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On the selected possibilities of the use of interactive whiteboard in technical education and training

Introduction

The penetration of information and communication technologies into all areas of life increases the demands for education. However, their presence does not automatically change the teaching process, as it depends on creative and innovative teachers (Adamek, et al. 2010). Information and communication technologies make a significant contribution to school change, changing how we learn:

- We learn visually and interactively, With visuals or interactive boards,
- Learning through a variety of media and tools, for example, using various multimedia resources and the internet.

The prerequisite for the development of digital literacy is the modernization of education using information and communication technologies, it is the mutual integration of traditional and digital educational materials using modern didactic techniques that will enable teachers to use digital educational content in the learning process, interactive whiteboard. Both the teacher and the student can actively engage in teaching while influencing and adapting to current needs. It is natural that the changes that are currently taking place in the learning and cognitive process are significant and extensive and also relate to textbooks, teaching aids, methods and forms of teaching. The form and content of textbooks and other learning materials is greatly changed (Brestenská, et al. 2009). According to Brestenská et al Brestenská, B. et al. (2009), we have seen the following changes in the context of traditional textbooks in recent years:

- Creative, innovative teachers use a wide range of different learning materials, textbooks use only as one source of their preparation,
- The material they use often fails to provide their pupils with work at home,
- Several new textbooks already contain a digital media with tasks and additional data, spreadsheets, text, etc., and links to web portals,
- In addition to textbooks, digital resources are also distributed, multimedia CDs or learning materials on the web,
- Students' access to web resources from home,

- Students do not want to memorize textbooks and require textbooks to be lightweight, not to contain a lot of text to be boring, tentative, and socialized,
- Increased student demand for unrestricted access to learning resources (trends leading to mobile learning),
- Changing the overall approach to learning and learning.

Interactive whiteboard in the technical education and training

The Interactive whiteboard is a touch-sensitive area where interactive communication between the user and the computer takes place in order to ensure the maximum possible level of clarity of the displayed content. Using an interactive whiteboard, we can:

- Share all necessary information and educational materials with all participants in education,
- Tap an electronic pen or index finger to control the computer program directly from the board,
- Add notes to all applications by directing on desktop, in the case of bad additions you can easily delete and overwrite,
- Interact with the Internet and use all the possibilities of computer programs.

Working on an interactive whiteboard moves learning forward as it engages both the student and the learner. From this, we can conclude that: "The Interactive whiteboard is a modern learning tool that helps us streamline the learning process through presentations with a thorough use of ICT. It's an electronic device that lets you interact live with your PC or Notebook directly from the board by clicking on the projected image using an interactive pen. Using it, it is possible to control learning programs, office applications as well as teaching aids and teaching texts about subjects that the educator himself prepares in external graphic or text environments, teaching pictures or videos, all directly from the board" (Brestenská, et al. 2009).

Didactic benefits of using an interactive whiteboard (Pavlovkin, Novák 2013):

- Use of IT leads to motivation to learn,
- Using the principle of clarity – visualization, interactive moving,
- Better attention,
- Reuse of the already prepared subject,
- Active involvement of students and pupils in teaching,
- Networking and Internet sharing,
- Development of computer and information literacy,
- Direct use of resources from the Internet.

Didactic Disadvantages of Using an Interactive Board (Pavlovkin, Novák 2013):

- Threatens to slip into the encyclopaedias and thus suppress interactivity,
- Suppression of abstract thinking,
- The table is only a technical supplement, with frequent use falling,
- The table is not used interactively, but only as a "screenplay",
- High demands on time when teaching,
- The necessary knowledge in the field of computing,
- Absence of finished multimedia programs,
- Absence of e-textbooks and i-textbooks, their high price,

- The problem of low pupils, low teachers,
- High cost of elements, energy intensity, vulnerability to damage,
- Refusal to write and work by fingers younger pupils,
- Suppress the meaning of classical textbooks and lessons,
- Written and oral representation,
- Suppress the use of real aids and experiments,
- Simulation only of reality,
- Poor readability from a greater distance,
- Low light area problem, shaded shadow.

Possibilities of using the interactive whiteboard software

The differences between the individual types of whiteboard consist mainly of the way of transferring the changes made on the board to the digitized dimension. Active Inspire software is a program specially designed for the school environment. The main workspace is the presentation of a workbook in which we can create presentation content using interactive tools. The number of pages is unlimited, there are several open ones, and we can export the content to other formats or print it out. One main toolbar allows you to control the entire software and choose the features we need and use; all other tools are clearly arranged and described in the appropriate panels.

