarantee policies or the development of qualifications frameworks).

However, besides creating and implementing reform measures, schools need to be supported to raise the quality of teaching and learning. The quality of teachers is key to the process, as without them education reforms cannot be expected to be effective (Hattie, 2009).

ICT has transformed almost all aspects of our lives and work (OECD, 2015a). A person incapable of navigating through a digital environment is today considered unable to take part fully in the economic, social and cultural life around them. From the perspective of an individual who has yet to enter the labour market, the set of skills developed during their education will largely have an impact on how effectively they can meet the needs of their country's economy. Given the overall impact of digital technologies worldwide, it is no wonder that ICT and, thus, DOL are seen as key instruments in providing a variety of tools that can open up new opportunities in the classroom (Ala-Mutka et al., 2008). These tools can, for example, help tailor the educational process to an individual student's needs; enable the implementation of individualised learning programmes; and provide learners with

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<sup>4</sup> [www.etf.europa.eu/](http://www.etf.europa.eu/)

<sup>5</sup> Public spending on education includes direct expenditure on educational institutions and education-related public subsidies given to households and administered by educational institutions.

the digital competences needed in today's society. In these various ways they can serve to advance the effectiveness of learning and learning outcomes, and nations' economies as a whole.

However, although many authors agree that DOL provides a number of ways to improve teaching and learning, its integration into existing educational programmes is seen as a complex process involving many different factors at both the teacher and the school level (Balanskat et al., 2006; Law et al., 2008). Those factors include teacher behaviours, beliefs and knowledge, and technological infrastructure, software, internet connectivity and technical support.

This means that schools, in addition to having specially trained ICT teachers, also have to provide all subject and general teachers with the knowledge and skills that will enable them to integrate DOL into their own practice. A decade ago, a positive trend was observed in teachers' use of computers in class, yet general motivation for its usage was to some extent questioned (Korte and Hüsing, 2007). It has become evident that the necessary professional development to enable teachers to integrate ICTs into their classrooms is not a 'once and for all' event. Teachers need regular support to keep up with the latest developments, and a lack of technical support is frequently seen as one of the main barriers to the introduction of ICT resources and DOL into daily routines.

In almost all European countries, specific strategies relating to digital competence and the use of ICT in schools have been adopted, yet data show that technology is greatly underused in the classroom. At both primary and secondary school levels, approximately half the students across the EU do not use computers in mathematics or science lessons, even when computer availability is not an issue (European Commission, 2012). In 2012, 96% of 15-year-old students in OECD countries reported having a computer at home, 72% of them reported computer use at school, though in some countries fewer than half of students reported using computers at school (OECD, 2015a). Against this background, it is salutary to see evidence that the impact of ICT on learning outcomes, and thus on student performance, is mixed, at best (Ibid.). Moderate use of computers at school tends to have better learning outcomes than infrequent use. The effects are reversed when students use computers very frequently at school, even after taking into account social background and student demographics. These results serve to support the arguments that, despite the significant affordances that DOL may bring to classrooms, technology can serve to enhance great teaching, but great technology cannot replace poor teaching (Ibid.).

## 1.2 Integration of DOL into the education and training system – progress to date in Serbia

Located in South Eastern Europe, Serbia is a candidate country with an ambition to join the EU, and is actively aligning its policies with legislation at the EU level. The structure of Serbia's compulsory schooling consists of four different levels (**TABLE 1.1**).

Secondary education (covering students aged 15–19 years) is provided in the following types of educational institutions (Centre for Education Policy, 2015):

- (a) general education schools – general and specialised;
- (b) secondary vocational schools (SVET);
- (c) secondary artistic schools;
- (d) combined schools – general education schools and secondary vocational or artistic schools;
- (e) secondary schools for adult education;
- (f) secondary schools for the education of individuals with developmental difficulties/disabilities.

**TABLE 1.1 A SCHEMATIC OVERVIEW OF THE EDUCATION SYSTEM IN SERBIA**

ISCED levels <sup>1</sup>	EQF levels	Education level	Structure			
8	8	Higher	III cycle	PhD students (180 ECTS)		
7A	7		II cycle	Graduate academic studies (60–120 ECTS) Master professional studies (120 ECTS)	Specialist academic studies (60 ECTS)	Specialist professional studies (60 ECTS)
6A	5, 6		I cycle	Basic academic studies (180–240 ECTS)	Basic professional studies (180 ECTS)	
3C 3D	4	Secondary	Secondary four-year education (secondary vocational schools and grammar schools)			
3B	3		Secondary three-year education (secondary vocational schools)			
2	2	Primary (compulsory)	Grades 5–8 (different subject teachers)		Total duration: eight years	
1	1		Grades 1–4 (one general teacher)			
0		Pre-school	Preschool preparatory programme (min. six months)			

Notes: (1) ISCED (International Standard Classification of Education) 2011 classification; ECTS – European Credit Transfer and Accumulation System

Source: Centre for Education Policy, 2015

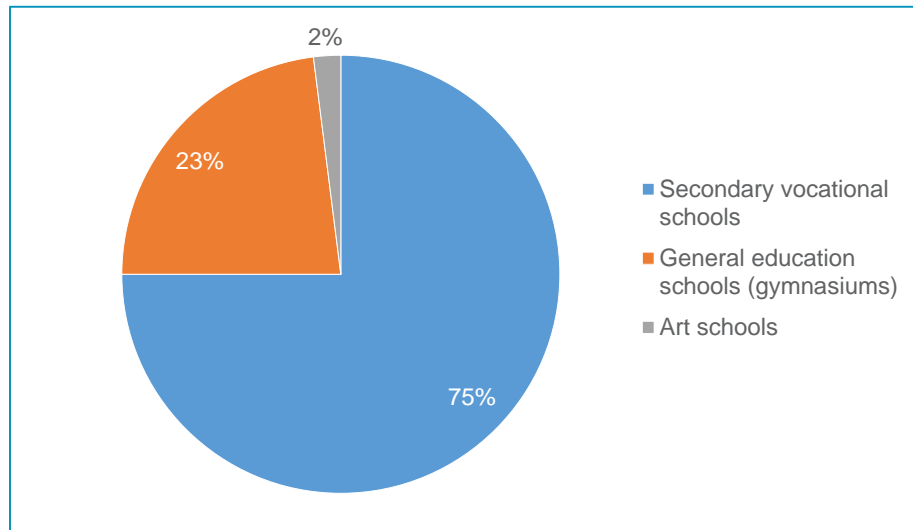
Over the past decade the structure of SVET, in terms of its duration, has shifted towards a four-year education programme offering a considerable number of specialist profiles; in 2014/15, there were 278 profiles, grouped into 15 sectors. Four-year programmes (general education and VET) offer the opportunity for students to continue their studies to higher education, whereas this is not an option for three-year profiles without taking additional exams to qualify for a four-year diploma as defined in the Law on Higher Education<sup>6</sup>.

Secondary schools enrol students who have completed compulsory primary education. According to data from the Statistical Office of the Republic of Serbia for the 2013/14 school year, 203 312 pupils (out of a total of 270 356) were enrolled in secondary vocational schools, with an equal representation of boys and girls.

The overall share of students attending SVET is 75% (**FIGURE 1.1**). Among the 75% of SVET students, the most commonly chosen sector is economy, law and administration (14.5%), followed by electrical engineering (9.8%), medicine (9.5%), mechanical engineering (9%) and trade, catering and tourism (8.5%) (Centre for Education Policy, 2015).

<sup>6</sup> [www.minoritycentre.org/sites/default/files/law-higher-education-serbia.pdf](http://www.minoritycentre.org/sites/default/files/law-higher-education-serbia.pdf)

**FIGURE 1.1 OVERALL SHARE OF PUPILS ATTENDING SECONDARY EDUCATION, 2013/14 SCHOOL YEAR**



Source: Statistical Office of the Republic of Serbia

In the past decade, Serbia has made considerable progress in defining its strategic vision for, and legal regulation of, the education system in general, and the VET system in particular. The country's major intentions and provisions are stipulated in the Law on Secondary Education (2013) and the Strategy for Education Development in Serbia 2020.

The Law on Secondary Education provides a comprehensive set of objectives for schools offering secondary education programmes. In particular, Article 2 defines the targeted key competences, although there is, unfortunately, no explicit reference to digital competences.

The Strategy for Education Development in Serbia 2020 highlights the importance of the role of ICT for education development.

The general aim of transforming the national education system, as envisioned by the Strategy, has received strong support from donors. Within the Instrument for Pre-Accession Assistance (IPA) in the budgetary period 2007–13, several projects that directly tackled vocational education were implemented and completed (e.g. Modernising the Vocational Education System in Serbia – IPA 2007; Quality Assurance within the Examination System in Primary and Secondary Education – IPA 2008; and Second Chance – Development of Functional Elementary Education of Adults in Serbia – IPA 2008).

Within IPA 2012, VET is represented by support for further modernisation of vocational education and the provision of equipment for practical work to vocational schools. IPA 2013 aimed at empowering local communities in the early detection and prevention of student dropouts. Within the same period, the National Qualifications Framework (NQF) for Pre-University Education was developed and approved by the Council for Vocational Education and Adult Education and presented to the professional public<sup>7</sup>; a unified NQF with qualifications at all levels of education and training is currently being developed. Implementation of pilot profiles in SVET has also been supported by donors, especially in relation to the equipment procurement necessary for adequate delivery of vocational education in those profiles. Some 25% of all 278 SVET programmes have now been reformed.

<sup>7</sup> [www.zuov.gov.rs/nacionalni-okvir-kvalifikacija/](http://www.zuov.gov.rs/nacionalni-okvir-kvalifikacija/)

Over the same period 2007–13, the development of DOL practices in their widest sense has been the responsibility of the following seven national institutions and bodies:

- Ministry of Education, Science and Technical Development;
- Ministry of Trade, Tourism and Telecommunications;
- Institute for Improvement of Education;
- Institute for Education Quality and Evaluation;
- National Education Council (NEC);
- Academic Network of Serbia (AMRES)<sup>8</sup>.

