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Reflections on the Use of Interactive Whiteboards in Instruction in International Context

Abstract

The article discusses up-to-date problems entailed in the use of interactive whiteboards in instruction. The author reflects on their use in the international context and evaluates the results of previous research. Further, the methodological and technical aspects of the use of interactive whiteboards and specificity of creating interactive instructional presentations are dealt with.

Key words: *interactive whiteboards, educational technology, information technology, computer use in education, audiovisual aids, interaction, educational equipment.*

Introduction

The traditional model of teaching has been increasingly affected by the use of modern technologies in recent years. It is particularly the interactive whiteboard which is gradually gaining popularity in Czech basic and secondary schools in a wide range of subjects of study – it is incorporated into the instruction of science, geography, mathematics, physics, but also chemistry, music and art education, etc. It is an accelerating trend. However, the Czech educational theory is not responding to the new situation adequately, as proved by an analysis of the key publications in the field. There is not a comprehensive monograph dealing with modern technology focused on the interactive whiteboard in the Czech context, only papers from conference proceedings, e.g. Szotkowski, R. (2009), Lavrinčík, J. (2010), Krotký, J. – Honzíková, J. (2007), Martinková, A. (2009), Bártek, K. (2010), or in journals,

e.g. Dostál, J. (2009) dictionary entries, e.g. Průcha, J. – Walterová, E. – Mareš, J. (2009). A few textbooks aimed at practice have been published, e.g. Hausner, M. et al. (2005) or Hausner, M. et al. (2007). However, the theory of the use of modern technologies in education should be developed systematically and should be grounded in research and in the international context.

Previous research conducted in the Czech Republic was focused only on the use of computers and instructional software (or traditional teaching aids), however, these results are now outdated due to recent development, e.g. Kouba, L. et al. (1985), Kouba, L. et al. (1986), Rambousek, V. et al. (1989), Geschwinder, J. et al. (1987), Bohony, P. (2003). The problem of ICT in general and its incorporation into education is examined qualitatively mainly by J. Zounek (2006) in collaboration with K. Šeďová (2009), however, without an emphasis on the interactive whiteboard. Outside the CR the field has been studied systematically and in the long term, e.g. in the work of Smith, H.J. – Higgins, S. – Wall, K. – Miller, J. (2005), Betcher, Ch. – Lee, M. (2009), Gage, J. (2006), Beeland, W.D. (2002), Hall, I. – Higgins, S. (2005), Higgins, S. – Beauchamp, G. – Miller, D. (2007), Kennewell, S. – Beauchamp, G. (2007), Kent, P. (2008), Lee, M.R. – Gaffney, M.F. (2008), Lee, M.R. – Winzenried, A. (2009), Matthews, J. (2009), Schmid, E.C. (2008), Schmid, E.C. (2010), Smith, F. – Hardman, F. – Higgins, S. (2006), Smith, F. – Higgins, S. – Hardman, F. (2007), Thomas, M. – Schmid, C.E. (2010).

The role of the interactive whiteboard in instruction and its benefits

The interactive whiteboard is a modern educational technology allowing effective instruction full of various learning activities. However, this type of teaching does not just interest and capture pupils' attention, it helps pupils acquire knowledge for a lifetime, provided there is the right methodological integration of the interactive whiteboard into the instruction adhering to the methodological principles, e.g. of clearness, systematic teaching, scientific quality; cf. the publications by G. Gonschorek, – S. Schneider (2000), Seidel, R.J. – Perencevich, K.C. – Kett, A.L. (2005), Kalhous, Z. Obst, O. et al. (2002).

Regarding the incorporation of the interactive whiteboard into instruction it is no longer an issue of whether or not, but "how"? A number of related questions arise, e.g. how often to use the whiteboard, what tools to use, for what type of content, at which stages of instruction, what organisational forms to choose, which

educational objects to choose (specially designed or ready-made i-textbooks), how to make pupils active, what technology to choose?

In technical terms, the interactive whiteboard can be seen as an electronic device designed to impart knowledge and it is applicable in education. It is a touch-based display enabling mutual active communication between the user and a computer in order to present content as clearly as possible. The interactive whiteboard is typically connected to a computer and a projector. Those three devices basically form a comprehensive integrated system.

