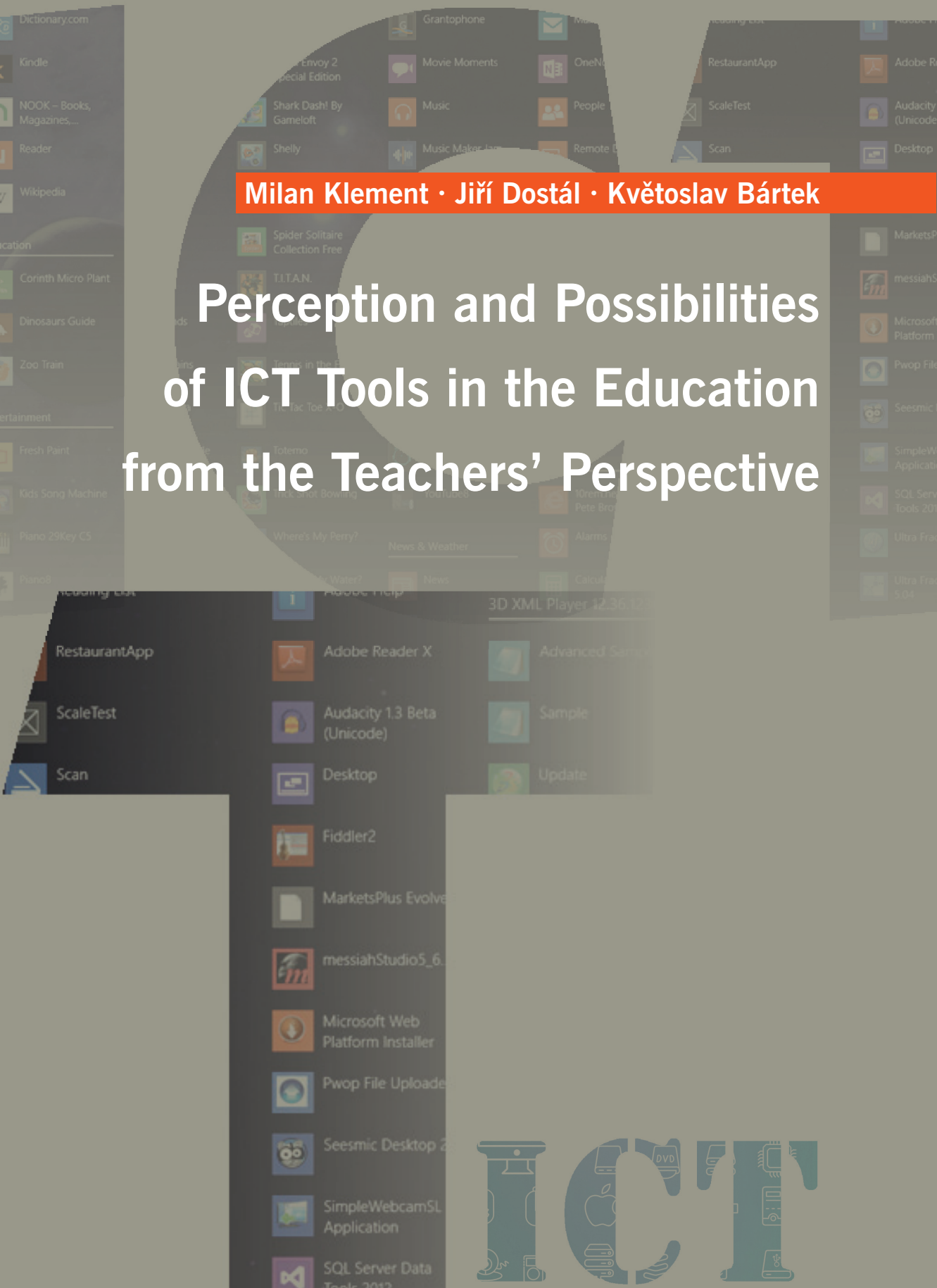
Milan Klement · Jiří Dostál · Květoslav Bártek

Perception and Possibilities of ICT Tools in the Education from the Teachers' Perspective



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Perception and Possibilities of ICT Tools in the Education from the Teachers' Perspective

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CONTENT

EDITORIAL

The submitted monograph summarizes main results of a project solved in a framework of the Grant Fund of the Dean of Faculty of Education, Palacký University Olomouc called "(Between the Adoration and Resistance: Perception and Possibilities of ICT in the Education from the Teachers' Perspective. This project was solved in 2016 at the Department of Technical Education and Information Technology at Faculty of Education, Palacký University Olomouc.

