The Role and Use of E-Materials in Vocational Education and Training: The Case of Slovenia

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ABSTRACT
In the paper some issues and problems regarding the implementation of ICT in initial vocational education and training in Slovenia are discussed. After the brief analysis of the main theoretical characteristics of ICT and e-materials, the key findings from the recent EU survey on the ICT in schools are presented and some conclusions on the basis of the results of the ICILS study are drawn.

In the second part of the article, some of the most relevant findings from the empirical research conducted on the representative sample of Slovenian secondary VET teachers and students are summarized and interpreted.

We have asked teachers and students how often do they use offline and online available e-materials in teaching and learning and how do they evaluate their usefulness. While being quite critical towards the usefulness of available e-materials, the vast majority of teachers and students also claim that they use e-materials quite rarely. The reasons for such results should be further explored, compared with relevant statistical data in the national as well as international context, and appropriate systemic measures should be introduced.
Keywords: e-materials, learning in IVET, ICT, digital competence, vocational education and training

INTRODUCTION

In this paper, we are discussing issues and problems related to the roles of information-communication technology (ICT) in initial vocational education and training (iVET) in Slovenia. In the first part of the article we are briefly describing the theoretical characteristics of ICT and e-materials in educational contexts, its main features and recent developments, particularly in the context of iVET. In order to show the current state of affairs regarding ICT equipment and its usage in Slovenian iVET, we are also summarizing key findings from the recent EU survey on ICT in schools, issued by European Commission in 2013 (Survey of Schools..., 2013). Furthermore, we are drawing some conclusions on the basis of the results of the International Computer and Information Literacy Study (ICILS, 2014).

In the second part of the article we are presenting some of the most significant empirical findings related to the use of e-materials in Slovenian iVET. The study was conducted in 2011 on the representative sample of teachers and students attending three iVET programs.

ICT IN EDUCATION: KEY CONCEPTS AND ISSUES

At least in the Western civilization, digital computer-based technology and its various forms and functions have already become an inseparable part of everyday life. ICT cannot be ignored or avoided anymore – or even if it could be, at least in principle, the price an active individual would have to pay in contemporary society for being excluded from technological developments seems to be rather high and is thus not considered as a plausible option. Education institutions and processes that take place within them are a significant and constituent part of society, so it seems logical that they are inevitably affected by the contemporary computer-based technological developments as well. Discussions on that topic are numerous and can be followed by several decades already (cf. e.g. Groff, 1983; Apple, 1988). As early as in 1983, Groff stated that vocational education in the past saw its relation to the economy "primarily in terms of providing a trained work force", but in his opinion this focus "will not be sufficient. New expanded relationships will be required between occupational education and the economy in the computer-literate, high- technology, information society." (Groff, 1983, p. 93)

Discussing about the impacts of the new technology on education, in 1988 Apple posed a question of whether the "new technology is part of the solution or part of the problem in education". He emphasized that "there is something of a mad scramble to employ the computer in every content area. In fact, it is nearly impossible to find a subject that is not being 'computerized'" (Apple, 2003, p. 455). Nearly three decades later it is obviously even more so[1]. Many reasons for that can be identified: as Hawkridge (1990 in Tondeur, van Braak & Valcke, 2007, p. 963) points out, at least four rationales are driving the policies related to the implementation of ICT in education, namely the *economic, social, educational* and *catalytic* rationale (ibid.). In other words, students are required to develop their ICT skills – or we should probably name them "digital competencies" – because they are (1) necessary for the entrance to the contemporary labour-market (economic rationale), they are (2) inevitable for the students to become "responsible and well-informed citizens" (ibid., i.e. social rationale), because we believe that (3) ICT can significantly support and improve teaching and learning processes (educational rationale) and (4) contribute to the acceleration of educational innovations (catalytic rationale).