There are different definitions of the interactive whiteboard:

- the interactive whiteboard is a touch-based display enabling its users to communicate interactively and thus facilitating the acquisition of knowledge and skills (adapted from J. Dostál, 2009),
- the interactive whiteboard is a large interactive display that connects to a computer and a projector, or it is a large-screen display (LCD, plasma) with a touch switch (Wikipedia, 2010).

Every interactive whiteboard is composed of a white display of various sizes, which is touch-sensitive. The board is usually connected to a computer with special software via a cable or wirelessly. The image is transferred from the computer into a digital projector, which projects it on the whiteboard.

The whiteboard is controlled directly with a finger, pen or a special pointing device (depending on the type), similarly to a computer being controlled with a mouse. In addition, an electronic eraser or buttons on the whiteboard itself can be used. Interactions are registered and transferred back into the computer. According to the type of scanning technology to track, interaction whiteboards can be divided into: resistive, touch-based boards, electromagnetic and capacitive, infrared, laser, ultrasonic and camera-based boards.

In general, we can distinguish two types of interactive whiteboards: those with a front and rear projection. Interactive whiteboards with front projection have a digital projector in front of the board. There are 99% of whiteboards of this type, however, the drawback of this type of projection is the location of the projector, which can be mechanically damaged and moreover, a shadow can be cast on the whiteboard. The manufacturers are already offering solutions by reducing the distance of projection, where the problem with the shadow is resolved.

Rear-projection whiteboards have a projector placed behind the board, so there is no problem with the shadow. A significant disadvantage of this type is a rather higher price and large size (depth), which can cause problems with installation directly on a wall.

Thanks to the dynamic development, the traditional system "whiteboard + video projector + computer" is increasingly often supplemented with other options and so interactive instructional systems are developed. The interactive whiteboard can be connected primarily to the following accessories: student response systems, wireless pen tablet and interactive multi-touch display.

By means of a student response system the extent of acquired knowledge can be identified and pupils are actively involved in instruction. They are asked a question and immediately, even the pupils who are not paying attention, are made to respond. If the pupils do not respond correctly, there is a possibility to obtain an extra explanation thanks to the prompt feedback. There is no problem to export the results of response to MS Excel. A positive effect of the response system on the quality of teaching was demonstrated in an investigation carried out by E.S. Cutrim (2008). The author states that the interactivity of the teaching process was significantly improved thanks to the response system.

Another accessory of the interactive whiteboard, a wireless pen tablet, allows teaching from any place, even the rear corner of a classroom. This convenience is appreciated mainly by teachers who teach in large classrooms and need to move around. It is a peripheral device allowing control of the computer like a mouse, in the case of the pen it can be used in free drawing. The wireless pen tablet is not aimed only at teachers, but also at pupils. It is convenient that more pupils can cooperate simultaneously, of course each of them on their own tablet. The use of the tablet is recommended for students with a disability, who can get fully involved thanks to it. In the case when it is necessary to apply interactive instruction but the interactive whiteboard is not "sufficient" any more, interactive multi-touch display can be used. We write and draw on it in a similar manner to the whiteboard and the image is projected on a large projection screen. The multi-touch display can be used simultaneously with the whiteboard, e.g. when we perform frontal teaching and do not wish to turn our back on the audience.

Almost an integral part of the interactive whiteboard are loudspeakers, which provide the audio output (they transfer the electrical signal into sound). The loudspeakers can have various performances depending on the size of the classroom. Amplifiers are often used as well. The problem of installation of the sound system is discussed in detail by Drtina, R. – Chrzová, M. – Maněna, V. (2006).

In many cases it is advisable that the whiteboard is mobile. Virtually any interactive whiteboard can be set in a mobile frame allowing its easy transport into another classroom. The whiteboard does not have to be fixed even when installed on a wall as there are horizontal and vertical rails to adjust the board. When the board is installed fixed to one place, it can cause a problem for pupils who have to

bend down while writing on the bottom part of the board and shorter pupils might not be able to reach the upper part, even if the board is installed at the optimum height.

The advantage of the vertical shift is that the height is adjustable. The horizontal shift allows a horizontal movement of more boards, e.g. a blackboard can move to cover the fixed installed interactive whiteboard when necessary.

Together with the interactive whiteboard special software tools are supplied, by means of which lessons can be easily planned, interactive teaching aids can be created, presented and edited. It is possible to paste texts, pictures, sounds, animations, drawings, etc. into interactive presentations. Software tools usually include patterns and educational objects available for teaching. It is possible to use presentations created in MS PowerPoint when working with the whiteboard.

