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Digital Didactics: New field in the Education's Philosophy

Abstract

Digitalization, digital economy is a concept that is linked in the world with the concepts of Industry 4.0 and "Smart Industry". IT influences all spheres of people's lives. In education, digital technologies are often seen as new tools for old didactics. This article is devoted to the consideration of didactic principles of VET educational process in times of digitalization. The authors discuss how the content of these principles is transformed and refer to the fundamental difference of VET digital didactics in relation to the traditional one. The article examines possible changes in the system of students' motivation, systems for selecting the content and skills training, working with information, system for control and evaluating learning outcomes. The problem of interaction between developers and consumers of digital educational products is also analysed in this paper. Such products should be developed on the basis of the educational needs and the analysis of opportunities system - taking into account the properties of various information technologies, products and didactic principles, and features of the educational process in VET.

1   Introduction

After years of discussion, everybody must have recognizing the definition of the modern era as „digital". Digital technology (such as the Internet of things) went far beyond industrial production and offices, and became a fact of daily life for millions of people. Russia is no exception in this regard. For example, the federal project Electronic Government has been implemented for ten years by 2015, a trend that can be observed in the United States and some other countries. At present, there is a new large project called "Digital Education" as a framework that should support educational organizations with the most modern, high-performance computing and network facilities.

Nevertheless, in practice, the process of digitalization of education, at least in Russia, is extremely contradictory. On one hand, there is a huge variety of digital tools and "educational products" imposed on schools by their producers and the state. The introduction of computer technologies in education is attended with hopes that this will make education considerably cheaper by transferring a significant part of the educational process to on-line mode, getting rid of expensive paper textbooks, and by replacing "natural" workshops by virtual ones (Luksha & Peskov 2013). On the other hand, the school itself, with its inherent conservatism, still implements traditional approaches in the educational process. On the third side, children themselves ("chip children", "digital" or "tablet generation", "generations of Y and Z") are much more knowledgeable in the digital world than their teachers and parents and therefore less willing to perceive the "pre-digital" educational process (Kerdellant & Gresillon 2003; Strauss & Howe 2007).

It is necessary to note that in countries that are ahead of Russia in their development, the hopes for a transition to mass distance education have not been justified even at the level of higher education institutions - not to mention the general education school or pre-university vocational education. Characteristic in this respect is the recognition of the international group of futurologists that "Human-to-human education" is supposed to be the key development process, the most effective form of teaching and learning in both directed and "self-managed" aspects (Compare: Luksha et al. 2013).

Anyway, in the system "children - school - computers", the school makes the impression of a lagging link. In the opinion of the authors of this article, it is not enough to simply analyze the reasons that are already quite clear (the traditionally conservative role of the school as a transmitter of culture, knowledge and skills, the psychological characteristics of the personality of a typical teacher, expectations from the education system from parents) to solve this problem. A constructive approach is needed, based on building a new branch of pedagogical science – digital didactics, which successively uses the basic concepts and principles of the traditional (pre-digital) didactics and at the same time is complementing and transforming them according to the conditions of the digital environment. Such step will, in turn, significantly modernize the content of training and professional development of teachers, changing their traditional worldview positions, habitual ways of thinking and building their own professional activities – while preserving the leading role of the teacher in the educational process, even highly saturated with digital technologies.

The development of "digital didactics" is the leading direction of the Center for Vocational Education and Qualifications Systems, FIRO research work since 2019. Currently, work has begun on 9 experimental platforms in 7 territories of the Russian Federation. Some ideas that can be used as basis for digital didactics are presented further.

2   Main ideas

2.1   Digital didactics is not "digitized" didactics

These are not just different words or semantic nuances, but principally different approaches to the construction of the educational process. The digitized textbook is a traditional educational text, transformed into electronic form, equipped with cross-referenced hyperlinks and links to external resources, and also, perhaps, "live pictures" – animation and video fragments. Such way of using digital technologies in education was described and didactically understood in pedagogical works at the end of the last century (Compare Polat et al. 2000; Lobachev & Polyakov 2000; Machulis 1999). Its use, perhaps, allows creating higher learning motivation for modern children than usual but this motivation is external and short-term. The main problem in this case is that the strategy of learning activities with such textbooks does not change, or changes for the worse, losing its humanistic component. This last happens because the teacher, trusting the capabilities of the digitized textbook, increasingly withdraws from the educational process and supports the "student-computer" interaction.