Writing and highlighting on the interactive whiteboard allows the user to write on their desktop, Change colours, use the highlight feature to create notes for text and images, charting, and write simple notes on a blank page. The pen allows you to change the size, colour, and line properties, e. g. add the arrow to the beginning and end of the line. Most interactive whiteboard software includes digital rubber that is used to remove text from the screen.

Moving objects and joining them is the easiest operation on an interactive whiteboard, on the screen by dragging the mouse or directly onto the desktop that has a wide use. Text tools allow you to add blocks of text, words, or longer text to the screen. They include all common word processor tools that can change size, fonts, and highlight parts of text by colouring or highlighting. Hide and uncover text, e.g. write the word the same colour as the background of the screen and then change the colour to make the word visible. Spotlight/Spotlight allows the user to explore individual parts or object properties on the screen. The user can change the size of the surface or change its shape – to a square or rectangle, e.g. when viewing pictures or text. Hidden and uncovered tools/shades, blinds are a simple screen cover that a teacher can use to completely or partially cover it, respectively. The gradual discovery of individual points or activities during teaching, e.g. as a roller shutter that can also be used horizontally. Handwriting recognition enables you to write a pen on an interactive plaque and automatically convert the handwriting to text. Typically, the software offers multiple transcript alternatives that take into account different handwriting styles, converting hand-written text into a specific target language. Creating Object Copies/Cloning and Duplication is a simple feature that allows you to create multiple copies of one object. Cloning and duplication allows the user to quickly create an unlimited number of copies of the same word or image within

an hour. The user selects the object and sets its properties so that it automatically copes. Duplicates can also be used by individual parties and advanced users can use this feature to prepare learning materials to save time. Timer devices/clocks and clocks allow the teacher to control the length of the individual parts of the clock and set the playback of the sound or melodies that mark the end of the activity. Hours can be set to display time in 12 or 24-hour format and are used instead of traditional clocks. The interactive whiteboard software, in addition to the timer, also includes a calculator and a thermometer. Uploading a screen or page is a tool that teachers use to record activities on an interactive whiteboard during a lesson. You can record a whole screen or just a certain area. The resulting video can be saved in various formats and viewed with most players. Teachers can use it to upload, for example, A lecture they delivered during a lesson. Layering/Rubbing and Uncovering allows you to place objects on the screen in the desired order in the so-called Layers, e.g. to create different tasks in which students reveal hidden images, covered texts, etc. The user hides an object, e.g. Text or image, under the colour layer. Colour can be the same colour as the background of the page or create colour contrast. The user simply uses the rubber to remove the colour to expose the word or image below it. Animation allows animation of objects on the screen in different ways, Create a page and the amount of a copy of it, move each object slightly, similar to the animator block, if it scrolls, the object moves or changes. This feature can be used well in explaining processes or cycles. The second animation technique used is to program objects on the screen to move, disappear, or change (Bernát 2015).

Advantages of an interactive whiteboard against the classic blackboard

The Interactive whiteboard unifies the classroom instruction with a computer-aided instruction, enabling the creation of dynamic content. The interactive whiteboard area provides plenty of space for work while teaching, with tools on the main toolbar being used when the teacher can use, for example, the width of the pen and the colour it needs. Students do not have to distribute their attention to the computer monitor and the teacher's interpretation. Mimics and teacher gestures are an important part of teaching, and important knowledge escapes with distant attention. An interactive table offers the possibility to work with an inexhaustible amount of images that can be accessed, edited, saved with the changes captured during the classroom. Interactive whiteboard means more in one, e. g. includes a recorder, player, video recorder, and the like. We can animate the lesson with video, sound effects, and so on.

Interactive whiteboard for the learning of electrotechnics (in technical education and training)

Teaching of the Thematic Unit Production and transmission of electricity by application of an interactive board

The subject of Electrical Engineering for Teaching-oriented Faculties provides students with knowledge from the field of electrical engineering and technology that deals with the transformation of other types of energy into electricity, transmission

of electricity (both wire and non-conductive) and transformation of electricity into other types of energy, In the acquisition of heat, light and motion, as well as its use for electrochemical, information and communication purposes. The aim of the subject is to teach students how to characterize the technological equipment of each type of power plant, to identify what it consists of, to explain the principle of electricity transmission, to explain the function of the transformer in electricity transmission, to explain the principle of electricity consumption measurement and to define basic principles, Which must be observed in electrical installations.