Project aim:

The aim of the project was based on a generally accepted fact that in times of an ICT boom, modern ICT tools based on digital technologies are coming into the focus of educators, especially the one using *multimedia* (Sokolowsky & Šedivá, 2002). *Multimedia are time-dependent or time-independent media integrated by a computer which may be interactively, i.e. individually and selectively, induced or processed* (T. Svatoš, in Průcha, 2009). According to N. and J. Chapman (2001), it is possible to derive individual components of multimedia presentations which *are processed by demanding technical composition where computer technology plays the main role - it is the only way to transfer information from different sources into the same process called digitalization* (Chapman & Chapman, 2004). Multimedia presentation is thus a "new" type of educational material that consists of several basic parts enabling the full usage of digital technologies in the educational process.
All of the stated facts therefore put new requirements on teachers who have to be ready to work with modern didactic means and technologies as well as to create suitable educational materials for the needs of education designed in this fashion. In this modern paradigm of education, there are new requirements put on teachers; and even that the teachers do not have to be necessarily experts on the field of ICT tools (meaning technical devices, e.g. interactive boards, tablets, computers, etc., but also educational software, educational websites, e-learning portals, electronic educational materials, e-books, etc.), they should be able to use them in their teaching in which they should perform a role of pupils' mentors (Jonassen et al., 2003). It is possible to derive the delimitation of these requirements from TPCK[1] model by L. Shulman (1986). This model was also addressed in Czech[2] environment by Zounek and Šeďová (2009) or Janík (2005), while it was further elaborated by P. Mishra and M. Koehler (Mishra, Koehler, 2006). This model operated by three dimensions:

[1] Technological Pedagogical Content Knowledge
[2] The Czech term is *technologicko-didaktické znalosti obsahu*

1. Pedagogical knowledge;
2. Content knowledge;
3. Technological knowledge.

These dimensions accept a fact that the teaching is a complex activity which requires various types of knowledge (e.g. skills, attitudes, etc.).
Discovering of the level of technological knowledge among the teachers is therefore one of the main themes of the performed research while there were also causes of some teachers' resistance towards the use of ICT tools, including the research of selected teaching methods even non-traditional ones (inquiry-based instruction, e-learning, m-learning, etc.), were indicated.

The project set out to research the issue of ICT tools' employment by basic and secondary school teachers, including the issue of creation necessary competences and mastering of relevant methods of teaching designed in this fashion. The achievement of this main aim was conditioned by the realization of several research sub-aims:

- realization of a research focused on the issue of employment of modern ICT tools in the education and the identification of causes of their employment from the side of teachers,
- realization of research focused on the optimization of a model of teachers' competences necessary to employ ICT tools in the education meaningfully,
- realization of research focused on a non-traditional concept of IT teaching at basic and secondary schools, focusing on the teacher's competences.

Characteristics of the Execution Team:

doc. PhDr. Milan Klement, Ph.D. was the main researcher and he dealt with the coordination of project activities, organization of activities connected to the collection of research data at 35 basic and secondary schools, preparation of research questionnaire, theoretical analysis of the issue of the area of employment of ICT tools in the education, and publication of project's sub-outputs.

doc. PaedDr., PhDr. Jiří Dostál, Ph.D. dealt with these activities: consultation activities, preparation of materials for statistical processing of obtained research data, analysis of the issues of activation and non-traditional methods employing ICT tools, publication of project's sub-outputs.