Nevertheless, none of these institutions has had a clear responsibility or a dedicated department for this policy area, nor has a steering body been established at national level with the purpose of coordinating and advising. As a consequence of these organisational features, the majority of ICT-related activities have been introduced only partially and within different educational projects<sup>9</sup>.

An important step towards the recognition of DOL as a relevant educational policy issue was taken by the NEC in 2013 through the introduction of their first Soft Policy Paper on ICT use in Education, Guidelines for Advancing the Integration of Information Communication Technologies in Education<sup>10</sup>. The document stipulates that the existence of computers and other ICT equipment is not the most important factor in the successful integration of ICT into the teaching and learning process. It is emphasised that school computers and equipment need to be integrated into the implementation of the entire teaching process, teaching activities in lessons and laboratories, during exercises and for homework completion. The document also provides many quantitative and qualitative data that reflect the current state of development and the application of ICT within the national system of elementary and secondary education. On the basis of a detailed discussion within each of the stated fields, 71 recommendations have been formulated. These aim to direct and harmonise future activities in order to achieve efficient integration of ICT within the education system, seen broadly, but with a clear focus on teaching and learning practice.

A second attempt to integrate ICT and DOL into current education policy in Serbia was made during 2014–15 through the revision of the indicators developed to monitor the education system. The indicators were initially developed by the NEC in 2009, and the revision included three additional areas, among them ICT. The revision of the indicators has not been officially adopted by the NEC owing to interruptions in their work during 2015, but the report on the revision of the indicators was accepted. The development of these indicators represents another serious attempt to embed DOL in education practice (**TABLE 1.2**).

Similarly, the only attempt at the national level to analyse current practices relating to ICT and DOL has been an online survey in 2013 by the Social and Poverty Reduction Unit<sup>11</sup>. SVET teachers were part of the survey, but the issue was not tackled specifically. It should be noted that, to date, there have been no VET-specific endeavours at the policy level specifically targeting DOL.

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<sup>8</sup> [www.amres.ac.rs/](http://www.amres.ac.rs/)

<sup>9</sup> <http://mtt.gov.rs/en/projects-and-funding-programs/>

<sup>10</sup> [www.nps.gov.rs/wp-content/uploads/2013/12/Smernice\\_sredjeno\\_cir.pdf](http://www.nps.gov.rs/wp-content/uploads/2013/12/Smernice_sredjeno_cir.pdf)

<sup>11</sup> <http://socijalnoukljucivanje.gov.rs/wp-content/uploads/2014/06/Istrazivanje-o-upotrebi-IKT-u-skolama-u-Srbiji-jun-2013.pdf>

**TABLE 1.2 OVERVIEW OF THE INDICATORS DEVELOPED FOR ICT IN EDUCATION**

Socioeconomic context	Coverage, progression, completion	Quality of educational achievement	Teaching and learning process	Educational resources
Availability of computers in general population	Percentage of students enrolled in educational profiles in ICT at ISCED 3 levels	Competence in the use of ICT according to the level of complexity of the execution of the ICT task	Number of teachers who have, in a defined period, completed CPD courses	Availability of computers and equipment in school
Availability of the internet in general population			Average number of lessons focused on ICT content in regular teaching plans	Availability of the internet in school
			ICT teachers in the education system	Availability of computers, educational software and the internet in teaching
			Learning goals in relation to ICT	Financing ICT in education
			Teacher ICT skills	
			School e-maturity	

Source: National Education Council

At the same time, OECD data (2015a) show that the percentage of students aged 15 years<sup>12</sup> who reported having at least one computer at home in 2012 is 95.7%, higher than OECD average, with a remarkable progress from 2009. The percentage of students who reported having three or more computers at home in 2012 is 10.7%, much lower than the OECD average. The number of students per school computer is 8.8, almost twice the OECD average. Although the average age of first computer use is slightly better than the OECD average, it is significantly worse when it comes to use of the internet. Computer games, both one-player games and online collaborative games, are more popular in Serbia than in any other country that participates in the Programme for International Student Assessment (PISA). More students in Serbia play games using computers than use email. As result, the proportion of students using the internet for schoolwork at least once a week at school and at home is only 24.9% and 48.7%, respectively (OECD average 41.9% and 54.9%).

Finally, and most importantly, integrating ICT into teaching and learning is a challenge, according to OECD data. ICT use at school is lower than the OECD average: 46% of 15-year-old students in Serbia do not use computers at school, despite the progress observed compared with 2009. At the same time, progress has been achieved in relation to access to the internet at school. Unfortunately, this is still below the OECD average.

<sup>12</sup> Data are based on the PISA survey cycles 2009 and 2012.

## 2. METHODOLOGY

The case study, conducted in 2015, adopts an explorative and comparative approach consisting of two strands of work. First, field visits took place in Serbia in July 2015, with visits to eight IVET schools (SVET, in the Serbian context). Second, an extensive literature review was conducted on the latest progress in DOL in developed and transition countries, followed by a comparative analysis with the information gathered on DOL in VET in Serbia.

During the field visit, interviews with school principals, teachers and students were based on three separate interview guides (see Annex). The three sets of guiding questions and the subsequent comparative analysis were structured on the basis of the European Framework for Digitally-Competent Educational Organisations<sup>13</sup> (DigCompOrg), a European Commission initiative.

The case study methodology also required the setting up of a steering group with members from the Ministry of Education, Science and Technological Development, the creation of a virtual community for online collaboration, and the contracting of two DOL experts.

As part of the dissemination activities, preliminary key findings were presented in a webinar on 18 November 2015<sup>14</sup>. The project started in January 2015, concluding its activities in December 2015.

### 2.1 Field visits to schools

FIGURE 2.1 CITIES AND NUMBER OF SCHOOLS VISITED



Eight SVET schools in major cities in Serbia were selected for the field visits. The selection was based on their good practice in respect of DOL provision. The selection process of schools to be visited was discussed with the steering group, based on information from the Ministry of Education, Science and Technological Development, after consultations with local experts involved in DOL and the recognition of quality of current practices in each of the schools. The list of schools to be visited was finalised in June 2015 (TABLE 2.1). A ninth school was also selected for the visit. Since this institution falls

<sup>13</sup> <https://ec.europa.eu/jrc/en/digcomporg>

<sup>14</sup> [www.youtube.com/embed/7F45j\\_OSAGw](http://www.youtube.com/embed/7F45j_OSAGw)

under the higher education system in Serbia, its practices are discussed in a separate section of this report (**BOX 3.4**). All the schools were visited by a team of two ICT/DOL specialists and two experts.

The visits took place between 6 and 10 July 2015, and interviews were held with school principals, several teachers and students attending the schools. All visits were announced in advance to participating schools. All interviews were conducted in Serbian and recorded with the approval of the participants.

**TABLE 2.1 OVERVIEW OF SCHOOLS VISITED DURING THE FIELD VISITS IN JULY 2015**

City	School name	Domain	Basic structural/organisational data	
Novi Sad	Vocational Secondary School of Electrical Engineering 'Mihajlo Pupin'	SVET	Number of teachers	181
			Number of students	1 800
			Student-computer ratio	7:1
	Special Primary and Secondary School 'Milan Petrovic'	SVET	Number of teachers	450
			Number of students	1 000
			Student-computer ratio	3:1
Niš	Electrical Engineering School 'Mija Stanimirovic'	SVET	Number of teachers	78
			Number of students	760
			Student-computer ratio	8:1
	Electrical Engineering School 'Nikola Tesla'	SVET	Number of teachers	88
			Number of students	786
			Student-computer ratio	7:1
Kragujevac	Polytechnic School	SVET, provides CVET in collaboration with FIAT	Number of teachers	140
			Number of students	2 000
			Student-computer ratio	10:1
Užice	Technical School	SVET, provides limited CVET	Number of teachers	100
			Number of students	1 100
			Student-computer ratio	10:1
Belgrade	Secondary Technical PTT School	SVET, provides limited CVET	Number of teachers	69
			Number of students	723
			Student-computer ratio	9:1
	Vocational Secondary School of Electrical Engineering 'Rade Končar'	SVET	Number of teachers	92
			Number of students	1 058
			Student-computer ratio	9:1