Students will learn about basic forms of energy conversion to electrical energy and its use in practice. They learn how to solve electrical circuits. The methods, forms and means of teaching the subject should stimulate the development of cognitive abilities of students; promote their aim, autonomy and creativity. The laboratory in which practical training takes place is equipped with technologies that provide students with the appropriate environment in the process of learning. The learning material contains all the principles of transforming different forms of energy into electricity. In fig. 1 to 3, there is a demonstration of the energy conversion to electricity, its transmission from the power plant to the point of consumption and utilization. Figure 4 is a repetition task. In repeating tasks, if a student chooses the correct answer, he or she will get another job, and if he/she chooses the wrong answer, he/she automatically gets into the text to find the correct answer. After pointing to numbers 1 through 10, the student will see the explanatory text in the bubble, e. g. by placing the cursor on the number 1 in fig. 1 shows the information of generator. Figure 1 to 3 illustrate the graphical interfaces of the key sequences in animation on a system of interactive animation simulation models presented by the interactive chart, which the authors of the article use in the subject of the thematic unit Electricity Distribution and Use of Electricity in the subject Electrical Engineering for Teaching Study. The interactive whiteboard presents in particular the complexity of the view of the production, distribution and use of electric energy, but also the so Functional dynamics of the individual processes of the mentioned topic.

