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EDUCATION DEVELOPMENT AND TEACHING METHODS
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THE APPLICATION OF INTERACTIVE WHITEBOARDS IN PRIMARY SCHOOLS OF VOJVODINA

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Abstract - The structure of the information society, the growing of "net-generation's" visualization, the way of production and acquisition of information, as well as the dominant pedagogical principles of nowadays (interactive education) make it important to include such an interactive tool in the process of education, which fits these principles and is connected to the virtual space via the Internet. The appropriate technological background, decreasing prices and simplification of equipment, together with the direction of educational goals have opened the door to the use of interactive whiteboards in schools by the millennium. This paper gives a situation analysis of primary schools in Vojvodina, pointing out the deficiencies, opportunities and advantages of using interactive whiteboards.

I. INTRODUCTION

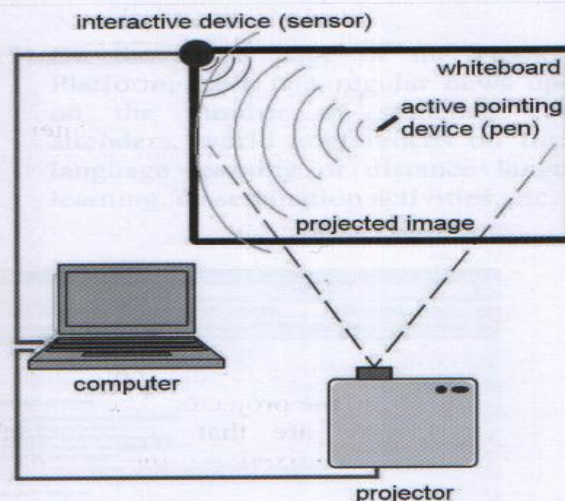
Looking back at the history of schools and education, it can be stated that the latest technical achievements have inevitably (although with some delay) entered the education process. Examining the background of this phenomenon, it becomes clear that it has happened for two reasons: 1. It was important for students to get familiarised with the use of certain pieces of equipment, to prepare them for carrying out work processes that require such devices; 2. In order to improve the quality of school classes, resulting in more motivated participants and more effective knowledge transfer.

When talking about the education of younger generations, we have to remark that the use of these devices has to appear in an integrated way, primarily based on games and basic skills (digital ink and pointing devices).

II. APPEARANCE OF INTERACTIVE WHITEBOARDS

The interactive whiteboard is located at the end of the evolution process of education technology leading from chalk and traditional blackboards, over felt-tip pens and whiteboards,

then computers, projectors and whiteboards, to computers, pens, projectors and whiteboards (or touch-sensitive surfaces). It is an educational tool that consists of a computer, a projector, an interactive board and the cables connecting them.



Picture 1. Working principle of an interactive whiteboard

If we compare this system with the previous development stage (computer, projector and whiteboard), we can see that the advantage of the interactive whiteboard is in its interactivity. This interactivity could be achieved only in a restricted way at the previous stage, coming near to the computer. While here we have complete interactivity since this device does not tie the user to the computer. Standing in front of an image projected to a touch-sensitive surface we can teach interactively. We can initialise various mouse functions (left click, right click, double click) using a pen or touching the surface. Moreover, with the help of the interactive keyboard and the handwriting recognition system we can input even handwritten texts to the

whiteboard without leaving it or losing eye contact with the audience, and not interrupting the natural flow of the class.

Interactive whiteboards first appeared in the field of business at the end of the '80s and the beginning of the '90s, used for in-house trainings and presentations in certain companies. The especially high price of that time has decreased by the beginning of the 2000's making this device available for educational institutions as well. This meant the beginning of their use in schools. Beside the price the other obstacles for spreading of this device were the lack of ready contents presentable on these boards and the lack of necessary knowledge. The intensified and centralised utilisation of interactive whiteboards in the field of education began in 2002, first in England, Scotland, New Zealand, Canada and the United States of America.

