FOLIA 240

Annales Universitatis Paedagogicae Cracoviensis

Studia ad Didacticam Biologiae Pertinentia 7 (2017)
ISSN 2083-7276
DOI 10.24917/20837276.7.4

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The use of media for educating the intellectually disabled – for and against

Introduction

Nowadays, much debate concerns the education of learners with severe disabilities, including those with moderate to profound levels of intellectual impairment, severe difficulties in communicating their needs to others, and those with potential concomitant physical, behavioral or sensory disabilities, as well as health issues (multiple disabilities). Lower intellectual fitness causes not only learning difficulties, but also the limitation of cognitive ability in terms of the surrounding world. While past perceptions questioned the ability of those with severe disabilities to learn, current perspectives support the notion that all individuals can, and do, learn (Downing, McFarland, 2010). Education is crucial for individuals with multiple disabilities, especially in family and peer-to-peer environments, and in broad social contacts, because it supports their ability to assume more typical adult roles upon graduation (Agran et al., 1999; Downing, MacFarland, 2010).

People with intellectual disabilities have their identity, self-esteem and dignity, they feel the need for respect and pride, are aware of their personality and strengths, and realize that they constitute a group that could be socially and politically influential (Schalock, Luckasson and Shogren, 2007).

Particular hope is invested in the development of new information and communication technologies (ICTs) that allow the individualization of education of people with special educational needs. While working with an intellectually deficient learner, digital devices along with specialized software serve to communicate with the teacher, effectively motivate learners who are suffering from cognitive impairment, improve their manual skills or perception, serve to increase focus, as well as address the important emotional and social needs of learners (Białek, 2013).

The aim of the study was to explore the possibilities of using modern information and communication technologies in the process of educating persons with a deeper level of intellectual disability. The intensity of involvement, ability to focus on a task, degree of autonomy, ingenuity, and interpersonal relations of 7 special school students aged 15 to 19 were observed. In teaching them, three concepts were used in the organization of classes, i.e. one using multimedia, one based on the multi-sensory

experience of the world, and blended learning (practical exercises combined with the use of ICT).

Educating persons with intellectual disabilities

According to DSM–5 TM (2013: 33), the term intellectual disability is defined as follows: "Intellectual disability (intellectual developmental disorder) is a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains".

According to the International Classification of Diseases ICD–10 WHO (2016: available on-line http://apps.who.int/classifications/icd10/browse/2016/en#/F70--F79), mental retardation is characterized as follows: "A condition of arrested or incomplete development of the mind, which is especially characterized by impairment of skills manifested during the developmental period, skills which contribute to the overall level of intelligence, i.e. cognitive, language, motor, and social abilities. Retardation can occur with or without any other mental or physical condition. Degrees of mental retardation are conventionally estimated by standardized intelligence tests. These can be supplemented by scales assessing social adaptation in a given environment. These measures provide an approximate indication of the degree of mental retardation. The diagnosis will also depend on the overall assessment of intellectual functioning by a skilled diagnostician".

The ICD-11 classification (2017: available on-line http://icd11ct.cloudapp.net/ct/icd11beta_jlmms/en/current#/), not yet approved by WHO, suggests changing the terminology used for neurological diseases (neurodevelopmental disorders) to "disorders of intellectual development, mild, moderate, severe, profound". The diseases are defined as follows: "Disorders of intellectual development are a group of aetiologically diverse conditions originating during the developmental period, characterized by significantly below average intellectual functioning and adaptive behavior that are approximately two or more standard deviations below the mean (approximately less than the 2.3rd percentile), based on appropriately normed, individually administered standardized tests. Where appropriately normed and standardized tests are not available, diagnosis of disorders of intellectual development requires greater reliance on clinical judgment based on appropriate assessment of comparable behavioral indicators".

According to the results of the National Census of Population and Housing in 2011, the total number of people with disabilities was about 4.7 million at the end of March 2011, representing 12.2% of the country's population (Demographic data… 2015) (Fig. 1).

