Opportunities for Self-Evaluation in the Field of Vocational Subject Teachers’ Digital Competencies with an Accent Placed on Reference Framework Standardization

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Abstract
In the proposed paper, the issues of self-evaluation in the context of vocational subject teachers’ digital competencies are elaborated with an accent placed on the currently applied reference frameworks in the European environment. Special attention is paid to the DigCompEdu reference framework, within which digital competencies are considered among teachers’ key competencies in the current information society. From among the number of reference frameworks, we mention ECDL – European Computer Driving Licence, as well as ISTE and MENTEP standards. Particularly, the questions of educational transformation in the context of distance teaching and opportunities for improving the quality of the teaching profession in the information society are dealt with. Self-evaluation is presented as a dynamic process of a changing set of interconnected activities, which are in mutual interaction. The topic is discussed in the context of the European environment having an impact on education in Slovakia.

Keywords: Teachers’ digital competencies, self-evaluation, vocational education and training, distance teaching.

JEL Classification: I2

1. Introduction
In the modern information society, people are surrounded by digital technologies, which form its basis. Technologies mediate huge amounts of information, which is reflected in the name of the current society. They have an impact on all phases of our lives and so, this phenomenon cannot be omitted in the sphere of education, what is more, it is probably education which is most influenced by digital technologies. Understanding digital technologies in relation to humans is not easy and is not clearly defined by experts at all. Nevertheless, certain initiatives by the information science can be observed and it is information scientists who consider digital literacy among the most important topics in their field of interest. But it is not only the information science that focuses on digital literacy and digital competencies, but also pedagogy, sociology, and informatics deal with them. These phenomena can be considered transdisciplinary. The target group is formed by teachers in the context of information society, expectations placed on them, and the undergoing changes in the teaching profession. Their role has been changing as a consequence of massive technological development during the last decades and therefore, technological transformation is necessary, and teachers’ digital competencies must be developed for evaluating educational activities, the educational environment or the outputs of education.
2. Standardization of vocational subject teachers’ digital competencies

A dynamic development of the society can be observed in all its dimensions, not only on social, cultural, economic levels, but also on the technological one. It is reflected in clear changes in the educational content but also approaches applied in the educational process both by teachers and students. In other words, in the context of new challenges, not only the content of education but also the approaches to sharing and acquiring knowledge are changing. It must be noted that in the field of secondary education – if compared with vocational subjects - there is no sufficiently extensive field didactic theory, which would help understand newly observed phenomena. Such a situation requires systematic research activities. In available research, the aspect of teachers’ digital competencies and their link with online teaching in secondary schools have been in the centre attention with an accent placed on distance teaching, particularly on teachers’ professional competencies including communication at the workplace, professional collaboration, reflective practice and continuous professional development.

Lorenzová, Jirkovská, and Mynaříková (2020) presented the results of their extensive research (N = 2015) focused on secondary school teachers’ digital competencies. They aimed to find out about the knowledge and user specific digital competencies of human and social sciences teachers compared with the whole data set, but above all with ICT and technical subject teachers. As the research tool, an author-constructed questionnaire was used. Data analysis was carried out by means of Chi-square test of independence, Chi-Square goodness of fit test, ANOVA, independent samples T-tests and paired T-tests, and IBM SPSS Statistics, version 24 was used. The results showed that teachers tend to apply simple digital devices for the purposes of teaching, the didactic application of which is not difficult. More complex means (e.g. e-learning or virtual laboratories) are applied less frequently. The results also highlighted that even though teachers see the educational potential of didactic technologies, they do not know much about the forms and means of digital education. The authors of the research study pointed out the discrepancy between the expectations regarding the pedagogical effect of using digital technologies and only moderately developed knowledge and user aspects of digital competencies. From the point of view of knowledge and user specifics, human and social sciences teachers statistically significantly lag behind ICT and technical subject teachers in the field of evaluating their knowledge and user skills. If compared with the whole dataset consisting of teachers of maths, science, medical, agricultural and environmental sciences, no statistically significant differences were observed, but VET teachers achieved poorer results. It is important to pay sufficient attention to the development of digital competencies in teachers as it is them who prepare students for their lives in the digital society. Teachers’ digital competencies can be analysed based on a whole a range of frameworks or models [1, p. 39].