III. CLASSIFICATION OF INTERACTIVE WHITEBOARDS

There are several classifications of interactive whiteboards, while the most frequently used one is the following:

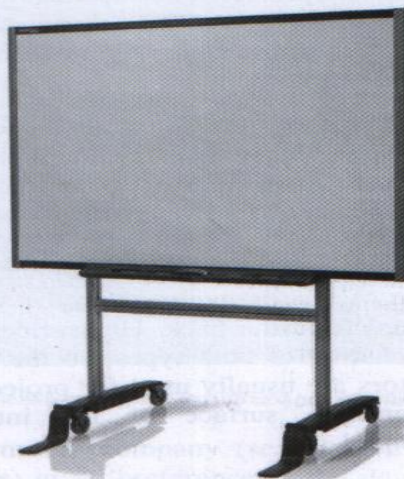
- **Hard boards:** Their feature is that we make a suitable surface (mostly a whiteboard) interactive. For the operation of such a system it is necessary to have a suitable projection surface and a pointing device (pen) as well, beside the computer, the whiteboard and the projector. The advantages of these types are that they are easily movable (being fixed to the board with suction-grip discs), their prices are generally more favourable, but they require a special pointing device, which operates with batteries.



Picture 2. mimio Xi, one of the most popular hard boards

- **Soft boards:** Their feature is that they project the image to a board placed usually on a

stand (or built into the wall). This surface is touch-sensitive since numerous micro controllers are mounted on it. As a result there is no need for special pens to use these boards, since this technology senses the touch of our finger, a plastic pen or any other object. We can mention as disadvantages that their price is higher and their movement is more complicated.



Picture 3. Smart SB640, one of the most popular soft boards

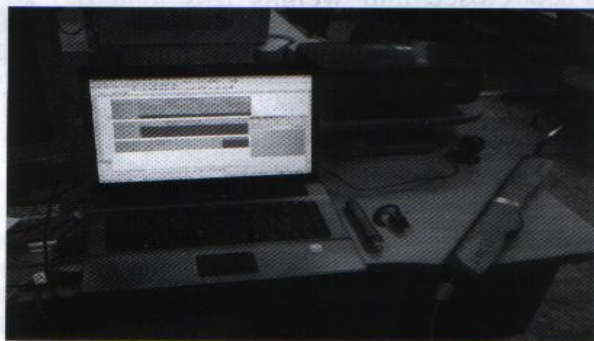
IV. OPTIONAL ACCESSORIES OF INTERACTIVE WHITEBOARDS

Producers of interactive whiteboards offer various accessories, some of which are useful, while some are less inevitable or can be only partially utilised by a teacher working in a traditional class. Beside the standard equipment we can choose from the following optional accessories of interactive whiteboards:

- **Voting and response system:** Feedback from students and the students' knowledge level are the best and most reliable measures of the effectiveness of teachers' work. Within the traditional teaching model this feedback is often delayed, occurring usually over certain forms of assessment. Using voting and response systems teachers can get immediate feedback from students about how well they have learnt the subject-matter, and may ask their opinion. They can view the results on the interactive whiteboard (as a chart) after the voting, thus achieving reliable information about the successfulness of learning. This way, teachers get a true picture

of the outcome of their work at individual level. These responses highlight the deficiencies and the teaching methods that need to be improved.

- Sketching boards enable students to draw on the projected image, write comments and display explanations. Furthermore, they provide mobility to teachers since they can write on the projected surface from any part of the classroom. This device can be excellently utilised in the education of disabled people.
- Ultra-short throw projector is a special type of projector that unlike the traditional ones projects the image to the surface from a very small distance. Its advantage is that the light of the projector does not irritate the teacher. The same problem can be eliminated with the use of boards mounted on the wall and projected from the back. High prices hinder the spreading of both types, so the existing projectors are usually used for projecting on the sensitive surface of the interactive whiteboard.
- Wireless connection: cables are usually annoying (they are not long enough, teachers may stumble over them). These problems are resolved with the use of wireless connections based on the widely utilised bluetooth technology.



Picture 4. ECDL training where hospitalised students could join via the Internet (Mali Idoš, 2010). Hardware: computer, mimio Xi, projector, web camera, bluetooth headset. Software: Windows XP, Skype, Excel, mimio Notebook, mimio Tools.