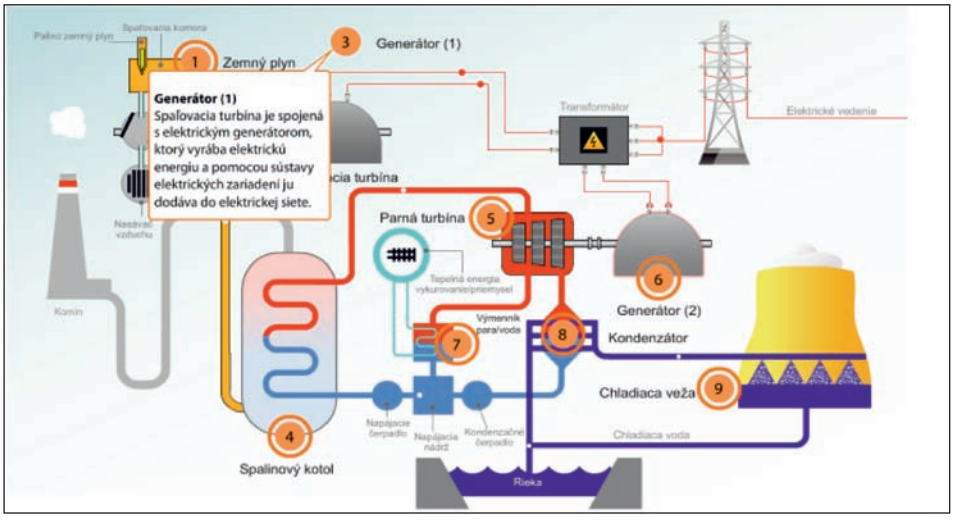


Fig. 1. Scheme of a thermal power plant for gas

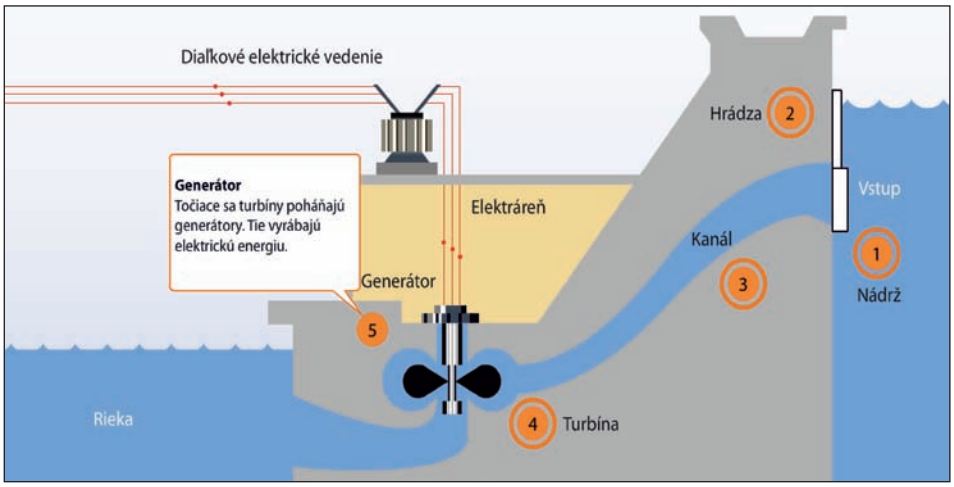


Fig. 2. Hydroelectric diagram

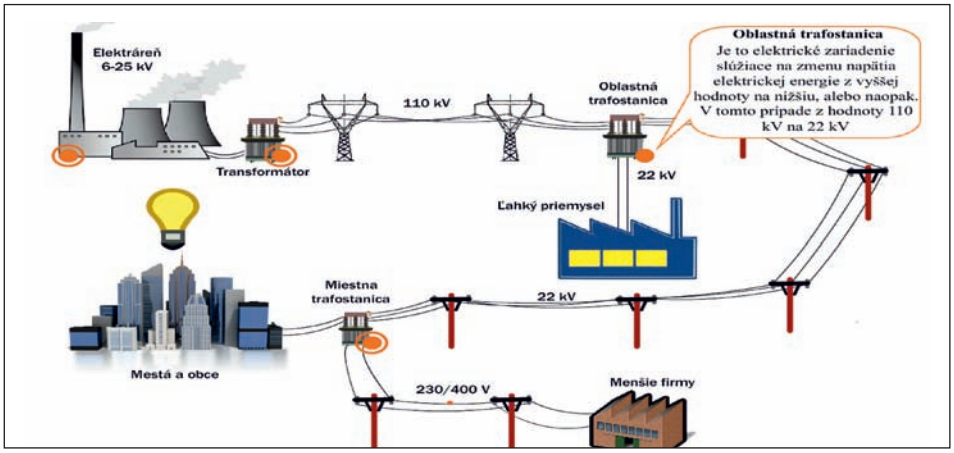


Fig. 3. Hydroelectric diagram

A particularly didactically efficient use (based on the conclusions of our didactic experiments in order to determine the didactic efficiency of teaching) has the use of an interactive chart in the subject of home electrical homework. For this purpose, the authors of the contribution suggested and use the innovative experimental teaching system (hereinafter referred to as NIESVE). The innovative innovation part of NIESVE is the application of a virtual way of visualizing processes and phenomena based on an interactive whiteboard.

Teaching of the thematic unit the basics of home electrical installation by application of an interactive whiteboard

The teaching of the thematic group takes place in 4 consecutive phases:

Phase 1, on the platform of traditional visualization methods and techniques for visualizing processes going on in the electro physical systems (characteristic of the

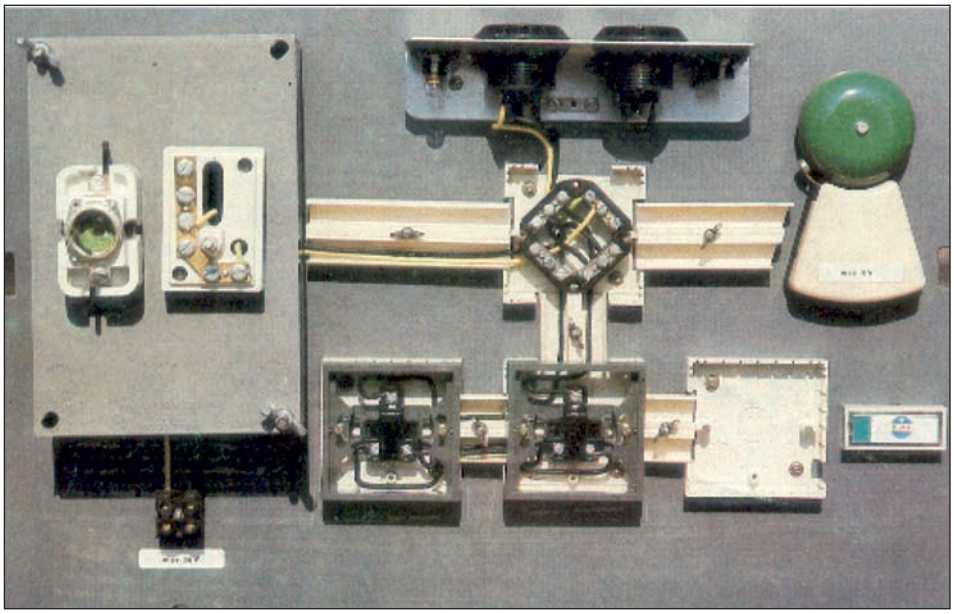


Fig. 4 and 5. Electrical installation kit for primary and secondary schools

traditional teaching system). The visualization of the course of electromagnetic processes at this stage in the realized lessons is carried out on a real model of the electro physical system (based on the use of the kits Electro-assembly kit for primary and secondary schools): see fig. 5.

