Interactive whiteboard in the primary school environment

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Abstract – This paper focuses on one of the most advanced teaching facilities currently used on all types of schools, on the interactive whiteboard. Specifically, the contribution deals with the use of interactive whiteboards in primary school. Based on surveys that were carried out on the subject, defines the basic concepts on which the text is based. The empirical part of the contribution is based on a questionnaire survey aimed to find out how teachers work with the interactive whiteboard in primary school. A secondary objective was to identify what are the opinions of teachers on the use of interactive whiteboards in primary school.

Key-Words – Primary Education; Interactive Whiteboard; Didactic Tool; ICT; Computer Literacy

I. Introduction

Naturalness of a child and especially a child of younger age is controlling of things by his hand. Small children touch things and they intuitive manipulate with them by their fingers. Opposite to all other didactic tools, interactive whiteboard automatically provides feed-back, if the task was fulfilled correctly or not. We can consider interactive whiteboard nowadays as a significant didactic tool, which finds more and more implementation in educational process, not only at the first level of primary schools, but also in kindergartens.

Interactive or electronic whiteboard technology first emerged in the early 1990s; its uses and impacts in K-12 education, teacher preparation and professional development have grown significantly in recent years. Interactive whiteboards (IWB) are touch-sensitive white boards linked to a computer and a digital projector, enabling one to control the computer by touching the board by hand or with a special pen. Educators increasingly are using IWBs in conjunction with other tools such as personal response systems that enable educators to rapidly assess their students' comprehension of the topic at hand, Internet connectivity that allows educators to blend web-based materials with other digital resources, and wireless slate and tablet computers that permit control of the IWB by a teacher or student from any location in the classroom [1].

Interactive whiteboards are designed to engage a wide variety of students in the learning process. They evolved from constructivist pedagogy and support each of the three principles of universal design for learning. The product provides teachers with multiple ways to represent information using interactive text, images, sound and video files, and thus engage a broad range of learners. Students can use the same features of the product to demonstrate their understanding of a topic. Touch-sensitive boards in particular give multiple options for interacting with displayed information, including by finger, pen tool or other object. Finally, interactive whiteboards captivate learners of the digital age, increasing student engagement with instant, tactile access to digital resources. The following sections review these principles in greater detail [2].

In the Czech Republic has not been realized yet sufficient number of research investigations, aimed at exploitation of interactive whiteboard on the first level of primary schools. The submitted results could help in investigation of the discussed problem.

II. Theoretical Background

Most IWT literatures are highly positive about the impact and the potential of the technology. Therefore, some of the advantages associated with the use of IWT that it identifies are: (a) it facilitates the effective integration of multimedia in the traditional ICT classroom, it facilitates the design of activities/materials which are tailored to meet the needs of students with diverse learning styles, b) its use to enhance motivation, interaction and collaborative learning in the classroom, and (c) it has a positive impact on students' and teachers' developments of ICT skills and attitudes towards the use of computers for teaching – learning [3].

How we have mentioned, in abroad in spite of the Czech Republic, a number of research investigations were realized concerning the discussed topic. We can mention e.g. [4], who found out, that interactive whiteboard supports mutual communication and helps to students to apply in class new cultural and language elements. This result and results of other researches showed that if interactive whiteboard is currently used, it improves more process of learning. Latham's [5] observation brought cognition that work with interactive whiteboard brings strategies suitable for the development of interactive teaching. Coxat et al. [6] in the conclusions of the report, beside other, introduces, that interactive whiteboard helps to deeper understanding of students, who are able to learn better and cooperate with others. British Educational Communications and technologies Association (BECTA), which supports research aimed at exploitation of interactive whiteboard in education at primary school, financed the project, in which Cogil [7] took part together with the teachers on the first level of primary schools. According to them attention and interest of the students increasd during lessons, where interactive whiteboard was used. Students are as " glued", they concentrate during the time of learning and obtain more pieces of information.