V. POTENTIAL USE OF INTERACTIVE WHITEBOARDS IN EDUCATION

Interactive whiteboards enable the realisation of virtual, multimedia and interactive classes led from a board. Every application that is running on the computer may be loaded and applied on

an interactive whiteboard. We can classify the forms of use of interactive whiteboards the following way:

- The interactive whiteboard can be used instead of a traditional whiteboard. We can write on its surface using various tools (felt-tip pen, ballpoint pen, highlighter). This form of use is not only advantageous because we do not need chalk or felt-tip pen, but because it is easy to erase, the image on the board can be saved, printed or forwarded after a few clicks (it can be reloaded at any time). Beside still pictures we can also make motion pictures (videos) about the whole process. Furthermore, we can transform the projected image into a surface with squares, lines or staves for writing musical notations or even to a merils or chess board at any time.
- The use of an interactive whiteboard may be very useful during the presentation of various types of software (operating systems, word processing, spreadsheets etc.), since it enables the projection of not only static images but also entire processes (developing menus and submenus, operations with dialogue windows, dragging various contents etc.). It is very important that the teacher can freeze certain phases of a process and give further explanation. Browsing the Internet on the board may also be very expressive, the points of activity (clicks) can be followed and the explanations of certain parts are also more effective grounded on a big, projected image.
- The interactive whiteboard can be used for presenting previously prepared materials. These can be ready software or supplementary materials made by the teacher. Supplementary educational materials made using whiteboard software (mimio Notebook, SMART Notebook) provide the highest level of interactivity, and with the use of various integrated components (gallery, exercise editor, multimedia, experiments) teachers may get the best use of interactive whiteboards.

Numerous surveys have proven that the use of interactive whiteboards result in more effective knowledge transfer and more motivated students. In addition, teachers also get motivated after a successful class that has achieved its goal and the students have learnt effectively and with pleasure. Although the preparations require careful planning and are time-consuming (and

not lastly knowledge demanding), their hard work pays off multiple times, since a properly structured interactive curriculum is fascinating, can be used more times and is easily modifiable.

The use of interactive whiteboards can be incorporated to any of school activities, from certain types of frontal work (as a whiteboard, for presenting multimedia and PowerPoint presentations), over group work (a group prepares a presentation on the computer and then presents it on the board) to individual work (students come out to the board one by one to perform some tasks: drawing, matching, filling in some fields, activating some interfaces), improving the quality of work in the classroom.

An interactive animation available on this link <http://vault.smarttech.com/videos/classroomtour/index.html> presents the potential use of interactive whiteboards and their accessories.

VI. INTERACTIVE WHITEBOARDS IN VOJVODINA

Although a considerable number of teachers from Vojvodina know the potentials and advantages of interactive whiteboards, schools are equipped at a very low level. The main reason for that is in the lack of money. The number of interactive whiteboards in schools not only falls behind an expected level, but also in comparison with surrounding countries, especially Hungary and Croatia (in Hungary according to the National Development Plan II 40 thousand classrooms out of 62 thousand have been equipped with an interactive whiteboard by 2010). Another huge problem is the lack of centralised funds that could be spent on such developments.

Apart from this fact we can see that those types of boards that are popular on the international market are also available in Serbia.

These are:

- Systems based on Wii control: connecting the Nintendo Wii control (that was originally developed for detecting 3D movements) to the computer, adding a projector and using an infrared pen we can create an interactive and sensitive surface. Even a teacher with adequate technical skills can compile this system (commonly the pens are home-made). The biggest advantage of this type is its price since it can be made for a fraction of the cost of an original interactive whiteboard. Its

disadvantages are the difficult calibration (the synchronisation of the computer and the projected image – the system works perfectly only with two Wii controls), the lack of software support, the wide dead area in front of the projection surface (the teacher has to pay attention not to hide the light and beams of the two controls and the projector).



