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How Technical Teacher Use Digital Means in Their Teaching Practice

Alena Hašková[1], Ján Záhorec[2]

Abstract

The paper presents some results of the research of the ways the teachers use interactive educational activities and digital means in their teaching practice in dependence on the subjects they teach, i.e. which purposes teachers of different subjects follow if they apply these means into the education process. The main research question was whether it is the same for all teachers, independently on the character of the subject they teach, or whether it depends on the taught subject. As the results have showed, the purposes significantly differ in dependence on the character of the taught subjects. In frame of the presented research results in more detail the results for technical teachers are discussed.

Keywords:
Teacher training
Teachers` didactic technological competences
Use of digital means
Interactive activities
Efficiency of teaching

1 Introduction

As the roles of teachers and schools are changing, expectations about the teachers are still broaden. They are asked to teach in increasingly multicultural classrooms, integrate students with special needs, use information and communication technologies for teaching effectively, engage in evaluation and accountability processes, and involve parents in schools (OECD, 2009). One of the official documents which in this context points out importance of teacher digital competence and the use of digital means in their teaching practice is the European Commission`s communication *Rethinking Education*, in which the European Commission invites European Union Member States

> *...to revise and strengthen the professional profile of all teaching professions reviewing the effectiveness as well as the academic and pedagogical quality of initial teacher education, introducing coherent and adequately resourced systems for recruitment, selection, induction and professional development of teaching staff based on clearly defined competences needed at each stage of a teaching career, and increasing teacher digital competence* (EC, 2012).

When most of the teachers undertook their initial education, many teaching tools based on the digital technologies were not available and the role of education and training was more narrowly conceived. Moreover these technologies are constantly further innovated and developed what results in a need on the one hand to innovate the pre-graduate teacher training in this area and on the other hand to offer also continuing education with up-to-date content related to this area to in-service teachers. But should this education and training be the same for all teachers, independently on the majors they are teaching or are there any differences in the ways the teachers of different subjects use the digital means in their teaching practice? To answer these questions a research, which should serve as a platform for innovation and at the same time optimalization of the pre-gradual teacher training (the parts of the teacher training study programs

[1] Faculty of Education, Constantine the Philosopher University, Dražovská cesta 4, 949 74 Nitra, Slovakia.
Corresponding author. E-mail: ahaskova@ukf.sk
[2] Faculty of Education, Comenius University, Bratislava, Slovakia.

focused on development of teacher trainees` professional didactic-technological competences), as well as for creation of appropriate continuing education courses for in-service teachers.

2 Aims and methodology of the carried out research

Following the demand to ensure a conception of an optimal pre-graduate teacher training in the area of teachers` didactic-technological competence there was carried out a research which primary aim was to identify needs and requirements of in-service teachers ´ for upgrading their professional digital literacy skills, i.e. their didactic technological competences (Záhorec -- Hašková - Munk, 2017; 2018; 2019a; 2019b).

Teacher`s skills to use material and technical teaching means in teaching processes of the school subject s/he teaches are an integral part of a teacher`s professional competence profile, abstractedly from the subject the teacher is teaching (Gadušová et al., 2017). In frame of this we were interested which kinds of different digital applications should be integrated into the teacher trainee professional preparation to become competent to use the digital means intentionally in their teaching practice to enhance learning achievements of pupils/students. The secondary aim of the carried out research was to review the ways the teachers use interactive educational activities and digital means in their teaching practice. We were interested in which part of the education process teachers apply digital teaching tools, and with them connected interactive activities, to support teaching and learning processes. In this part of the research one of the particular research questions was whether it is the same for all teachers, independently on the character of the subject they teach, or whether it depends on the taught subject. In other words, a question was which purposes teachers of different subjects follow if they apply these means into the education process. And if there are really significant differences, a final question was what are the ways and purposes the technical teachers use the digital means in their teaching practice.

To collect necessary research data a method of personal inquire was used (Záhorec – Nagyová - Hašková, 2019) and one of the questions, the respondents responded to, was

In which part of the lesson (in sense of for which purpose) *do you most often use interactive education activities (supported by digital means)?*

To answer this question the respondents were asked to choose one from the five offered alternatives answers (the one that corresponded mostly to their teaching practice and experiences):

a) to invoke greater motivation to learn,
b) to explain and exemplify new subject matter,
c) to fixate new subject matter,
d) to apply acquired knowledge,
e) to diagnose and grade pupils / students.

The research sample consisted of 156 teachers – participants of teacher continuous education carried out from December 2017 to October 2018. The participants were primary and secondary school teachers representing primary and secondary schools in three of eight regions of Slovakia (Nitra region, Trnava region and Bratislava region, regions for participants from which the continuous education was done). From this number 68 respondents were teachers of primary schools (ISCED 1), 69 teachers of lower secondary education (ISCED 2) and 19 teachers of upper secondary education (ISCED 3). 50.29 % of the total number of the respondents had the pedagogical practice within the scale from 5 up to 20 years.