It should be emphasized, however, that responding to disability questions was voluntary, due to the specificity and sensitivity of the topic. According to the information from the Chief Statistical Office, almost 1.5 million people refused to respond, which had an effect on the completeness of the information (Slany, 2014). Children under 16 represented 4.4% of the total population of legally disabled people. The percentage of children with mild, moderate and severe intellectual disabilities in primary school was 1.1% of the school population while, respectively, learners

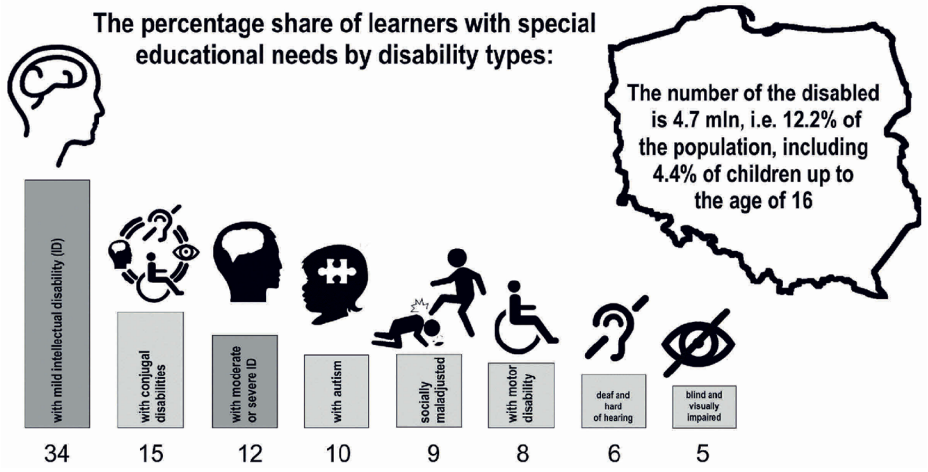
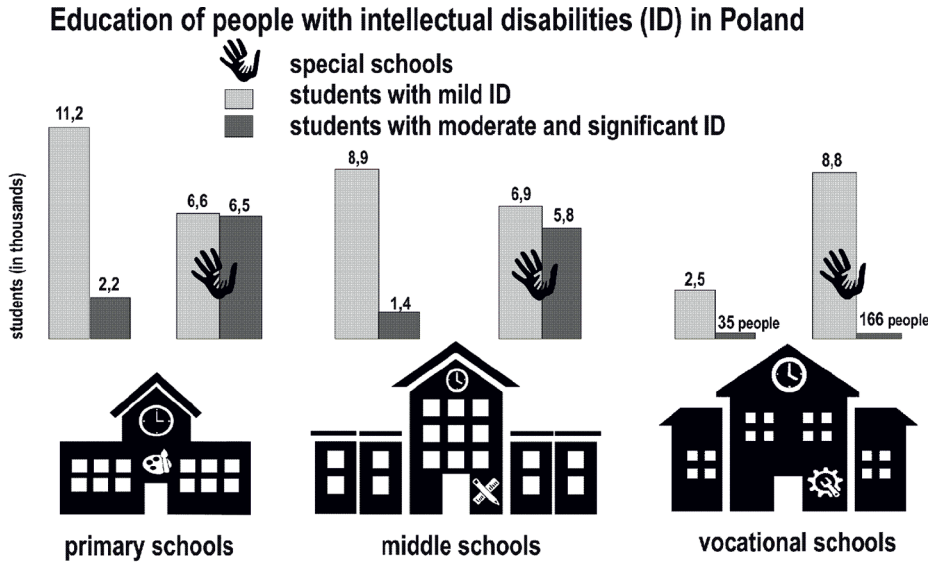


Fig. 1. The percentage share of learners with special educational needs by disability types.

with intellectual disabilities attending junior high school constituted 2.1% of the population of junior high school students, and 6.4% of the population of students attending vocational schools (Uczniowie i studenci… 2016; Oświata i wychowanie… 2016) (Fig. 2).



Source: Own elaboration based on data from the Office of the Government Plenipotentiary for Persons with Disabilities 1 Dec. 2016

Fig. 2. Education of people with intellectual disabilities (ID) in Poland.

Young people studying in special education schools, which accept learners with moderate or severe mental retardation and those with more than one disability,

constituted 1% of the population of young people learning in senior high schools (Uczniowie i studenci… 2016; Oświata i wychowanie… 2016). The inconsistency between the incidence rates of intellectual disabilities depending on the age of the study groups is due to the fact that many people with mild intellectual disabilities function relatively well upon completing their education.