As a process, *e-learning* is closely connected with the implementation of ICT in education. According to the 2005 report *The use of ICT for learning and teaching in initial Vocational Education and Training* (2005), fostering e-learning in educational contexts is justified by several assumptions:

- It is expected to support synchronous or asynchronous communication between all the relevant stakeholders (i.e. students, teachers, tutors, mentors, master craftsmen etc.).
- It can enable simulation-based learning and thus significantly contribute to the intertwining of theoretical and practical dimensions of educational contents, particularly while using contemporary competence-based didactic approaches.
- It enables effective access to online media in all its forms (text, audio, video) from the classroom as well as from student's or teacher's home, and thus allowing the vast quantities of knowledge to be reached and processed relatively fast.
- By using automated Learning Management Content Systems managing large amounts of information and knowledge is more efficient (The use of ICT..., 2005, pp. 9-10).

It could therefore be argued that ICT can productively contribute to the popular (and actually quite traditional) idea of *lifelong learning* (see e.g. Vidmar, 2014), not only of youngsters and active adults, but of older population as well (Kump & Jelenc Krašovec, 2014). On the other hand, the study about the current and possible uses of ICT in iVET, carried out by Ramboll Management on behalf of the European Commission (The use of ICT..., 2005), identified a number of weaknesses related to the implementation of ICT in VET settings. Among issues to be tackled are (1) a lack of IT skills and training among teachers, (2) a low degree of e-readiness and a skeptical attitude towards e-learning among students, and (3) inadequate infrastructure, technical support and equipment among the institutions (ibid., p. ix). Some authors are critically stressing the most prevailing assumptions about the didactic functionalities of ICT and e-learning as well: it is worth noting, for example, Clark and Feldon's text on the "myths" constructed about the benefits of multimedia learning. Although we may believe that multimedia learning can by itself improve the motivation, knowledge and overall performance of students, authors (Clark & Feldon, 2005) convincingly argue that there is no firm empirical evidence supporting such presumptions. As they put it: "The questionable beliefs include the expectations that multimedia instruction: 1) yields more learning than live instruction or older media; 2) is more motivating than other instructional delivery options; 3) provides animated pedagogical agents that aid learning; 4) accommodates different learning styles and so maximizes learning for more students; and 5) facilitates student managed constructivist and discovery approaches that are beneficial to learning." (Ibid., p. 98)

Additionally, Kuskaya Mumcu and Kocak Usluel (2010, p. 99) argue that on the basis of some recent studies teachers do not "benefit from ICT in activities they developed in the classroom environment already and teachers' ICT usage often remains on a personal level" (ibid., p. 99). In other words, although teachers use ICT regularly for their personal purposes, they are not as successful in transferring these habits to their professional life. It should be mentioned, however, that such difficulties may be strongly related with the lack of the appropriate infrastructure: as noted by Alsabwy et al. (2013), not enough attention has been paid to investigate the role of IT infrastructure services as a foundation to create the success of e-learning systems. However, it needs to be considered that certain data regarding ICT infrastructure in schools at the EU level exists. In the following section we are briefly presenting some of the most relevant figures related to the access and ICT usage in vocational schools in Slovenia.

[1] In this text, we are consciously putting aside the otherwise highly relevant question of what may be or are the problematic dimensions of ICT implementation in education, although it should not be ignored that issues related, for example, with the reproduction of social inequalities through education are closely connected to the development and establishment of ICT in education – as well as in other social contexts.

HOW WELL ARE VOCATIONAL SCHOOLS IN SLOVENIA EQUIPPED WITH ICT AND HOW DIGITALLY LITERATE ARE SLOVENIAN STUDENTS?

With the population of 2 million inhabitants, Slovenia is one of the smallest EU countries. Nevertheless, vocational education system is traditionally well developed, although facing challenges otherwise typical for all the European VET area. Since we have – in this same journal – already described the main systemic and curricular characteristics of VET in Slovenia (see Mažgon & Štefanc, 2012), we will primarily focus here on its ICT related characteristics. The 2013 *ICT in Education* survey conducted by the European Commission (see Survey of Schools ... 2013) showed that situation in Slovenia regarding ICT equipment is mainly satisfactory, but some figures point to certain inadequacies that should be more carefully addressed. In 11th grade, for example, there are on average 2 students per computer in vocational schools (which is more convenient comparing to the average of 3 students per PC in EU), but at the same time as much as 25% of Slovenian VET students (compared to the average of 15% at the EU level) report that they actually "never or almost never" use a computer in lessons (ibid., p. 65). Furthermore, when it comes to the number of students per internet-connected laptop computer, the ratio in Slovenia is 11 students per laptop (while the average EU ratio is as low as 8:1). To put it differently, data shows that there may be relatively high number of PC computers (either internet connected or not) available in schools, but students do not seem to use it very often during the lessons, while at the same time they do not use their own laptop computers very frequently either.

