Journal of Innovation in Psychology, Education and Didactics	Vol. 19, No. 2 2015	199 - 216

GREEN TECHNOLOGY TO SUPPORT EDUCATION OF STUDENTS WITH MODERATE INTELLECTUAL DISABILITY

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Abstract

The purpose of this study is to investigate the aspects that green technology offers in the education of students with moderate intellectual disability. The theoretical part highlights the technical facilities that green technology offers to education. An analysis of the most recent studies focuses on the use of interactive whiteboard to improve teaching and learning activities. A comprehensive research methodology is proposed by this study. This is based on the use of the educational experiment meant to investigate the impact of using green technology on the learning outcomes of students with intellectual disabilities. Closed responses to the applied questionnaire are also analysed in order to identify the predominant component in assessing students' attitude towards assistive technologies used in teaching, learning and evaluation. Ten students with moderate intellectual disabilities participated in the research. Descriptive and advanced statistical techniques were used to interpret the obtained data. The results show that there are no significant differences between the results of students with intellectual disabilities who attend a lesson based on a green technology type of interactive whiteboard and of those who attend a traditional lesson. There were also identified two principal components which explain the attitude of students with intellectual disabilities towards using assistive technology in education. The results of the study highlight the need to extend the interests of including innovative assistive technologies in the education of students with special needs.

Key words: Assessment; green technology; intellectual disability; statistical analysis

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Introduction

Although there is a long history of efforts to support people with disabilities, either by using technologies available to the public or technologies specifically designed to be used by disabled persons (Elder-Hinshaw, Manset-Williamson, Nelson & Dunn, 2006), the last 20 years have seen unprecedented interest in the use of assistive and support technologies. The use of the new tools in this context has contributed to creating the trend of *e-inclusion* (Abbott, 2007). Assistive technology is defined as “*an item, an equipment part, or a product of the system, which is used to increase, maintain or improve functional abilities of people with disabilities* ” (Jones & Vincent, 2006). Assistive technologies include devices of low, medium and high technology. An example of high-tech device is the interactive whiteboard. These technologies represent, according to Verenikina et al. (2010), an instrument that allows the teacher to meet the specific necessities of students with special needs.

The interest shown by researches related to investigating the impact of assistive technology to support students with disabilities is higher and higher at the international level. More than that, it appears that such studies are becoming increasingly numerous. The reasons which support the studies in this field are manifold: researchers’ wish to demonstrate the utility of modern technologies in the development of various skills for students with special educational needs; the necessity of valuing new technologies in the teaching and learning process designed for students with various disabilities; the need to upgrade education for students with special needs by the integration of the latest technological innovations. In addition, economic reasons become the basis of such studies more frequently, as the obtaining of effective results from the use of assistive technologies will produce significant financial benefits to the education for pupils with special educational needs. The imperative of sustainable development requires that environmental issues be taken into account in all our actions. Therefore, only the use of some new technologies in the education of students with disabilities is not enough, the study focusing on green technologies that can be used.

Studies undertaken in the field of using interactive boards in the teaching and learning activities meant for students with disabilities indicate that designing the lesson with the help of interactive whiteboard streamlines the learning activity of students with disabilities and the teachers’ training, too (Plosa, 2003; Thompson et al., 2003; Somekh et al., 2004). Regarding the contribution of multimedia technologies and those based on interactive whiteboards, there are studies that demonstrate positive results obtained in motor development, cognitive and affective-regulatory processes, and personality.