In practice we encounter so-called browsers, which are, simply saying, derivatives of software tools without the function of saving, i.e. in a browser we play a lesson or presentation created in the full version. Lessons can be freely edited and commonly used but all the changes made during lesson are not saved. Most manufacturers provide browsers for free and they can be installed on any number of computers.

Inexperienced teachers are frequently concerned that the whiteboard might be damaged by pupils. It is true that there is a certain risk, however, that is no reason why to refrain from using it. The whiteboard can be damaged just as any other piece of equipment – desks, chairs, cabinets, laboratory equipment, windows can be broken, etc. With this in mind manufacturers take specific measures to improve the properties and prolong the service life of the device.

Educational aspects of using interactive whiteboards

Teaching aids are objects imitating reality or symbols enhancing creating, reinforcing and extending images as sources of information in teaching and learning and enabling pupils to develop skills in practical activities. Some teaching aids need to be supplemented with educational technology for their presentation.

The whiteboard is a piece of educational technology allowing the use of teaching aids created by special software tools, or purchased separately (e.g. an interactive textbook and special instructional programmes aimed at the interactive whiteboard). Using the interactive whiteboard together with other suitable teaching aids, conditions for more intensive reception of the subject matter are created so that many receptors (mainly visual and auditory) are involved for the development of imagination and thinking.

Interactive whiteboards can be applied at all levels of education – for preschool children, primary or secondary school pupils as well as university students. It is a suitable tool in the education of children with vision, hearing, or multiple disabilities. For pupils with a vision disability or low vision the whiteboard allows enlarging characters, images, diagrams, etc. If the whiteboard can be controlled with a finger, it is particularly suitable for pupils with a disability of fine motor skills, because they do not encounter problems associated with writing with chalk, marker or pen. Furthermore, pupils who are immobile can be integrated into the lesson via a wireless tablet, thanks to which they do not have to access the board.

In addition, the whiteboard can be used for out-of-school education or personnel education. The reason for this is that the whiteboard is a piece of educational technology and teaching aids (prepared presentations, interactive textbooks, etc.) are always adjusted to the age of the audience and set goals. In the past a number of foreign investigations were conducted aiming to prove the positive effect of the interactive whiteboards on the quality of teaching; e.g. S.E. Higgins, (2010) carried out research in Great Britain, which proved a positive effect. The results, however, were ambiguous, because in the interviews with teachers and pupils also negative points were found, though they were minimal, as the author mentions.

A different investigation conducted by Thai scientists, C.C. Shen and H.M. Chuang (2009), had a sample of 340 elementary schools, and similarly to the above-mentioned investigation positive effects of the interactive whiteboard on teaching were confirmed. The author also points out the need for further improvement of the tool for creating interactive presentations. Similar results were obtained by K. Swan, J. Schenker and A. Kratcoski (2008). P. Warwick – N. Mercer – R. Kershner – J.K. Staarman (2010) emphasise that apart from the interactive whiteboard in the classroom, the teacher's active encouragement of pupils' cooperation is necessary, as well as the teacher's ability to design tasks compatible with active learning.

Mercer, N. – Hennessy, S. – Warwick, P. (2010) in their work emphasise the significance of the interactive whiteboard for the dialogue between the teacher and pupils. Correct use of the whiteboard stimulates and facilitates dialogue according to the educational needs of pupils. Research conducted by C. Lewin – B. Somekh and S. Steadman (2008) implies an interesting fact that in the cases where teachers had been using the whiteboard in their teaching for minimum 2 years, there was a significant improvement in knowledge acquisition, as proved by nationwide testing. Also, a positive effect on the learning process was confirmed in children with limited writing skills and in children with special educational needs. The effects were clearly best in individual teaching or teaching in small groups.

Summary of the advantages of using the interactive whiteboard in instruction:
- pupils can be more motivated by appropriate use of the whiteboard
- subject matter can be better visualised, it is possible to use animation, move objects, the principle of clearness is followed
- pupils' attention is captured longer (though even here it wanders after some time),
- ready-made materials can be used repeatedly (the advantage of parallel lessons), or they can be easily adjusted,
- pupils can be more easily and actively involved in teaching,
- the text written on the whiteboard directly during a lesson can be saved and shared on the Internet with students.