The fact that student engagement directly affects teaching and student motivation to learn has been well

documented. In an action research study conducted by William D. Beeland, Jr. [8], he set out to determine and document the effect of the use of interactive whiteboards as an instructional tool on student engagement. He specifically sought to find out if student engagement in the learning process was increased while using an interactive whiteboard to deliver instruction. He also sought an answer to the question of whether or not the manner in which the whiteboard is used affects the level of student engagement. As students and teachers used whiteboards in their classrooms [8] used surveys and open-ended questions to collect data on the use of this technology and asked questions specifically targeting whether or not an interactive whiteboard engages students during the learning process. The information that was gathered from the student surveys and questionnaires was used to determine student attitudes toward the use of the whiteboard in the classroom and teacher perceptions that pertained to whether or not using the whiteboard to deliver instruction engaged students during the learning process. The results of the surveys and questionnaires indisputably proved that the use of whiteboards in teaching and learning do positively affect student engagement and learning.

How it is in the Czech Republic? Framework educational programme for basic education [9], key curriculum document of Czech basic education system introduces educational area of Information and communication technology, where it counts that at the end of the 5th year of primary school, the pupils will be able to use basic standard functions of computer, to work with data, search information on Internet on portals, communicate with the help of Internet, etc. It is obvious from it that we should enable to a child to meet with new technologies in such way to utilize effectively and correctly by him, in accordance with hygienic and health demands.

We agree with Gerard and Widener [10], who says that the beauty of using a whiteboard to teach these kinds of learners, according to, is that it provides a bridge that allows using the features of computers without breaking communication – it even supports it. Secondly, it may enhance new kinds of learning processes, for instance when working with two windows. Bringing the internet into the classroom for all students to use simultaneously is easier and more conducive to discussion with an interactive whiteboard.

We consider interactive whiteboard from educational point of view as a didactic tool. In the most extent sense of the word as didactic tools are understood all material tools (e.g. real objects, instruction aids, whiteboards, etc.) and of none material (e.g. methods, organization forms of lessons, etc.) character, which contribute to effectiveness of educational process as a whole [11]. Duminy, Dreyer, Stevn [12] comprehend didactic tools as objects and phenomena, serving to reach demarcate aims. Tools in wider sense include all, what leads to fulfilment of educational aims, compare with [9]. Kalhous and Obst in Maněnová [14] introduce that "function" of material didactic tools follows from reality that man gains 80 % of pieces of information by sight, 12 % by hearing, 5 % by touch and 5 % by other senses. They add that interactive whiteboard takes place among the most modern didactic tools without any doubt.

In the framework of modern didactic tools we most often meet with a computer. We use computers with different teaching programmes for primary education, in some kindergarten we can meet with a computer centre Kidsmart [15].

Further representatives of modern information technologies are internet and mobile phone [15]. Even the children of younger school age currently meet with both mentioned means. These apply not only at school but also outside it, as stated Zumarova and Sykora [16]. The same is valid for company as well [17].

If we would like to define interactive whiteboard more precisely, we can use some of the number of definitions, offered by Czech and foreign literature. Dostál, e.g. describes interactive whiteboard as a "touch-sensitive area, by which mediation is carried out mutual active communication between the user and computer with an aim to secure maximum visualization of imaged content [18]". According to the SMARTBoard material [19] it is case of large resistant displaying area reacting on a touch. Picture of computer is by help of data projector transferred on the board and teacher or pupil can master computer applications by simple touch on the board surface, write notes or draw.

According to Maněnová [14] the interactive whiteboards could be divided as follows:

1. resistant interactive whiteboard,
2. electromagnetic interactive whiteboard,
3. capacity interactive whiteboard,
4. laser interactive whiteboard,
5. ultrasound interactive whiteboard,
6. optical interactive whiteboard.

There are different types of interactive whiteboards for disposal, which are offered on the Czech market. It is case of the following ones, when especially the first two named occupy exceptional position on the Czech market, e.g. SMART Board; Active Board;Clasus;PolyVision Eno; Hitachi StarBoard; EkoTAB pprojection; ONfinity CM2 and eBeam Edge.

With regard to above mentioned Milan Hausner, chairman of the work group European SchoolNet for active board, carried out in 2007 comparison of SMART Board and Active Board, in which he aimed on comparison of technologies and author's software.

Table 1 – Comparison of technologies and author´s software SMART and ActiveBoard [20].