Regarding *motor* development, there are recent studies that confirm the effectiveness of assistive technology, such as Computer-Based Video Models used to improve fine and gross motor task performance for students with autism and moderate intellectual disability (Mechling & Swindle, 2013). Other studies highlight the positive impact of the use of assistive technologies in terms of *cognitive development*, such as improving reading skills, the level of understanding information and memorizing it (Boone & Higgins, 1993; Beck, 2002; Elder-Hinshaw et al., 2006; Campbell & Mechling, 2009). However, there are very few studies which are focused on highlighting the role of new technologies on the development of the affective-regulatory processes, in order to help facilitate motivation, self-determination and to increase the participation of students with special needs (Anderson, 2008; Mazzotti, Wood, Test & Fowler, 2012; Mead, 2012). Just as rare are researches focused on investigating the impact of assistive technologies on the *development of different personality components*, such as self-determination, self-efficacy and outcome expectancy, and transition planning knowledge of students with disabilities (Lee, Wehmeyer, Palmer, Williams-Diehm, Davies & Stock, 2011). The new teaching tools provide multiple facets due to the complex technical features they integrate. Among these facets, an increased role can be identified in the environmental features, as a key component in promoting environmental education (Selvi & Yıldız, 2004; Hadjileontiadou, Faxiridis & Kekkeris, 2008; Moghaddam, Maknoun & Tahershamsi, 2008). Another category of facets is the pedagogical one, due to the positive effects generated by the use of new technologies in teaching and learning. "*Interactive whiteboards provide a common educational space where teachers and students can interact with the curricular content and with each other*" (BECTA, 2004). Not only do students focus on learning resources in this situation, but it also provides a common image, a common space and encourages student-centred learning.

There is an increasing interest in the use of modern technologies as the interactive whiteboard in South Africa (Slay, Siebörger & Hodgkinson-Williams, 2008), due to the benefits it offers to create, capture and share information in the educational environment. In the context of Romanian education, green interactive whiteboards, in particular, are a new environment for teaching and learning. The movement toward the full integration and high requirements of academic standards motivate teachers to be informed about the use of interactive technologies with students with disabilities (Hennessy et al., 2007). Every teacher should be aware that when technology is integrated for these students' education, it can facilitate the learning process for the following reasons: benefits offered by the integration of interactive technology for students with mild disabilities, the fact that students with mild disabilities can be found in every classroom, the tendency to integrate students with special needs in mainstream education. It is an obvious need to perform studies centred on using interactive technologies for the education of students with special needs. The originality of this study is given by the use of green technologies in order to facilitate the teaching and learning activity for students with intellectual disabilities. There are two main objectives of the present study: identifying the impact of using the green technology type of interactive whiteboard on the outcomes of students with intellectual disabilities, and exploring students' attitudes towards the integration of assistive technologies in the teaching-learning-evaluation activity. In the present study, the ēno interactive whiteboard with integrated sound is valued as assistive technology.

Green product facilities of ēno whiteboards with integrated sound

Interactive whiteboards are an essential component of the learning environment of the 21st century and ēno technology helps support a "green class" and protect the environment by using environment friendly eco-materials, and establishing strategies of social responsibility.

Ceramic steel surface warranted forever

The ēno screen is made of ceramic steel, a technology which allows the manufacture of products that meet the highest environmental protection standards, by not using volatile organic products and other environmentally toxic products, without affecting the product performance. The ceramic steel surface has a lifetime warranty; it is resistant to scratches, stains, graffiti, chemicals, bacteria and heat. Due to multi-user technology, the screen surface can be controlled by up to three users simultaneously, facilitating teamwork on common subjects, the projected images can be manipulated by using your hands, too, and gestures can be used to zoom or scroll through images or documents. The magnetic surface of the interactive whiteboard allows the use of magnetic elements to highlight and to understand information more easily, but also to have easy access to current functions with shortcut buttons located on either side of the ēno screen. The ēno screen is currently the only environmentally certified writing surface in the world to improve the environment both inside the classroom and outside it.

Ēno Bluetooth pen

The ēno screen allows the interaction with a computer by a wireless connection using a ēno pen equipped with Bluetooth communication. An important feature of this ēno pen is the use of a digital ink, which is non-toxic both for the user and the environment. Different options can be chosen from the toolbar of the ēno pen: different colours, the thickness of the lines which can be drawn on charts, diagrams, pictures or important parts of the text, in order to highlight the information. The ēno pen combines the function of writing and control of the cursor, which allows text input by using a virtual keyboard on the screen, in a dialog box or any other application window provided by the computer.