The application of the interactive whiteboard can have the following disadvantages:
- as everything new, pupils' interest in the whiteboard flags after some time and they begin to take it for granted,
- it is easy to slide into encyclopedism, where the teacher spouts lots of new facts (this can be prevented by proper methodology training of teachers),
- some teachers use the whiteboard solely as a projection screen (the interactivity is lost and the use of the board therefore is not meaningful),
- the creation of one's own teaching objects is time-consuming, especially at the beginning,
- there are still few so-called i-textbooks (textbooks for the interactive whiteboard) and other ready-made teaching objects,
- classical textbook can be shunted (pupils will not learn to work with a printed book),
- handwriting is restricted as compared to the traditional board (pupils often only click on buttons),
- some teachers can be tempted to use the whiteboard instead of demonstration of real experiments, products of nature or other teaching aids,
- with the lights on or in intensive daylight the text displayed on the board can be legible only with difficulty,
- the energy consumption is increased (school has to pay the extra cost of electricity),
- the whiteboard can become of tool for bullying the teacher by pupils – they intentionally change the focus of the video projector, unplug or switch over cables between the computer, projector and interactive whiteboard.

In contemporary education a wide range of teaching methods and organisational forms are employed. Different teachers have different styles of teaching and it is

no problem to incorporate the interactive whiteboard into their teaching without a significant modification of their teaching style (it can be used, e.g. in a lecture as well as in individual, project or group work).

The interactive whiteboard is aimed at all age groups of teachers and anyone regardless of gender can learn to operate it. It is essential to bear in mind that it is not enough to be able to control the whiteboard or to be able to create interactive presentations (to know how). Above all, it is necessary to be able to incorporate the whiteboard into teaching appropriately. It is necessary to learn to create interactive presentations which will facilitate the development of the required competences corresponding with teaching goals. It would be a mistake to, e.g., project presentations full of new facts for the whole lesson, because pupils would hardly acquire them. It is advisable to motivate them first, then present new subject matter, reinforce it and verify it at the end. The whiteboard can be employed at all the mentioned stages of a lesson.

Some teachers' opinion that it is only them who will control the whiteboard during a lesson is false. It is an undeniable fact that through active involvement in instruction pupils learn more effectively. Therefore, the whiteboard does not mean only interactive teaching, but mainly interactive learning. Let us also mention the fact that more users can work on the whiteboard simultaneously, e.g. two pupils can simultaneously solve mathematical problems.

Pupils' learning activities do not have the same value regarding the quality and quantity of the acquired knowledge. A number of investigations, e.g. A.RIEDL (2004), proved that while listening we remember only 20% of the information, while observing it is 30%, when formulating ideas 80% and 90% of the information is remember ed through an independent activity. With regard to these facts, the use of interactive whiteboards is beneficial for educational purposes because they allow the teacher to actively involve pupils in learning activities. The results of other research, e.g. J. Průcha et al. (2009), imply that information is perceived by vision in 87%, 9% by hearing and 4% by other senses. That does not mean that the more visual material is conveyed by a whiteboard, the higher quality of teaching is achieved. The modern conception of the principle of clearness requires the unity of the sensory and rational approach in acquisition of facts, i.e. the unity of concrete and abstract dimensions in processing of information.

We have observed in practice that there is a group of teachers who are unwilling to give up using traditional blackboards. For these teachers an optimum solution would be boards which integrate several types into one:

1. *interactive whiteboard* – controlled with an electronic pen or finger,
2. *magnetic whiteboard* – dry-erase boards allowing non-permanent marking

with a marker as teachers were used to (the writing board is not scratched, but chalk is used no more),

3. *copy whiteboard* – allows saving a text written with a pen into a computer.

There are cases when it is not possible to write on the screen of the interactive whiteboard with a marker and the only tool which can be used is the special pen or a finger. In these cases it is advisable to leave also a common whiteboard in the classroom, or install an arrangement combining both types. Some supporters of interactive whiteboards hold a strong opinion that apart from the interactive whiteboard nothing else should be placed in a classroom. However, many teachers feel handicapped in such an environment and rather require a presence of a traditional board. Nevertheless, there are also combined boards where it is possible to write on some parts with chalk as well as a marker and take advantage of interactive features.