2.1. DigCompEdu reference framework

DigCompEdu is a recommendation by the European Commission for EU Member States in the field of teachers’ digital competencies. It builds on the previously designed European digital competence framework for citizens, consumers, and also digitally functioning organizations. The declared goal of the DigCompEdu framework is to reflect on the existing programmes or tools and to synthetize them into a coherent model enabling teachers at all levels of education to evaluate their educational digital competencies and to develop them. The framework focuses on teachers’ competencies in the field of using digital technologies. It divides teachers’ digital competencies into 22 key competencies categorized into 6 areas – Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners’ Digital Competence – as described below.
Professional Engagement includes digital competencies in the field of using digital technologies for job-related tasks. This field can be characterized by four competencies. The first one is professional communication where teachers interact with students, parents or anyone else through digital technologies and work on the improvement of their communication skills. The second competence is professional collaboration including teachers’ activities and collaboration with colleagues, sharing knowledge and experience through digital technologies. The third competence is represented by mediation, which means that teachers use digital technologies within their professional practice. The last competence is continuous professional development including using digital technologies for systematic lifelong learning. Currently, a large scale of digital resources to be worked with in the classroom are available. To use them meaningfully, teachers should work with them effectively. This is included in the three competencies belonging to the field focused on digital resources. The first one can be characterized by selecting from among the available digital resources, when teachers search and evaluate the appropriateness of digital content. In this process, educational goals, educational content, pedagogical approaches, and other factors are taken into account. The second competence is represented by digital content, which means that teachers develop and modify existing digital resources considering the context of teaching, educational goals, the target group, and pedagogical approaches. The third competence is organizing, protecting, and sharing digital resources, as well as making accessible and sharing digital content by teachers. An emphasis is placed on digital content protection, copyright and privacy protection. This field also includes the requirement to understand the concepts of open licences and open educational resources. Technologies can increase the quality and efficiency of teaching, but it requires a certain level of teachers’ digital competencies. The third field is teaching. This field is represented by four teacher competencies. The first one is teaching, which means that teachers modify their activities, implement digital technologies and digital resources in order to increase the efficiency of their teaching procedures. Pedagogical intervention is managed by means of digital technologies. Moreover, new forms and didactic methods are introduced, teachers experiment with them, and examine their suitability. The second competence is leading students, implementation of digital technologies as means of communication, and using them for students’ individual and group interactions. Digital technologies can also be used for tutoring [8, p. 15]. The third competence is represented by students’ cooperation. Teachers try to use the potential given by digital technologies for promoting students’ mutual collaboration. The final competence is independent learning. Teachers promote students’ independent learning through digital technologies, encourage them to plan, organize, monitor, and evaluate their own learning activities. The fourth field is digital evaluation. Competencies in this field focus on using digital technologies for a range of forms of evaluation and assessment, as well as providing students with feedback. In the process of assessment, there is a huge amount of digital data at teachers’ disposal and therefore, it is important to know how to work with them effectively and how to analyse them. The next field consists of three competencies. The first one is the strategy of assessment, which means that teachers apply a whole scale of ways and approaches to student performance assessment by means of digital technologies. The second competence is analysing educational outputs including active involvement in gathering data regarding students’ activities and their subsequent analysis and interpretation. The third and last competence is feedback and planning, which means that teachers provide students with feedback by means of digital technologies. Digital technologies enable promoting students’ performance in entirely new ways as students can actively participate in educational activities and also the application of an individualized approach to students is enabled. The fifth field is supporting students and includes three competencies. The
first one is access and inclusion, where teachers ensure equal opportunities for all students including those with special educational needs. The second one is differentiation and individualization, which means that teachers use digital technologies for meeting students’ educational needs. By means of digital technologies, teachers allows students to learn at their own pace, various levels and in various ways. The third competence is activating students, when teachers use digital technologies to promote students’ active learning. It means application of cross-cutting skills, higher order cognitive skills, and creative thinking. Teachers try to use real-life situations in the classroom with the aim to promote students active participation [5, p.142]. They are those whose task is to prepare students for their lives in the digital society and should promote the development of their digital competencies. So, the final field is promoting the below described five students’ digital competencies. The first one is information and media literacy. Teachers make efforts to implement such activities in their teaching, which develop students’ information and media literacy and make efforts to include also activities related to formulating information need, browsing and searching information in the digital environment, organizing, processing, analysing and interpreting information, a critical comparison and evaluation of the credibility and reliability of information and information resources. The second competence is digital communication and collaboration within which teachers lead their students towards an appropriate and responsible usage of digital technologies. Teachers also introduce activities where students use various types of digital technologies for communication, collaboration and engaging in citizenship [7, p. 84]. The third one is digital content creation where teachers teach students how to express themselves through digital technologies and create digital content. Alongside with that, students learn about copyright, citations, and using licences. The fourth competence is responsible usage of digital technologies when teachers focus on physical and mental safety, as well as socially responsible usage of digital technologies. Teachers also teach students how to manage risks related to using digital technologies. The final, fifth competence is problem solving by means of digital technologies which means that teachers develop their students’ ability to recognize and solve technical issues and apply their existing knowledge in new situations. Where can teachers use their digital competencies?

