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INTERACTIVE WHITEBOARDS IN MATHEMATICS TEACHING

Abstract. An interactive whiteboard (IWB) is a large interactive display, it can either be a standalone touchscreencomputer used independently to perform tasks and operations, or a connectable device used as a touchpad to control computers from a projector. It has provided interesting affordances in the classroom environment, such as multiple visualization and multimedia presentation and ability for animation and interaction. In this paper, some aspects of comparison of the classical and the new IWB- technology classes are presented in order to find out advantages of this new device. It is shown that capabilities of IWBs to enhance the quality of interaction, and better and deeper mathematical understanding.

In this article also says, thatIWB reduces the psychological barrier, allowing the student overcomethe fear and start using moderntechnologies. It should be mentioned here, that in these lessons even lagging students change their behavior, they follow the course with interest, raise their hand to go to the board and solve the tasks. Here, the factors associated with increasing motivation students and visual presentation of the material are working.

Key words: interactive whiteboard, mathematics teaching, Smartboard.

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Аннотация. Интерактивті тақта үлкен интерактивті дисплейден тұрады. Олар түрлі операциялар мен тапсырмалар орындауға арналған автономды сенсорлы компьютер немесе проекторға қосылатын компьютерді басқаратын сенсорлы панель болуы да мүмкін. Бұл құрылғы көптеген көрнекіліктерді көрсетуге және мультимедиялық презентация, анимацияларды өзара байланыстыратын қызықты мүмкіндіктер ұсынады. Бұл мақалада осы жаңа құрылғының артықшылықтарын анықтау үшін интерактивті тақта технологиялары қолданылатынжаңа сыныптар менклассикалық сыныптарды салыстырудың кейбір аспектілері көрсетілген. Интерактивті тақталардың ұсынатын мүмкіндіктері оқушылармен байланысты арттыратыны және математикалық түсінікті тереңдетініне баса назар аударылған.

Сондай-ақ бұл мақалада Интерактивті тақтаны сабақ барысында қолдану оқушылардың психологиялық қорқынышын жеңіп, жаңа технологияларды қолданып үйренуіне септігін тигізетіні айтылған. Сабақ кезінде тіпті деңгейі төмен оқушылардың өз іс-әрекеттерін өзгертіп, қол көтеріп тақтаға тапсырманы орындау үшін шығып, сабаққа белсенді қатысқандықтары байқалған.

Кілт сөздер: интерактивті тақта, математиканы оқыту, SmartBoard.

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Аннотация. Интерактивная доска представляет собой большой интерактивный дисплей, это может быть автономный сенсорный компьютер, используемый независимо для выполнения задач и операций, или подключаемое устройство, используемое в качестве сенсорной панели для управления компьютерами с проектора. Он предоставляет интересные возможности в классе, такие как многократная визуализация и мультимедийная презентация, а также возможность анимации и взаимодействия. В этой статье представлены некоторые аспекты сравнения классических и новых классов IWB-технологий, чтобы выяснить преимущества этого нового устройства. Показано, что возможности интерактивной доски повышают качество взаимодействия, а также улучшают и углубляют математическое понимание.

В этой статье также говорится, что интерактивные доски способствуют преодолению психологического барьера, позволяя ученику преодолеть страх и начать использовать современные технологии. Здесь следует упомянуть, что на таких уроках даже отстающие ученики меняют свое поведение, они с интересом следят за курсом, поднимают руку, чтобы идти на борт и решать задачи. Здесь работают факторы, связанные с ростом мотивации учеников и визуальной презентацией материала.

Ключевые слова: интерактивная доска, преподавание математики, Smartboard.

Innovations are coming to all aspects of our life: smart watches, smart phones, internet… Among the technical novelties coming today to school, interactive whiteboards (IWB) play a special role. IWB is a set of equipment that allows the teacher to make the learning process more modern, dynamic and clear. The use of interactive equipment makes it possible to replace many traditional teaching aids, even provide the possibility of distance education. In many cases, such a substitution is effective, since it allows students to keep interest in the subject under study, to create an information environment that stimulates the interest of the student. IWB allows the teacher to combine a variety of tools that contribute to a deeper and more informed assimilation of the studied material, saves the time of the lesson, allowsthe organization of the

learning process by individual programs.All these facts explain the relevance of the considered topic.

