HOW TO WORK THINGS AROUND US (IN THE COMPUTER MODELS)

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Abstract : ***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.*

Key words: *computer, teaching technical and natural subjects*

INTRODUCTION

Our expectation as well as the goal of our research was to prove that the new visualisation platform would help increase the effectiveness in the technical subject teaching process.

The main goal of our research was to create computer models for improving technical subject teaching. Our objective was not only to **create** an innovative system of teaching electrical engineering subjects but also to verify it in the conditions of real school.

For this purpose we created over two hundred computer models. The computer models were created, i.e. **the individual static pictures and figures from the traditional printed text books or schemes** included in the instructions for use in **pupils' model construction kits (meccanoes) were animated (or simulated).** Our final objective was to create a virtual visualisation 'appendix' which enlarged the radius of action of traditional printed text book visualisation (as well as visualisation of instructions how to use pupils' model electro-component-construction kits) and moved it behind its natural borders.

Moreover, on one of the computer models we demonstrated the technique of the computer model creation and its didactic application. The creation principles, strategies and tactics of the other computer models are analogical. In general, the key point of the application of visualisation may be articulated as follows: those phenomena, processes and objects that can be visualised in a traditional, it means static way (a picture or a figure in a textbook, a plastic model or other three-dimensional models such as a model construction kit, etc.) are to be visualized traditionally. Those phenomena, processes and objects which go beyond the possibilities of the traditional and conventional ways of visualisation are to be visualised by means of computer models ('enlargement of a hand of knowledge').

On the contrary, the visualisation by means of an computer model may be improved by a practical and real attribute that is contained in a textbook or a model construction kit but not in an computer model.

THEMATIC UNIT OF THE COLLECTION OF COMPUTER MODELS

The created collection of computer models was called **Electrical Engineering and Informatics around us in computer models.** In order to strengthen the didactic application of the computer model the names of the individual computer models begin with the words "How does……operate/function? To be more concrete: (Selection of core programmes which form the basis of educational package)

1. thematic unit : *How to produce electricity in nuclear power? How is electricity produced from hydropower? How to produce electricity in thermal power plants? How does the production and distribution of electricity from the power plant to the consumer?*

The principal essence of the whole : ***What is the principled nature of production and distribution of electricity (electricity distribution chain) from the power plant to the consumer****?*

2. thematic unit : *How does the wiring for lighting in the living room chandelier? How does the wiring for the lighting of a long hallway? How does the wiring for lighting stairs?*

The principal essence of the whole : ***What is the principled nature of wiring a house?***

3. thematic unit : *How does iron in the household ? How does instant water heater? How does an electric boiler (water heater)? How does the electric refrigerator? How does the kettle? How does a traditional stairway light switch in the projects?*

The principal essence of the whole : ***What is the essence of principled action "thermostat (bimetal with) -temperature controller"?***

4. thematic unit : *How does the child control toy car controlled buffers? How does management run the elevator ? How does the management of crane operation? How does the schedule line motor control contactor with two buttons? How does the contactor control of three different cities? How does the blocking and signaling transport links? What is the principled nature of reversing the motor running?*

The principal essence of the whole : ***What is the essence of principled action-relay circuit controlled by two buttons?***

5. thematic unit : *How does the driving electric? How does the trolley drive? How does the battery charger? What is the essence of principled action rectifiers? How does a dynamo on a bicycle? How does snow ski lift operator? How does the carousel drive? How does the power cable?*

The principal essence of the whole : ***What is the nature of activities principálna direct electrical rotating machines? What is the nature of activities principálna AC electrical rotating machines? What is the essence of principled action star delta switch?***

5. thematic unit : *How does "photocell"? How does the fire alarm? How does security protection objects (bezkontakná)? How does security protection (information Contact) objects, eg. in galleries or museums? How does "trigger at the toilet water"? How does management work "hand dryers" in the toilet? How does light dimmer?*

The principal essence of the whole : ***What is the principled nature of the activities of the transistor operating in switching mode? What is the principled nature of the difference in operating activities of the transistor amplifier mode?***

6. thematic unit : *How does the "audion" (audio amplifier)? How does the amplifier (sound) for guitar? How does "bug" ("spy")? How does the intercom (speakerphone between rooms)? How does the "electronic babysitter" ("singing potty")? How does Domophons (home phone? How does "amplifier for hearing aids?" How does "optical telephone"? How does "Optical Network? How does a conventional "wired" phone? What is the principled nature of the activities one-amp?*

The principal essence of the whole : ***What is the essence of principled action and two multi-stage amplifier ?***

7. thematic unit : *How does an electronic thermometer to measure the temperature of the human body? How does personal electronic weight? How does the electronic scale in store? How does an electronic gauge for measuring blood pressure? How does electronic barometer (measuring pressure)? How does an electronic hygrometer (air)? What is the operating principle CD player? What is the operating principle CD recorder? What is the principled nature of AD converter work?*

The principal essence of the whole : ***What is the essence of principled action DA converter?***