SMART Board	**ActivBoard**
Controlling with "passive pen" or finger	controlling with "passive" pen
softer" surface"	hard surface finish
connection via USB	connection via USB
sounding of parts of delivery	delivery without sounding
different types of size	different types of size
author's software SMART Notebook	author's software ActivStudio or ActivPrimary
Withdrawal from web	part of delivery, actualization on web

Work with two layers	work with three layers
gallery of picture, sets, animation	gallery of picture, sets, animation
extended gallery on web	extended gallery on web
Does not have preprogrammed activity	set of preprogrammed activities
Turning Point for voting	own voting software
Accessories tablet, Active panel recorder	Accessories tablet, slate, Active panel
rekorder	rekorder
slightly lower price	higher price
non-transportable of objects	non-transportable of objects

Implications for Teacher Educators

There is thus compelling and growing evidence that IWB use can positively impact student engagement and achievement significantly, across many subject areas, for students across the full spectrum of abilities and achievement levels including, most notably, students with special needs. Teacher educators therefore should seek faculty development, as needed, to develop their familiarity and proficiency with IWB technologies; equip their students with knowledge of research-based practices for planning for, supporting, teaching with and deploying IWB tools in ways most likely to improve student engagement and achievement; and conduct and encourage others to undertake qualitative and quantitative research to deepen our understanding of the factors that most impede and enhance the positive benefits of IWB technologies. Research also is needed regarding ways in which IWB can best be used in conjunction with e-learning, personal response systems and other rapidly emerging learning technologies. Ideally, such research should, wherever possible, be longitudinal and include a blend of experimental, quasi-experimental and qualitative studies, in order both to measure as well as to explain and optimize the learning gains that IWB technology foster. Finally, teacher education faculty and leaders should seek opportunities to inform policy makers and educational administrators of this growing body of evidence of the highly promising educational benefits of investing in IWB technology [1].

III. Methodology of Research

The main aim of research investigation was to find out, how the teachers work with interactive whiteboard on the 1st level of primary schools. The second aim was to identify, what are opinions of the teachers on usage of interactive whiteboard on the 1st level of primary schools.

Research investigation was realized as a quantitative one, the results are, with regard to the primary aim of research of descriptive character. A questionnaire was used as a research tool, of our own construction, which contained 17 in the first place closed, half-closed and opened and tested questions [21]. Just before administration itself, pre research was carried out, on its base was the used instrument tool adjusted.

Selection of research sample was carried out on random [22]. Total numbers of 156 questionnaires were administrated to all types primary schools in Hradec Králové region. Return ability was 60,3 % - it is 110 questionnaires. Differences among fully organized primary schools and small schools were not followed, 45,5 % respondents have practice longer than 24 years, 30,9 teachers are active in school 16-23 years, 11,8 % respondents work in school 8-15 years and the same percentage of the questioned teachers have practice 0-7 years. It is case of data obtained in most cases from experienced teachers.

IV. Research Results

In the first place we were interested in the answer to an question, if the questioned teachers have for their disposal interactive whiteboard in their school.

The results revealed, that in total 66 (60 %) of the questioned persons have to their disposal at least one interactive whiteboard on the 1st level of primary school. From this number only 16 (24,2 %) has the interactive whiteboard for disposal in each class, it forms only 14,5 from the total number of the questioned.

Table 2 An interactive whiteboard in primary school

	frequency	%
Yes	66	60,0
No	44	40,0

Of a total of 66 schools in our survey responded that they are equipped with interactive whiteboards, 71 % of schools were fully organized, 17 % only primary school and 12 % schools were of small (multi-age) schools (see Figure 1).

