

INTERACTIVE WHITEBOARD AND GEOMETRY LESSONS IN PRIMARY SCHOOL

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Abstract: Interactive whiteboards are modern technology in schools. They are especially suitable to be used in primary schools. Some authorities already recognized that and help schools equipping with them. Now, when a moderate number of schools are having them, minority of teachers proactively use them, while others are waiting to get prepared materials for them. In the paper we discuss the usage of interactive whiteboards and present our software for interactive whiteboard that can be used in the first grade of primary school for geometry lessons. Reasons to develop own software and results of experimental usage are given, too.

1 INTRODUCTION

Over the last 20 years information-communication technology (ICT) has become an integral part of all levels of education. It is used in primary schools, secondary schools, faculties, private educational institutions and organizations. During that period, different ICTs emerged. Last 7 years many schools all over the world enriched their activities by using interactive whiteboards (Gavin, 2005).

Without doubt we can observe that IWBs are becoming ubiquitous feature of many primary school classrooms. For example, UK provided extensive funds for integrating IWBs into primary schools (Coghill, 2005; McCormick, 2007; Moss, 2007). Impressive examples are also in Australia (Lee, 2003) and in Sweden (Markman, 2008). Some authors also believe that IWB will become the preferred teaching media in China (Hui-xian, 2009).

In 2007, the Ministry of Education and Sport of the Republic of Slovenia started cofounding purchasing of the new interactive equipment. In October 2008 they started to supply primary schools with the IWBs. Nowadays many primary schools have at least one IWB, some are still lacking them. Using ICT in schools is not obligatory. In some

schools some teachers are much more proactive by using IWBs. They prepare guides of how to effectively use the IWBs in the classrooms, prepare the materials and the software, which will be presented in this paper.

The organization of the paper is the following. Section 2 describes IWBs, benefits and drawbacks. Lacking of proper materials for the IWBs is emphasized. Section 3 describes the software "Matko's world of geometric objects" we developed to be used with the IWB in primary school for mathematical geometry lessons in the first grade of school. In Section 4 we present some results of the observations we made on using our software and Section 5 concludes the paper.

2 PRELIMINARIES

IWB is comprised of an electronic whiteboard, a projector, an electronic pen, computer, whiteboard operating system and software, and other accessories. The contents of the whiteboard can be pointed to, selected, operated, and processed directly by using an electronic pen or by hand, depending on the IWB's hardware. It combines computer and

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electronic technology and can be seen as an intelligent communication platform between computer and users (Xing-fu, 2005).

With proper capacity and knowledge of teachers, the ICT and especially the IWB can be used in all phases of learning process. Although the ICT will probably significantly change traditional classroom environments in the future, in schools most teaching is still done in classrooms in conventional ways. Teaching is usually performed as the following four types: frontal work, group work, work in pairs, and individual work. IWB is a technology that supports all types. Figures 1 and 2 show two examples of teaching with the IWB.

2.1 Benefits and Drawbacks of using IWB

Some benefits and drawbacks for different ages of pupils can be found in (McCormick, 2007). Among many benefits for the pupils and the teachers we observed the following: interaction, collaboration, ownership, involvement, individual needs, ICT skills, novelty of experience, diverse resources, quality resources, individual results, sharing, and school interconnections.

As other technologies the IWBs are also prone to some drawbacks. Mostly we experienced the following ones: calibrating, limited collaboration, pupils left aside, contact sensitivity, electricity problems, and sharing resources.



Figure 1: IWB and frontal work.

IWB is a very young technology, and resources for many lessons are still not yet developed. If they are developed and ready to use, they are probably licensed by companies or publishers and have to be bought by schools or by teachers. Prices are too high and teachers are therefore left to themselves. Last year an initiative of The National Education Institute

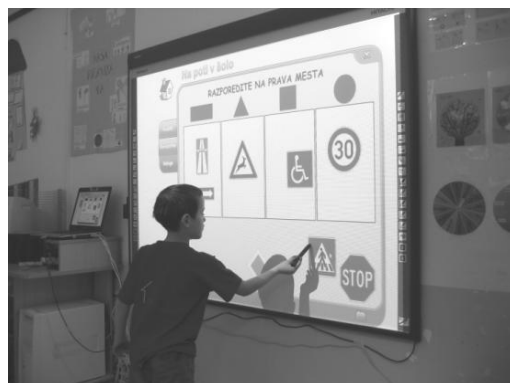


Figure 2: IWB and individual work.

of Slovenia (NEIS) started to organize meetings for teachers that wish to use IWB. The meaning of these meetings is basic acquaintance with the IWB and associated software, which can be seen as the first step of using IWB in Slovenia. By Hooper and Rieber (Hooper&Rieber, 1995) this is the first phase from five phases of introducing the new technology.

Although many teachers are inspired with the IWBs and their usage, now they are waiting for proper resources supplemented with instructions how to use these resources in lessons (syllabus). As we can see, one of the benefits of using the IWB is also the biggest disadvantage.