Even the opportunities for individualization of learning, which digitization of traditional educational content carries out, often affect the process of development negatively: the student closes in his personal computerized learning environment, to the detriment of group forms of work and more or less empathic but spirited dispute.

However, such approach, which we called "digitization," is used in the educational process in the overwhelming majority of cases, up to the present time. It resembles a cart with a jet engine attached to it in the expectation that it will still fly, not minding that it is not adapted for flight.

In vocational education, at first glance, the situation is better in general, thanks to the use of various simulators that support the effective development of professional skills, combined with immediate evaluation. However, in practice the students' learning activities in the "digital educational environment" remain the same or even become more primitive, and professional activities sometimes are simulated (working on simulators instead of full-fledged practices at the enterprise). Few people understand how to use digital technologies to create the universal and professional competencies necessary for the employee.

In contrast to the "digitized" didactics, which relies on the omnipotence of digital media, digital didactics uses these tools to solve concrete pedagogical tasks that are relevant precisely for the upbringing of the "digital generation" in the digital society. These problems are primarily related to the need to correct the typical features of the "digital" generations Y and Z, which are sometimes regarded as deficiencies in personal qualities. In our opinion however, these typical features represent "gaps in social competencies", and replenished by targeted pedagogical activity (analogy with "gaps in knowledge" – a term adopted in the Russian pedagogical tradition). Among such "gaps in competence" are (also referred to as): infantilism, individualism, conformism, non-communication and non-cooperation, clip-minded, impatience and hyper-pragmatism (Strauss & Howe 1997).

And digital didactics can help to overcome many of the negative qualities that the "digital generation" has:

- infantilism, impatience - practice oriented environment
- individualism, introversion, non-communicative, non-co-operation - group, collective learning activities
- conformism - tasks requiring independent actions and critical thinking
- hyper pragmatism - socially useful activity (for example, volunteer projects)
- clip consciousness - tasks that require figurative thinking and tasks of a complex type that require coverage of the whole situation.

All these solutions are well known, but they can be modified or strengthened in the digital environment.

And it's important to understand that digital learning/educational environment is not more than a system of possibilities. In order for its potential to unfold, it is necessary to ensure

students' activity in the environment, therefore our task is to develop a system for organizing activities in the digital environment using digital tools.

It is crucial that a person has an active position in the process of his learning. For most VET students this is not typical the case due to both age and typological features (incomplete self-determination), which is further strengthened in the "digital generation". Therefore, the main task is to develop methods of organizing activities in the digital educational environment. The richer the resources of the environment, the more diverse the activity should be.

Table 1: **Comparison of traditional (pre-digital), "digitized" and digital didactics**

Approach	Objectives of the educational process	Learning content	Forms and methods of teaching	Teaching tools
Traditional didactics	Knowledge	Subject oriented and systematical	Teacher centered	Analog or similar
"Digitized" didactics	Traditional, weakly meaningful	Traditional	Traditional, with predominance of individual	Digital
Digital didactics	Transformed in relation to the needs of the digital economy, digital society, the characteristics of "digital children" and the pedagogical capabilities of digital learning tools			Digital

2.2 The complexity of the teaching forms and methods should be adequate to the complexity of the training tools used

A common misconception is the expectation from computerization of education has exactly the opposite effects: teachers expected that their professional activity becomes easy, and the state – less budget on the part of education. In this regard, we can remember the tradition of "TV-lessons" that existed in the late USSR, when lessons were broadcasted in the whole country. The teacher's task in such lessons was to provide "class-conscious discipline" in the classroom (silence), while the pupils themselves passively watched the material broadcasted for them. Undoubtedly, this form of work may be economical but it does not have high pedagogical efficiency, due to poorly structured educational activity of students.

Modern digital technologies, including network, can greatly facilitate learning activities, give it multidimensionality - varying not only the elements of content but also the speed, logic, size and composition of the training group (including students from other schools, regions, countries if necessary).