Phase 2 is the dominant application of an interactive whiteboard on the platform of innovative methods and visualization techniques (characteristic of NIESVE).

For NIESVE, it is a typical symbiosis of visualization on the real model (traditional visualization techniques and techniques) and on a computer model of the same electro-physical system (based on interactive graphic animation simulation computer models). It should be reminded that the essence of the strategy of access to our design of the innovation of traditional systems of visualization of processes and phenomena in the curriculum is not to "duplicate" in practice didactically proven ways of visualization (e. g demonstration by measuring on an electro technical kit or a measuring instrument) and to replace them with new, But on the contrary – to keep them and only to enrich them organically with new innovative elements in an innovative base. Thus, in the concrete, it remains to be a priority that what is possible and appropriate to demonstrate by measuring on a traditional real-world measuring device or an electro technical kit can do so and what extends the visualization possibilities of the preparation or the kit to be realized virtually. In other words, the use of so-Intelligent computer graphics allows the visualization of the subject to a degree of clarity that is otherwise unreachable (traditional visualization, e. g on a circuit-based demonstration).

The aim of this experimental lesson is to deepen and expand the knowledge inter thematically causal and application. The computer models described in this part of the work were mainly synthesized on a schematic basis, which contains instructions for use with a pupil electrical kit – a wiring kit designed for primary and secondary schools. In the didactically oriented simulation of the "basic" types of electrical circuits of residential electrical installation, certain didactic priorities, principles and didactic demonstration sequence must be respected. First of all, it is necessary to highlight in particular the differences in the working patterns of individual electrical contact systems forming the serial, alternating and crossover switches and, secondly, the connection of these "differences" to the way of controlling the electrical lighting elements. A high degree of clarity in explaining the essence of this problem is achieved (based on the conclusions of our didactic experiments) by simultaneous simulation on the functional submodule (on the principle diagram) and on the submodule assembly of the individual basic circuits of the residential electrical installation (in the sense of emphasizing the essence of the causal relationship between phenomena). At first, however, students' attention should be focused on the processes running in the functional submodule, and then, when these processes are readily understood, it is possible to demonstrate the design and assembly features of the individual basic types of switches and switches in the electrical distribution system. The basis of this didactic activity with high degree of clarity is captured in fig. 6.

Phase 3 is project-applied teaching. The NIESVA support pillar is also the use of elements of the project-application teaching in comorbidity with the inquiry-best instruction, whose purpose is to give the teaching pragmatic-practical and, in our case, mainly application sense. The above mentioned concept represents educational projects "Electrical installation of cottage (small house)" (see fig. 7).

The specifics of didactic strategy and learning tactics using computer models of residential electrical installation are that the teacher conducts a demonstration on computer simulation models to first deepen and extend the familiar knowledge of the students, ie knowledge related to the basic circuits of this installation, and then demonstrated The operation of complex systems of these basic circuits (e. g on the home electrical wiring model or cottage).