Note: FIAT – Fabbrica Italiana Automobili Torino

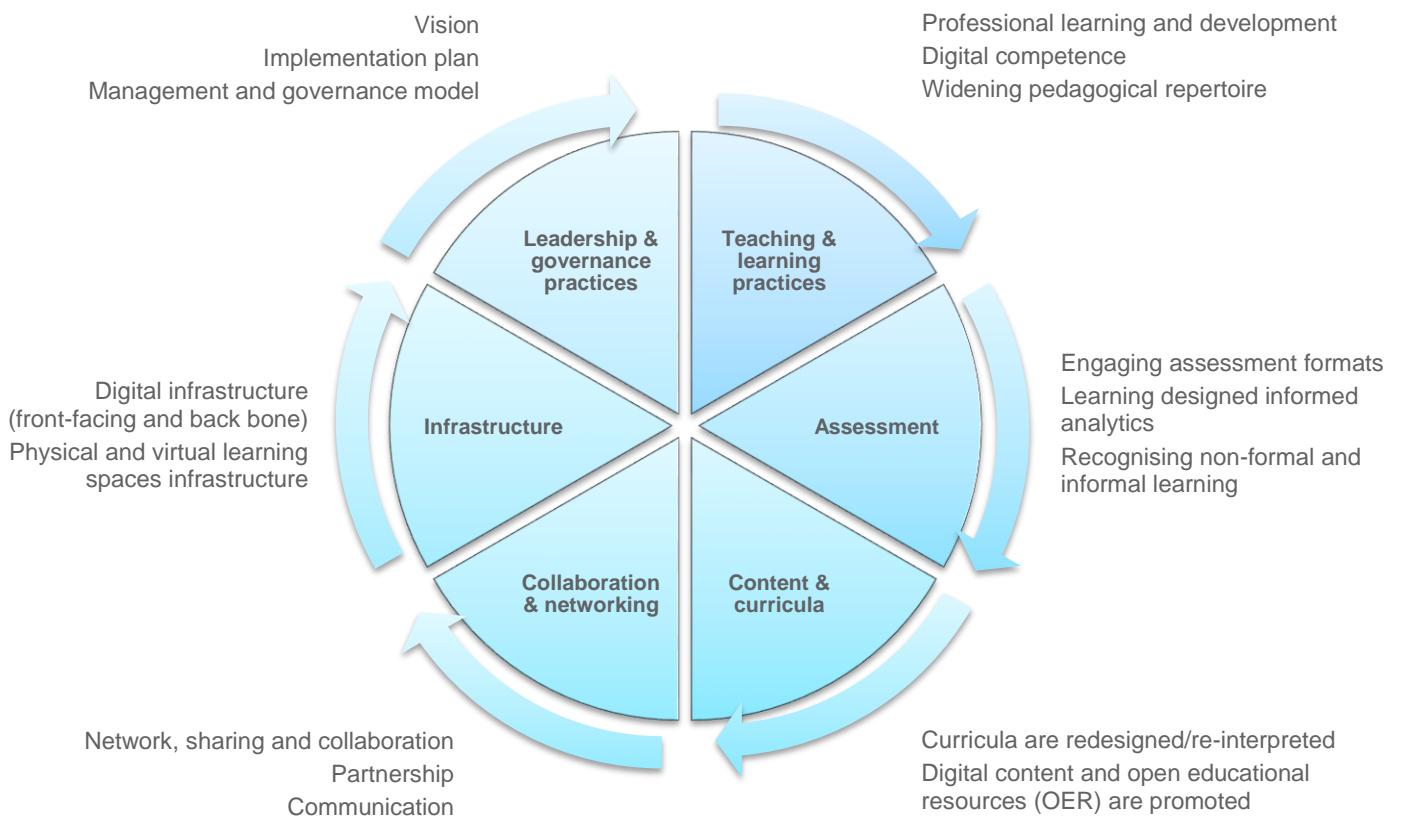


The interviewees included school principals with various levels of experience, from nine months to 14 years; they had all previously been teachers in their current school. In the case of the students, the team was able to interview them in five out of the eight vocational schools visited. The size of the groups varied from two to six students, and students were in the age range 16–19 years old. Teachers were interviewed in all of the schools visited. They were professionals from different educational profiles, both general subject teachers and vocational subject teachers. They also varied in terms of their years of professional service, from relatively new teachers to those who had been at the school for many years. In all cases the teachers were a reasonable representation of the school staff.

## 2.2 Instruments

As previously mentioned, three separate interview guides – for school principals, teachers and students – were defined on the basis of the DigCompOrg framework and focused on a number of cross-cutting elements (**FIGURE 2.2**).

**FIGURE 2.2 CROSS-CUTTING ELEMENTS OF THE DIGCOMPORG FRAMEWORK**



The framework fosters a systemic approach that emphasises the links between the cross-cutting elements for the effective integration and use of digital technologies by educational organisations. It has a clear focus on ICT-enabled innovation, but it is not technology-driven.

The framework also acknowledges multiple pathways to innovate organically over time, emphasising that (i) there is no single or best route to innovation; and (ii) either the change is systemic or it is not a change at all.

Given the overall objectives of the project, the framework presented itself as a good reference tool for building up the interview guides. In addition to this, school documentation, such as school annual reports, development plans and websites, were also analysed in respect of DOL practices.

## 3. KEY FINDINGS

The key findings are presented in the context of the six cross-cutting elements of the DigCompOrg framework.

### 3.1 Infrastructure

#### MAIN FINDINGS

- The basic infrastructure is sound, but the costs of hardware upgrades have, to date, been met largely from donors.
- All schools have their own website.
- The lack of a dedicated system administrator is a significant issue in most schools. Teachers often have to maintain networks, fault-find and troubleshoot problems.

The principals of the eight schools visited expressed favourable views in relation to DOL. They referred to the extent to which their schools are equipped with ICT resources, in terms of the equipment and software, as well as the connectivity. The approximate ratio of students to computers in the schools visited varies from three students per computer to ten students per computer (Table 2.1). The best student-computer ratio can be found in the Special Primary and Secondary School 'Milan Petrovic', in which assistive technology implemented through ICT plays an important role.

On average, the schools visited are equipped with up to two multimedia classrooms, up to ten computer laboratories and at least one additional space in which students are able to use digital tools online. Owing to the high percentage of students who travel to school from other neighbouring places, some of the schools, such as the Electrical Engineering School 'Mija Stanimirovic', use computers to make sure that students spend quality time before their transport arrives to take them home. This particular school has set up an additional space for these students, in which they can study using DOL tools.

At the school level, separate sets of resources are available for the administration and teachers in all the schools visited. These include both computers and internet connectivity. Nevertheless, a reliable and regular funding mechanism for the maintenance, renewal and upgrading of existing equipment represents a challenge for all of these institutions. The majority of the equipment received by the schools has been project- and donor-driven. Most schools have been involved in such programmes since 2000 (e.g. CARDS 1, CARDS 2, Application of e-learning methods in VET, Application of Microsoft 365). Especially over the past five years, there has been a visible trend to increase the acquisition and development of hardware, software and skills relating to ICT. However, schools lack systems for administrative personnel to take care of the equipment. In most cases a single computer science teacher is responsible for maintenance and troubleshooting. Special Primary and Secondary School 'Milan Petrovic' does have a system administrator, but it is only a part-time position, despite the fact the school has 181 teachers and 1 800 students.

School policies on Wi-Fi access vary, but all schools do have wired and/or Wi-Fi internet connections available. The majority of the schools visited also provide this service to the students, though the extent of network openness differs. Separate systems are provided for teachers and administrative personnel. While in some schools Wi-Fi is always open to the students, in others there are limits, such as the network being available only during breaks, or passwords being changed on a monthly basis and teachers deciding which students will have access, depending on behaviour and merit. In one of

the schools, the network is closely controlled and restricted, even in the computer laboratories. However, in none of the schools was there any explicit mention of safety policies, or of educating students how to be safe in an online environment and how to behave responsibly online in respect of digital property rights.

All schools have their own website (**TABLE 3.1**), although the format is not standardised and the sites generally have different functionalities. All include information about the school, its staff, the educational profiles offered and extracurricular activities available. They all have clearly stated titles, and in all cases there are evident attempts to make the home page attractive. However, in most cases the website design does not comply with international standards for accessibility. For example, the level of information displayed often demands vertical scrolling, and in some cases the site is cluttered. Despite this, there is general consistency in respect of overall colour use, button colour, position of navigation button and similar navigation features. With regard to structural issues, in general the pages load quickly and users are able to move around with relative ease, but the lists of links are organised differently on the different sites.

In some cases the website includes public and private sections. Private sections are intended for the teachers and the students of a particular school, and usually involve an electronic platform such as Moodle (e.g. Electrical Engineering School 'Mija Stanimirovic' has a section called 'E-learning'). Schools do differ in the relative visibility of the content of such sections. While in some cases the content is fully accessible, in others a password is required. When teaching materials are provided, they may be used as an open source; this is the case, for example, with Special Primary and Secondary School 'Milan Petrovic'. The Electrical Engineering School 'Nikola Tesla' has two additional websites, one dedicated to school activities and an electronic magazine for students ('Elektron'), and the other focusing on the Tesla Info Kup, a national competition established by the school. Webmail for employees. All websites include school pictures and/or promotional videos.

**TABLE 3.1 SCHOOL WEBSITES**

School	Website
Vocational Secondary School of Electrical Engineering 'Mihajlo Pupin' (Novi Sad)	<a href="http://www.etspupin.edu.rs/index.php/src/">www.etspupin.edu.rs/index.php/src/</a>
Special Primary and Secondary School 'Milan Petrovic' (Novi Sad)	<a href="http://www.smp.edu.rs/">www.smp.edu.rs/</a>
Education portal	<a href="http://www.milance.edu.rs/">www.milance.edu.rs/</a>
Electrical Engineering School 'Mija Stanimirovic' (Niš)	<a href="http://www.etsmijastanimirovic.edu.rs/">www.etsmijastanimirovic.edu.rs/</a>
Electrical Engineering School 'Nikola Tesla' (Niš)	<a href="http://www.etstesla.ni.ac.rs/">www.etstesla.ni.ac.rs/</a>
Tesla Info Kup (IT competition)	<a href="http://tik.etstesla.ni.ac.rs/">http://tik.etstesla.ni.ac.rs/</a>
Polytechnic School (Kragujevac)	<a href="http://www.politehnickakg.kg.edu.rs/">www.politehnickakg.kg.edu.rs/</a>
Technical School (Užice)	<a href="http://www.tehnickaue.edu.rs/">www.tehnickaue.edu.rs/</a>
Secondary Technical PTT School (Belgrade)	<a href="http://www.pttskola.edu.rs/">www.pttskola.edu.rs/</a>
Vocational Secondary School of Electrical Engineering 'Rade Končar' (Belgrade)	<a href="http://www.koncar.edu.rs/">www.koncar.edu.rs/</a>

The principal and students of the Electrical Engineering School 'Mija Stanimirovic' reported dissatisfaction with the school's website and the extent it is being used. A plan has been implemented to revise it in order to make it more of a place for student interaction. In order to ensure that this happens, when the site is revised there will be full student involvement, and students will also act as site administrators.