Mgr. Jan Kubrický, Ph.D. dealt with these activities: consultation activities, edition of publication outcomes, participation on the creation and layout of research questionnaire, analysis of the issue of the current state of teachers' competences for the work with ICT tools, publication of project's sub-outputs.

Mgr. Květoslav Bártek, Ph.D. dealt with these activities: preparation and realization of methodological aspect of research, evaluation of obtained data, participation on the preparation of research questionnaire, publication of project's sub-outputs.

Mgr. Jan Gregar dealt with these activities: edition of publication outputs, proofreading of selected publication outputs, participation on the theoretical analysis of possibilities to employ virtualization tools in the education, publication of project's sub-outputs.

Monograph characteristics:

The monograph is aimed at the issue of ICT tools' employment in the work of basic and secondary school teachers. It therefore summarizes sub-research activities of the execution team focusing on the issue of employment of ICT in the educational process with an overlap into the area of non-traditional educational methods while it integrates them in a form of a complex research aimed at possibilities and limits of this type of employment from the side of basic and secondary school teachers. The issue of research of modern electronic materials in which not only the text is bearing the educational content, but also a multimedia element, simulation or even virtual reality. On one hand, these ICT tools are frequently used by both teachers and pupils, on the other hand, they are also opinions which question their efficiency and necessity. Some teachers refuse to use these ICT tools, and, contrarily, some teachers uncritically adore them. From both the Czech national budget and the budget of European Union, there are spent not inconsiderable costs, however, the situation of ICT tools employment at schools is changing, at least in our opinion, only very slowly.

In this connection, a wide range of issues focused on the fact of to what extent is the cognitive process of a pupil or student influenced by modern ICT tools and vice versa – how these technologies enable teachers to improve their uneasy work and how (and if) they use them in their practice. Considering the abovementioned facts, it is not necessary to ask "what" do the teacher employ, or "how often" they do, or even "how well are they able to operate it". It is necessary to ask the purpose of ICT tools' employment, "how" they employ it,

"how they accept them", "which approaches and strategies do they choose while teaching in this fashion". However, the main question should be "what stimulates or dissuades them from employing ICT tools in their work".

As it follows from the stated list, although the areas of conditions and issues, which are dealt in the monograph, are wide, however, important for the development of modern ways of education based on the employment of ICT tools. The following-up to both "classical" and new educational theories overlapping into the didactical principles is necessary for the whole process of introduction and employment of ICT tools – this is the reason why they are given a proper space. We actually think that it is possible to additionally enrich educational theory not only in the area of e-learning based on their study or description of their employment in the educational practice.

Monograph structure:

The monograph is formally divided into 9 separate chapters which describe the issue of employment of modern ICT tools by basic and secondary school teachers, including the issue of creation of necessary competences and usage of relevant methods of the teaching designed in this fashion. In the publication, also the issue of indication of causes of some teachers' resistance towards the use of ICT tools, including the research of selected teaching methods even non-traditional ones (inquiry-based instruction, e-learning, m-learning, etc.). The content of individual chapters of the publication might be closer delimited in these points:

- The first chapter (written by: Milan Klement) is devoted to the issue of possibilities and concepts of ICT tools employment in the teaching from the perspective of historical development. In this area, we delimited the meaning of the learning theories for various stages of ICT tools' development and their influence on the way of employment of these educational theories via a comparative analysis.
- The second chapter (written by: Milan Klement) deals with the analysis of topical issues and calls which determine the employment of modern ICT tools in the education, including some modernizing trends of both educational and technological aspects which influence this field.
- The third chapter (written by: Milan Klement and Květoslav Bártek) maps the area of employment of ICT tools in teaching at 35 pre-primary, basic and secondary schools from the perspective of their 260 members of teaching staff. Based on the performed (and here described) research, the employment of ICT tools is therefore not only explained, but some

connections determining the ways of employment of those tools in conditions of real teaching or its preparation are pointed out as well.