Thus, the educational process, built on the use of digital tools, requires teacher to design and use, depending on pedagogical tasks, the variety of teaching forms, methods and specific study assignments that ensure the transition:

- from simple to complex and from complex to simple;
- from the general to the particular and from the particular to the general;

- from real object or model to image, and sign system and from the sign system to the image or the description of the experiences with objects and situations;
- from individual to group and from group to individual;
- from working with external support to independent studying/learning/working and from independent studying/learning/working to support other students;
- from an audio-visual-kinaesthetic simulator to real objects and from real objects to their models;
- from study tasks – to industrial tasks and from industrial tasks – to their reflexive comprehension in educational activities.

There are three traditional forms (front-mass, group, individual), which was then joined by the "collective way of learning". Digitalization let us use wide range of dynamic forms involving rapid alternation of class, group and individual forms, distributed groups organized in various ways and using different communication technologies.

In the context of VET, these various forms and methods are used at the stage of industrial practices, internships, production and research projects in which not only the tasks of work and content are dynamic but also the composition of groups, place of work, equipment (including various simulators), as well as the alternation of virtual and real processes, works in remotely distributed and in ordinary production teams.

2.3   Emphasis on teaching forms, and methods

In its historical development, didactic practice passed several stages, there was a difference in emphasis among the triad elements: the goal – content – forms / methods. In the last quarter of twentieth and especially in the beginning of the twenty first century, there was new emphasis on the goals (expected results, outcome) of training, which was reflected in the professional education competence approach (Coles et al. 2010). This was reflected in the educational practice by shifting from content-based teaching approach ("What to teach?") to learning outcome-based teaching approach ("What should be learned / mastered?").

At the same time, the third tradition developed in Russia (and many others countries) was so called "pedagogical technology" or "technology of training", in which the emphasis is placed on the forms and methods of teaching ("How to teach?"). However, up to the present time this trend has remained in "the marginal space" of pedagogical science without the opportunity to build its own full-fledged didactic theory. Only the appearance of publicly available digital technologies with their educational potential allows to reconstruct the idea of "pedagogical technology" in which the leading element of the didactic system is no longer the goal, result or content but form and method.

Let us note that the pedagogical concept, where the emphasis is on forms and methods, and the purpose and content are open and are not defined by the state, society, economy or any other "educational customer" – is not new in the history of pedagogy. Remember the theory of "free education," as alternative to the Herbartian "pedagogy, based on the goal of

education" (Neil 2014; Venttsel 1923). According to the Russian researcher G. B. Kornetov, education with an open goal is a feature of the Anglo-Saxon pedagogical tradition, while the education of a person with pre-set features of characters is a continental one, primarily German and Russian pedagogy (Kornetov 2001). At present, in the conditions of the liberalization of societies the idea of "free education" under different names finds approval in different countries. Returning to digital didactics and the priority of teaching forms and methods over goals and content, we can call this "free learning" (by analogy with "free education").

In other words, the factor of the digital didactics development, primarily forms and methods of teaching, is not only the pressure of digital tools and their producers, but also the liberalization of educational objectives. In the educational process, this last tendency is manifested in the form of individual educational routes and individual curricula. Individualization can be carried out not only according to the objectives, which the student formulates himself but also according to the content, speed, partners in the training group, teacher, and additional support tools (for example, for students with disabilities) etc.

2.4 The leading role of fixing results (learning outcomes)

The emphasis on teaching content led to the dominance of the explanatory function of teacher. Until now traces of this tradition are preserved in ordinary minds: "A good teacher is one who knows how to explain new material well." The shift in focus to learning outcomes led to hypertrophy of the control function of teaching. This is still the case in Russia in both general and vocational schools. The latest reform of VET is an attempt to introduce a demonstration exam according to World Skills International standards, without introducing any significant changes to the "pre-examination" part of the educational process as final assessment procedure. It is considered that the new, more complex and responsible form of final control will "automatically" force teachers and students to rebuild educational process and their own motivation seriously but in practice this of course does not happen.