### **BOX 3.1 INTEGRATION OF ASSISTIVE TECHNOLOGIES (AT) AND ICT TOOLS FOR STUDENTS WITH SPECIAL EDUCATIONAL NEEDS AT SPECIAL PRIMARY AND SECONDARY SCHOOL 'MILAN PETROVIC', NOVI SAD**

The education and rehabilitation of students with special educational needs is based on a lifelong learning perspective. Services and support to students and their families are available from students' birth to adulthood and integration into the wider community. The school has around 13 000 m<sup>2</sup> of available space, while the building covers some 7 000 m<sup>2</sup>. Within one building, there are 18 different artisan workshops, a playground with an indoor court, a dormitory for 40 students, a rehabilitation centre for sensory stimulation, a resource room for AT, a work centre, and an extended rehabilitation programme for individuals with a disability. The school is well equipped, and has a 'bring your own device' (BYOD) policy. All students and teachers have full internet access through Wi-Fi. Major developments have taken place within the past five years, during which time the school has acquired increasing amounts of ICT and AT, and teachers have participated in a substantial number of training courses relating to technology use. The organisational structure is flexible: the teachers are available wherever students are, whether face to face, online, at home or even in hospital, and provide formal and informal training. Two working teams have been established, the ICT team and the AT team.

The school's programme provides a framework for teaching and support activities. Owing to the wide range of learners' disabilities, the work is usually organised around each individual student, according to the Individual Educational Plan (IEP). The IEP is learning-outcome-based and is prepared by between two and ten experts from the school. Once every three months the IEP is assessed and revised. An assessment for the use of the specific AT for a particular student is carried out prior to the development of the IEP. For learners with multiple disabilities, ICT is almost the only teaching tool that can, when combined with a particular method, foster developmental change. There are many individual examples of transformative practice using AT. For example, one student had serious difficulties expressing himself, and teaching staff persisted in finding a device to help him to establish basic communication. When they found it, he started reading and writing and is now able to enrol in adult education.

AT and ICT are seen as crucial elements of school life, of teaching and learning processes, and of facilitating students' potential. In 2008 the school established 'Milance', a learning portal based on the Moodle LMS, for the purpose of organising learning activities inside and out of the school. The portal contains resources and activities structured around key curricular requirements for the primary schools (Serbian language, mathematics, science) and additional content, which adds to its attractiveness (ecology, sports, ICT, etc.).

## 3.2 Leadership and governance practices

### MAIN FINDINGS

- School leaders are consistently strong in their support of DOL.
- DOL does not feature prominently or explicitly in strategic plans.
- School leaders state that a critical mass of committed and skilled teachers is necessary to carry forward changes in respect of DOL.

In most cases strategic planning for DOL should be an element within the overall school development plan. Each school is obliged to make a concrete plan for the following three to five years. Implementation of the school development plan is carried out through an annual school programme. Despite the fact that in the interviews with both staff and students a clear reference is made to DOL practices, these are frequently not strongly evident in the development plans. Rather, several of the plans include implicit statements in the section on teaching and learning, such as 'to improve and widen active teaching approaches'. ICT is directly mentioned in only two cases, but these are more in connection with overall management processes in running the school. Similarly, the maintenance and provision of new equipment for ICT and DOL are contained within general plans for equipment upgrades. Consequently, actions relating specifically to DOL remain, to some extent, private or personal endeavours by teachers and/or principals, and this serves to reinforce a tradition based on donor aid. Even when DOL proposals are seen as part of systemic planning, the supporting documents do not clearly reflect the integration of the vision. It is evident that, in most cases, school administrators do need support on this issue.

Although the leadership styles and capacity vary from school to school, it is evident that school principals do have a clear perception of the importance of DOL in providing up-to-date school pedagogy. This clear vision is present at least at the level of public discourse, and in the recognition that future capacities must be increased in terms of both human resources and technology in order to realise the vision. In that sense, all principals are very much aware that they must act as both pedagogical leaders and good managers who support innovative teachers and make sure that these individuals have all the technology needed to move forward. As one principal pointed out, 'it is up to me to get it'. Yet, despite such clear verbal commitments, the written records to support the ambition are rarely available. The visions for realising innovation in learning and teaching practice are often mentioned retrospectively in school annual reports. The picture that is portrayed most often is one in which DOL practices are, for the most part, derived from external resources, and are donor-driven.

All the principals interviewed were aware that, if DOL practices are to be support and further sustained in their schools, there must be a critical mass of teachers, coupled with an adequate set of skills. In that way, even when they step out from their positions, 'things will not go back to the old ways'. A consistent finding of the consultancy team was that in all of the eight schools, a core of skilled and committed teachers does exist. However, it is questionable whether or not this represents a critical mass that is capable of transforming the professional practice of all teachers across each establishment.

In the schools where the team had the opportunity to talk to the students (five out of eight schools) the students who were interviewed were clear that their schools are making great efforts to improve teachers' skills relating to DOL. Students consistently said that those teachers who had taught them in the lower grades using technology had progressed with their teaching skills and their mastery of technology. The students also observed that it is clear which teachers are committed to using DOL, and in these cases the learning process becomes a mutual endeavour in which students learn from the teacher, and vice versa.

The team found a good example of this in one of the schools visited in Niš. In order to promote DOL in the school and to promote the school's brand, Electrical Engineering School 'Nikola Tesla' has set up an IT competition, Tesla Info Kup. This now operates at a national level, and over the years, has become part of the Ministry of Education, Science and Technological Development's annual calendar, with teachers and students participating as equals in it every year.

In some of the schools visited, CVET was delivered using DOL; however, this sector as a whole remains underdeveloped. Examples of good practice were reported in schools in Belgrade and Užice. The only examples of an effective and deep partnership with the private sector were found in a school in Kragujevac. For years a partnership has existed with FIAT and through ATC Serbia project (Automotive Training Centre for Central Serbia)<sup>15</sup>. Secondary Technical PTT School in Belgrade also provides training and is a testing centre for the European Computer Driving Licence (ECDL).

### **BOX 3.2 CONTINUOUSLY REFORMED AND ICT-ORIENTED VOCATIONAL SCHOOL: TECHNICAL SCHOOL, UŽICE**

The Technical School in Užice covers four areas: engineering and metalworking, electrical engineering, metallurgy and graphics. It currently has 38 classes, 19 educational profiles and 122 employees, 98 of whom are teachers. Since 2003 the school has been actively involved in various projects relating to VET and DOL. Although the school is still struggling with providing full Wi-Fi access and is not equipped to a satisfactory level, it has been decided to use the Moodle LMS as the main school teaching and learning portal and Microsoft Office 365 as the main school administrative and management tool (although the school started with Live@EDU and SkyDrive in 2012). The selected software has now been integrated, as this feature became available in mid-2015.

The school started to provide ICT training for its teachers in 2001. The first school portal was developed in 2006. Using Moodle, 20 teachers have developed online lessons and organised activities (tests, quizzes, glossaries) within 20 subjects. The portal has been updated and innovated with new content ever since. All teaching plans are submitted electronically and emails are used on a regular basis for the internal exchange of information, although the content is structured around teachers' folders, which are accessible to all staff. Mailing lists have been established to allow quicker and more targeted internal online communication.

There is a strong emphasis on the quality of school management, as per the European Foundation for Quality Management (EFQM) model. Teamwork and matrix-management are the preferred management styles. A substantial number of teachers are seen as online educational activists who run blogs, participate in webinars, have Facebook groups, develop websites, create electronic collections of resources, use presentation software, and experiment with the use of electronic student diaries and the use of mobile phones for teaching and learning purposes. The school has recently organised information literacy training in the library premises for the students in their final years at the school to help them prepare for their future academic studies in higher education.

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<sup>15</sup> [www.rsedp2serbia.eu/project/support-to-grant-scheme/project28/](http://www.rsedp2serbia.eu/project/support-to-grant-scheme/project28/)

### 3.3 Collaboration and networking

#### MAIN FINDINGS

- Moodle is the LMS of choice in all the schools visited.
- BYOD is becoming commonplace, but no minimum functional specification is yet evident.
- Access to Wi-Fi varies widely: some networks are securely 'locked down' with no open access, while others are less restricted.
- A wide range of cloud-based storage is in use, but no specification or standardisation exists.

In the vast majority of the schools visited there are no existing policies on the openness of and access to the technology platforms in the school. The schools are yet to develop net-safe policies. Current practices relate to restricting access to some websites, limiting download speed, or even closing the network to students. In schools where there are student dormitories, the policies also differ in respect of the extent of internet access that is available via the school network. In some schools the access is fully open (e.g. PTT school), while in another schools only a single room with computers is available. This is linked to a more general issue of network management and schools as 'gatekeepers' of unsuitable online content. So long as net-safe policies remain underdeveloped, the role of the 'gatekeeper' can easily become one of 'censor'.

In several cases, the team was told that students do bring their own devices to school (i.e. tablets, laptops and smartphones), though policies vary widely as to how, when or whether these devices can be connected to the school network. Students reported that it is easier for them to use their own devices when they are allowed. However, others said that it is not necessary for them to bring their own devices as the schools themselves have the necessary equipment for the needs of the current curriculum.

The open-source Moodle platform prevails as the LMS of choice. This has been influenced by the CPD provision that all schools have undertaken, which has been closely linked to the functional operation of Moodle<sup>16</sup>. In addition to Moodle, some students and teachers are also active users of Edmodo. All teachers mentioned Facebook as a place for information exchange and sharing, although a limited type of information is shared there, such as notes from classes or, more frequently, short announcements that need to reach a wider group of students.

As part of the functionality within the Moodle, repositories of various resources and forums are used predominantly for exchanges between students and teachers. In this environment students can ask questions, upload their own homework or download course presentations. Some students reported that when they need a teacher's help, they preferred face-to-face meetings or, at least, personal contact through email. Although no learning analytics were seen being used to monitor exchanges among students and teachers, it might be argued that such tools could serve to limit interactions and the frankness of exchanges. This also raises another issue. Many teachers have been educated to use Moodle through professional development courses that cover only a small subset of functionalities. Is such highly focused product training the best strategy for preparing teachers for the DOL environment? Alternatively, should training be more generic, in a way that allows teachers to choose the tools that they need rather than use only the small set about which they are taught out of convenience?

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<sup>16</sup> Office 365 is used in two schools. In one this is solely for administrative purposes, while in the other the system will also be available to the students in the next school year.