The main goal of this paper is to discover and explain the possible advantages of the use of the IWB in mathematics teaching. In order to find out these advantages, the lesson with IWB is compared with the traditional math's lesson. Often the classical mathematics lessons show a lack of variety, with typical lessons concentrating on the acquisition of skills, the solution of routine exercises and preparation for tests and examinations [1]. It could be boring for a student. Therefore, the use of multiple representations and the flexibility to switch between them is an important component in mathematical thinking, learning, and problem solving. This could be the main function of the IWB [2]. An electronic whiteboard is a large interactive display that connects to a computer and shows images thrown by a projector. The mounted or freestanding whiteboard mirrors the computer's screen, and you can control the computer by interacting with the board using a pen, fingers or a supported input device. While the first interactive whiteboards were used in offices for sharing and presenting ideas within business groups, they are now also found in schools, sports training rooms and TV studios [3].

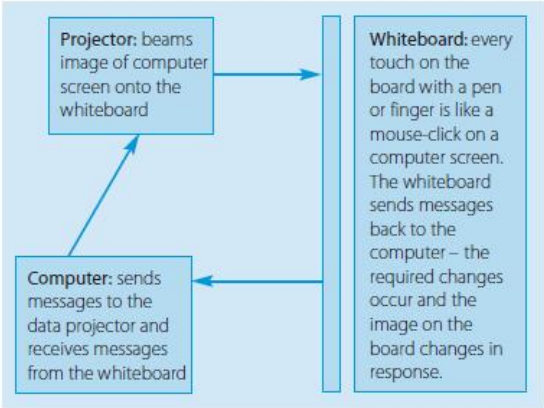

Fig.1. Scheme of IWB

Interactive whiteboards connect to PCs via wired or wireless connection. Therefore, an electronic whiteboard can connect to a PC via USB, serial port cable, Bluetooth or Wi-Fi. Most of these whiteboards use infrared scanning with or without ultrasonic pens, resistive touchscreen or electromagnetic pens for interactivity. A few examples of electronic whiteboards are the MimioBoard Interactive Whiteboard, Hitachi FX-79E1 and eBeam Edge.

In the simplest terms, a multimedia projector allows the user to display anything that is on their computer for an audience, and to control the computer from the interactive whiteboard itself instead of having to return to the computer (see Figure 1). This allows even a novice user to run applications such as CD-ROMs, word-processing documents, spreadsheets, presentations and the internet simply by 'clicking' in the right places on the board without

losing engagement with a class. With a little bit of practice, teachers can then start to use 'floating tools' to add notes or comments and highlight sections of these pages. The effective use of interactive whiteboard technology can radically transform the interaction between teachers and learners and allows for discussing and analysing in a visual, auditory and kinaesthetic medium.

They are a powerful tool in the classroom adding interactivity and collaboration, allowing the integration of media content into the lecture and supporting collaborative learning. Used innovatively they create a wide range of learning opportunities. However, in many environments they are not being used to their full potential, and in many cases acting as glorified blackboards.
An interactive whiteboard can be a cost saver as this technology demonstrates how one computer can provide learning stimuli for a whole classroom. This is more cost effective than equipping an entire IT room, or every student with a laptop.

Examples of the features available when using an interactive whiteboard:

- Add annotations
- Highlight text
- Add notes and drawings and then save them to be printed out and shared, or added to a virtual learning environment.
- Show pictures and educational videos
- Demonstrate the content available on a website in a teacher-directed activity

In other words, IWB allows to:

• Improve the quality of interactions and teacher assessment through the promotion of effective questioning

• Redress the balance of making resources and planning for teaching

• Increase the pace and depth of learning.

The teacher can call upon the students to interact with the whiteboard himself or herself. The lecturer can sit at the computer, with the student at the whiteboard, and the class offering suggestions and contributing ideas.

Interactive whiteboards promote group discussion and participation. They are an effective tool for brainstorming as notes made on the screen can be turned into text, and saved to be shared and distributed later. They are an ideal tool for small group work and collaborative learning, as students can huddle around the board developing ideas, and then save the work for sharing over a network or by email.

Further we present several examples in order to discover advantages of the IWB-technology. We compare several aspects of tradicional and IWB-lessons and prove that the interactive whitebords could improve quality of teaching and make lessons more interesting and effective.

Interactive and Classical lesson

Homework checking

If the homework is checked with a scanner, that is possible with interactive technology, the work of the student is simultaneuously displayed on the board. The sudent has possibility to explain his solution. If necessary, the teacher or other students could correct the mistakes and discuss it with the class. If the problem has several solutions, other options are displayed on the board using the scanner, and students have the opportunity to compare different ways of solving the problem.