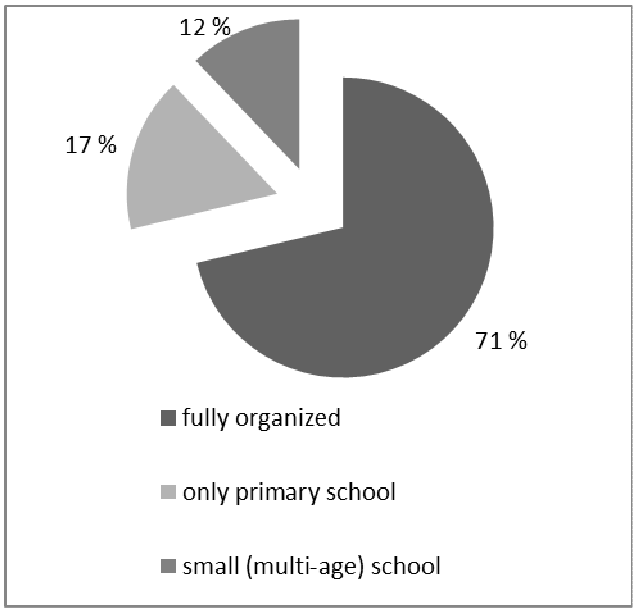

Fig. 1: Schools by type

Further we were interested, where the interactive whiteboards are located in separate classes.
With regard to Table 3 we indicate, that the following results are elaborated from statement of 66 respondents, who stated that they have the interactive whiteboard at school.

Table 3 Position of an interactive whiteboard

	frequency	%
Front wall	54	81,8
Back wall	12	18,2
Side wall	0	0

It follows clearly from the results that 81,8 % of the questioned have interactive whiteboard located on the front wall of the class. The others have the interactive whiteboard on the back of the class and none of them on the side wall. It is not a surprising finding as due to practical exploitation and also health condition of children, location on the front wall seems to be the most suitable.
We were also interested, if interactive whiteboard is located directly in the basic classroom of the respondents and in positive case, which type of interactive whiteboard is involved (Fig. 2).

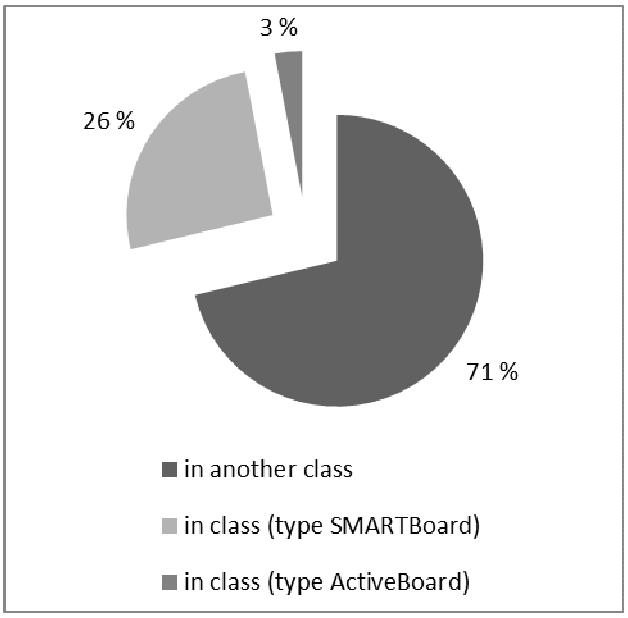

Fig. 2: Location of interactive whiteboard and its type

It shows that that most of the schools have interactive whiteboard in other than in basic classroom and it is necessary for the work with interactive whiteboard for given lesson to change the classroom. Only 29 % from the questioned teachers dispose with interactive whiteboard in their basic classroom. What concerns the type of interactive whiteboard type SMARTBoard prevails.

We obtained the following answers concerning the frequency of interactive whiteboard usage.

Table 4 – Frequency of an interactive whiteboard usage

	Frequency	%
Every day	16	24,2
2x – 3x weekly	14	21,2
1x a week	10	15,2
2x – 3x monthly	8	12,1
1x a month	10	15,2
Less frequency	8	12,1
Never	0	0

Nearly a fourth of teachers (24,2 %) use interactive whiteboard every day. At least once a week and several times a week works with the interactive whiteboard 36.4 of teachers. We can conclude that more than 60 respondents use the followed didactic tool at least once a week, we can consider it as positive phenomenon. Another positive phenomenon, according to us was, that when the teachers have the interactive whiteboard, they use it in teaching (lessons), though about 12,1 % less than once a month.

We were also interested in which subjects the interactive whiteboard is used most often.

In this connection our interest was how the teachers prepared themselves for the work with interactive whiteboard. If they create their own materials and if they make preparation at home or at school. The results are as follows:

Table 4 – Preparation of own materials for interactive whiteboard

	Frequency	%
Yes	18	27,3
No	18	27,3
Sometimes	30	45,4

It reveals that more than one fourth of teachers prepare their own materials. At the same time the same numbers of teachers utilize materials, which for disposal, it means they do not create their own support. Nearly a half of teachers create their own materials from time to time and sometimes they use already created materials, made by other teachers or specialized firms.