### **BOX 3.3 CONNECTIVITY, OPENNESS AND STUDENTS AS AGENTS OF CHANGE IN ELECTRICAL ENGINEERING SCHOOL 'NIKOLA TESLA', NIŠ**

Electrical Engineering School 'Nikola Tesla' has operated for four decades. It covers three- and four-year educational profiles. Among the four-year profiles, with direct access to tertiary education, are those for computer technician, electrical automation, electrical electronics, electrical refrigeration and cooking appliances, electrical process control and electrical engineering. At the beginning of the 2007/08 school year, through participation in the second stage of the reform of vocational education (CARDS 2), under the auspices of the EU and the European Agency for Reconstruction, the school introduced a new experimental four-year educational profile for mechatronics technicians.

The school has made continuous improvements to its equipment, both hardware and software, as well as to the strength of connections available in the school. The school has a unique computer network, which is part of the academic computer network. The Moodle LMS is the main school teaching and learning portal, with the Searle repository system for the students within the LMS, in addition to the lectures and exercises posted by the teacher.

The Ministry of Education, Science and Technological Development and the Electro-technical School 'Nikola Tesla' in Niš are joint organisers of school, regional and nationwide IT competitions for elementary school students, Tesla Info Kup. Since 2014, the competition has been organised within the 'Information and communication technologies in the service of the competition of elementary school students in the field of computer science' project, co-financed by the Ministry of Foreign and Internal Trade and Telecommunications. The aim of the competition is to popularise modern ICTs, and it plays a very active role in the preparation and total organisation of the students in the school.

The competition is organised at three levels – school competition (qualification), regional competition (semi-finals) and national competition (finals) – held at the school in Niš. All questions and tasks in the competition are in the fields of informatics and computing (available at: <http://tik.etstesla.ni.ac.rs/vezbaonica/course/view.php?id=2>).

Of the eight schools visited, only one provides an online space as a students' repository. In other cases, students use personal repositories such as Dropbox or Google Drive. However, although Google Drive is used, it is evident that students are not utilising all functionalities of the system. When the team asked the students how they would organise online collaboration on an online document, the dominant answer was that they would send documents via Facebook, and not that they would use, for example, Google Docs.

Although the Google search engine is the most common method used by students to find online resources, all reported that they do have good libraries in schools and that they frequently use them. Students in Kragujevac were especially proud of their library, which has 30 000 books. However, it should be noted that these are technical books relating to specific engineering profiles and subjects. At the same time, students attending multimedia and programming courses often reported that no books are yet available on a particular subject and, consequently, Google is the only way for them to find the information sources they need.

All of the students interviewed said they also have online access from home, as do the majority of their classmates. There is a rough estimate that in the least developed areas, student access at home falls to 50% and in the most developed areas it is almost universal, though around 10% of students have only limited access to internet and online resources.

### 3.4 Content and curricula

#### MAIN FINDINGS

- DOL is evident across the curriculum in most subjects, but its expression is teacher-dependent.
- Only a hazy understanding of digital property rights and net-safe policies exists.
- Open-source repositories are being used by teachers.

The team was able to hear both principals' and teachers' views on the curriculum and its content. Both parties agreed that digital learning is taught across the subjects. However, in most cases this is not visible in the curriculum documents (i.e. implicit or described among expected learning outcomes), and restrictions already exist in terms of the way the curriculum is implemented in the education system as a whole.

The Serbian education system, and its related teaching practices, is organised on the basis of prescriptive teaching programmes with fact-based outcomes relating to specific subjects. Comprehensive curricular reform has yet to be implemented. This means that for some subjects it is natural to use digital tools, while in others the use of such tools depends on the individual teacher's own initiative. However, irrespective of implicit or prescriptive visibility, based on information that the case study team were able to gather, as well as the digital content that is officially prescribed, there are several examples of additional opportunities to use DOL as part of the subject content. This is in line with the students' accounts that they have multiple opportunities to gain various ICT skills and to learn in a digital environment. As for the teachers, those whose subjects 'prescribe' the use of DOL report that this is done 50–60% of the teaching time, whereas for non-computer-science subjects, teachers use DOL for 30% of the teaching time.

In some of the new education profiles, such as 'multimedia' (in which students have been enrolled for three years), the team found that DOL is necessarily a dominant component of the curricula. Such provision only contributes to an already uneven and somewhat muddled situation, as there are many and varying levels at which DOL is present or absent in different part of the curriculum. For example, there are up-to-date education profiles with a strong DOL emphasis in all subjects; there are subjects and profiles in which DOL is present but the curricula need to be updated; and there are subjects that do not require DOL at all, but as a result of the interest of the teacher, students have the opportunity to make use of it. This situation restricts the development of an effective process whereby DOL provision as a whole can be monitored.

With regard to open resources, teachers reported that they are using open repositories with lesson plans such as Kreativna škola (developed by the Institute for Improvement of Education in cooperation with Microsoft) and Digitalna riznica (as part of the Razvionica project). Participants also reported using open-source software (OSS). However, it is worth noting that in the majority of interviews with the students, they do not fully appreciate the meaning and relevance of OSS. In some cases they confused this with meaning that they have open-access Wi-Fi in school. The only clear example of students having a good understanding of OSS was in Electrical Engineering School 'Nikola Tesla' in Niš.

The reasons behind this hazy appreciation of OSS are diverse. For example, the existing software in the school may be adequate for the quality provision of the subject curricula; teachers may be unaware of the existence of specific open code; or teachers may not know how to use such software, or simply be disinclined to use it. Regardless of the reason, this lack of understanding of the whole area of intellectual property rights, Creative Commons and commercial licensing has implications for practitioners (teachers, students and principals).

### 3.5 Teaching and learning practices

#### MAIN FINDINGS

- In most schools about one third of teachers are keen DOL users, one third are beginning to incorporate DOL, and the remaining third carry on with existing practices and do not use DOL.
- Teachers are often strongly committed to DOL, but little transformational practice is in evidence in most cases.
- Social media sites are widely used by both teachers and students, mostly as a means of communication.

One of the important evidence indicators of 'maturity' for DOL is the extent to which teachers view digital learning as simply an extension of regular classroom practice or as a means of facilitating learning and teaching in original and novel ways. In this respect, the teachers interviewed expressed a range of views. At one end of the spectrum, the technology enthusiasts were using DOL in original and stimulating ways, while at the other end, teachers who were not at all in tune with new technology were continuing to teach in a way that barely acknowledges the existence of the digital world. What is a common reference is the fact that all teachers say that when they first started using DOL in their teaching, it was difficult and demanded additional preparation. However, once DOL had become part of their practice, no additional time was necessary, as it was part of the regular process of planning and preparation.

Nevertheless, the mere understanding of 'part of regular practice' seems to be a point of diversion among the teachers. While some observed DOL at the level of 'either/or' practices, others saw it as the extension of regular work, with face-to-face teaching still seen as the 'real' teaching. A third group spoke of 'integrated practices'. These answers are largely in accordance with the accounts of principals and students, namely that in their schools one third of teachers are proficient in DOL and use it continuously, one third are still ambivalent or refuse to try out such practices, and one third are somewhere in between. In answers from both principals and students it was evident that the use of DOL in teaching is related not to the age and experience of the teachers but rather to their attitudes and motivation. Over the years, more and more teachers have developed an open and welcoming attitude towards DOL, while students notice that if a teacher applies DOL, he or she is fully committed to it, and from the students' perspective, learning then becomes a mutual endeavour.

But how does the introduction of DOL change teachers' practice? From the narratives of the teachers interviewed, those who believe they have integrated DOL into their own practice acknowledged that working in the DOL environment does effectively mean 'turning everything upside down'. They have to change the way they observe the learning process, and how they observe the students' role and their own role in it. This indicates that they are prepared to become much more reflective practitioners beyond their normal subject material. The amount of literature that teachers need to assimilate increases, and some of them recognise that they will be on a continuous learning pathway following the introduction of DOL. This changes how they prepare their own lessons and how they conceptualise the whole teaching and learning process. All the teachers interviewed perceived that the use of DOL makes them more available for students and enables them to reach those who are not in school regularly. In addition, teachers who have students with special educational needs or who are working in special schools reported that using DOL has introduced a whole new palette of tools that has allowed them to be more effective teachers when working with this category of student. In this context, learners' potential that has not been evident during regular teaching suddenly blossoms with the availability of the new digital tools.

In all of the teacher accounts, social media emerged as a frequently used tool. There are differences in what information is shared, for example, through Facebook, and this again is in line with the accounts given by the students, who are themselves very active in the exchange of learning materials via the social networks. Facebook is used to reach a larger group of students – ‘the group’ – and is also used when the information needs to reach students fast. Other means, such as the LMS or personal email, are widely used, though this is for one-to-one communication. Teachers said that they still prefer face-to-face contact, but that they are aware that personal email, LMS and social media do help them to reach the more disaffected students and those who are absent, but also simply to be more available outside official working hours.

Students perceive the school as a place that allows them a variety of opportunities to develop their own information literacy skills in several of subjects taught in school. This is understandable if viewed from the perspective of vocationally oriented subjects, as the vocational schools visited offer a variety of educational profiles relating to ICT, programming, multimedia, etc. However, students stated that such practices are also often visible in general subjects, such as mathematics, biology, history and languages. This confirms the important finding of this case study, namely that the use of DOL is not restricted by teachers’ age, subject matter or prior experience. However, it is important not only that students notice these efforts, but that they also share the idea that when DOL is used in so-called non-programming subjects, it is done with care, and that teachers are willing to learn how to be better in using technology to enhance learning.

This finding has significant consequences if it is assumed that digital competence is a necessary transversal competence, along with numeracy and literacy. Are those teachers who are reluctant technology users providing equality of opportunity for their students? Furthermore, if we consider that educational standards in transversal competences, including digital competence, for secondary education are obligatory for everyone, the question is why not all teachers within all subjects offer equal opportunities for students. The answers emerged from the interviews with teachers. While in some schools the current infrastructure does not support this, at the same time not all teachers are ready to use DOL, nor are they sufficiently equipped to support students’ development in this area. Thus, the issue relates to a combination of both teacher- and school-related factors. It also reinforces the fact that the introduction of DOL in a purely hardware-led fashion will not have a significant impact. Rather, DOL should be introduced in a meaningful and properly contextualised way so that its benefits are evident even to the most reluctant teachers.