In the classical way, much more time is taken when the student rewrites the solution on the blackboard, and then explains it to the other students. If the problem has several solutions, then the time for the reproduction of these tasks on the board increases, or even there is no time to show all possible solutions. So, we may conclude that the IWB saves the time and does not avoid the class discussion and interaction with the audience.

In the case of the oral interrogation IWB also show its efficiency. When the teacher asks a question, it simultaneously appears on the board. An illustration could appear on the board, if necessary. If there is no IWB, then the students listen to the question asked by the teacher, which reduces the degree of understanding of some students. It takes time to perform the illustration to the task. In that case IWB increases the level of understanding and visibility of some mathematical objects.

New material explanation

If the topic is not well-represented or is not sufficiently fully described in the textbook, then the educative movie or animation on the IWB could help to understand abstract mathematical objects. If necessary, teacher draws attention to the most important points, highlights the main ideas and answers questions from the students.

Primary fixing of the material

Solving problems from the textbook takes the same time as when working with the interactive whiteboard, and in the classic lesson. However, the use of prepared in advance figures allows writing in the lesson 3-4 tasks in writing, as well as comparing different ways of solving the same problem and considering how many different solutions it can have.

Assignments

When completing assignments for variants, students solve them in notebooks. Then, using the scanner, the solution is projected onto the IWB, and the teacher asks the students to comment on the solution. Thus, the IWB eliminates mindless copying from the board, saving time on the reproduction of the solution.

In the classical sense, there are two ways to organize this part of the lesson. The main part of students performs assignments in notebooks, and two students simultaneously solve the problem on the blackboard. Then these tasks are commented on. A significant disadvantage of this method is that a part of the students, instead of solving tasks independently, writes them off the board,

and this material remains untreated. Another way to do assignments in classroom is as follows. All students solve tasks in their notebooks, and then one representative goes to the board and reproduces the solution. At the same time, the percentage of dropping out students decreases, but there is a loss of time.

Concluding remarks and home task

Students can be assigned not only a general, but individual home task, which is issued in the form of printouts. Also all information appearing during the lesson on the board is saved. This allows the teacher to repeat the main points, make a conclusion. On the other hand, without interactive technologies, home task is usually given by the textbook or written on the board. In this case, all students have the same task. Due to lack of free space on the board, most of the solved tasks could be erased. So, the teacher can address to the students notebooks, when mentions the most important issues of the lesson and makes concluding remarks. If a student has a question at the end of the lesson on some solved problem or when formulating conclusions, the drawing for the task or the stages of reasoning have to be restored on the board.

When building math lessons around the essential characteristics in the table, it is important that the IWB not be the only tool students interact with during lessons. The best way to use an IWB is either before or after a small-group task in which students use concrete materials, such as plastic cubes that children can link together and pull apart. Use the IWB to introduce a topic, to stimulate discussion, or to connect math concepts to real-world situations. Avoid using the IWB to show students how to complete the task.

In addition, there are more advantages of the IWB. First of all, teachers do not need to worry about the safety of paper maps, posters and teaching aids. They do not need them. All the work done in the lesson with all the notes can be saved in the computer for later viewing and analysis.

Working with an interactive whiteboard, a teacher can increase the level of understandin of the material through a combination of different forms of information transfer -visual, sound and tactile. During the lesson he can use multi-color schemes and graphics, animation accompanied by sound, interactive elements. If there are students with poor eyesight in the group, the teacher can enlarge one or the other element drawn onthe board. Competent work with the interactive whiteboard in the classroom also allows to optimize the learning process [4].

From the point of view of the students, IWB reduces the psychological barrier, allowing the student overcomethe fear and start using moderntechnologies. It should be mentioned here, that in these lessons even lagging students change their behavior, they follow the course with interest, raise their hand to go to the board and solve the tasks. Here, the factors associated with increasing motivation students and visual presentation of the

material are working. Individual more complicated tasks can be offered to the students with a high cognitive motivation [5].

The IWBs potentialities to enhance the quality of interaction (both the social interaction between the teacher and the students, and the content interaction with mathematical concepts), and, consequently, to improve conceptual mathematical understanding and problem solving, are broadly recognized. IWBs have the potential to aid the teaching of difficult, abstract, and complex ideas, to improve students' motivation to learn and increase lessons' pace [6], and to reinforce conceptual learning through the use of animation or visual representation [7].

Also we can conclude that unless the use of the interactive whiteboard is supported by carefully developed materials, teachers will either use them as conventional boards with little impact on teaching effectiveness, or spend a great deal of time in the preparation of materials to the detriment of other lesson planning and student assessment work.

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