2.2 Levels of teachers’ progress in self-evaluation

The DigCopmEdu framework works with six proficiency levels – from A1 (Newcomer) to C2 (Pioneer) – along which educators’ digital competence typically develops. Teachers on the level Newcomer (A1) have very limited experience with digital technologies. They need guidance and encouragement in the field of using digital technologies in the classroom. Teachers on the level Explorer (A2) are interested in using digital technologies in the classroom and are aware of their potential. They have already started using digital technologies but without following a comprehensive or consistent approach. These teachers need encouragement, support, and inspiration. The Integrator (B1) level is achieved by teachers when they start experimenting with digital technologies, using them in a creative way, and integrating them into professional activities; when they are willing to try out new tools and improve in using them. These teachers need time, further experiments, reflection, and collaboration with colleagues to move to the next level. On the level Expert (B2), there are teachers who are confident, creative, and critical in using a range of digital technologies in their work. They select tools meaningfully considering the particular situation. They experiment in the classroom, broaden and consolidate the repertoire of their strategies, and are open to new ideas. They provide support when new strategies, technologies or tools are to be introduced. Teachers on the level Leader (C1) have a consistent and comprehensive approach
to using digital technologies to enhance pedagogical and professional practices. They rely on a broad repertoire of digital strategies and know how to choose the most appropriate one for any given situation. They continuously work on their improvement, they are in touch with their peers; they exchange ideas and experiences. They serve as a source of inspiration for others. The highest level – Pioneer (C2) – is achieved by teachers when they start questioning the adequacy of contemporary digital and pedagogical practices, of which they are Leaders. They try to introduce innovations, experiment with highly innovative and complex digital technologies and pedagogical approaches, and introduce new ones [6, p. 110]. These teachers are role models for their colleagues. The DigCompEdu framework considers digital competencies among teachers’ key competencies in the current information society. It works with digital competencies as interconnected fields influencing each other and creating a complex unit. The link between teachers’ professional engagement and promoting students’ digital competencies is interesting. These to fields are not exclusively connected to education. They are influenced by the context in which teachers work, but also their broader environment. Various authors try to unify terminology and to develop a common concept of teachers’ digital competences. DigCompEdu was inspired by already existing frameworks and tools and base on them, it presents a new approach to digital competencies. For teachers, it can be useful for its simplicity on one hand and complexity on the other hand. Digital competencies are classified into six fields covering twenty-two competencies. The frameworks’ universality (for teachers of various subjects and at all levels of education) and the fact that it provides examples of practical activities for each competence can be considered its contribution. The field of digital educational resources discussed in this paper is represented by a whole category. According to DigCompEdu, working with them includes their selection (including evaluation), organization, and modification. An emphasis is placed on teachers’ ability to create new digital content and to share it. Also privacy protection and copyright are important in the course of such activities, as well as understanding the principles of working with digital educational resources.

3. Forms of institutionalized education

Lešková and Švač (2001) in the work (Zlámalová, 2006), [9, p.86] classified the forms of institutionalized education into conventional traditional forms of education, distance education, virtual education, and online education.

3.1 Conventional traditional education

Conventional traditional education is represented by typical forms of education applied in schools characterized by dialogical methods of teaching, lessons, lectures, seminars, exercises, and excursions [3, p. 47], vocational practice in a target environment, by studying in libraries (including the virtual ones), by means of devices such as data projectors, blackboards, but also using other educational environments – organizations, exhibitions, museums, etc.

3.2 Distance education

Distance education has been influenced by the development of digital technologies as distance learning is typically realized when teachers and students are separated in space and they interact through a range of technologies, which means that personal contact is replaced by mediated communication.
3.3 Virtual education

Virtual education is face-to-face education realized remotely, which would not be possible without digital technologies. In virtual classrooms, teachers and learners are separated in space, they are not in the same physical classroom. Currently, for educational purposes, digital technologies offer a wide range of information in their multimedial form [2, p. 43]. The digital environment provides huge amounts of information, as well as digital and multimedial content, and therefore, working with information requires high levels of digital literacy from learners. Nowadays, a range of online educational technologies are available. Considering the above processes, the need for optimizing vocational subject teachers’ digital competencies arises, which can be defined as a set of various mutually connected activities in interaction. Teachers need to assess their level of competencies, formulate goals, consider strategies, and the overall realization of the planned distance teaching activities.