In Poland, the main assumption made by the Ministry of National Education that the overriding aim of educating learners with intellectual disabilities is to enable them to participate in various forms of social life equally with other members of a given community still remains the most significant. Therefore, in educating people with intellectual disability, the use of multimedia as a means of communication combining different forms, such as text, sound, graphics, animation, and video, should be common. Interactive media devices such as smartphones, computers, interactive whiteboards should, as in the case of people without disabilities, serve as a tool for communication and education.

The reasons for the discrepancy between limited perceptual and cognitive abilities and "good" social functioning stem from factors other than intellectual ones, such as personality, motivation, emotion, family and peer environment (Kościelska, 1984, 1995). It is, therefore, possible to use these factors in ICT-based education. For it was argued that regardless of whether it be a game, a film, or a messenger, ICT methods enforce relationship-based activities to a much greater extent than traditional methods of work. The need to understand what is happening on the screen triggers a whole range of thought processes, from simple perception, inference, to empathy and creativity (Sobocha, Pietrzak, 2017).

Learners with intellectual disabilities are eager to work with ICT tools because it gives them the opportunity to get to know the consequences of their actions. Owing to this, upon becoming active, learners are more aware of consequences of their decisions. The development of autonomy of people with intellectual disabilities is important because of developing their ability to make choices in life, which promotes greater social inclusion (Kwiatkowska, Rola, 2015).

The use of information and communication technologies in education in Poland

The European Commission report on ICT in Education shows that Poland occupies a very low position in the ranking of digitally equipped schools (ICT in Education, 2013; Pietrzak, 2017). In Poland there are fewer computers available for learners of all grades than the EU average, and their provision is fairly consistent at all grades. In respect of this indicator, Poland ranks in the lower group of countries, with 8 learners per computer. With high numbers of learners per interactive whiteboard at all grades, Poland ranks in the lower group of countries, and the situation is similar as regards learners per data projector. Although in Poland the numbers of learners in schools without broadband are generally lower than the EU mean, there is a low percentage of schools with fast broadband.

The report on the study "Do teachers use information and communication technologies in education?" (2012) shows that the limited implementation of ICT in schools results from teachers' concerns related to the fear of losing authority, their lack

of computer skills, the time-consuming process of preparing classes, organizational and technical difficulties, the unavailability of ready materials compliant with the core curriculum, as well as the possible negative influence that computers and the Internet may have on students (Czy nauczyciele… 2012).

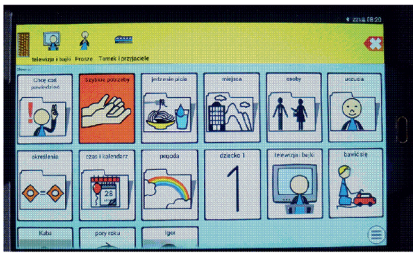
Studies conducted so far point to the numerous advantages of using ICT in work, including the report from the IBE's "Digital School" program run in 399 schools. In the 2013 report from 20 schools selected for detailed studies, it was stated that in revalidation classes and within psychological and pedagogical support activities, the computer became a link between the learner and the teacher, enlivened the atmosphere and, by stimulating mobilization to work in the classroom, helped in understanding reality, and allowed individual selection of speech therapy and therapeutic-correction-compensation programs. The report stated that for people with disabilities, the opportunity to improve communication skills through the use of a computer is especially important, because it contributes to maintaining concentration, improves motivation, and triggers curiosity (Białek, 2013).

Information and communication technologies dedicated to people with disabilities

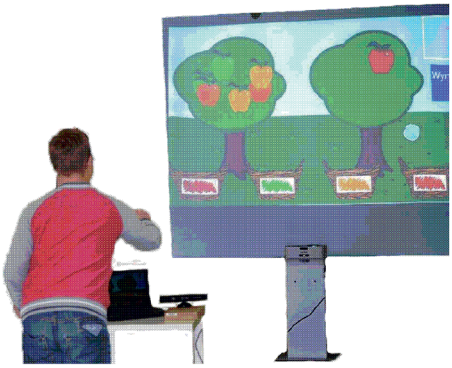
Currently, the market offers electronic equipment and numerous computer programs for people with motor, visual, auditory or speech impairments. Advanced technology and state-of-the-art software have made it possible to better diagnose disabled people and customize the equipment to suit their individual needs. The disabled can support themselves using wheelchairs, speech synthesizers, instant messengers, hearing aids, book players, "talking" TVs, touch screens and monitors. Here are some examples of ICT use (Fig. 3).