Picture 5. The Wii control and the infrared pen with the accessories

- The mimio company (seated in the United States) gives preference to the development of portable interactive whiteboards, which make the whiteboards in schools become interactive surfaces complemented with a projector and a computer. Their best-known product is the mimio Xi, which is 24 cm long when closed and weighs less than 0.5 kg. This way it is easily portable and moveable, its setting-up and calibration is easy, and has a medium price. The software provided (mimio Notebook and mimio Tools) fulfils the needs of an average user.
- SMART (seated in Canada, but since 2009 also producing such whiteboards in Vác, Hungary) is the pioneer of boards that can be placed on stands, mounted on the wall or built into the wall. They not only make whiteboards interactive, but also provide the projection surface with various accessories. Their products belong to the group of soft boards, their movement is difficult or almost impossible (types built into the wall), the prices are the highest from the three mentioned types, however the quality and software support of the devices are one of the best in the market. The software of the board (SMART Notebook), beside different tools, gives opportunity to prepare exercises fast and simply, and also provides interactive

games and experiments.

There are very few interactive whiteboard courses in Serbia. Usually dealers of the boards provide trainings and presentations before and after a board is sold. There is only one accredited training about interactive whiteboards in Serbia organised by the Hungarian teacher-training faculty from Subotica with the title: Training of practicing teachers on the use of interactive whiteboards.

VII. SURVEY ON THE PRESENCE OF INTERACTIVE WHITEBOARDS IN PRIMARY SCHOOLS OF VOJVODINA

After our theoretic and methodological discussion we deemed it worthy to survey the situation in primary schools concerning the number of interactive whiteboards and the most popular types.

Our survey involved those primary schools and their departments that operate in Vojvodina.

We have evaluated 88 primary schools from 22 municipalities. The number of schools by municipalities: Apatin (1 school), Ada (6 schools), Čoka (7 schools), Bela Crkva (2 schools), Odžaci (1 school), Kovin (1 school), Mali Idoš (2 schools), Kula (1 school), Kanjiža (6 schools), Zrenjanin (3 schools), Kikinda (3 schools), Bečej (8 schools), Pančevo (1 school), Subotica (14 schools), Srbobran (1 school), Temerin (3 schools), Bačka Topola (8 schools), Novi Bečej (2 schools), Novi Kneževac (3 schools), Novi Sad (3 schools), Senta (7 schools), Sombor (5 schools).

From the 88 schools there are interactive whiteboards only in 6 (6.83%). There is a slightly better situation in the municipality of Subotica where 4 of the 14 schools have interactive whiteboards (28.57%).

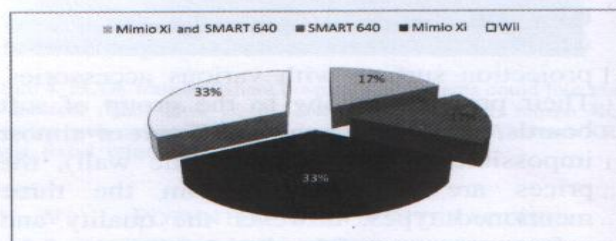


Chart 1. Appearance of certain board types in schools of Vojvodina (Námesztovszki, 2010.)

Analysing the types of interactive boards we have found that various types are present in these schools: Mimio Xi and SMART 64 (1 school),

SMART 64 (1 school), Mimio Xi (2 schools), Wii (2 schools).

VIII. SUMMARY

We can state that the appearance of interactive whiteboards in primary schools of Vojvodina is at a very low level. Teachers are moderately familiar with the potentials and efficiency of interactive whiteboards, while those teachers who have already met these boards on trainings or in another schools make efforts so that their school can also get such a device as soon as possible. They mention the bad material situation of schools for being the biggest obstacle of purchasing these boards. According to them the utilisation of the boards would be intensive, firstly instead of traditional blackboards, but there would also be willingness for learning and preparing digital curriculum.

Of course, we also face some opposition. Those teachers who have lagged behind somewhere with the use of computer or the computer and projector, will surely be less motivated for using the interactive whiteboard and for digitalising their traditional (paper based) contents. We can achieve the use of interactive whiteboards among these teachers if we provide them ready and instantly integrated parts or entire contents. However, even then they may be reserved because of the fear from failure that can emerge from the phase of downloading the materials until the time of presentation. We have to know that these failures may be prevented with life long learning, invested time and energy (that pay off later), while technical problems constantly emerge at students, teachers and even IT teachers in every system controlled by a computer.

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