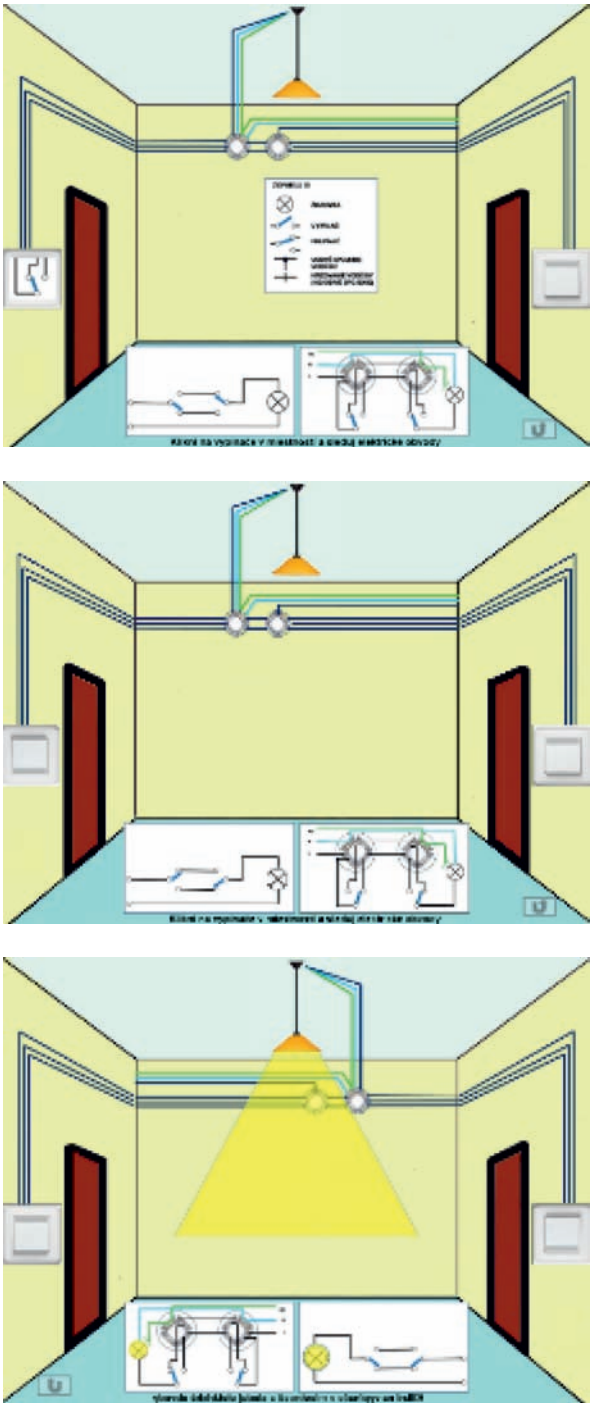


Fig. 6. Key sequence visualization interactive whiteboard platform an interactive applet "How does the wiring long hallway"

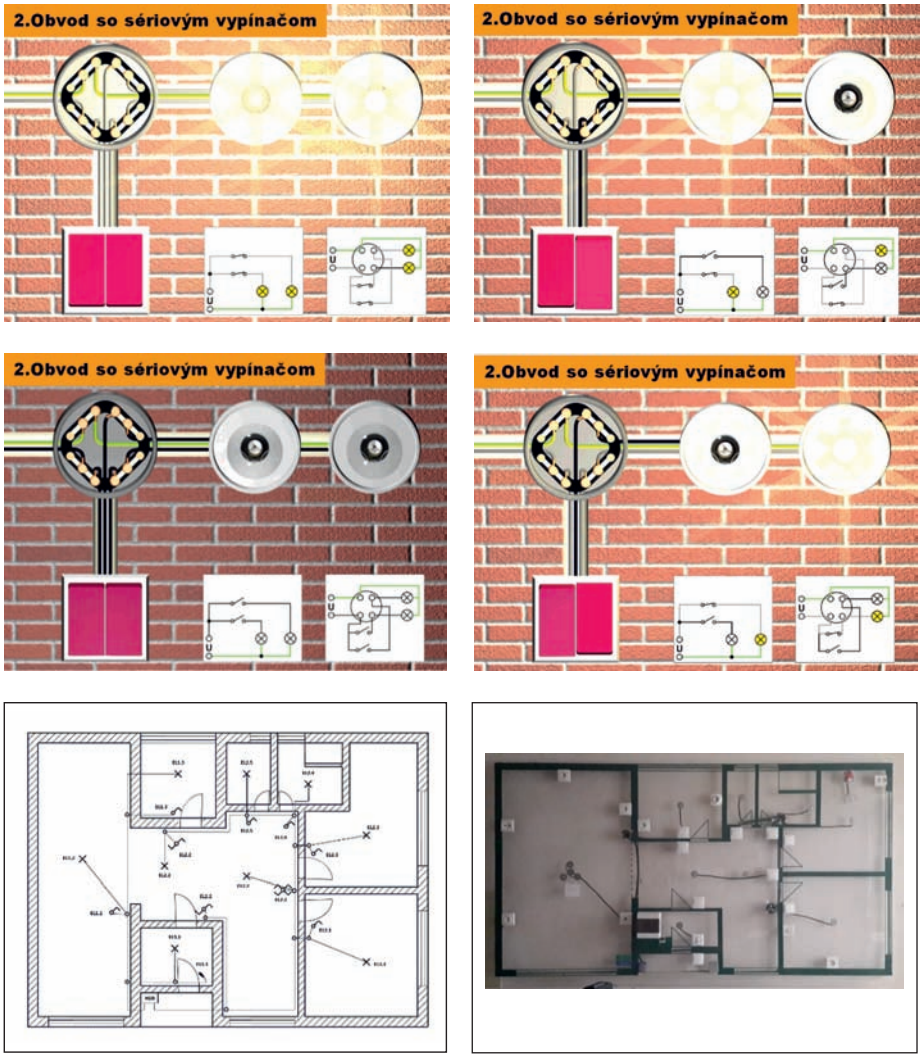


Fig. 7. Demonstration of symbiosis of virtual visualization and visualization on real models of housing distribution of cottage (small house)

The teacher should emphasize before demonstrating the computer model of home electrical wiring that although this installation looks like a very complicated system at first glance, it is nothing else, it only knows how the system of basic circuits (already demonstrated, which students should already have mastered) To a larger unit.