In all of the schools it was apparent that a significant part of the CPD practice in recent years has been devoted to mastering ICT skills, from basic computer skills to the LMS and other software. In this respect, both teachers and principals noted an increased interest from teachers for seminars in this area, or on various subjects relating to teaching within an online environment. However, it is unclear to what extent these seminars were oriented towards profoundly changing teachers’ practices by also changing their beliefs about the teaching and learning process. The CPD content could merely have been covering topics of immediate relevance to the teachers, such as assessment and reflective practice in an online environment. Both types of training are important, but it has been found that a balanced approach containing the right amount of each is most effective in bringing about lasting change.

Shortage of funds was an obstacle mentioned in all of the schools, and this is an issue that affects the functioning of schools in Serbia more generally. Nevertheless, when there are opportunities, those who are interested seem to find a way to attend their chosen training courses. Some principals noted that, despite this high level of interest, there are still teachers who refuse to attend DOL training or, even when they do, they make no effort or are unable to actually apply and use the skills and knowledge gained through training and professional development.

When speaking of successful experiences relating to DOL training, most teachers mentioned Partners in Learning seminars (in collaboration with Microsoft) and seminars within the Razvionica projects (use of different online tools in teaching and general topics relating to teaching within a digital environment) as the most useful training events they have attended. Some schools have a specific focus for their training on first consolidating basic ICT skills before progressing to training on the LMS. However, there is an emerging picture that the mechanics of how to use digital tools is, by now, fairly familiar to many teachers, and that they are more inclined towards online training as it is more convenient for them in terms of use of their own time and resources. As previously mentioned, the proportion of the training that relates to the mechanics of LMS and other digital tools as opposed to how the learning process changes in an online environment is rather unknown.

### 3.6 Assessment

#### MAIN FINDINGS

- A great deal of testing takes place in the LMS through the use of online tools and facilities.
- Assessment is mostly summative and fact-based; there is little assessment of application through, for example, e-portfolios.
- Impact assessment is mostly on the basis of school self-evaluation reports.

It is helpful to consider assessment in three ways: diagnostic, formative and summative. Diagnostic assessment takes place at the beginning of a learning programme to ascertain a student's knowledge and prior attainment of special educational needs. Formative assessment is an integral part of the learning and teaching process, whereby the learner is given regular feedback on how they are performing and the areas on which they should concentrate in order to improve. Summative assessment is the final component of a learning programme, and is an opportunity to confirm the knowledge, skills and understanding of the learner. Summative assessment needs to be authentic and verifiable. In order to be authentic, the assessment must not simply be an exercise in knowledge recall, but should test the learner's capacity to manipulate and apply the knowledge. It should be verifiable, so that there is a high degree of confidence that the learner taking the test is the authentic subject (not an imposter); that the knowledge, skills and understanding could be reliably demonstrated again in controlled conditions; and that the grading of the assessment is free from assessor bias and is based on objective criteria.

One of the main limitations of assessment practices in the education system in Serbia is the dominance of summative assessment. This is coupled with a restricted understanding of assessment modalities and actual application of formative modules. The information gathered from the students' interviews confirms the prevalence of this type of assessment. Although teachers may include oral questioning, project and assignment work in addition to tests to assess students, grades are always given as a summative indicator.

It is worth noting that at least half of the students interviewed reported the administration of regular testing practices online (within the Moodle environment). However, these also have summative purposes. Only a few students mentioned that they perform not-for-grade online testing as part of the teaching/learning practice prior to for-grade testing. In that sense, the available tools are used to extrapolate existing assessment practices and not to add something new, such as changing cognitive activation in relation to the task students are involved in, or creating an e-portfolio. Even when online testing is performed, it is carried out on the school premises.

In this context of formative assessment, and in the overall context of DOL practices, an e-portfolio, in which students are encouraged to bring together examples of their best work, is an ideal vehicle for creativity and confidence-building and as a means of allowing 360-degree feedback (including peer assessment) of their work. Online quizzes are often described as being ‘formative assessment’, and to some extent this is true. However, since these assessment tools rely too much on short-term factual recall, they are not really assessing ‘authentic learning’ in the same way that an extended piece of writing – or, indeed, an e-portfolio page – can demonstrate these high levels of synthesis that characterise deep learning in a behavioural sense. Furthermore, diagnostic assessment, such as recognising and accrediting prior and non-formal learning, is a key element in ensuring equality of access and opportunity. A well-constructed e-portfolio, the contents of which have been verified through a formal process, is an excellent means of showcasing a prospective student’s competences and creativity, as well as acting as a receptacle where formal qualifications and credentials can be stored and, as necessary, displayed. The means for achieving this already exist in the LMS used by teachers. Unfortunately, the practice is still seldom used in a systematic way. Most of the students interviewed have their own online cloud-based repositories (such as One Drive, iCloud or Google Drive) where they store their assignments, artefacts and digital resources, but none of them showed a real sense or understanding of how these could be organised in a way that would demonstrate their knowledge, skills and competences.

Assessment in Serbian schools is currently almost always summative. It is seldom used formatively to evaluate students’ achievement and give them feedback on progress; nor is it used in an institutional sense as a corporate strategy to monitor progress and bring about change. One of the principles of successful continuous institutional improvement is that an institution should be focused on purposive and evidence-based change of practice through a system of (self-)assessment and reflection that is established across the institution as a whole. In schools in Serbia this is usually done through self-evaluation reports that then serve as vehicles for introducing and planning new sets of changes.

Finally, although DOL has been implemented for more than a decade, there seem to be no measures in place to track it directly. When the team asked teachers in the schools visited about it, they often said that a ‘smile on the students’ face’ and a perceived increase in students’ motivation are sufficient indicators for them. While this may be the case, and can be acknowledged as important pieces of information when teachers interact with students, it also indicates that there is no systemic follow-up of the impact and effectiveness of practices that are being introduced. Teachers did mention demonstrating model and experimental lessons, which are part of the obligatory in-school CPD, though it still seems that no measurement of the direct effects is carried out. Some of the model and experimental lessons mentioned may have been prepared in collaboration with colleague(s). However, again, besides the visits to such lessons by the school psychologists and/or pedagogues, no other tool for measuring impact seems to exist. In that sense, it is not surprising to find that there is very little additional information in the school development plans in relation to transformational professional practice through the implementation of a detailed strategy for DOL.

### **BOX 3.4 SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING OF APPLIED STUDIES: A SUCCESSFUL EXAMPLE OF DOL IN HIGHER EDUCATION**

As part of the field visits, the team also visited a ninth education institution, the School of Electrical and Computer Engineering of Applied Studies. The academic staff vary in terms of their length of professional experience. As in the other institutions visited, the team was given the opportunity to discuss various issues relating to DOL practices with both general and vocational subject teachers. Because the semester had finished and it was the middle of the examination period, there were no opportunities to include students in the interviews.

The school is an educational institution within the higher education system of Serbia, and in this respect it differs from the other purely vocational schools that the team visited. The institution offers seven study programmes of three years' duration, which, on completion, grant 180 European Credit Transfer and Accumulation System (ECTS) points. The programmes are audio and video technologies, automation and vehicle control systems, electronics and telecommunications, e-business, new energy technologies, new computer technologies, and computer engineering. Students can continue to further education in six one-year accredited specialist study programmes that grant 60 ECTS points on completion. These programmes are multimedia and digital television, mechatronics, electronics and telecommunications, information technology, electric power engineering, and security of information and communication systems. The school is also an ECDL testing centre and a Cisco certification centre.

The school has around 2 000 students, with 600 being enrolled every year. Upon enrolment, all students are given a password that allows them access to college's network and the student portal. The college also uses the Moodle platform, within which all necessary materials can be found for about two-thirds of all the courses available within all the study programmes. As the majority of subjects have elements of DOL in the widest sense, technology is used for face-to-face teaching, as well as for blended learning. Several study programmes are also available as distance-learning programmes. In addition to having a fully established virtual learning environment, the school has plans to introduce mobile learning as an enhanced learning feature in future.

The school dean and the academic staff who were interviewed told of the major developments within DOL practices that had been introduced from 2012/13, when the majority of courses started to be delivered using digital resources. Strategies included a more systemic use of YouTube, developing multimedia materials and initiating video blogs. There is now a regular section for each course that involves lessons, tests, simulations, quizzes, and texts with links. Interaction within the online environment is also encouraged and fostered. Students have opportunities for regular online discussion. For example, teachers can receive an email showing all discussions that take place on forums. Some of the study programmes offered to students are also available as distance-learning modules, while in other programmes, students are able to learn how to create courses within Moodle on their own.

Because a significant proportion of learners are those who are in employment and have families to care for, some of the DOL study programmes offered provide an opportunity to continue with professional development or to finish studies that students may have previously given up.

## 4. CONCLUSIONS

From the perspective of current technological infrastructure, most of the schools visited are equipped to meet most of the teachers' needs. The issue of individual outdated workstations in computer laboratories is, to some extent, mitigated through implicit, or emergent, BYOD policies for students. However, these arrangements are somewhat ad hoc, and no agreements are in place for the definition of minimum requirement specification and purposes for BYOD. In all of the schools visited there was also a clear demand for a system administrator to be in charge of maintaining existing ICT devices.

As there are currently no explicit network security policies in place, in most cases the issue is resolved pragmatically by simply 'locking down' and restricting network access. This serves to hinder the development of an integrated DOL environment. At the same time, students do not receive explicit instructions on how to be safe in an online environment, nor on how to behave ethically online in respect of digital property rights and the prevention of plagiarism. Thus, there is a clear demand for the creation of explicit network security policies, and for students to be educated on how to be safe and behave ethically in an online environment.