Furthermore, it needs to be noted that according to the same report (ibid., p. 28), 7% of 11th grade VET students in Slovenia attend schools without broadband internet connection. This is the second highest share among all EU countries. However, this is not to say that Slovenian VET schools are not well equipped with ICT – in this regard Slovenia's VET schools are quite comparable to the average ICT equipment of other VET schools across EU. But being "well equipped" and "equipped enough" to enable unrestricted use of ICT in teaching and learning processes is not the same.

Therefore, it should be emphasized that more effort and resources would need to be invested for the purpose of (i) further equipping schools with broadband Internet connections; (ii) providing students and teachers with appropriate devices (such as tablets, laptops and similar devices); (iii) providing appropriate teacher education to foster their practical knowledge in this area. Such measures would also significantly contribute to better computer and information literacy results. If we take a brief look at the International Computer and Information Literacy Study (ICILS 2014), we can find out that the average Slovenian student's score in CIL assessment was 511, being the second worst score among 9 participating EU countries. More than one third of participating students (36%) did not achieve 2nd difficulty level, 8% of them did not even achieve the level 1, while the highest difficulty level was only achieved by 0,4% of Slovenian students. If we would like to foster the active usage of ICT in individual learning and during the classes, it seems obvious that more should be done to reduce the share of students whose computer literacy is rather weak.

In the following section, some of the empirical survey results regarding the usage and the usefulness of the e-materials in Slovenian VET programmes are presented. Since the survey was conducted in 2011, i.e. in the same period when the above discussed data was gathered (see ICILS, 2014; Survey of Schools ..., 2013), our findings can be productively linked to the empirical figures we have already summarized.

METHODOLOGY

We have used the descriptive and causal non-experimental method for the research. The data was gathered by a questionnaire consisted of opinion and evaluation scales. SPSS statistical package software was used to analyze the obtained data. We have calculated the degree of reliability (Cronbach $\alpha \geq 0{,}60$) and validity (in all the cases more than 33% of variance has been explained by the first factor).

Figures are shown in frequency and structural tables. Certain variables, although they are ordinal, were treated as interval, and arithmetic means were calculated for them. In addition, the Wilcoxon Signed Rank Test for testing the null hypothesis has been used to assess whether population mean ranks differ.

Sample

The questionnaire was completed by 370 *teachers* (29.6% males and 70.4% females) and 552 pupils (50.4% males and 49.6% females). 37.5% of the participating teachers worked in the *mechanical technician* programme, 32.3% of them in the *health care* programme and 30.2% taught in the *economic technician* programme. More than half of participating teachers taught general subjects (such as Math, Mother tongue, ESL, Social Sciences etc.), while 41.5% of them taught professional modules. There were some of individuals who taught both general and professional courses, but their share can be considered as negligible (5.5%). Participating teachers had an average of 15.12 years of working experience, majority of them six years or more, so the sample can be

considered as consisted of the experienced teachers who are competent enough to give a reliable, professional assessment of educational materials.

The *sample of pupils* included the pupils from the aforementioned educational programmes as well. 40.8% of them were enrolled in the *health care* programme, 32.2% in the *mechanical technician* programme and 27.0% in the *economic technician* programme. At the time when survey was conducted, one third of the student participants (33.0%) attended the third year of the programme, while 29.3% attended the fourth year, 23.2% the second year, and 14.5% of students attended the first year of the respective educational programme. In other words, the majority of participating students (62.3 %) attended either the third or fourth year of their respective educational programmes, allowing us to presume that they had enough experience to assess the level of usage and usefulness of e-materials.

TEACHERS' PERCEPTION OF USAGE AND USEFULNESS OF AVAILABLE E-MATERIALS

We have asked teachers to estimate how often they use offline and online available e-materials to prepare and conduct their lessons. Respondents were asked to choose among the four variable values (1-never, 2-rarely, 3-frequently and 4-very frequently). The main descriptive statistics results are presented in Table 1.