As part of the INOVATELL project, an innovative touchless computer control tool and a computer literacy training program for individuals with severe physical disabilities were developed (http://inovatell.reabilitacija.lt/index-en.html). The technologically advanced devices, called augmentative and alternative communication (AAC) devices, allow people with no speech or poor speech to overcome their communication problems. Descriptive video services (DVS), which provide narrative verbal descriptions of visual elements, help the blind or visually impaired to "read and watch images" (Hasselbring, Williams, 2010).

One of the most popular portals supporting the education of people with special needs is DrOmnibus (www.dromnibus.com). The DrOmnibus Edukacja Włączająca [DrOmnibus Inclusive Education] application includes over 5,000 tasks to practice skills such as recognizing colors, shapes, numbers, fruits, vegetables, animals, body parts, emotions and occupations; it also contains lesson plans, is equipped with a system of awards and hints, and generates reports on learning outcomes. Exercises help to train perception and visual analysis, differentiate between elements, recognize emotions, identify sounds, and classify and enhance communication skills. Another portal that develops the focus and recognition of objects as well as the identification of feelings and emotions is Prosta Edukacja [Simple Education] (www.prostaedukacja.org.pl).



Augmentative and Alternative Communication devices and equipment



RehabKinect – motion control game

Touch Screen

Fig. 3. Currently, the market offers electronic equipment and numerous computer programs for people with motor, visual, auditory or speech disabilities.

Valuable materials and tips for teachers, educators, trainers and tutors can be found through this unique pedagogical program on websites created under projects funded with support from the European Commission, e.g. Fascinating IT Tools for Persons with Intellectual Disability (http://disfit.eu), European Certification of ICT Skills for People with Mental Disabilities (http://www.easy-ict.nl/), Further Education for People with Intellectual Disabilities (https://www.includ-ed.eu/good-practice/further-education-people-intellectual-disabilities-fepid), Job Trainers for People with intellectual disabilities and Autism Spectrum Disorders (http://www.trainingforjob.eu/wp/), Disabled in Theatre and Music (http://grundtvig.org.pl/www.grundtvig.org.pl/galeria-projektow/projectsppg/621.html).

An interesting overview of the possibilities of using computer technology in the education of people with various disabilities is presented in an article by Hasselbring and Glaser (2010). The authors draw attention to the value of involving and individually tailored ICT-based education, but at the same time emphasize the lack of appropriate training for teachers and trainers, which is the main obstacle to the ease of operation of various devices and the use of specialized software. Studies of the role of ICT in providing services to adults with intellectual disabilities have shown its positive impact on social inclusion and greater participation in mainstream

life. The authors of the studies point out that the beliefs of staff members and the organizational culture of sites play a substantial role in how ICT is used (Parsons et al., 2008).

The software on offer for people with intellectual disabilities is poor and the applications are incomprehensible as a result of not taking into account complex ability deficits (Kwiatkowska, Rola, 2015).

For learners and other people with moderate or severe intellectual disabilities, the educational and ICT market does not offer practically any supportive software which would allow a special education teacher to tailor the program to a learner's individual needs (Kwiatkowska, Rola, 2015). Special education teachers often seek various ICT uses in education themselves and individualize programs to satisfy their learners' needs.

Teachers working with pupils with intellectual disabilities emphasize that these learners become bored very quickly, and that when they are given interesting tasks to do they should be allowed more time to respond and work creatively. The didactic experience of persons working in special schools recommends that, when formulating a message, one should focus on direct references to reality and introduce abstract elements later, and only if one recognizes that the learners are ready for that (Kondratowska, Wróbel, 2009).

Study material and methods

The idea of undertaking the research emerged during the co-operation between SOSW No. 3 in Krakow (Special School for Children with Disabilities) and the Jagiellonian University. The observations made during student practicum prompted the authors to use different educational methods in class and to conduct the study using the observation sheet. The participant method applied is typically used in qualitative research. Bogen James in the Encyclopedia of Philosophy (2017: https://plato.stanford.edu/entries/science-theory-observation/#HowObsEviMigTheLad) states that "observational evidence plays important and philosophically interesting roles in other areas including scientific discovery, the development of experimental tools and techniques, and the application of scientific theories to practical problems".

Due to the specific functioning of people with intellectual disabilities and the lack of standard ICT learning models for this group, the 'case study' method was used. In non-typical situations, it allows the best analysis of phenomena and their in-depth explanation (Babbie, 2007). As Earl Babbie states (2007: 320) "case studies may form a basis for the construction of more general nomothetic theories".