Teacher of his previous claims (after initial acquaintance of the students with the scheme of the housing distribution of the cottage) subsequently demonstrates the demonstration of his statement by sharing with the students in detail the whole residential electrical installation of the cottage on the above mentioned individual elementary circuits. The presentation of the models from the previous section may reinforce the presentation of the deduction from general to specific whole.

The didactic importance of the strategy and tactics of the above didactic procedure is also that in the broader context, students are systematically involved in the analysis of residential electrical wiring circuits and also that in the above-mentioned context, the computer model of the cabinet's electrical installation is a sensible application unit composed of Known basic circuits.

Computer simulation as a method of didactic visualization gives an illustration of the teaching of home electrical wiring circuits, compared to the simplicity realized by traditional methods, an unachievable dimension. Its benefits, which are already beyond the scope of traditional visualization, can be summarized in the following paragraphs.

The foregoing relates to another didactic aspect of said computer simulation of electrical circuitry of residential electrical installation, namely, that the electrical processes running in the above mentioned models can be slowed or even divided into steps. Furthermore, on the models there are preserved the colour differentiation of the drivers according to the valid standards, but at the same time it is also possible to "highlight" the colour of the driver if the live conductor is under tension. Such indication of the driver, if under voltage, is also important in didactic training of diagnostics, while such "extensive" visualization cannot be achieved in traditional ways. Phase 4. of the test, by means of feedback whiteboard.

Empirical research conducted interactive whiteboard application in teaching

The arrival of computer technology has offered unprecedented opportunities for the application of computer simulation and animation in the teaching process. It has raised our awareness of the necessity of a new quality platform creation for visualisation of objects, processes and phenomena in teaching technical subjects

We made a database of Flash animations that served as a platform for the creation of the experimental innovative teaching system called NIESV. It was designed for visualisation of teaching processes and phenomena through applets. In the process of our research the NIESV system (in the form of concrete models designed for

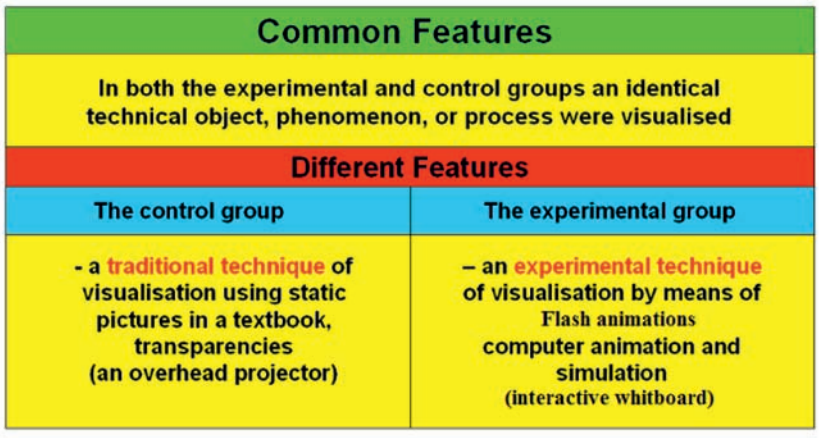
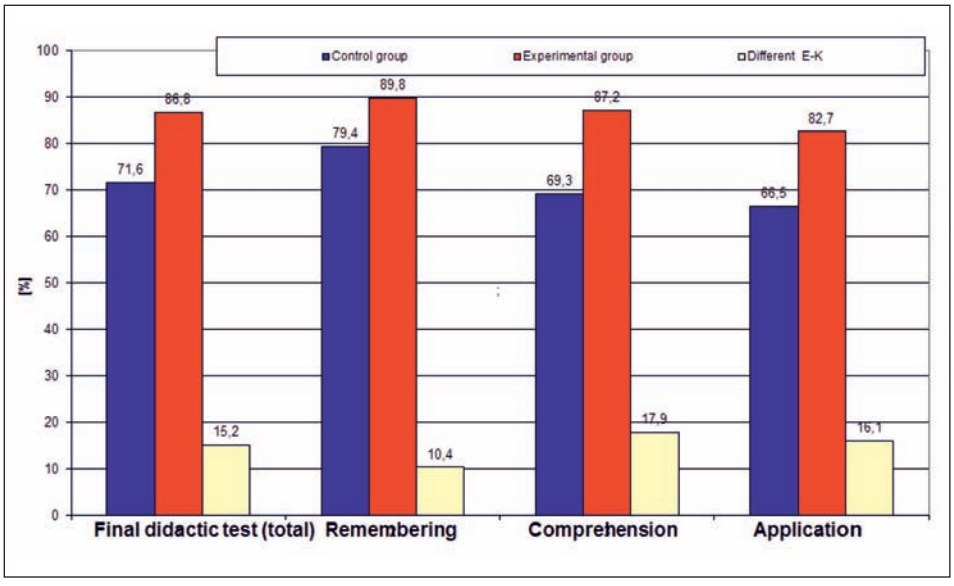