Work Page

All interactive whiteboards have spaces where educational materials can be created. The teacher can prepare the work page before starting the lesson by introducing notations, photos, musical effects or drawings, or he may start the lesson with a blank page and prepare the design elements while teaching. Teachers and students have the opportunity to view the previous or next page, depending on the lesson plan. While the activities created on pages can be exported into other programs, documents taken from website pages or other programs can be used as an album. The pages resulted after teaching the lesson can be saved for future use or can be distributed to students through online communication media (BECTA, 2004).

Spot Lamp

It is a useful tool for focusing attention on a particular screen area which has to be highlighted. It can only light a certain area on the screen, and it can be customized by the settings of the lamp, such as the location of any point on the screen, changing the shape and configuration of the transparency. To better understand the importance of using the technology of interactive ceramic whiteboards as a tool for the education of students with disabilities, technological facilities are summarized in Table 1.

Table 1. *Technological facilities of using the technology of interactive ceramic whiteboards as a tool for the education of students with disabilities*

Visual impairments	**Hearing impairments**	**Motor impairments**
• use of visual effects, schemes, pictures, images in the lesson (Kuzminsky, 2008) • playback of videos and increase the font size (Cooper & Clark, 2003) • adding phonetic elements (Salintri, Smith & Clovis, 2004)	• creating emoticons (symbols based on letters and punctuation marks) (DeMonte, 2013) • creating picons (pictograms based on a realistic image) (DeMonte, 2013) • the use of handwriting recognition software can replace handwritten texts with an editable one (Blanton & Helms-Breazeale, 2000; Zirkle, 2003) • adding high intensity colours, accompanied by text (Salintri et al., 2004; DeMonte, 2013)	• Using the wireless pen and moving items on the interactive whiteboards (IWB) screen (Moss, Jewitt, Levačić, Armstrong, Cardini & Castle, 2007) • creating own images, charts, drawings, diagrams following the teacher's instructions (Cooper & Clark, 2003) • the touch, the movement on an interactive whiteboard screen (Cooper & Clark, 2003)

Studies and approaches centred on using interactive whiteboard for the education of students with special needs

The results of studies focused on the use of multimedia technology in various areas, by students with disabilities, demonstrate that it can contribute to improving reading comprehension, memory and learning skills. Over time, a number of studies have been performed having as main objective the investigation of the effects of using multimedia technologies on the development of reading skills, of the level of understanding and memorizing information, of the participation degree for students with disabilities. Regarding the use of assistive technology to support students with special educational needs (Krüger & Yorke, 2010; Donohue & Bornman, 2014), there are a few studies in South Africa. Another study investigates the programme content and its arrangement in order to elucidate educational programme purposes and effects (Basson, 2004).