3 IWB'S SOFTWARE

IWB is always supported with software and resource database management. Resources and materials that teachers prepare and use depend on the curriculum and the syllabus. Accompanied software is very general and "only" teachers' imagination and energy are needed. As stated before, such resources can be successfully used and can improve the success of teaching (Coghill, 2005; Condie, 2007; Gavin, 2005; Hanson, 2006).

3.1 Matko's World of Geometric Shapes

Accompanied by the facts that Becta research showed 20% increase in success in mathematics (Becta, 2007), and that IWB offers better manipulation with geometrical shapes and objects, and our aim to couple the real and the abstract world, we decided to develop our own software for the IWB. The software is called "Matko's world of geometric objects", or shortly just Matko by the main character (shown on figure 3). It was developed in

collaboration with company Videofon, Flash and Promethean Activ Studio are used. It is designed specifically for teaching (learning) geometric shapes such are triangles, rectangles, squares, circles and geometric objects such are cubes, blocks, spheres, cylinders, cones and pyramids. The didactical approach in Matko is “from real to abstract”.

As a must have feature according to (Bandoh, 2000) in the main menu (figure 4) teacher can select different scenarios: classification of geometric objects, cube, block, sphere, cylinder, cone and pyramid.



Figure 3: Main screen of Matko's world of geometric shapes.



Figure 4: Main menu.

Teacher can always come back to the main menu by using buttons on the right side of the screen (figure 5). Each scenario has the instructions for the teacher, like the one shown upper right on figure 5. It is shown on the demand and teacher can choose to use it or not. Each scenario also has a video showing real objects that introduce pupils to learning subject. Figure 6 shows a screenshot from the video where Matko classify objects based on their shapes.

After introductory video teacher can use exercises that are offered in Matko. Figure 7 shows some of these exercises where pupils classify and sort objects, search for objects behind curtain, play the memory game, search and name the objects.



Figure 5: Menu buttons on the right and the instruction for the teacher.



Figure 6: Accompanying video.

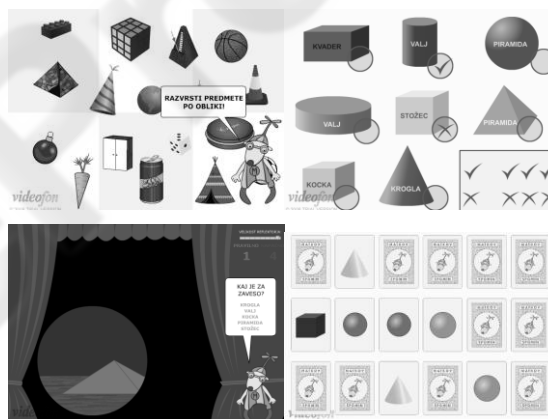


Figure 7: Different exercises in Matko.

4 OBSERVATIONS

The usage of IWB and Matko was tested in primary school Dolenjske Toplice. 32 pupils aged from 6 to 7 years in the first grade were introduced the IWB. At first, by using resources and materials that teacher personally prepared with the IWB's accompanied software. At the same time, in primary school Preska pri Medvodah 18 pupils of control group were taught the same lessons by conventional methods, without ICT. Pupils from Dolenjske

Toplice were highly motivated, more than pupils in control school. Some of the advantages and the drawbacks mentioned in subsections 2.1 were observed.

Later pupils were introduced Matko's world of geometric shapes and the main character Matko. All geometry lessons (in both schools) were performed in 14 days which is the maximum number of days for geometry lessons at that age. After these lessons pupils were individually asked 18 different questions about IWB and about the Matko. Overall result was:

- that pupils liked IWB and Matko (especially the games as they called the exercises),
- they reported that they saw much familiar and new things at the same time in movies (video sequences in scenarios),
- they liked when teacher read the instructions,
- they liked to repeat the actions which were shown in video sequences, and
- the most liked exercises were the hidden objects behind the curtain.

In both schools an additional observation was done before and after geometry lessons. 50 pupils were orally tested for their prior and learned knowledge. Discriminative analysis showed that both groups of pupils were statistically comparable. Analysis of the post test showed that pupils that used IWB had better results. On average results were 22% better, specifically by objects 27%, by shapes 16%, and by curves 22%.

The results are close to the results in (Becta, 2007) and (Condie, 2007) what proves that IWB is a learning improving technology. In addition, as in (Bandoh, 2000) pupils were well focused when IWB was used.

5 CONCLUSIONS

Interactive technologies and especially IWB are technologies that enrich teaching and learning activities. Over the world a lot of schools are already equipped with IWBs. Same is in Slovenia, although too many schools have none or only a small number of IWBs, or they even have them in classrooms where teachers never use them. There is an initiative that helps teachers about basic IWB usage, but there is still a lack of proper instructions for individual lessons (syllabus), resources and materials.

For teaching the geometry lessons on geometric shapes, objects and curves in the first grade we developed the IWB software called "Matko's world of geometric shapes". Software is still in developing

phase but already exhibits improvements in learning outcome of pupils. In the future, the lessons in Matko will be expanded to all curriculum contents for first three grades of primary school and extended analysis including more pupils will be done.

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