In all of the schools visited, ICT development and DOL are often referred as key, and all the school principals have acknowledged their responsibilities in this regard. Unfortunately, this evident commitment is not so visible in the accompanying school documentation. Although DOL has the potential to innovate education and training, to open new ways of teaching and to increase the ability of individuals to acquire new skills, the lack of reliable data makes it difficult for governments and schools to develop coherent and effective policies in this area and to assess the effectiveness of DOL. It is critical to set realistic objectives, and to monitor and evaluate progress at school and system level, if concrete progress is to be made.

Because the schools selected for this case study have been recognised as places of original and valuable innovative practice, some of the findings were somewhat surprising. Although approximately one third of teachers are active and enthusiastic users of DOL, about one third are willing, but lack skills and confidence, and the remaining third are resolute in their refusal to consider using DOL. There is little consistent evidence in the strategic planning that principals are addressing this issue of teachers' competences in the use of ICT in general and DOL in particular, nor the issue of how technology can and should help to transform the learning process itself and the position of both the teacher and the student. The need for this latter issue to be addressed is critical.

Most of the teachers and principals interviewed had a rather limited vision, that is, using ICT to perform familiar things in a 'better', more 'digital' way. Only a few had an ambition to take DOL and online communities to the next level of 'metacognition'<sup>17</sup>. In practice, in most of the schools visited, ICT and DOL are essentially productivity tools that serve to reinforce a status quo in which teachers do 'more of the same, only electronically' with existing curricula, rather than using the technology to innovate how teachers teach and learners learn. This is also evident from the way students speak of DOL. Despite evident enthusiasm, knowledge and, in many cases, visible expertise in relation to the online learning environment, and the tools available to them (e.g. Facebook, Dropbox, Google Drive and Moodle), the tools are often used in an ad hoc and uncoordinated way, and they currently represent an underused set of learning resources and facilities. The latter issue is also connected to the significant lack of basic ICT skills among a large proportion of the enrolled students, indicating a lack of opportunity to acquire those skills in primary schools. Both issues demand further action, the

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<sup>17</sup> 'Higher-order thinking that enables understanding, analysis, and control of one's cognitive processes, especially when engaged in learning' (Dictionary.com).



former through specific CPD provision and the latter in a reconceptualisation of the primary school computer science curricula.

With regard to assessment practices, these have often been translated into the 'e-environment', but represent a mere extension of existing summative practices. This indicates a clear need for high-quality CPD provision on the subject, especially in the light of the answers received from those teachers who are active users of learning technology and who do see the benefits of DOL. Their enthusiasm should be used, but in a way that enhances competences in the use of ICT in general and DOL in particular, with an emphasis on how this transforms the learning process and the position of all involved in the process. This was especially evident during the visit to the Special Primary and Secondary School 'Milan Petrovic', where the team witnessed the use of ICT and ATs for students and adults of all ages who have special educational needs. Much of the work in evidence here is truly world class in its use of technology to aid the learning and life chances of learners – young and old – with special educational needs.

The project team observed a great deal of encouraging professional practice among many of the principals, teachers and students within the places visited. It is encouraging, for example, that there is such a widespread knowledge and awareness of Moodle as a learning platform. Although this awareness exists, there is evidently a wide range of professional practice in terms of the extent to which DOL is seen as a set of tools for regular and routine use. It is clear that some schools are embedding DOL in the curricula of various subjects, widening the space for teacher–student interaction, while for others the Moodle learning platform represents little more than a data repository, alongside several others, such as Dropbox and Google Drive.

Overall, DOL policies, organisation and governance in Serbia are still at an early stage of development. The only policy document specifically dedicated to DOL was developed by the NEC in 2013<sup>18</sup>. Governance of DOL is shared among several institutions without clear roles and responsibilities. Nevertheless, as DOL begins to become embedded within VET, it is helpful to have some sort of reference model against which to evaluate and assess the current stage of development and to provide a signpost as to future direction. Salmon's Five Stage Model<sup>19</sup> is widely used among the e-learning community and describes a useful series of sequential steps. Currently, on the basis of the evaluation of the Serbian vocational schools, it seems that most people are operating at about stage three of this model. DOL is being used to share information and to socialise online, but there is, as yet, little evidence to indicate that the technology is being used to formulate new ways of learning and teaching and to co-construct new knowledge.

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<sup>18</sup> [www.nps.gov.rs/wp-content/uploads/2013/12/Smernice\\_sredjeno\\_cir.pdf](http://www.nps.gov.rs/wp-content/uploads/2013/12/Smernice_sredjeno_cir.pdf)

<sup>19</sup> [www.gillysalmon.com/five-stage-model.html](http://www.gillysalmon.com/five-stage-model.html)

## 5. RECOMMENDATIONS

### 5.1 System-level policy recommendations

- A national DOL strategy should be developed in relation to VET, together with practical guidelines for schools, including a governance model defining clear roles and responsibilities, objectives, support infrastructure and resources.
- A set of minimum digital skills and DOL competences that VET teachers are required to have should be established. Digital competence should be acknowledged as a key competence and systematically supported by CPD.

**Rationale:** The Ministry of Education, Science and Technological Development should establish a set of minimum competences in respect of DOL that all VET teachers are required to demonstrate. Alongside these competences, a policy framework should be agreed with all stakeholders for developing the programme of professional development necessary to promote DOL within the teaching workforce. The emphasis of the programme should be on professional practice and pedagogy rather than on the technical mastery of ICT; the programme's implementation should be part of teachers' regular performance management, within which teachers themselves should take responsibility for their own learning.

- Better network administration support and clear network security and integrity policy guidelines need to be given to schools.

**Rationale:** There is a need to create a network administrator position in schools. This individual would mediate between the security imperatives of network integrity (and virus-free operation) and the pedagogical needs of teachers and students. The current practice, in which one computer science teacher is in charge of this task, is evidently not functioning. Computer science teachers are not necessarily equipped with the required knowledge, while time for servicing this task interrupts their teaching hours.

- A series of pilot studies should explore the scope for online curriculum delivery for youth and adult learners, thus covering IVET and CVET from a lifelong learning perspective.

**Rationale:** In view of the overall cost of schooling a child outside their area of primary residence, the number of student travellers in schools and the current lack of distance-learning opportunities at secondary level, DOL needs to be thoroughly explored with a view to enlarging the VET provision and making it more cost-effective. One possible scenario could be running several experimental pilot studies to review a particular subject curriculum that lends itself to a blended-learning approach, and modelling this pilot curriculum and its delivery in selected regions and education profiles.

### 5.2 School-level policy recommendations

- DOL should be embedded in school development plans, and schools should adopt monitoring and self-evaluation measures to review the progress of implementation.

**Rationale:** Schools do not currently have in place either the assessment tools or a set of indicators that would allow for the scrutiny and subsequent follow-up of DOL implementation so that systems and practices could be adjusted according to the specific school needs. Schools should be clearly supported in creating such systems and be assisted in developing and planning professional development opportunities to begin the transformation of pedagogical practice in the light of the opportunities afforded by DOL. These instruments will allow for a more systemic follow-up and for the gathering of evidence relating to best practice in DOL. In order to ensure their effectiveness,

the Ministry of Education, Science and Technological Development must give a strong steer for clear and unambiguous policy implementation. A bottom-up approach may only foster the process, which, although positive in itself, would be slow to bring about substantial transformations within an optimal timeframe.

- All teachers should receive more and appropriate support and guidance for developing their own digital skills. CPD programmes should include functional training in basic ICT skills and the efficient operation of the LMS, and should also include new pedagogy.

**Example:** As part of the in-school CPD practices, which are aligned with the current legislation on CPD in schools, special attention should be given to the different forms of assessment that are available with DOL. Summative forms prevail and are very much aligned with the frontal teaching approach. Wide acceptance of the validity of DOL is often connected to the authenticity of assessment provided within the learning and teaching process. However, if teachers do not use the tools effectively, the overall use of DOL may not be as effective as a whole. This, in particular, relates to adopting diagnostic and formative assessment formats. E-portfolios are among the best known, and can serve as an authentic vehicle for validating and authenticating students' achievement in distance and online learning, at the highest level.

- Schools should be responsible for adopting modern network policies aimed at ensuring the safety of learners and data integrity on the internet.

**Rationale:** Schools do not have net-safe policies in place; custom and practice currently determines policy. Introducing and developing net-safe and integrity policies will help the overall self-assessment of DOL practices and at the same time will help students to learn what net safety and data integrity truly entail, including the ethics of intellectual property exchange in the online environment.

# ANNEX: INTERVIEW GUIDANCE

## School principals

This interview is conducted as part of the Study on Digital and Online Learning in VET in Serbia. The project is run by the ETF and implemented in close cooperation with the Ministry of Education, Science and Technological Development. We are focusing on a selected number of vocational schools in Serbia and your school is among the ones selected.

The interview will take approximately 30 minutes, and while we talk I will record this conversation with a voice recorder. Do we have your permission to do so? [NOTE: If they refuse, taking notes will be offered.]

Please describe briefly your experience working in the school. What is your current position? How long have you been in the position of [NAME POSITION]?

### Infrastructure

1. How do you assess the extent to which your school is equipped with ICT resources (equipment and connectivity)? If you were to assess the current state in your school with reference to ICT, what has changed in the past five years? What are the key ICT infrastructural issues that should be tackled?
2. What is the approximate computer-to-student ratio in your school?

### Teaching and learning practices

3. In your opinion, to what extent does the school support, and have the capacity to support, innovative teaching practices made possible by the use of digital learning technologies? Can you give an example of such practice? To what extent are teachers open to such practices?
4. Have these in any way changed the CPD practices of teachers in this school? Are they more open to seminars within a digital environment?

### Content and curricula

5. How would you explain the approach to digital learning in the curricula (taught in one subject or across the subjects)? If it is taught across the subjects, how it is presented in the curricula documents (implicit or described among expected learning outcomes)?