Creation of interactive presentations

The mere presence of an interactive whiteboard in a classroom will not automatically enhance efficiency. What is important is the quality of teaching aids which the whiteboard allows the pupils or teachers to present. Therefore, the type or manufacturer of the used whiteboard is not important. What is important is rather the fact which presentations and instructional programmes are used. In addition, it is the extent and manner of their application that matters.

The preparation of a lesson incorporating an interactive whiteboard includes several steps:

- Setting the goals of the lesson.
- Choice of the subject matter suitable for the achievement of the goals.
- Consideration of the instructional tools available (material and non-material) and which of them we are able to apply.
- Planning the individual learning activities and considering suitable teaching aids. Drawing up a time plan for the lesson.
- Preparation of teaching aids (e.g. the interactive whiteboard), or their development if necessary (e.g. creating an interactive presentation for the whiteboard).
- Connecting all the prepared material and organising it into one whole, which respects the personality of a pupil and content and time links.

A frequent question of the teachers who have no previous experience with the whiteboard is: how long will the preparation take?

If ready-made products are used (such as interactive textbooks), then minimum time is necessary. More time will be spent preparing if objects created by other teachers will be used and we will only adjust them to our lesson needs. However, if we want to create original materials, then it will take time commensurate with the quality of the result. Also, it is crucial to what extent the teacher can operate the whiteboard and proprietary software. The teacher's extra effort, such as the design and creation of interesting puzzles, tasks or anagrams, will enhance teaching and moreover, pupils appreciate such effort. Furthermore, the materials can be recycled and used again in the future, just as the materials can be used repeatedly in parallel classes.

As mentioned above, teaching materials for interactive whiteboards do not have to be created by the teachers themselves. Nowadays, there are servers on the Internet offering, for free or for a fee, ready-made teaching materials. These can be used directly without modifications or they can be adjusted to one's lesson needs. So-called i-books (professionally produced) and instructional presentations that teachers had created previously in MS PowerPoint. However, much more interesting interactive presentations can be created with special software tools, provided with the whiteboard on a regular basis.

When creating interactive instructional presentations a rule should be followed, according to which they should be: dynamic, correct, motivating, interactive, clear and open to modification (adapted from M. Hausner, 2005). Nevertheless, the interactive whiteboard can be used also without ready-made teaching objects. Many teaching materials can be created during the lesson spontaneously in teacher – pupil collaboration.

Teachers can prepare their lessons at home on their computers. Most providers of interactive whiteboards offer multi-licences of software tools, which can be used on the PCs of the staff at home. It is advisable, though, that the teachers check all their materials before the class on the interactive whiteboard at school. Many problems can be avoided that way, e.g. sometimes the teacher chooses too small font size that is not visible from the back of the class or they can choose colours with little contrast (light characters on light background) or the pictures are too small.

It is beneficial if the teachers creating materials for their lessons (involving the interactive whiteboard) have an opportunity to collaborate with their colleagues, ideally the colleagues who teach the same subject, no matter if they are from different schools, as it is no problem nowadays to communicate on longer distances. When creating teaching materials it is necessary to be cautious. All works are protected by the law of copyright (121/2000), however, in some cases it is possible to use other authors' materials. It is no violation of the copyright law if, e.g., the

material is used for teaching or by way of illustration or for scientific research. It can be a literary piece of work, but also, e.g., an illustration, sketch, photograph, animation or even audio or audiovisual recording. Even if the material is used for educational purposes, the name of the author (if he/she is not anonymous), title of the work and source must be given, if possible. The whole work can be adopted for educational purposes as long as it helps achieving a specific educational goal.

Interactive textbooks are a special type of software which is, similarly to printed textbooks, focused on a specific subject in its content. There are interactive textbooks for science, English, chemistry, physics, geography, history, the Czech language, etc. Interactive textbooks allow the presentation of not only texts, but also other objects (e.g. pictures, animation, audio, video), which enables multimedia teaching and static elements are adequately combined with dynamic ones. A good interactive textbook should not only include the exposition of subject matter, but also exercises. Moreover, it should be well-structured and clear.

The Internet also contains a huge number of quality web pages which can be employed in the process of education. It would be a pity not to deploy them in school teaching which incorporates the interactive whiteboard. Attention should be paid to the wealth of information available on the Internet. Let us emphasise that in this case too, all the activities must be geared towards the achievement of educational goals. It is advisable in teaching to draw pupils' attention to Internet sources with further information related to the subject matter. Any instructional programme can be used by the interactive whiteboard in a similar manner. The only difference is that it is not controlled with a mouse and keyboard, but with a pen or a finger directly on the whiteboard.