Boone and Higgins (1993) investigated the effectiveness of multimedia technology in the development of reading skills for children with disabilities aged 7-9. During the study, animations, definitions, synonyms, digitized speech exercises, graphic connections between pronouns and their referents and other understanding techniques were used as multimedia elements. The result of this study showed an important development in terms of reading skills, comprehension and memorization of information in disabled children aged 7-8, except for those aged 9, where no disturbing factor could be identified (Boone & Higgins, 1993). Beck (2002) examined the effects of interactive technology within a group of ten children with developmental delays, aged three. A number of interactive tools were used such as communication symbols for images, books with graphics, sound and movement included on each page. By the introduction of these methods, reading became interactive, and the children began to work independently. The criteria on which this study was based were the following: the operation (results show that 9 out of 10 children were able to independently activate the main switch to start the presentation); the receptive identification of communication symbols on each activity page (results show that four children were able to independently show all symbols related to images, four children needed a verbal request to complete the task, and two children were unable to perform the task); repeating the spoken text (results indicate that two children were able to repeat the spoken text, four children repeated the spoken text several times, and four failed to complete the task) (Beck, 2002). Elder-Hinshaw et al. (2006) investigated the development of reading and comprehension skills after using multimedia methods, in a group of students with speech disorders. PowerPoint presentations, creating scenarios, graphics and sound for presentations, and ideas debate sessions among students were used in this study. The results suggested that the use of multimedia methods can increase the commitment of students with reading disabilities to understanding the utility of these methods in teaching and learning (Elder-Hinshaw et al., 2006). Another approach is that of Sessoms (2007) who emphasizes the application of constructivist learning theory with IWB integration, as it is a way to create better learning experiences for students with learning disabilities (Sessoms, 2007). The objective of the study conducted by Anderson (2008) is to investigate the degree of participation of pupils with special needs through the use of interactive whiteboards in a classroom from an inclusive kindergarten. Learning can be enhanced by increasing commitment through the use of an IWB device as assistive technology (Anderson, 2008). The study conducted by Kuzminsky (2008) brings forward the benefits of using IWB in education with reference to visually and kinaesthetically impaired students. Research results showed that the inclusion of IWB in lessons is a key incentive and support for teaching and learning by using visual effects, schemes, pictures or images. In this case, IWB was used as a tool to support construction and imagination, but also to experience the impact of a lesson by including images and sounds into the traditional written format, on a group of students with visual and kinaesthetic disabilities (Kuzminsky, 2008). Campbell and Mechling (2009) studied the effectiveness of teaching phonetics using the technology based on interactive whiteboards with three students with learning disabilities. The researchers used PowerPoint to present the phonetics of the 52 sounds, their writing, both upper and lower case. The study was able to demonstrate the effectiveness of using the interactive whiteboards technology combined with computer-assisted training for students with learning disabilities (Campbell & Mechling, 2009). Another study (Shannon and Cunningham, 2009) explores the initial reason to choose the interactive board as a way to encourage autistic primary school students' playing. An observational study was conducted on the physical environment of the classroom. The results of the study indicate that the physical environment of the classroom is not neutral as the arrangement of the classroom supports certain types of behaviour in teachers and students and prevents others (Shannon & Cunningham, 2009). Verenikina et al. (2010) conducted a pilot study based on the use of IWBs in the daily teaching of seven children with Autism Spectrum Disorders, aged 12-13. The methods of collecting data included a series of classroom observations, audio records, data collection and semi-structured interviews with teachers and the administrative staff. The results show that IWB is a tool that provides ASD children with opportunities to learn visually. (Verenikina et al., 2010). The aim of another recent study (Mead, 2012) is to investigate ways in which IWB can be used successfully to engage and motivate teenage students with learning disabilities. The focus is on comparing the author's experiences to other identified teaching ideas, to reflect on teaching practice more deeply. The analysis shows that IWBs are an effective tool for increasing commitment and motivation of students with learning difficulties and disabilities, despite the fact that there is very little research evidence for their use in this context (Mead, 2012).

The first conclusion derived from the analysis of the above studies is related to the limited research area of e-inclusion. The results show that the use of interactive technology improves the learning environment, and thus the learning outcomes as significant progress can be remarked. In the case of written communication, such as speech synthesis and word prediction, the use of interactive technology has often shown a positive impact on students with disabilities. In conclusion, the integration of interactive technology in the educational process of students with mild disabilities seems to offer an efficient way to improve school performance and appropriate behaviour. An integrative approach is the basis of the present study, and it brings together the main components of the educational process, tailored to the students with special needs and the features of green technology-based interactive whiteboards (Figure 1).