The study involved seven learners with moderate and severe intellectual disabilities from the Special School for Children with Disabilities No. 3 in Krakow. The study participants were junior high school pupils aged 15 to 19, two boys and five girls. Methodology course students from the Institute of Geography and Spatial Management of the Jagiellonian University were co-participants in the study. The classes were held at SOSW No. 3 and on the JU Campus (Institute of Geography and Spatial Management, Institute of Geology, Centre for Nature Education), under the supervision of five special education teachers.

The study was based on the self-developed questionnaire "Observation sheet for ICT classes taught to students with a deeper intellectual disability". The study was based on a questionnaire consisting of seven parts, each containing from 2 to 11 questions, which were answered by four pedagogues specializing in oligophrenopedagogy. We observed intensity of engagement, length of concentration on a task, degree of autonomy, ingenuity and interpersonal relations.

Observations took place during the educational classes taught between December 2016 and May 2017. In the process of education, three patterns for organizing classes were applied, i.e. with the use of multimedia, multi-sensory perception of the world, and blended learning (Fig. 4).

Fig. 4. In the process of education three patterns for organizing classes were applied: with the use of multimedia (a), multi-sensory perception of the world (b) and blended learning (c).

The purpose of the multimedia classes was for learners to become self-sufficient as far as their disability allows and to develop correct attitudes and behaviors so that they could respond to the needs of their lower-level classmates, such as the inclusion of a multimedia board, help with the performance of tasks, etc., in addition to stimulating them to engage in activity and collaboration, practicing self-presentation skills, triggering verbal, motivational, and artistic expression, as well as activating and motivating students to undertake joint actions in the classroom. Learners were supposed to cooperate with each other, aiming to create conditions for full integration in the peer group. Through acquiring the skills of operating modern equipment, learners were expected to undertake their own activity.

The aim of polysensory classes was to develop small motor functions, visual-motor coordination, and the recognition and making of models of objects encountered in the city. The learner was to shape and reproduce the terrain in colors (including hypsometric colors), and make a model of a knoll, hill or mountain chain according to their own concept. Using properly selected materials (sand, gravel, pebbles, boxes, sticks, bark, shells, cones, beans, moss, hair gel, colored paper, newspapers, sponges, beads), they made and put objects (hills, rivers, water bodies, beaches, buildings, roads, green areas, cars) in the right place on the model.

The aim of blended-learning classes was to combine direct observation with practical action, including the development of visual perception and spatial imagination. Learners were to observe the Vistula River valley and the limestone hills and urban development of Krakow from the observation deck of the Institute of Geography and Spatial Management at the Jagiellonian University Campus in order to raise their awareness and enable them to acquire new concepts. Visitors to the Centre for Natural Education were to observe specimens of butterflies and models of the moon and the solar system, while in the Institute of Geology, they looked at minerals and rocks. The purpose of the classes was to stimulate visual-motion associations: learners were to make a model of the terrain in the interactive sandbox, recognize sculpture forms, shape hills, mountains, valleys and flat areas on their own, and name them referring to field observations. During all classes, learners were to enrich their vocabulary. It was important for them to attempt to actively participate in the classes, reinforcing the concentration of attention.

Own research results

The collected data were analyzed and are presented in the table below.

Level of goal achievement:

	Multimedia classes	Sensory classes	Mixed classes
Targeted goals have been achieved	fully	partly	fully
Goals have been achieved with respect to learner abilities	tailored	too demanding	tailored

Achievement of goals, taking into account the individual capabilities of learners, is difficult and requires the knowledge of the level of functioning of a given learner. In all types of classes the goals were achieved, but in the case of sensory classes the obstacle was the later hours of their realization (the last two lessons in a day). It was observed that the level of activity of learners with intellectual disabilities is conditioned by the time of day. In mixed classes, the variety of activities and allowing plenty of time to get used to new places and get to know the activity helped to achieve our goals. Objectives tailored to the learner's abilities stimulated creativity and forced good orientation in the graphic program. However, attention should be paid to the degree of intellectual disability and goals should be modified in the course of classes so that each learner could attempt to perform the task on their own.