Traditional teaching aids can still flourish alongside the interactive whiteboard. The idea that since the installation of the interactive whiteboard nothing else is needed for teaching, is false. Therefore, by no means do I recommend that teachers should get rid of teaching aids for performing experiments or cancel laboratories or gyms, also printed textbooks will be useful in the future. It is not sufficient to present by means of the interactive whiteboard how to execute a perfect upward circle in gymnastics, but it is necessary to practise it in the gym. Similarly, it is not enough to present parallel electric circuit, but to connect it up. There are numerous similar examples.

As there are more types of interactive whiteboards, it is recommended that a number of factors should be considered before purchasing one. The following steps are suggested based on a detailed analysis of findings from practice:

- it is a mistake if an individual decides about the purchase of an interactive whiteboard on their own; a colleague or colleagues should be involved in it,

- discuss the possibilities of financing the purchase of the whiteboard (from a grant or own financial resources?)
- find out your colleagues' requirements concerning the whiteboard – they know pupils' needs and specific teaching goals,
- decide into which classroom you will place the interactive whiteboard, prepare the classroom and place for installation,
- contact the dealer, whom you may have found on the Internet, ask for information and try to get as much information about individual types of the offered interactive whiteboards as possible,
- ask the dealers for pricing, try to get a lower price, study the information about the interactive whiteboards available on the Internet, look at discussion forums as well,
- if there is already one whiteboard in your school, find out what type it is and discuss with the teachers whether they are satisfied with it,
- let the dealers make a presentation of the offered products, study the information about training for the staff, installation conditions and also the guarantee and post-guarantee service,
- try out how the given types of interactive whiteboards operate,
- if you are interested, visit a lesson in a school where they have experience and ask whether they can recommend it,
- compare the offers in detail, evaluate the pros and cons objectively, order the chosen whiteboard and start using it effectively.

Regarding the placement of the whiteboard, some teachers mistakenly hold that the interactive whiteboard belongs exclusively to an ICT classroom. On the contrary, we believe that it is convenient to place it in an ordinary classroom. If we do not have an interactive whiteboard and still we wish to employ the advantages of interactivity, we can use a mobile system that can be attached to a common blackboard and it becomes interactive. Obviously, apart from a scanner, we also need a projector and a computer. One of such systems is discussed, e.g., by K. Žilková (2007).

Conclusion

The current trend of equipping schools will result in the fact that we will see interactive whiteboards in schools increasingly often. Nevertheless, it should be pointed out that the installation of a whiteboard in a classroom does not automatically bring about a positive effect on education. The teacher's approach plays an

important role and therefore systematic further education and development of skills is essential.

Let us also emphasise that a teacher who does not use an interactive whiteboard does not have to be a bad teacher. We should bear in mind what the main objective is – generally, we want to provide quality education, which can be done also just with the employment of traditional teaching aids. Thus, a statement that "instruction + interactive whiteboard = successful and effective teaching" and "instruction + traditional teaching aids = poor teaching" cannot be always applied. However, it is true that an interactive whiteboard can help also in the case where the use of traditional means is failing.

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Learning Science
through Outdoor Learning

Abstract

Children from modern societies often enter the compulsory education system with a lack of experience in the outdoors. On the other hand, they possess much knowledge that they often cannot properly apply to the events in their environment and to their own everyday actions and activities. This study is based on research into the outdoor learning experiences in elementary education. By posing open-ended questions about previous outdoor school learning, we examined its effects on pupils in Slovenian elementary school. In this way, we confirmed correlations between the experience of observing life in water and around it and better knowledge of small organisms in an aquatic environment among 10-year-olds. For the *water-pollution-related experience,* a correlation with favourable attitudes and more appropriate use of water was not statistically confirmed. Outdoor learning provides pupils with the opportunity to combine and develop their knowledge of actual environmental and everyday phenomena. To overcome the gap between pupils' knowledge and their actions in terms of environmental education we suggest that teachers should integrate outdoor learning into their teaching practice. Conclusions are drawn with reference to the implications for the development of real and meaningful outdoor learning in order to develop in pupils the skills that are required for appropriate sustainable development in the future.

Key words: *environmental attitudes, environmental education, knowledge level, outdoor learning, sustainable development, water.*