Table 5 – Place of creation materials for lessons

	Frequency	%
At school	46	69,7
At home	7	10,6
At school and at home	11	16,7
I do not make any preparations	2	3,0

What concerns the place, where teachers make their preparation demonstrates Tab. 5, on the front place is mentioned preparation at school (nearly 70 % of the answers). Then it follows that the teachers prepare both at school and at home in dependence on time, which they need for preparation. Only less than 10 % of the

respondents make their preparation at home. The answers of two respondents are interesting, as they do not make any preparation. This is probably the case of very experienced teachers, who have saved during the time of their practice a great amount of materials, which they continuously use.

Table 6 – Subjects where is an interactive whiteboard used

	Frequency	%
Czech language	22	33,3
Science	16	24,3
Mathematics	15	22,7
English language	13	19,7

It occurs that interactive whiteboard is used most often (33,3 %) in lessons of mother tongue, in this case Czech language. The results in other subjects are without greater significant difference. We consider as interesting reality that only 4 respondents marked the possibility to use interactive whiteboard practically in all subjects. Though it was not an aim of the research, we suppose that the teachers work with interactive whiteboard in more subjects not only in those they marked.

In this connection we have asked teachers, what is the reason to use interactive whiteboard just in these subjects.

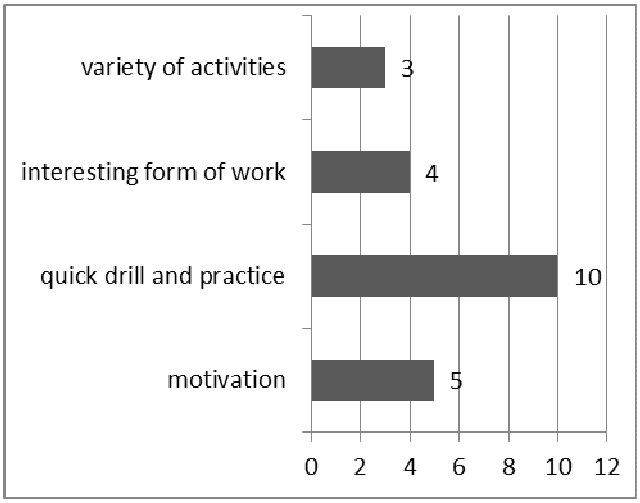

Fig. 3: Reasons for usage of interactive whiteboard in Czech language

As a main reason of usage of the interactive whiteboard in Czech language the respondents state possibility of quick drill and practice of subject matter, further they stress motivation element and interesting uncliched forms of work connected with variety of activity.

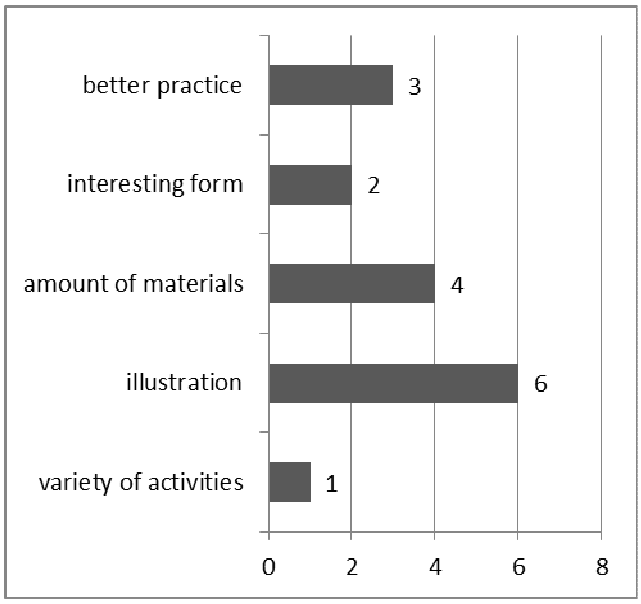

Fig. 4: Reason for usage of interactive whiteboard in science teaching

In science teaching the main reason for usage of interactive whiteboard is especially visualisation, further possibility to use a number of materials, mostly pictures. Following are introduced reasons as an interesting form of work and variety of activities.