Table 1: The usage frequency of online and offline available e-materials (teachers)

	N	M	SD	Min	Max
How often do you use offline available e-materials for preparing and conducting your lessons	360	2,44	0,909	1	4
How often do you use online available e-materials for preparing and conducting your lessons	354	2,30	0,898	1	4

We have applied Wilcoxon signed-rank test to verify whether the population mean ranks differ. On the basis of the test result we were able to confirm that teachers tend to use offline available e-materials slightly, but still significantly more often than online available e-materials (Z = -2,541, p = 0.011). Such tendency seems to be a bit surprising – in the contemporary "network society" (cf. Castells, 2010) we would expect the majority of teachers to rely on online accessible materials significantly more often. Their judgment about the *usefulness* of e-materials follows the same pattern: when asked how useful they find online and offline available e-materials, teachers in the sample assess the usefulness of the latter slightly better than the former, but we could not prove that means differ significantly (see Table 2).

Table 2: The usefulness of online and offline available e-materials

	N	M	SD	Min	Max
How useful are offline available e-materials	292	2,69	0,715	1	4
How useful are online available e-materials	311	2,67	0,675	1	4

These figures may be signaling that VET teachers – although they might recognize the functionality and quality of online e-materials – still do not trust the quality and reliability of broadband connections in their classrooms enough to include such materials more often in their lessons (and subsequently they are not as much included in the lesson preparation process either). Table 3 shows the frequency distribution of teachers' opinions regarding the usefulness of e-materials in more detail.

Table 3: Teacher's opinions on the usefulness of available offline and online e-materials

	Usefulness of offline available e-materials		Usefulness of online available e-materials	
	f	f%	f	f%
Cannot evaluate	61	17,3	44	12,4
None of e-materials	9	2,5	4	1,1
Only few e-materials	107	30,3	128	36,1
Majority of e-materials	142	40,2	147	41,4
All e-materials	34	9,6	32	9,0
Total	353	100,0	355	100,0

It should be noted that a significant share of teachers answered that they "cannot evaluate" the usefulness of e-materials: nearly 20% percent of them said so for the offline available e-materials, while slightly more than 10% do not feel competent to evaluate online e-materials. These figures can be also understood to indicate the share

of teachers who do not use e-materials or at least do not use them often enough to be able to express their relevant judgment about their functional features. The reasons behind this figures should be further explored, but at least two possible hypotheses could be tested: either e-materials are available, but for some reason teachers do not choose to use them actively in the preparation and conduction of their lessons; or this shares indicate the percentage of teachers teaching courses (subjects, professional modules) for which e-materials are simply not developed and available. Apart from that, data shows quite polarized picture of teachers' opinions: namely, roughly half of the respondents replied that all or at least the majority of e-materials are useful, while approximately one third of them recognized as useful only few or even none of the e-materials. These latter shares are even higher for the online available e-materials (nearly 40%), revealing that teachers might be more critical towards e-materials, developed for online access and usage.

WHAT ARE STUDENTS' OPINIONS?

We posed the same questions as presented above to the VET students as well. We have asked them to evaluate how often they use offline and online available e-materials in general subjects (such as mother tongue, ESL, etc.) and in professional modules. In Tables 4 and 5 the main descriptive statistics results are summarized both for general subjects as well as for professional modules. Students were asked to choose among the four variable values[2]. For both areas, i.e. regarding the usage of e-materials in general subjects and in professional modules, Wilcoxon signed-rank test confirmed statistically significant differences between the average usage of online and offline available e-materials (for general subjects $Z = -5{,}326$, $p = 0.000$; for professional modules $Z = -3{,}450$, $p = 0.001$).

Table 4: Using online and offline available e-materials in general subjects (students)

	N	M	SD	Min	Max
We use offline available e-materials during the general subjects lessons	546	1,89	0,816	1	4
We use online available e-materials during the general subjects lessons	543	1,71	0,737	1	4

Table 5: Using online and offline available e-materials in professional modules (students)

	N	M	SD	Min	Max
We use offline available e-materials during the professional modules lessons	546	1,91	0,918	1	4
We use online available e-materials during the professional modules lessons	547	1,80	0,845	1	4

The mean scores of teachers' and students' opinions regarding the usage of e-materials indicate that students might be far more critical when it comes to the judgment about how often e-materials are actually being used in the classrooms. None of the mean scores reaches the average value of 2,00. The lowest mean value (and also the lowest standard deviation) can be noted regarding the usage of *online e-materials in general subjects*, suggesting that – at least in students' opinion – the majority of teachers of general subjects do not include e-materials in their classroom activities.