3.4 Online education

Online education is a relatively new and not much examined phenomenon. Closing schools and other educational institutions has had great impact on people’s lives during the pandemic crisis. For teachers, the new situation represented a challenge in three fields. In the initial phase, the most important task was to maintain contact with their students, to ensure technologies, develop a routine, to create conditions promoting emotional well-being even in the online environment, and finally, to deliver education by using online platforms. Because of the inequity in opportunities given by differences in the availability of devices in students’ households and internet access, parents’ help was a necessity [4, p. 123]. In this situation, intensive collaboration between teachers and parents was more important than ever before. Recording lessons, as well as making educational content accessible to students at any time and from anywhere helped a lot as students could revise everything and watch videos again.

3.5 Comparison of the needs in the field of developing competencies in relation to teachers’ job position

During the pandemic in 2021, we carried out a research on the sample of 252 secondary school teachers (females represented 79.37% and males 20.63% of the sample) on the priorities in developing teachers’ digital competencies within a research project realized in collaboration with the Self-Governing Region of Trenčín. The respondents were categorized based on their job position. The first group consisted of school leaders, teachers with first or second attestations, and the second group was formed by novice teachers and teachers without an attestation. Within the research study, we were verifying the hypothesis H: “We assume that there are statistically significant differences in the evaluation of the results in the field of preferences as for the priorities in developing secondary school teachers’ digital competencies between two groups: school leaders and teachers with first or second attestations, and other teachers.” In the context of the investigation and examining preferences in the field of developing secondary school teachers’ digital competencies in the Self-Governing Region of Trenčín, we dealt with the priorities for school management at all levels, including the urgent need for solving the situation in the field of online education in secondary schools. Secondary school teachers were diversified in two groups, and we present the findings regarding the development needs in the two listed groups. The need for increasing the quality of competencies was observed in the following fields – creating new tests and tasks with an accent placed on new trends 74.78% and 66.39%; increasing the quality in integrating the available tools of educational platform Microsoft Office 365 – 42.25% and 33.95%; increasing efforts in searching for new innovative on-site programmes within competence development –
69.53% and 61.23%; increasing the quality of preparing competence development related to the visual side and animations in on-site learning – 53.52% and 45.22%; intensifying controlling information and internet safety as a part of competencies – 45.43% and 37.11%; improving the quality of creating e-learning courses by developing competencies – 66.44% and 10.13%; ensuring better usage of the opportunities provided by educational platforms when teaching online by developing competencies – 56.59% and 50.29%; improving material and technical equipment, as well as the competencies in the field of working with dynamic educational softwares – 66.45% and 58.14%; and increasing efforts in developing competencies in new CAD, CAM, CAE systems – 73.26% and 64.96%. The values are listed for the two participating groups of respondents – school leaders and teachers with attestation(s), and other teachers. We were interested in teachers’ responses regarding their educational priorities within the development of secondary school teachers’ competencies.

The results obtained by analysing data from both groups of respondents (1. school leaders and teachers with first and second attestations; 2. other teachers) are displayed in Figure 1. It displays the comparison of the needs in the field of developing competencies in both groups of secondary school teachers.

![Figure 1 Preferences of needs in the field of developing teachers’ competencies during the pandemic in year 2021 in the Self-Governing Region of Trenčín](https://example.com/figure1.png)

Source: own research

For examining statistically significant differences, the results of both datasets – school leaders and teachers with attestation(s); and other respondents – were compared, the Chi-square test was used. The obtained data are displayed in Table 1.

The unmarked values in Table 1 lower than the level of statistical significance α=0.05 are among the statistically significant differences of positive responses by the examined groups regarding their educational priorities in developing secondary school teachers’ competencies. In the context of comparing teachers’ needs in developing their competencies, no statistically significant differences were found between the two groups of respondents – school leaders and teachers with attestation(s); and other respondents – in priorities no. 3, 4, and 6 – opportunities to increase efforts in searching for new innovative on-site programmes within competence development; improving the quality of competencies in the field of interactive teaching; and increasing control in the field of information and internet safety within competencies.
Taking into account the above presented results, we consider the hypothesis H: “We assume that there are statistically significant differences in the evaluation of the results in the field of preferences as for the priorities in developing secondary school teachers’ digital competencies between two groups: school leaders and teachers with first or second attestations, and other teachers.” to be confirmed.