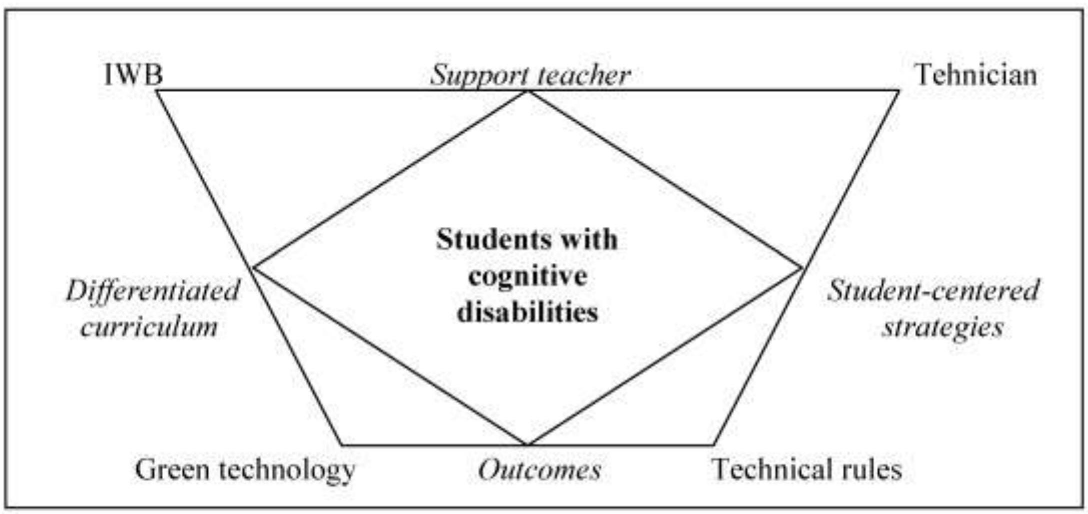

Figure 1. *Integrative approach of the use of green technology in educating children with cognitive disabilities*

On one hand, the *technological dimension* is configured, and it includes the technical components necessary for the lessons, i.e. the interactive whiteboard, the features of the green technology-based board, the instructor or technician who ensures the functionality of IWB and the technical rules for IWB use. On the other hand, there is the *pedagogical component*, consisting of key education agents participating in the lesson (students with cognitive disabilities and the support teacher), differentiated curriculum, student-centred strategies and educational outcomes. Thus, we get an integrative approach which provides the theoretical framework and the practical tools necessary for the optimal integration of assistive technologies in carrying out the teaching and learning process for students with special needs.

Research objectives and hypotheses

The research objectives are:

O1: investigating the impact of the use of green technology (GT), respectively IWB on the outcomes of students with intellectual disabilities;

O2: identifying the predominant components in the assessment of students' attitude towards the use of assistive technologies in teaching, learning and evaluation.

The research hypotheses

General hypothesis 1: Are there significant differences between the results of students with intellectual disabilities in a GT type IWB lesson and a traditional one?

General hypothesis 2: Are there predominant components in the assessment of the attitude manifested by students with intellectual disabilities towards the use of new assistive technologies?

Ethical issues in research

All research activities involving human subjects were conducted in accordance with three basic ethical principles, namely self-respect, respect for persons and justice. At the same time, this research was performed for the benefit of society. Prior to conducting the research, there was a discussion with the authorities involved in the current educational activities of the students about the purpose of research, why students are involved, students' awareness and willingness to participate in the research activities. The voluntary filling in of the questionnaire confirmed the acceptance of anonymous participation in the research and the understanding of its reasons.

Methodology

Research methods

The study involved 10 nineth-grade students with intellectual disabilities. Participants in this study were students showing moderate intellectual disabilities. The research methodology is mixed, as it combines two research methods derived from the research objectives. The comparative educational experiment was used to achieve the first objective. This method is based on the application of evaluation tests in two different educational contexts and on introducing the progress factor, which in this study consists of integrating GT type IWB. To achieve the second objective, a *questionnaire* was constructed to assess the attitude of students with intellectual disabilities towards the use of new assistive technologies in educational activities. The questionnaire is based on closed questions with different response options. The questionnaire items assess the role of technological and educational components involved in the green technologies-based educational process. Based on responses to questions, the Cronbach Alpha coefficient was calculated to assess the internal consistency of each dimension of the scale, as an indicator of the reliability of the instrument.

The analysed items selected for Principal Components Analysis were as follows: "*Which lesson made you understand concepts better*", "*What modern tools you would like to be used during lessons to better understand the taught concepts*", "*Which lesson you liked more*" and "*In which lesson you think you memorized the taught concepts more*". The Alpha Cronbach coefficient for these four items was 0.658.