Table 6: Using offline and online available e-materials during the general subjects lessons

	Using offline available e-materials during the general subjects lessons		Using online available e-materials during the general subjects lessons	
	f	f%	f	f%
Not using at all	199	36,4	236	43,5
Using in very few general subjects	227	41,6	242	44,6
Using in the majority of general subjects	103	18,9	52	9,6
Using in all of the general subjects	17	3,1	13	2,4
Total	546	100,0	543	100,0

In the Table 6 the frequency distribution shows that nearly 80% of students claim that they are only occasionally or even not using offline available e-materials during the general subjects lessons. The share of students claiming the same for online e-materials is even higher, only slightly below 90%. These figures are even more interesting if we compare them with the considerably lower share of Slovenian vocational students included in *ICT in Education* survey (25%) claiming that they "never or almost never" use a computer in lessons (Survey of Schools..., 2013, p. 65). This points to the conclusion that computers may be included in the lessons far more often than e-materials, or to put it differently, teachers may use ICT to support their instruction (for example, by

[2] The variable values were: 1-do not use in any general subject; 2-use in very few general subjects; 3-use in the majority of general subjects; 4-use in all of the general subjects

using PowerPoint presentations or other forms of overhead projections) rather than using it as an equivalent to the printed materials (textbooks, workbooks, worksheets etc.). Quite similar responses can be observed when students were asked about their usage of online and offline available e-materials during the professional modules (Table 7).

Table 7: Using offline and online available e-materials during the professional modules lessons

	Using offline available e-materials during the professional modules lessons		Using online available e-materials during the professional modules lessons	
	f	f%	f	f%
Not using at all	224	41,0	233	42,6
Using in very few professional modules	176	32,2	214	39,1
Using in the majority of professional modules	115	21,1	74	13,5
Using in all of the professional modules	31	5,7	26	4,8
Total	546	100,0	547	100,0

The vast majority of students claim they use offline available materials in either very few or none of the professional modules (73,2%). This share is again higher when asked about the usage of online available e-materials (81,7%). It has to be noticed, however, that the shares of students who claim that they use e-materials in the majority or even all of the professional modules are higher than the same shares when asked about the general subjects. The difference amounts to +4,8 percentage points for offline and +6,3 percentage points for online available e-materials. It would be worth exploring up to what extent this could be the consequence of the fact that traditional printed materials are far less widespread and available for professional modules: since printed textbooks and workbooks simply do not exist for considerable number of professional modules, this fact might stimulate teachers to include more e-materials in their lessons.

One of the important questions in this context is also the question about how often students use offline and online available e-materials while studying at home. Their responses are presented in the Tables 8 and 9.

Table 8: Using offline and online available e-materials while studying at home

	N	M	SD	Min	Max
I use offline available e-materials while studying at home	549	1,58	0,797	1	4
I use online available e-materials while studying at home	548	1,99	0,991	1	4

Similarly as already noted above, the mean scores in the Table 8 reveal that students use online available e-materials more often than offline available e-materials while studying at home[3]. It was confirmed by the Wilcoxon signed-rank test that population mean ranks statistically significantly differ (Z = -10,164, p = 0.000). In the Table 9, frequency distribution of students' answers is shown.