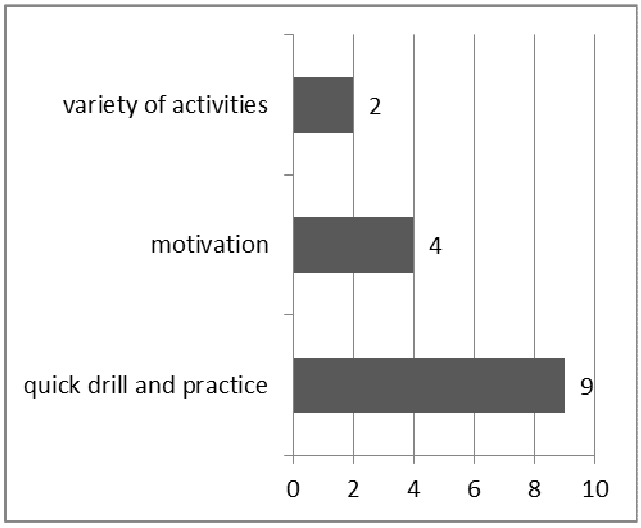

Fig. 5: Reasons for usage the interactive whiteboard in mathematics

In mathematics is the main reason for usage of interactive whiteboard possibility of quick drill and practice and further motivation connected with variety of work.

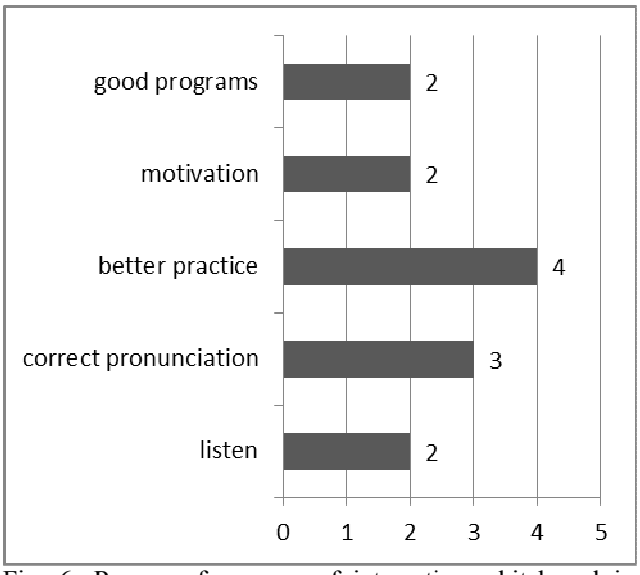

Fig. 6: Reasons for usage of interactive whiteboard in English language

Reason in usage of the interactive whiteboard in English language is especially better possibility of drill and practice both the words and grammar. Possibility to learn correct pronunciation and listen to original texts or fairy-tales is another reason. Inconsiderable is also motivation to work with the interactive whiteboard.

Then we wonder at what lesson of the teachers most frequently used interactive whiteboard.

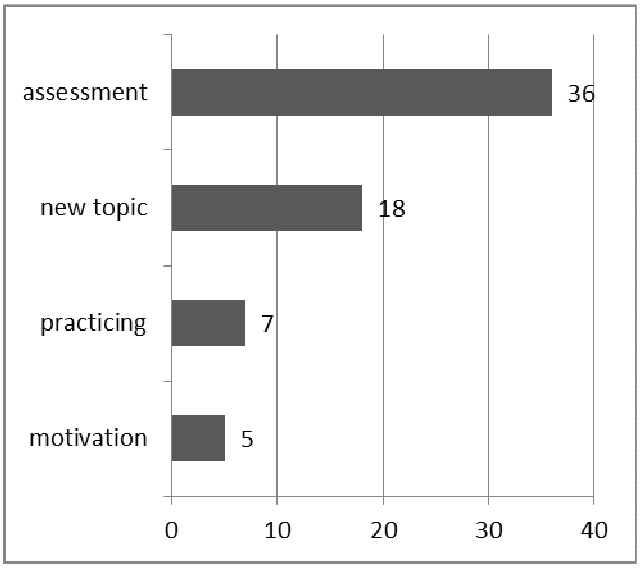

Fig. 7: Use of interactive whiteboard in the concrete part of lesson

In this case the results are rather surprising for us. It shows that the teachers use interactive whiteboard mostly as a motivation element at the start of the lesson (55 %). In the second place interactive whiteboard is used for presentation of the new topic (27 %), training or presentation of new topic. We think that in this case the teachers do not fully utilize potential offered by interactive whiteboard and they rather exploit effect of newness and modernity than the real sense of interactive whiteboard.