The research procedure exploits the educational partnership (Brezuleanu et al., 2013) between an inclusive education centre, which agreed to the participation of the 10 nine-grade students with intellectual disabilities and a university, which had a laboratory equipped with IWB to carry out the lesson by using assistive technologies. Before carrying out the IWB lesson, the support teacher and the project manager determined the way the lesson would unfold and the students' attitude assessment items. The itinerant/ support teacher who agreed to participate in the study showed a real interest in becoming familiar with the new teaching technology and enthusiasm for the use of the interactive whiteboard as a training tool for students.

Regarding the procedure for implementing the comparative educational experiment, the test meant to assess students' knowledge was applied after the lesson that had been carried out by using assistive technology and also after the same lesson which had used traditional teaching tools. A major aspect in the design of the experiment in the context of education is to ensure that the experimental procedure does not disturb the normal procedures of the educational activity (McGowan, 2011). Regarding the application of the questionnaire, students were ensured about the anonymity of their responses to eliminate the facade tendency.

There are a number of *limitations* of the study. Firstly, the number of participants in the study is small, which is an aspect found in most studies focused on the use of assistive technology in educating students with special needs (Beck, 2002; Verenikina et al., 2010). Secondly, the number of experimental activities based on the use of GT type IWB is very small due to the efforts to bring students with intellectual disabilities in a new learning environment with modern teaching aids, which is different from the normal school environment. Thirdly, although the initial questionnaire had a big number of items, the number selected to be discussed was only four. This version was the only one which complied with the statistical terms. Perhaps disabled students' lack of coherent thinking led to conflicting answers that altered their validity from a statistical point of view.

Results and discussion

This study allows us to draw some conclusions regarding the exploitation of interactive whiteboards as green assistive technology in educational activities for students with intellectual disabilities. The results of another study performed by (Howie, Muller & Paterson, 2005) led to the identification of some factors which hinder the use of computer in teaching and learning activities in South African secondary schools: financial constraints (lack of funds, lack of computers); lack of teacher training in terms of integrating ICT in various learning activities; lack of a curriculum designed to develop the new technologies operating skills. Regarding the implementation of assistive technology aimed at helping people with disabilities, many barriers have been identified, as the results of another study initiated in South Africa indicate (Jakovljevic, 2011): the cost of assistive technologies, confusion with disability definitions and reasonable disability accommodation, fear of disclosure, misconceptions and mindsets, moderate South African progress regarding assistive technologies, negative organizational attitudes towards the disability issue, negative attitudes of persons with disabilities.

In our study the comparison between teaching a lesson by using traditional methods and teaching it with IWB highlights the positive impact IWB had on students with disabilities. A percentage of 80% of the students believe that teaching lessons by using IWB would help them understand and consolidate knowledge much better than by using traditional methods and more than that, the interactive lesson would have a positive impact on the disabled students' attitude. Although 90% of students with disabilities admitted that after being taught the lesson by IWB they understood the concepts better, however the percentages of the traditional lesson versus IWB lessons are equal in terms of memorizing notions. The explanation would be simple, given by the fact that during the lesson taught by IWB, students did not take notes, their attention being directed to the IWB screen, to the interactive lesson with colourful images, to their interaction with IT to solve the lesson exercises.

After lessons taught by both the traditional and the interactive method, students were given a docimological evaluation test meant to assess the acquired knowledge. The marks in the lesson taught traditionally ranged from 6 to 8 while those in the lesson taught by IWB increased, but they also dropped from 9.5 to 4. It is to be noted that there were three students whose grades were lower after being taught by IWB than traditionally. Therefore, we conclude that the use of IWB in teaching and learning is not beneficial for all students with disabilities, this process being influenced by the state of disability, the causes of disability, the student's behaviour, etc.

To check hypothesis 1, the Wilcoxon test for nonparametric distributions of SPSS version 20 was applied. The difference between the results of the students with intellectual disabilities at a GT type IWB lesson and a traditional lesson (Table 2) is not statistically significant ($p>0.05$). So, the general hypothesis 1 is not confirmed, because there are not significant differences between the results of students with intellectual disabilities in a GT type IWB lesson and a traditional lesson.