8. thematic unit : *How does electronic advertising lights? How does light "flashing" the Christmas tree? How does the flashing rear lights on your bike?*

The principal essence of the whole : ***What is the principled nature of work shift register?***

9. thematic unit : *How does the electronic lock on the code? How does the automatic ticketing on public transport? How does the vending machine?How does the electronic control operation of traffic lights at the crossroads?*

The principal essence of the whole : ***What is the principled nature of the digital comparator function? What is the principled nature of "control logic circuits"?***

10. thematic unit : *How do electronic digital timer? How does the alarm clock? How does the electronic timing for the athletic oval? How does automatic mail sorter at the post office? How does an electronic speedometer on the bike? How does the electronic counting money in the bank? How does the timer for switching on and off electrical appliances? How does the electronic "dice"? How does the slot machine?*

The principal essence of the whole : ***What is the principled nature of the electronic pulse counter functions****?*

11. thematic unit : *How does automatic dishwasher? How does the washing machine? How does automatic autodishwasher? ?*

The principal essence of the whole : ***What is the essence of principled action "steps chain"?***

12. thematic unit : *How does electronic siren? How do electronic organ? How does the bell with the melody? How does an electronic metronome?*

The principal essence of the whole : ***What is the principled nature of the functions of electronic multivibrator?***

13. thematic unit : *How does the connection from the mobile network? How does the electronic digital control panel?*

The principal essence of the whole : ***What is the principled nature of the functions and the multiplex Demultiplex?***

14. thematic unit : *How does an electronic calculator? How does using an electronic cash register barcode scanner in the store? How does e-assessment in the play "arrow"? How does the arithmetic logic unit of the computer? How does the counting adder for two binary numbers? How does a microprocessor?*

The principal essence of the whole : ***What is the principled nature of the operation of the machine for processing information?***

15. thematic unit : *How does a computer keyboard? How does the indicator scores in the stadiums? How does sedemsegmentový viewer?*

The principal essence of the whole : ***What is the principled nature of the functions of digital transmitter code?***

16. thematic unit : *How do semiconductors? How does the semiconductor diode?*

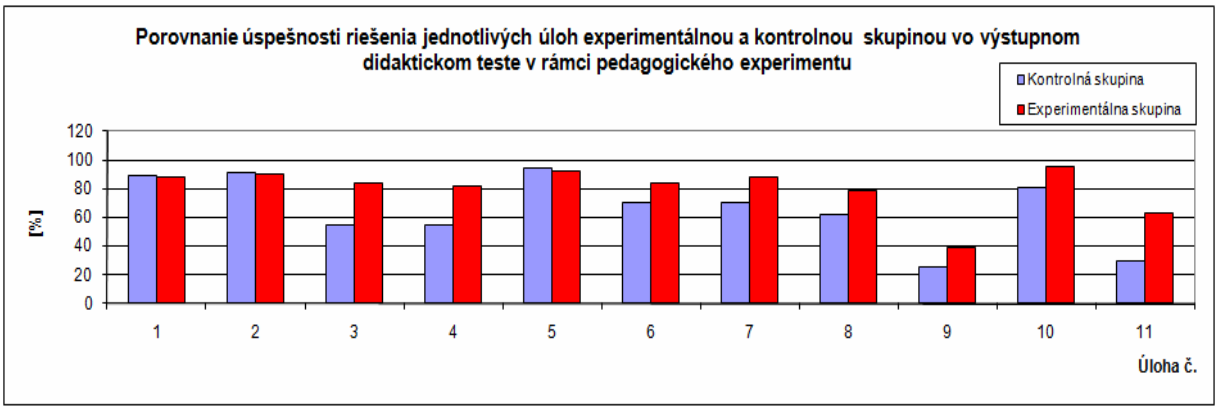
The principal essence of the whole : ***How does the band model of conductivity of solids****?*

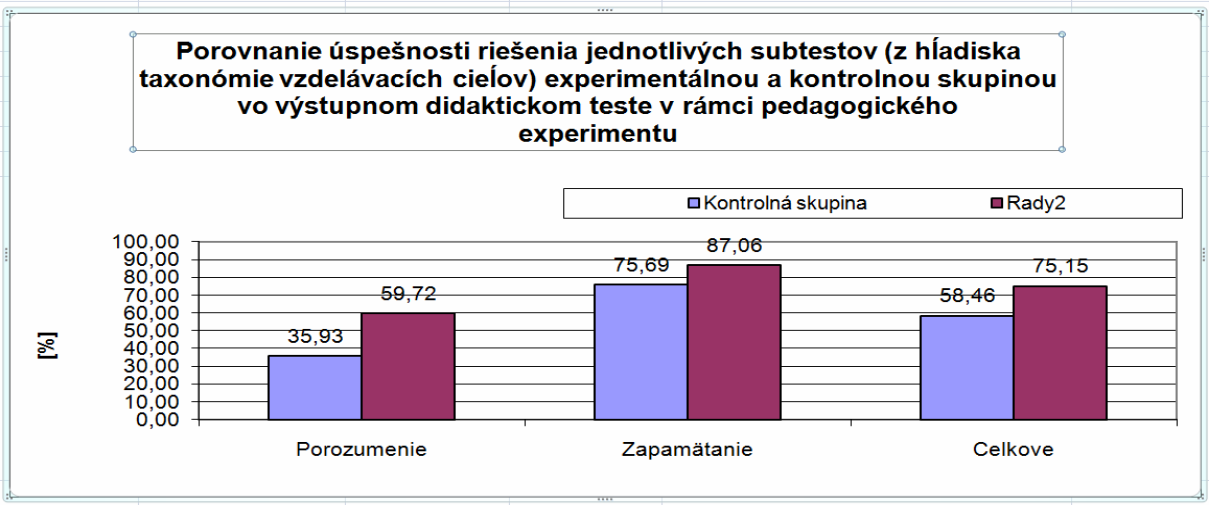
EMPIRICAL RESEARCH CONDUCTED INTO COLLECTION OF COMPUTER MODELS APPLICATION IN TEACHING PROCESS