- The fourth chapter (written: Jiří Dostál) deals with the issue of development of the ability to solve problems among basic school and secondary school pupils with a support of ICT tools, mainly from the perspective of non-traditional or inquiry-based methods of teaching. The provided overview is properly theoretically anchored while it provides a topical insight into the issue of problem-based teaching which is realized with the support of ICT tools.
- The fifth chapter (written by: Jiří Dostál and Květoslav Bártek) describes, based on the realized research, the current state of the employment of ICT tools in the realization of problem-based teaching with an overlap into the explanation of the state of employment of non-traditional methods. The described research was also realized at 35 pre-primary, basic and secondary schools from the perspective of their 260 members of teaching staff.

The structure of the monograph was designed to provide a reader a comprehensive insight into the issue of realization, arrangement and limits of a teaching supported by ICT tools with an overlap into the issue of planning, proposal and performance of educational research using multi-dimensional statistical methods. Therefore, we believe that this publication will interest you as well as provide you some new stimuli and information which will be usable in your further work.

On behalf of all of the co-authors Milan Klement

1 ICT TOOLS AND EDUCATION

The employment of information and communication technologies (hence ICT) in education at basic and secondary schools as well as universities becomes a natural thing these days. Employing ICT tools therefore result in many positive effects, it also suitably completes and supports the teaching while it is also a content of the teaching itself. The educational software (learning programs) or electronic learning materials employed in the teaching convey information, direct pupil's independent work while also evaluating it. It is hardly possible to not use the Internet in the teaching since it simplifies the teachers' work and their communication with both pupils and their parents.

Considering the rapid and global development of ICT, the further growing need of ICT tools' employment in the teaching might be expected. The number of possibilities ICT tools' employment in a whole framework of the educational reality is growing mainly in connection to the growing extent of applicability of computer equipment – concerning the hardware, but mainly the software area. S. Juszcyk, a respected expert on the field of IT employment in the education, states that *the employment of new technologies in the educational process will grow together with the grow of human society development, building of communities of science, information and communication. While the telecommunication, Internet networks, multimedia, ICT as well as the world information service – World Wide Web – prepared the way for the teaching and learning for various institutions, thus also for the educational institutions* (Juszcyk, 2003, p. 1).

The stated facts provide new stimuli for the development of educational theory. Already finished researches formulated basic principles of teaching supported by ICT tools. These principles delimit the function of educational software (learning programs) or electronic learning materials as a basic element of teaching supported by ICT tools while they lead to creation of teaching methods whose main element is the ICT.
Based on the teaching supported or controlled by the means of ICT tools, it is possible to further develop both theory and practical aspects of the education realized in this fashion. The individual aspects are represented by set aims of the teaching supported or controlled by the means of ICT tools, while the aims are the basic unifying element of the whole concept of involvement of ICT into the educational process. Furthermore, it is necessary to develop the teaching content focused on the usage and employment of ICT at basic and secondary schools as well as universities. Since the situation in the field of ICT is constantly developing, the constant modifications of corresponding educational content are necessary. Also the employment of ICT tools as a technical teaching means has to be constantly adjusted since, at least in some

cases, the current theories do not reflect the current trends and needs of modern education.

The described state, however, did not occur at once and at one step. Just as the educational or other theories develop, so too did and do develop the ICT. What was considered a technical novelty 10 years ago, it is already an outdated technology which was replaced by a new one – perhaps a more progressive one. It is possible to illustrate the situation on an example of implementation of interactive boards into teaching which started a broad both expert and lay discussion in 2008 about the possibilities of employment of these ICT tools in the teaching. Schools were massively equipped with those devices, and teachers were creating corresponding teaching materials for them. Despite the fact that this ICT tool is indisputably contributive for the teaching and a number of schools successfully employs it, it starts to be replaced by a new type of touch device – tablet.

Nevertheless, where should a unifying theoretical or practical perspective of technology employment (regardless of whether these might be information or other) in the education be searched? We think that the answer for this question is necessary to be searched both in the present and the past. It is possible to do refer to the well-know and still often used principle of Comenius – the principle of illustrativeness –, which, even after whole centuries has not lost its validity – quite the contrary, it got new dimension and possibilities of employment. For this reason, we would include a short historical excursion at the beginning of this chapter while its goal is to point out some of the connections and principles which might be followed even today.