Although the statistical analysis of data indicates that there are no significant differences, the graphical representation of the evaluation tests results in Figure 2 shows that students who do well in the traditional lesson get even better results in the IWB lesson, while students who have poor results in the traditional lesson, get even worse results in the IWB lesson.

Table 2. *Wilcoxon Signed Ranks Test applied to the evaluation test results of students with intellectual disabilities after a GT type IWB lesson and a traditional lesson*

Test Statistics[a]

	Evaluation test results - traditional lesson – Evaluation test results - lesson with IWB
Z	-1.127[b]
Asymp. Sig. (2-tailed)	.260

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

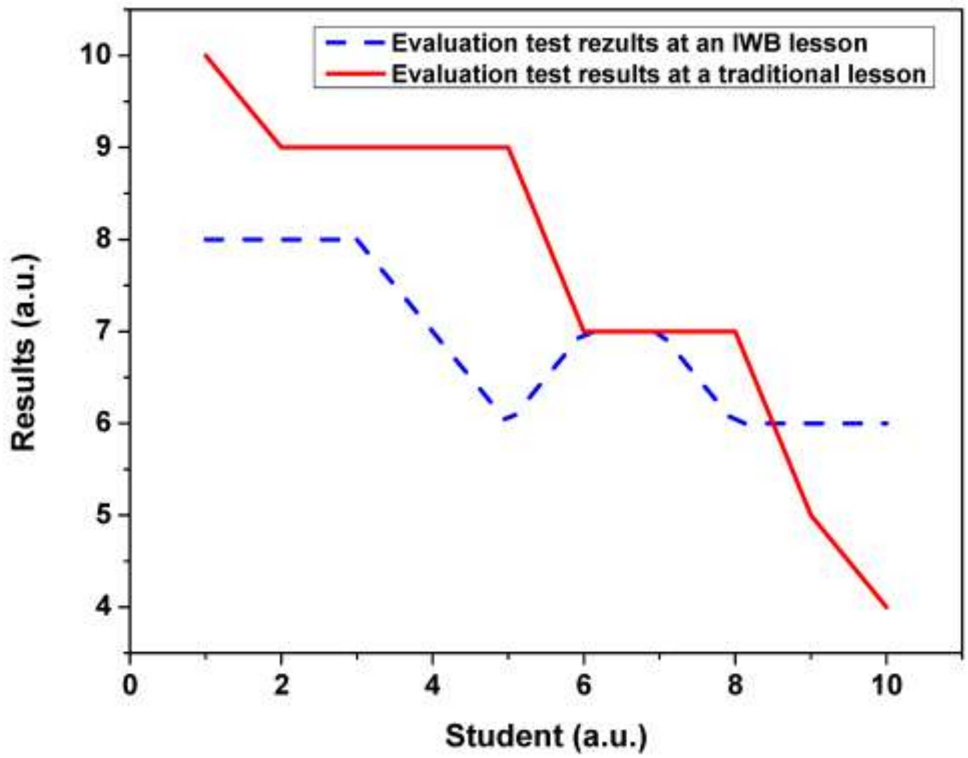

Figure 2. *Graphical representation of students' evaluation test results at an IWB and a traditional lesson*

The general hypothesis 2 is confirmed as there are predominant components in assessing the attitude of students with intellectual disabilities towards the use of new assistive technologies. This hypothesis was checked by using the factor analysis applied to the dependent variables represented by the questionnaire items. Kaiser-Meyer-Olkin (KMO) and Bartlett tests indicate that the set of dependent variables is appropriate for the application of the factor analysis. This is considered to be the optimal value when KMO is close to 1.0 (>0.60 is adequate, > 0.80 is high), while Bartlett's Test of Sphericity should be significant for the level 0.05 (Hair, Anderson, Tatham & Black, 1995). KMO value is 0.384, and Bartlett's Test of Sphericity BTS has a value of Chi-square of about 22.660 (p <0.001), which means the data correlation matrix for the factor analysis is appropriate (Table 3).