Table 9: Using offline and online available e-materials while studying at home – frequency distribution

	I use offline available e-materials while studying at home		I use online available e-materials while studying at home	
	f	f%	f	f%
Never	321	58,5	217	39,6
Rarely	157	28,6	170	31,0
Often	53	9,7	108	19,7
Very often	18	3,3	53	9,7
Total	549	100,0	548	100,0

As for the offline available e-materials, it is quite obvious from the above frequency distribution that they play an utterly negligible role in home studying of VET students. Namely, slightly less than 60% of the students claimed that they never use such materials while studying at home, while nearly 30% claim to use them only rarely. If compared with the shares related to the usage of online available e-materials, the latter are obviously used more often, but still the share of students claiming that they never or rarely use online available e-materials seems surprisingly high, at least if we consider the fact that the majority of students are relatively well equipped

[3] They were assessing their usage of online and offline available e-materials on the following scale: 1-never, 2-rarely, 3-often, 4-very frequently.

with broadband connections at home and thus the results cannot be assigned to the technological obstacles. But on the other hand, such figures do not come as completely unexpected: since the shares of teachers using online and offline available e-materials are also low, it is somehow logical that students more or less "follow" their example. Or to put it differently: at least two conditions should be satisfied if we want to stimulate students to use e-materials in their own studying at home, namely (i) such materials should be didactically functional (meaning that they allow students to acquire educational objectives set for the particular courses), and (ii) teachers should actively use and promote the usage of such materials during their lessons.
Regarding students' opinions about the usefulness of e-materials, the figures presented in the Table 10 reveal quite interesting picture.

Table 10: Usefulness of offline and online available e-materials – students' opinions

	N	M	SD	Min	Max
How useful are offline available e-materials	392	2,28	0.905	1	4
How useful are online available e-materials	422	2,49	0.962	1	4

It is not that much surprising that students evaluate the usefulness of online e-materials higher than offline ones – this tendency is pretty much in the line with their opinions regarding the usage of such materials. We were also able to prove that population mean ranks significantly differ: Wilcoxon signed-rank test showed that students assign statistically higher values to the usefulness of online available e-materials (Z = -4,383, p = 0.000).

Table 11: Usefulness of offline and online available e-materials – frequency distribution

	Usefulness of offline available e-materials		Usefulness of online available e-materials	
	f	f%	f	f%
Cannot evaluate	153	28,1	119	22,0
None of e-materials	82	15,0	73	13,5
Only few e-materials	159	29,2	137	25,3
Majority of e-materials	112	20,6	143	26,4
All e-materials	39	7,2	69	12,8
Total	545	100,0	541	100,0

What comes as a surprise, at least to some extent, is the fact that far more students actually expressed their opinions about the usefulness of e-materials which – according to the data in Tables 8 and 9 – they do not or very rarely use. Namely, only 28% of students claimed that they could not evaluate the usefulness of e-materials, meaning that considerable amount of the respondents either did not accurately assess the frequency of their actual usage of e-materials or they simply assessed the usefulness of e-materials they are not very familiar with. If we put this inconsistency aside and briefly compare the shares in the table 11, it is again evident that considerably more students assess the usefulness of online e-materials higher than offline e-materials: if slightly less than 28% of them claim that the majority or all of the offline available e-materials are useful, the share of students claiming the same for online e-materials amounts up to nearly 40%. Again, these figures seem to be in line with the tendencies towards the ever more frequent usage of online available information in general.

CONCLUSION

Based on the data presented in the empirical part of our study we could not confirm the expectations that e-materials represent the relevant knowledge source widely used among teachers and consequently students for the development of their learning strategies (Radovan, 2011). At least indirectly we can assume that relatively rare usage of e-materials by teachers during their lessons may contribute significantly to the fact that students do not use them very frequently either. Namely, the presented figures show that teachers – according to students' estimates – never or very rarely use e-materials in professional modules (80% of students claim so), while the share of students reporting the same for general subjects is even higher (80-90%).

Therefore, it remains as a question to be investigated in the future research what kind of didactic strategies teachers actually use in the classrooms, why do they hesitate to include e-materials more in their lessons and how much they encourage students to participate in the usage of such materials in the school and at home. It should be further explored what kind of incentives at the national and institutional levels could contribute to the more frequent and didactically functional use of e-materials as well. In this paper, we could not analyze the problems related to the connection between ICT use and wider socioeconomic conditions. Recently published data shows that the considerable share of VET students come from socially disadvantaged environments (cf. e. g. OECD, 2015). From this perspective, the questions related to the conditions for functional ICT use in home

environment become relevant, which also points to the importance of the productive collaboration between school, parents and students (Kalin & Šteh, 2010).

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