The research sample consisted of 118 pupils of the 4th grade from the five technical schools of the eastern region. Pupils of the 4th grade forming a research sample were on the basis of results achieved in the input didactic tests divided into experimental and control. group. 58 pupils were placed in the experimental group and 60 pupils in the control group.

Pedagogical experiment was carried out from January to June 2011. In the experimental group, there was applied the computer models and in the control group, there was education carried out without computer support (using traditional way of teaching).

The statistical interpretation of the research analyses findings is concise as the graphs are explicatory enough. They include the digital data related the values in question as well as the basic characteristics of the statistical ensembles arranged into the tables. As we find them sufficiently descriptive we do not provide any additional verbal explanations.





F-test - výstupný didaktický test (ako celok)						
Anova: jeden faktor						
Faktor						
Výběr	*Počet*	*Součet*	*Průměr*	*Rozptyl*		
Exp.sk (body)	55	4133,333	75,15152	175,6453		
Kontr.sk (body)	91	5320	58,46154	333,1624		
ANOVA						
Zdroj variability	*SS*	*Rozdíl*	*MS*	*F*	*Hodnota P*	*F krit*
Mezi výběry	9549,105	1	9549,105	34,83886	2,46E-08	3,906849
Všechny výběry	39469,46	144	274,0935			
Celkem	49018,57	145				
	F≥Fkr		signifikantný rozdiel			

F-test - subtest porozumenie výstupného didaktického testu						
Anova: jeden faktor						
Faktor						
Výběr	*Počet*	*Součet*	*Průměr*	*Rozptyl*		
Exp.sk (body)	55	3284,615	59,72028	348,375271		
Kontr.sk (body	91	3269,231	35,92561	422,162978		
ANOVA						
Zdroj variability	*SS*	*Rozdíl*	*MS*	*F*	*Hodnota P*	*F krit*
Mezi výběry	19409,33	1	19409,33	49,2007401	8,321E-11	3,906848866
Všechny výběr	56806,93	144	394,4926			
Celkem	76216,26	145				
	F≥Fkr		signifikantný rozdiel			

F-test - subtest zapamätanie výstupného didaktického testu						
Anova: jeden faktor						
Faktor						
Výběr	*Počet*	*Součet*	*Průměr*	*Rozptyl*		
Exp.sk (body)	55	4788,235	87,05882	174,8046		
Kontr.sk (body)	91	6888,235	75,69489	386,1659		
ANOVA						
Zdroj variability	*SS*	*Rozdíl*	*MS*	*F*	*Hodnota P*	*F krit*
Mezi výběry	4426,988	1	4426,988	14,4246	0,000214	3,906848866
Všechny výběry	44194,38	144	306,9054			
Celkem	48621,37	145				
	F≥Fkr		signifikantný rozdiel			

The overall analysis of the application of the present innovative teaching system utilising computer animation and simulation of technical processes and phenomena by means of computer models proves the good prospectives of the introduction of the innovative system into school practice. Moreover, it proves the system to become a valuable tool for increasing the effectiveness of the teaching of electrical engineering at non-electrical engineering faculties. Furthermore, it provides evidence to be a helpful means for achieving positive qualitative changes in students' knowledge structure. The most encouraging is the fact that the present innovative system can be introduced into the teaching process without any radical transformation of the traditional teaching system (and in our view it is its crucial advantage).

In addition, the NIESVE system was regarded as much more attractive and motivating than the traditional one by the participants of the research. What is more, the experiment students said that they were looking forward to being taught by means of NIESVE.

CONCLUSION

The research findings confirmed that the Java applet application in teaching in natural and technical subjects is of great didactic importance. It broadens the horizon of visualization, application, didactic and educational possibilities which cannot be made available by traditional techniques of visualization of objects, processes and phenomena in the teaching process. Using Java applets which would enable us to visualize more illustratively some processes that cannot be visualized through the traditional means of visualization.

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