### Leadership and governance practices

6. How is digital learning recognised in the school's development plan? Is there a plan for its realisation? What does the plan envisage? Who are the people responsible for implementing the plan? What are the possible challenges?
7. Would you say that there is currently a culture of openness in the school towards learning digital learning? Why is that so? (If not, what is hindering the establishment of such a culture?)
8. Are there any mechanisms in place within the school to ensure that teachers and students are confident and competent at integrating digital technologies into their everyday practices?
9. To what extent do you, as a school principal, feel encouraged and supported in fostering a digital learning culture in your school? Who are the sources of this support?

### Collaboration and networking

10. Are there any school policies in existence in respect of openness and access to the technology platforms in the school? Has the school developed its net-safe policy? If so who wrote it and/or was consulted?

11. Are students encouraged/allowed to bring their own devices to school (tablets, laptops and smartphones)?

## Teachers (T) and school psychologist and/or pedagogue (P)

This interview is conducted as part of the Study on Digital and Online Learning in VET in Serbia. The project is run by the ETF and implemented in close cooperation with the Ministry of Education, Science and Technological Development. We are focusing on a selected number of vocational schools in Serbia and your school is among the ones selected.

The interview will take approximately 45 minutes, and while we talk I will record this conversation with a voice recorder. Do we have your permission to do so? [NOTE: If they refuse, taking notes will be offered.]

Please describe briefly your experience working in the school. What is your current position? How long have you been in the position of [NAME POSITION, loop for all people representing the school]?

### Teaching and learning practices

1. How has the integration of ICT changed teaching practice? Are there any examples of such practice? (P) Can you give me examples from your classrooms? (T)
2. In your opinion, to what extent do teachers view digital learning as simply an extension of the regular classroom experience rather than an alternative to it? Do you think social media has any place in the mix of learning practices? (P) (T)
3. To what extent is teachers' CPD focused on mastering ICT skills? Are there examples in which teachers have participated in CPD online? (P)

### Assessment

4. Is there any kind of evaluation of impact of new practices that teachers apply? To what does this make reference (students' motivation and/or skills, educational standards)? (P) (T)
5. What are the common ways of assessing students in this school? To what extent is this done within the digital environment (e-portfolio, online testing)? (P) (T)

### Collaboration and networking

6. Which online tools are used the most in school, and for what type of activities? (P) (T)
7. Do the students each have their own online learning space where they can store and access their own files, and share them when necessary? Are these connected with specific subjects taught in school? (P) (T)
8. Are there any online learning communities operating in the school between students or between teachers? Do you support your students through any of these? (T)
9. What is the school library like? Is it a room filled with books or is it a resource centre for the students? Does the school also have a multimedia library? (P) (T)
10. What access do students have to the internet and online resources outside school? (T)

### Teaching and learning practices

11. Do opportunities exist for the students to develop their information literacy skills in a structured way, through a variety of subjects taught in school? (P) (T)

### Content and curricula

12. FOR COMPUTER SCIENCE TEACHERS: What is the ratio between programming, coding and computer science skills in relation to digital learning? (T)

13. FOR NON-COMPUTER SCIENCE TEACHERS: In your opinion, to what extent is digital learning visible in your teaching? Is social media playing any role in the mix of your teaching practices? (T)
14. To what extent are open educational resources being used in your class, compared with proprietary software and resources? (T)

### Leadership and governance practices

15. As employees of this school, if you were to assess the current state of ICT and digital learning within the school, what has changed (if anything) during the past five years? (P) (T)

### Infrastructure

NOTE: As we are interviewing several teachers or a school counsellor and a teacher together, we simply ask who in the school is in charge of the maintenance of ICT and then address these questions to that person.

16. What is the bandwidth available in the school?
17. What is the nature of the school network (computer laboratories or computers distributed throughout the school)?
18. To whom is the network available (students, teachers, administrative staff)? How is the network available to students, teachers and administrative staff?
19. What is the internet service provider (ISP), available through fixed cable and/or Wi-Fi?
20. Are the networks built on Linux or Microsoft?
21. How is hardware distributed in the school?

### Students

This interview is conducted as part of the Study on Digital and Online Learning in VET in Serbia. The project is run by the ETF and implemented in close cooperation with the Ministry of Education, Science and Technological Development. We are focusing on a selected number of vocational schools in Serbia, and your school is among the ones selected.

The interview will take approximately 30 minutes, and while we talk I will record this conversation with a voice recorder. Do we have your permission to do so? [NOTE: If they refuse, taking notes will be offered.]

Please tell me which grade you are in and within which educational profile.

### Teaching and learning practices

1. To what extent do approaches such as inquiry learning and student projects exist in your school?
2. In your opinion, to what extent do teachers view digital learning as simply an extension of the regular classroom experience rather than an alternative to it?
3. Do teachers encourage you to use social media while they teach?

### Assessment

4. What are the common ways in which you are assessed in this school (e.g. e-portfolio, online testing)?

### Collaboration and networking

5. Which online tools are used the most in school, and for what type of activities?
6. Do you have your own online learning space where you can store and access your own files, and share them when necessary? Are these linked to specific subjects taught in school?

7. Are there any online learning communities operating in the school between students or between teachers? If so, are you supported by teachers to use them?
8. What is the school library like? Is it a room filled with books or is it a resource centre for the students? Does the school also have a multimedia library?
9. What is your access to internet and online resources outside school?

#### Teaching and learning practices

10. Are there opportunities to develop your information literacy skills in a variety of subjects taught in school?

#### Content and curricula

11. In computer science classes, to what extent do you learn programming, coding and computer science skills as opposed to navigating in an online environment and learning material online?
12. To what extent are open educational resources being used in your class compared with proprietary software and resources?

#### Leadership and governance practices

13. FOR 4<sup>TH</sup> GRADE STUDENTS: Has anything changed in your school with regard to ICT and digital learning options since you started at this school?

#### Technological and physical infrastructure

14. Are you satisfied with how the school network operates?

# ABBREVIATIONS

<b>AMRES</b>	Akademaska mreža Srbije (Academic Network of Serbia – national research and education network)
<b>AT</b>	Assistive technology
<b>BYOD</b>	Bring your own device
<b>CARDS</b>	Community Assistance for Reconstruction, Development and Stabilisation programme
<b>CPD</b>	Continuing professional development
<b>CVET</b>	Continuing vocational education and training
<b>DigCompOrg</b>	European Framework for Digitally-Competent Educational Organisations
<b>DOL</b>	Digital and online learning
<b>ECDL</b>	European Computer Driving Licence
<b>ECTS</b>	European Credit Transfer and Accumulation System
<b>ETF</b>	European Training Foundation
<b>EU</b>	European Union
<b>ICT</b>	Information and communication technology
<b>IEP</b>	Individual educational plan
<b>IPA</b>	Instrument for Pre-Accession Assistance
<b>ISCED</b>	International Standard Classification of Education
<b>IT</b>	Information technology
<b>IVET</b>	Initial vocational education and training
<b>LMS</b>	Learning management system
<b>NEC</b>	National Education Council
<b>NQF</b>	National Qualifications Framework
<b>OECD</b>	Organisation for Economic Cooperation and Development
<b>OSS</b>	Open-source software
<b>PISA</b>	Programme for International Student Assessment
<b>PTT</b>	Post, telegraph and telephone
<b>SVET</b>	Secondary vocational education and training
<b>VET</b>	Vocational education and training



# GLOSSARY

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<b>Digital learning</b>	<p>Learning supported by ICT. Digital learning, also referred to as e-learning, is not limited to 'digital literacy' (acquiring ICT skills). It may encompass multiple formats and hybrid methods, including the use of software, the internet, CD-ROM, online learning or any other electronic or interactive media. Digital learning can be used as a tool for distance education and training, but also to support face-to-face learning.</p> <p>Source: <a href="http://www.cedefop.europa.eu/en/publications-and-resources/publications/4064">www.cedefop.europa.eu/en/publications-and-resources/publications/4064</a></p>
<b>Online learning</b>	<p>Distance learning<sup>20</sup> imparted via the internet, incorporating media<sup>21</sup> (i.e. text, graphics, audio, video, animation and simulations – live or recorded – protected by copyright or available as open educational resources) and web services (i.e. Web 2.0 social and networking services – synchronous<sup>22</sup> or asynchronous<sup>23</sup>) for a more collaborative, individualised and personalised learning experience, anywhere and at any time via desktop and mobile computing devices. Online learning is a specific type of distance learning.</p> <p>Sources: <a href="http://www.cedefop.europa.eu/en/publications-and-resources/publications/4064">www.cedefop.europa.eu/en/publications-and-resources/publications/4064</a> and <a href="http://www.tonybates.ca/?s=online+learning+definition">www.tonybates.ca/?s=online+learning+definition</a></p>
<b>Open educational resource (OER)</b>	<p>Learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open licence that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Open licensing is built within the existing framework of intellectual property rights as defined by relevant international conventions, and respects the authorship of the work.</p> <p>Source: <a href="http://www.unevoc.unesco.org/go.php?q=TVETipedia+Glossary+A-Z&amp;char=O#O">www.unevoc.unesco.org/go.php?q=TVETipedia+Glossary+A-Z&amp;char=O#O</a></p>

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<sup>20</sup> Distance learning encompasses correspondence courses, i.e. courses delivered via the internet, radio, educational TV, video conferencing and telephone.

<sup>21</sup> Media, also referred as resources, is the plural of medium and is linked to senses and 'meaning'.

<sup>22</sup> Synchronous services/technologies require all those participating in the communication to participate together, at the same time, but not necessarily in the same place (i.e. online meeting).

<sup>23</sup> Asynchronous services/technologies enable participants to access information or communicate at different points of time, usually at the time and place of choice of the participant (i.e. online community).

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## CONTACT US

Further information can be found on the ETF website:

**[www.etf.europa.eu](http://www.etf.europa.eu)**

For any additional information please contact:

European Training Foundation  
Communication Department  
Villa Gualino  
Viale Settimio Severo 65  
I – 10133 Torino

E [info@etf.europa.eu](mailto:info@etf.europa.eu)

F +39 011 630 2200

T +39 011 630 2222