As to the character of the subjects, these were classified into five categories:

- natural science subjects,
- foreign languages,
- social science subjects,
- artwork and educational subjects,
- professional (vocational) subjects.

From the research sample of the 156 respondents, 133 of them taught natural science subjects, 108 social science subjects, 107 foreign languages, 100 artwork and educational subjects and 18 professional (vocational) subjects. Those respondents who have taught only one subject or two subjects, but both of the same character, stated one answer (responded to the stated question only once). The rest of the respondents, i.e. those who have taught subjects of different character (e.g. math and foreign language), stated two answers – one for each of the two subjects they have taught. These differences in the numbers and characters of the subjects taught by the particular respondents is a reason why the sum of the respondents in the particular sub-

groups according the taught subjects in Table 1 is higher and not equal to the total number of the personal inquire respondents.

3 Research results and their discussion

Table 1 presents an overview of the results obtained in the part of the research related to the research question whether teachers use interactive educational activities and digital means in their teaching practice in the same way, for the same purposes, or whether the way and purposes they use them depends on the subject they teach.

The percentages of the relative frequencies of the responses presented in Table 1 refer to the total frequencies of the particular responses recorded at the respondents of the relevant sub-groups (see the above-mentioned explanation). These were in case of natural science subjects 133, in case of social science subjects 108, in case of foreign languages 107, in case of artwork and educational subjects 100 and 18 at professional (vocational) subjects.

Table 1: Relative frequencies of the particular responses stated by different subject teachers.

	Relative frequencies of the particular responses				
Teachers of	natural sciences	social sciences	foreign lang.	artwork, educ. s.	profess., vocat. s.
a – *to invoke greater motivation to learn*	39.85	30.56	44.86	60.00	33.33
b – *to explain and exemplify new subject matter*	50.38	43.56	28.97	17.00	16.67
c – *to fixate new subject matter*	4.51	15.74	15.89	15.00	38.89
d – *to apply acquired knowledge*	3.76	9.26	9.35	6.00	11.11
e – *to diagnose and grade pupils / students*	1.50	0.93	0.93	2.00	0.00

The results (Table 1) show a significant differences in the main purposes for which the teachers of different subjects use the digital means and interactive activities during their lessons to increase the efficiency of the education processes on the character of the taught subjects. Foreign language teachers and artwork and educational subjects teachers use the digital means in teaching mostly to invoke greater motivation of pupils/students to learn, and consequently then to explain and exemplify to pupils/students new subject matter. Vice versa is the situation in case of natural science teachers and social sciences teachers. These two groups use digital means in teaching their subjects most frequently to explain and exemplify new subject matter to pupils/students and the second reason for which they use these means quite frequently is invoking greater motivation of pupils/students to learn. The obtained results show as a special case just teaching professional/vocational subjects. In teaching these subjects, teachers use digital means mainly during the fixation of the new subject matter, and with regard to a less number of respondents from this sub-group of teachers can be said that almost just often they use these means to motivate their students to learn stronger.

As to the characters of the taught subjects, technology is usually incorporated in one group together with natural science subjects and mathematics (known as STEM – natural science subjects, technology and maths). From this point of view there are surprising significant differences between the results of the group of natural science subject teachers and the group of professional/vocational subject teachers (see e.g. the finding that natural science teachers use digital means to fixate new subject matter very rarely while in case of professional/vocational subject teachers this is the most frequent reason or purpose). Another surprising finding in case of technical teachers (professional/vocational subject teachers) is that by contrast to the other groups of teachers, these teachers do not use the digital means in their teaching practise not so identically as the other groups of teachers do. The relative frequencies 33.33 – 16.67 – 38.89 – 11.11 in Table 1 show that by contrast to teaching the other subjects, at teaching technology/technology oriented subjects instead of two purposes, because of which the teachers incorporate digital means and interactive activities into their teaching, there are even four very often occurring reasons. Moreover from fro these four purposes two and two are approximately equally common –a little bit higher frequent purposes for which the technical teachers incorporate digital means in by them taught lessons are *to fixate new subject matter* and *to invoke greater motivation to learn* and a little bit less frequently they do it *to explain and exemplify new subject matter* and

to apply acquired knowledge but however also these reasons are quite frequent for this category of teachers.

CONCLUSION

The obtained results has proved a dependence of the purposes for which teachers use the digital means during their lessons on the character of the taught subjects (there are differences among the main significant purposes to use the digital means in teaching the respective groups of the subjects to increase efficiency of their teaching). These results should be taken into consideration at creation curricula of teacher trainees` didactic-technological preparation as well as at creation curricula of professional development courses focused on upgrading in-service teachers` didactic-technological competences.

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