When asked, which type of teaching the respondents prefer at work with interactive whiteboard we recived following answers: more than a half (58 %) use classical frontal teaching, nearly one third (29 %) of teachers prefer work in groups and only 14 % set the work for pairs. (Fig. 8).

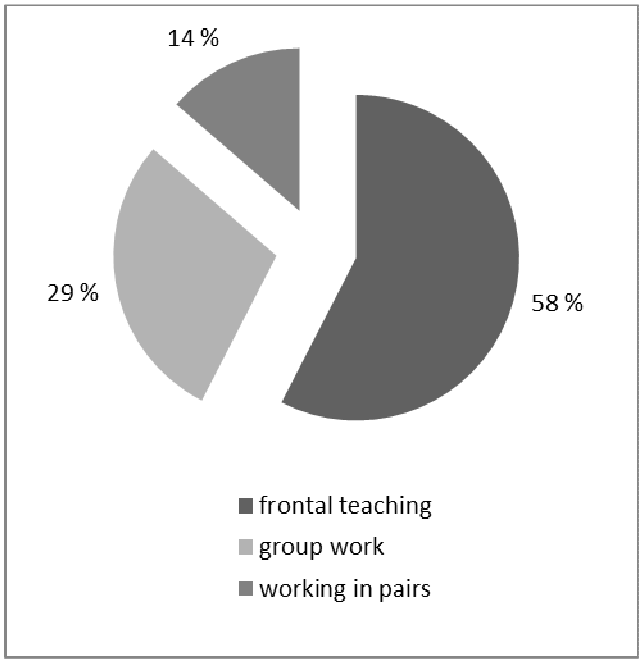

Fig. 8: Forms of teaching with interactive whiteboard

In the end we put a question to the respondents, what they consider as main advantages and disadvantages in usage of the interactive whiteboard in lesson on the 1st of primary schools. The teachers had opportunity to state more advantages and their answers were categorized as follows:

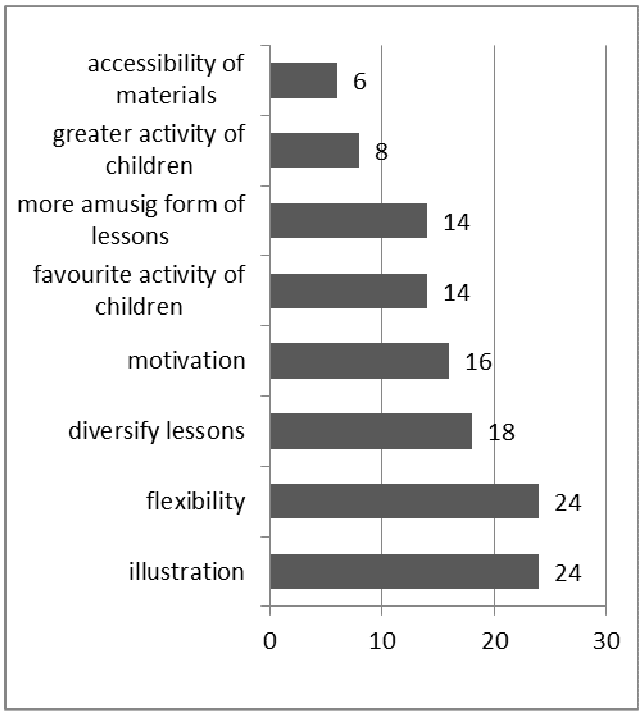

Fig. 9: Advantages of the interactive whiteboard usage

As a main advantages of usage of the interactive whiteboard the respondents state especially possibility of visualization in lessons, further possibility of flexible usage of the interactive whiteboard, diversity of lessons and also motivation of pupils to learning thanks to new, modern technology.