Table 3. *The results of KMO and Bartlett tests*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.384
Bartlett's Test of Sphericity	Approx. Chi-Square	22.660
	df	6
	Sig.	.001

Since these tests meet the requirements imposed by the fundamental statistical rules, the exploratory factor analysis procedures were initiated. The major factors axis method and the Varimax rotation provide an adequate solution for the exploratory factor analysis, even if the data are significantly non-normal. (Fabrigar, Wegener, MacCallum & Strahan, 1999). According to the results of the exploratory factor analysis, the percentage of variance is 91.722%. The first factor has an initial eigenvalue of 2.205, and it represents 53.681% of the total variance, while the second factor has an initial eigenvalue of 1.464 and it represents 38.041% of the total variance. The details referring to the eigenvalues and the explanation of the components variance are shown in Table 4.

Table 4. *Eigenvalues and the explanation of the variance according to each component factor*

Total Variance Explained									
Compo-nent	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.205	55.129	55.129	2.205	55.129	55.129	2.147	53.681	53.681
2	1.464	36.593	91.722	1.464	36.593	91.722	1.522	38.041	91.722
3	.293	7.318	99.040						
4	.038	.960	100.000						
Extraction Method: Principal Component Analysis.									

After analysing each element from the perspective of the theoretical significance and the consistency with other elements, the two factors were named as follows: *contribution to the IWB teaching-learning-assessment* (TLA-IWB), *understanding and memorizing information effectively with assistive technologies* (UM). The elements which define Factor 1 (TLA-IWB) refer specifically to the dimensions of the educational process that facilitates the teaching-learning-evaluation activities, while the elements which represent Factor 2 (UM) highlight the psychological components which are involved in the use of IWB, focusing on the cognitive component, aiming at a better understanding and memorizing of information. The weight of the two factors in the perception of students is different, they focus on the technological side 53.681% and less on the pedagogical one (38.041%).

The impact of assistive technology to support students with disabilities is visible from an economic point of view, too. The investment in purchasing technological resources is multiplied by the beneficial results obtained by the pupils with special educational needs. The current guidelines in educating students with disabilities increasingly emphasize the necessity of valuing assistive technologies and of ensuring the financial resources necessary to purchase them. Only such economic investment will lead to an efficient training for the students with disabilities to adapt to changes in contemporary society.

Conclusions

The green technology-based interactive whiteboards provide an innovative environment for the educational activities for students with special needs. Some researchers are interested in investigating the impact of assistive technology on various aspects of students with special needs. Nevertheless, the analysis of the researches in this area indicates the need to extend studies to support different categories of students with special needs by using the IWB.

The results of the experimental study show that there are no significant differences between the results of students with intellectual disabilities at a lesson taught by a GT type IWB and a traditional lesson. Until now, a detailed data analysis shows that students who do well in a traditional lesson, get even better results in the IWB lesson, while students who have poor results in the traditional lesson, get even worse results in the IWB lesson. The results of the questionnaire-based research contribute to the identification of two main components which are involved in the assessment of intellectually impaired students' attitude towards the use of IWB: the contribution to teaching – learning – evaluation of the technological component (53.681%) and of the pedagogical one (38.041%) is rendered by the effective understanding and memorizing of information by using assistive technologies.

After the studies carried out until now, it was found that the introduction of interactive technology has mixed results, probably because the positive results are attributed to students with moderate disabilities and negative ones to those with severe disabilities. From this perspective, further deeper studies have to be conducted in the field of e-inclusion as a possibility of improving the effective integration of pupils with special needs according to the educational requirements.

Acknowledgement

This research was financially supported by the Executive Unit for Financing Higher Education, Research, Development and Innovation (Grant PN-II-PT-PCCA-2011-3.2-1108, 'Networked interactive ceramic whiteboards with integrated sound (ENO) for teaching and learning science and technology').

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