Fig. 8. The principle of the pedagogical experiment

teaching selected thematic sections in teaching was also experimentally verified. The method of pedagogical experiment was used to compare the two teaching systems in the experimental group (the NIESV system) and the control group (traditional teaching system). The principle of the pedagogical experiment is demonstrated in fig. 7. The concrete teaching system (the lift operation control) is demonstrated in fig. 8. The main aim of the experimental research was to investigate the possibilities of the NIESV system application in order to increase the effectiveness of the teaching process.

Research sample

The research sample consisted of 36 research samples were in educational subject Electrical engineering for teacher education. The basis of results achieved in the input didactic tests divided into experimental and control group. 21 students were placed in the experimental group and 15 students in the control group. Pedagogical experiment was carried out from January to June (2015–2016). In the experimental group, there was applied the computer supported (using the computer visualization of sing an interactive whiteboard in teaching the theme of production, distribution and use of electricity, there was education carried out without computer support (using traditional way of teaching). The comparison of results showed that pupils of experimental group achieved in the final didactic test (total) from the Electrical engineering for teacher education of 86,8% success in solving, pupils of control group of 71,6% (see Graph 1). In the Niemerka subtest system, the following difference between the experimental and the control group was reached – 10.4% in the memorandum, 17.9% in the understanding and 16.1% in the knowledge application. Thus, in our experiment, we have achieved not only a quantitative increase in knowledge



Graph 1. Percentage of successful solution of the final didactic test by experimental and control

through NIESV but what is essential and qualitative for us (knowledge is better understood and have better application ability).

Conclusions

In conclusion, we would like to say that we present only partial results of the continuous pedagogical experiment in the article, which we implement in educational subject Electrical engineering for teacher education. The current results described in our article show that computer-supported learning of technical science subjects in has a positive impact on the acquisition of the educational contents of the technical sciences by school students.

The interactive tab, operating on the principle of electromagnetic sensing, which is controlled by an electronic pen, also offers the possibility of dual control. This interactive table can also be used as a classic tab, we can write it with erasable fixes. We can say that a teacher of a subject working on an interactive whiteboard should be creative and creative to be able to capture the most important feature of interactive boards, and that is the simplicity. In particular, this didactic principle can help pupils to motivate new curricula and help them understand the curriculum. In addition to working on an interactive whiteboard, both teachers and students are expanding their knowledge of computer literacy and IT skills. Another important factor is that teachers themselves try to educate themselves in the field of information and communication technologies. This article describes some of the options offered by interactive whiteboard software. The slideshow contains all of the illustrative elements such as, for example, Pictures, videos and animations, just need an Internet connection and speaker connections to play audio from videos and sound effects. In its proper use, teachers should have more effective educational and educational goals in the learning process. Finally, we can summarize that the interactive table is a modern didactic tool that cannot be used in all the topics that are taught in schools, but it will certainly contribute to the professional subjects to improve and make more effective the acquisition of pupils' knowledge, skills and habits in the teaching process, And is a very good means of motivating pupils.

Acknowledgment

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Abstract

The paper describes the possibilities of innovation in teaching students in the field of electricity generation and transmission at faculties of teaching (in technical education and training). The article contains a description of the interactive whiteboard, interactive whiteboard software, and ways to use the interactive whiteboard in the classroom. The authors find out the effectiveness of the teaching of these topics traditionally (using real electro physical models) and the innovative computer simulation model presented by the interactive chart as a support of a real electro-physical model. The individual teaching systems were tested in the student sample. Based on the results of the tests, it was shown that the instruction supported by the interactive chart showed better quantitative and qualitative results in the knowledge tests than in the traditional teaching system.

Key words: interactive whiteboard, technical education and training, electricity, generation of electricity

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