The transition to digital didactics, which focuses attention on the teaching forms and methods, is associated with the strengthening of the fixing results (learning outcomes) role. Until the last years, in the didactic chain of "explanation – fixing – control", the middle link remained the weakest point: its importance for the transformation of knowledge into skills and competences was constantly emphasized in theory but had little effect on the practice. It is clear why: fixing is much more routine and time-consuming, and for VET it is also a resource-intensive process. The appearance of digital tools allows solving the "fixing problem". It is possible to organize it taking into account the type and level of education and age of students on the basis of computer games, model tasks, simulators, etc., releasing the teacher (instructor, trainer) from the routine part of this process. In addition, the use of digital tools allows the teacher to use the diverse possibilities to protect the student from the "monotony effect" in the process of fixing and to provide him with high motivation. This could be a game or, on the contrary, realistic entourage, the selection of individual rhythm and speed of work, pauses, multimodality as simultaneous use of all channels of perception,

immediate evaluation, large number of difficulty levels with the option of selecting any of them, or with automatic transition from level to level, individual selection of training tasks based on the characteristics of the student or his future profession, etc.

The final thesis of this article is not so much theoretical-methodological as practical. We formulate it as follows:

2.5 From dictate of tools, their producers and sellers – to the design of reasonable pedagogical request

One of the most serious obstacles in the development of didactically grounded digital education is the lack of adequate interaction between developers and consumers of digital educational products. Instead of interaction, in practice, we see influence of producers and sellers who impose their digital products. Often, the developers of such products know IT programming well and widely understand "service delivery" but they have less understanding of the professional tasks which teachers face and no idea about scientific pedagogy. As a result, numerous digital educational products and services are produced and positioned under the slogan of simplifying the professional activity of the teacher. In the authors' point of view, digital educational products should be developed on the basis of the systematic analysis of educational needs and objectives, the abilities of students and teachers, taking into account the specific of various information technologies, products, as well as didactic principles, the features of the educational process of vocational education and training.

Solving this problem requires the introduction of a new professional position – *a methodologist-architect of digital learning tools* – acting as a qualified facilitator between teachers who are familiar with didactics and developers who are familiar with IT programming. Their task should include the identification of actual deficiencies in the practice of the educational process and the development of technical task in a language understandable to IT specialists. In this case, digital educational tools can really become necessary for solving urgent pedagogical tasks.

3 Conclusion: is there an alternative to digital didactics?

This is a question that should start to worry us. Many methodological, organizational functions are quite possible to automate today. The fact of adapting computer programs to the individual tempo of human learning, to the amount and quality of knowledge and skills, will be to determine the degree of current skill formation and to do many other things, impossible for even the most talented teacher.

We talk a lot about learning motivation and difficulties of its formation among students. The reasons for its insufficiency are fully understood. The fall of interest protects person from unnecessary efforts, negative emotions from situations of failure, lethargy and drowsiness when performing monotonous actions are also protective reaction. Like the pain threshold, our "laziness" and reluctance are strictly individual. Good teachers know an arsenal of tools

to overcome these problems. The creators of computer games took all these techniques into account: creation of success situations, visibility, variety of incentives and dosing efforts. A child in a computer game is doomed to success, a new level awaits him, the recognition of the network community awaits him, and his computer will never punish him. Routine activity turns into an exciting business. Nevertheless, is this not the main function of the teacher?

Many teachers are already asking about the place of the teacher in the digital world. Perhaps, in this perfect and yet fantastic world they are not needed at all? You can safely answer that you cannot educate a person without the help of a person. The functions of the teacher and the tools of his work will change but the goal is the same – give new generations all the best we have. In the digital class it may be that not thirty but three hundred pupils will study, and it will be necessary to teach not two but twenty subjects at once. It is quite possible, even quite realistic and necessary, however, to master IT-programs, and the design of robotic facilities, and additive technologies. The modern world is already badly divided into "humanitarians" and "technics". The convergence of professions has already covered the sphere of art, and the sphere of high technologies, and science.

At the same time, we have no right to deprive the child of human communication, empathy and sympathy in joy or difficult times. The child will always need human respect and respect for the adult. Not so much we can rely on machines and media - only human should tell the child that he grew up and is ready to be autonomous. Today, we are facing this not simple problem of distinguishing "pedagogical functions". The teacher of the digital world should be free from the routine; enormous intellectual and spiritual loads will be awaiting him. His main "working tools" will be living mind, inexhaustible fantasy, kindness, decency and the desire to learn.

Teacher should combine several roles:

- The facilitator, motivator for activities in the digital educational environment and in professional and personal development
- Carrier of personal example (example of professional success)
- Master in the formation of social and communicative soft-competences
- Intermediary between the virtual and real world, coordinator of various types of practices
- Assistant in resolving problems and conflicts arising in various situations of educational and industrial cooperation.

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