1.1 Educational technology – the predecessor of ICT tools, and its development

Since the technology was permanently developing, it was possible to employ Comenius' principle of illustrativeness in constantly better forms. It was possible to depict phenomena or processes that are visible to the naked eye (models). It was also possible to display dynamic pictures to demonstrate not only individual images, but the whole sequence of subsequent images (films, video, etc.). After 1940, when recording and reproduction devices were developed, an additional step in a form of auditive means was taken.
Additionally, a purposeful research of the influence of audiovisual means, which were created by a joint application of visual and audio information, on the educational process. While involving the theory of communication into the educational process, there was a complex system of didactic technology established, based on which the education was a communication process – there was a division in its framework:

- A source of information including educational content (teaching aids)
- Information transmitter (teacher and didactic means)
- Information channels (sight, hearing, touch, smell, taste)
- Receiver of information with acquired knowledge (pupils, students) (Bohony, 2003, p. 26).

The field closely dealing with this issue is called *didactic technology*. It is a *scientific discipline about didactic means, or about their optimal employment in order to realize a successful and efficient teaching* (Bohony, 2003, p. 8). According to this definition, the didactic means can therefore represent *all means which might be used by a teacher to achieve set educational aims* (Bohony, 2003, p. 38). Based on the results of didactic technology, it is possible to specify mutual relationships between ICT tools (in previous conceps represented mainly by personal computers (henceforth as PC) and programmed learning. These connections developed over time based on technical development of didactic means. The overview of historical context is presented on Image 1.1.

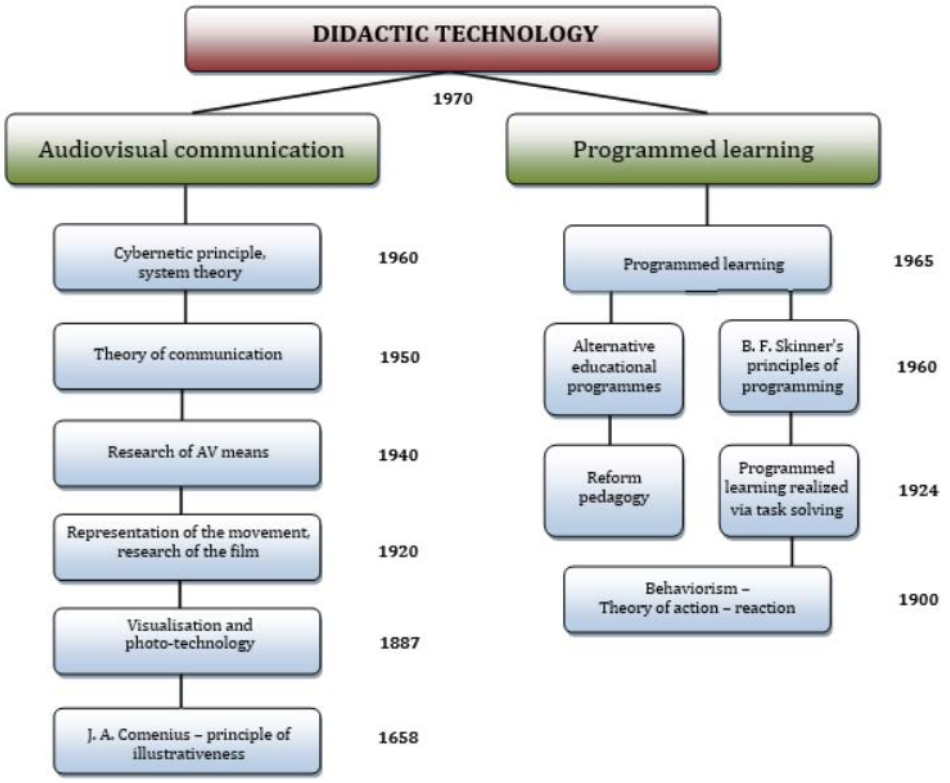

Image 1.1 – Connection of audiovisual means and programmed learning over time, according to P. Bohony (2003, p. 39).