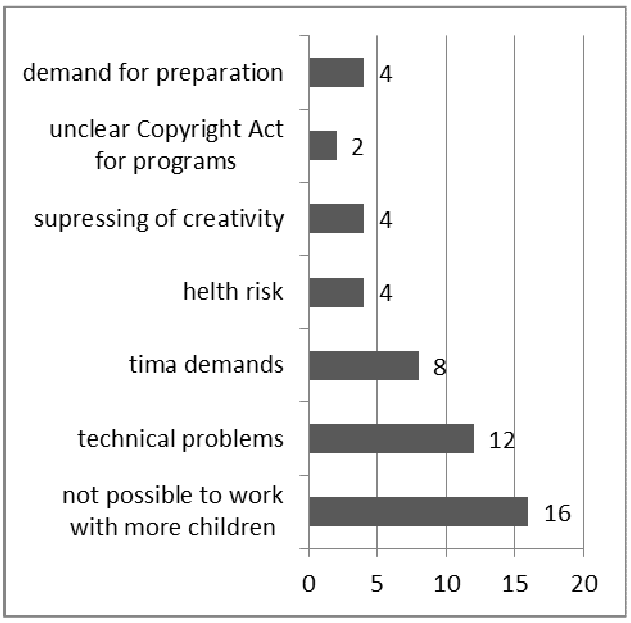

Fig. 10: Disadvantages of the interactive whiteboard usage

As a greatest disadvantage the respondents consider impossibility to work with more children at once, further often technical problems and also greater time demands on preparation of quality lesson unit.

5 Conclusion

The results of our investigation reveal that in the Czech Republic the interactive whiteboards are for disposal in primary schools in 60 %. This result is not quite satisfying, it is connected with limited financial means in school system.

What we consider as important is finding that when the teachers have the interactive whiteboard for disposal, they exploit it more than in a half at least once a week, in the fourth of cases even every day. As the group of respondents was formed mostly by teachers with long practice, who were not systematically prepared for usage of modern technologies, we consider the result as satisfying one.

A satisfactory we find that the teachers use not only the materials prepared beforehand, for the work with interactive whiteboard, which are routinely delivered as a didactic support, but in significant extent they prepare their own materials. We regard it as an important fact as it reveals interest of the teachers on improvement of teaching by means of their own active work.

In this connection increasing trend of preparation for teaching is observed at school. Connection is clear. The teachers do not want to take their work home, but they prefer to spend their time with family. The second element, which significantly influences this trend is an effort to keep the rules of psycho hygiene as prevention against “burning out” syndrome..

Our expectation was fulfilled that the interactive whiteboard would be exploited mostly in fundamental subjects as is Czech language, English language, mathematics and elementary teaching. These subjects provide enough space for visualized work with the board and at the same time, with regard to their importance in education, there exists a number of teaching and training programmes, which could the teacher use in their practice.

Also reasons of the interactive whiteboard usage in educational process correspond with our expectation and with researches realized already both in the Czech Republic and in abroad. The teachers value not only better possibility of drill and practice of new topic, but also motivation character of new technology, interesting way of work and possibility of variety of activities, which leave the line from classical approach to lessons. In this case is necessary to evaluate effort of the teachers, who are interested in improving the quality of work in class with help of new modern information and communication technologies and contribute generally to development of information literacy of young generation [23].

In this light it is a little surprising that teachers exploit interactive whiteboard mostly as element of motivation and didactic character, which is offered by this modern mean, is still to a certain level omitted. An important factor is probably that it is still a relatively new technology in Czech schools and teachers have not learned to fully exploit the potential offered.

As main obstacles, which protect greater engagement of the interactive whiteboard in lessons, we find limited amount of financial means in education, further unwillingness of teachers to change their grooved stereotype of teaching and also lack of interest and uneasiness from new technologies. We are convinced that the situation will gradually improve with the start of new teachers in educational process, who are already systematically prepared for work with ICT. “In this case, it is necessary to appreciate the efforts of teachers who are interested in improving the quality of work in the classroom with the help of new information and communication technologies and that in general contribute to the development of information literacy of young generation.” [17].

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