In relation to solving problems being a part of the subject of the research project, a whole range of interesting phenomena were revealed and new questions with the potential to contribute to the educational theory and practice arose. It is recommended to pay similar attention to secondary schools as their work is influenced by online education and innovations. Also an investigation focusing on the methods teachers use would be interesting as they can assign certain topics a particular degree of importance. But also on the level of the realized online teaching, the teaching content – due to the impact of a range of factors – is not necessarily presented to students effectively.

In order to make distance teaching efficient, secondary schools’ material and technical equipment should be optimized by building digital infrastructure, but as research results show, neither high-quality equipment nor a more frequent use of digital technologies automatically guarantee innovative teaching. Infrastructure represents a challenge for schools in another sense – it must be continuously renewed and schools are not able to establish regular and adequate cycles of infrastructure renewal (especially computers) taking into account the length of its technological and moral life. Therefore, purchasing new equipment prevails, but the share of older technologies is alarming.

Based on the above, it is a necessity to consider the needs in developing secondary school teachers’ competencies in the field of online teaching not only on the level of self-governing regions, but to find conceptual solutions for entire Slovakia. Primarily, teachers’ teaching competencies in the field of Using digital resources – creating and modifying, but also organizing, protecting, and sharing digital resources; within the field of Digital evaluation – strategies of evaluation, analysis of educational results, feedback, and planning [10, p. 138]; within the field Teaching – teaching, leading students, cooperation between students, and students’ independent learning; and in the field of Supporting students – accessibility and inclusion, differentiation and individualization, and activating students – should be developed.
Also the development of teachers’ professional competencies as a component of their professional engagement, especially those of cooperation, professional collaboration at various levels should be dealt with, examples of good practice from both Slovakia and abroad should be used, and continuous professional development should focused on as well.

4. Conclusion

Vocational subject teachers’ self-reflection was evaluated from the aspect of the quality and efficiency of their work in the process of distance teaching. National and international organizations have taken measures to help teachers to provide such education that will enable graduates to find application on the labour market of the 21st century. In this field, a lot of work has been done by the European Union, which – by its approaches and recommendations – provides its members with examples of good practice that should help them create ideal teachers for the current world. The DigCompEdu framework can be considered some kind of a recommendation, which provides an intersection of many of teachers’ roles and duties they have to deal with at a certain level. It uses strategies, tries to set such goals and plan interventions that have the potential to help particular school systems to compete with the rest of the world. But their application and edification do not always penetrate the direct teaching practice. Therefore, developing the educational system is a gradual process. The current pandemic situation has had an impact on the process of transformation and has forced teachers to improve their strategies and competencies faster. In the context of the challenges in the field of using digital technologies, we focused our attention on reference frameworks having an impact on teachers’ professional preparedness. They are also a part of their personal development plans. The DigCompEdu framework considers digital competencies among teachers’ key competencies in the current information society. There exist several evaluation reference frameworks for teachers’ digital competencies, including ECDL – the European Computer Driving Licence, as well as worldwide and European ISTE and MENTEP standards. Similarly to the DigCompEdu framework, there is a self-evaluation tool, which offers teachers an opportunity to find out about their digital competencies, to receive a certificate of their proficiency level in using digital technologies in an app. Within the reference framework, digital competencies are considered mutually interconnected fields influencing each other and forming a complex unit. Teachers’ professional engagement and promoting students’ digital competencies [12, p. 231] is an interesting field as well. These to fields are directly linked not only by education, they represent a context, in which teachers work and also other circumstances are taken into account. Many authors try to unify terminology and provide a basis for common understanding of teachers’ digital competencies.

Digital competencies are perceived as one or more teachers’ abilities that can form a part of their digital literacy, but not necessarily [11, p. 42]. To be competent means that a person is equipped with a complex set of effectively interconnected knowledge, skills, and attitudes, which enable individuals to successfully deal with tasks and situation occurring during their studies, at work, or in their private lives. To be competent means that individuals can find orientation in a certain situation, they carry out appropriate activities, and apply a positive approach. It can be concluded that the implementation of the Strategy 2030 aims to create and develop open educational system, which could react to the changing external environment and provide relevant educational contents from a lifelong perspective. In compliance with the European model – as a reaction to the educational needs in the information society – a change leading towards individuals’ participation in educational processes and developing competencies necessary for living in the 21st century is required. Those competencies include
the ability to react to the changing environment, self-improvement, as well as the development of the whole society. For carrying out such a change, all stakeholders should be prepared.

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