Efficiency of learning: Learners

	Multimedia classes	Sensory classes	Mixed classes
They understand the teacher's instructions	Yes	Yes	Yes
They are active in class	Yes	Yes	Yes, but they require constant motivation

They work and think on their own	learners received orders and instructions	learners received orders and instructions; a female learner demonstrates ingenuity;	the more stimuli, the higher the interest
They can collaborate with each other	they demonstrate teamwork skills; but there is no possibility of simultaneous activity of all learners		individual fascination
Do they show ingenuity (initiative)	Yes	Yes	Yes

During all classes the learners understood the instructions given by the teacher. It was helpful to use the elements of alternative communication, take into account the learners' interests in the selection of particular tasks. In turn, the number of functions used by the graphical program was dependent on the learner's ingenuity; it varied and was dependent on the degree of intellectual disability.

Each of the proposed activities stimulated the learners to be active, but in the course of multimedia activities the limitation is that only one person can work at the interactive whiteboard, while the other learners quickly lose interest. Sensory classes involved all the learners. They were interested, willing to take action. Mixed classes are equally attractive but require constant motivation, interest and support from an adult and the behaviors exhibited depend on the degree of disability and individual preference.

Learners received orders and instructions tailored to their capabilities. In individual cases, learners showed ingenuity. Mixed classes showed that the more stimuli there are, the more interested the learner is. An example is the sandbox which raised the highest interest. Action and independent thinking is conditioned by the degree of intellectual disability.

In the course of classes, learners demonstrate teamwork skills; however, there is no possibility of simultaneous activity of all learners in the case of the interactive whiteboard, for example. Individual fascination (individual preferences of a given person) is also noted. An example is the sandbox, which almost "mesmerized", and kinetic sand which encouraged the learners to have fun together.

The proposed activities allowed the learners to demonstrate their ingenuity (initiative) according to their own concept; they discovered new, different solutions without provided hints. The sandbox and the dynamics of colors on the sand aroused great interest, allowing them to independently form the relief of the terrain and recognize individual forms. One of the learners correctly associated sand coloring with the relief of the terrain.

Teaching quality: The educational space in the classroom was properly organized

	Multimedia classes	Sensory classes	Mixed classes
Were the methods and techniques properly selected	Yes	Yes	Yes
Was the technique of work clearly presented	Yes	Yes	Yes
Tasks tailored to individual needs and capabilities were assigned	Yes	Yes	Yes
Were all the learners involved (interested)	Yes (if each learner approached separately)	Yes	Yes

Interpersonal relationships:

	Multimedia classes	Sensory classes	Mixed classes
Alternative communication rules were used	Yes, for the needs of using the program	Not required	Not required
Positive reinforcement was applied	Yes	Yes	Yes
Did the learners inspire each other	To a large extent	Partly	To a small extent
Did the learners help each other?	Yes	Yes	Yes
Did the learners collaborate (work together)	Rather yes, it is affected by the degree of intellectual disability	Rather not because of individualized tasks	Rather yes, it is affected by the degree of intellectual disability
Does the learner undertake activity with the teacher's help	Rather yes, it is affected by the degree of intellectual disability	Yes	Yes

The use of positive reinforcements was an important element of individual classes. These were usually verbal praise, constant motivation, and in individual cases learners expected interest from the students participating in the project. Thanks to this, learners are more willing to undertake mutual help activities in terms of operating the equipment, the software and the program used; no conflicts.

The learners did not always inspire each other. Each of them wanted to create original work, one of the learners was constantly looking for confirmation of whether he was doing the job well from another classmate. Mutual inspiration depends on the activity or task being undertaken, e.g., the sandbox dynamics is so engaging and mesmerizing that the learner is focused on their own work, activity.

Shared work was dependent on the learner's individual abilities and the degree of intellectual disability. There are learners who need constant help, because it is only then that they undertake collaboration.

The impact of a didactic aid on the quality of education:

	Significant	Unimportant	With no impact
Interactive whiteboard	X not for everyone	x	
Kinetic sand	x		
Salt dough and other products	x		
Interactive sandbox	X not for everyone	x	
Plastic and natural materials	x		

Didactic aids have a large impact on the quality of education of learners with intellectual disabilities. The interactive whiteboard and sandbox are not good didactic aids for each learner because of the organization of classes. They do well in individual work with the learner. Undoubtedly, they are attractive tools and work best when used in mixed classes. It depends on individual preferences and the possibility of simultaneously involving more learners in the course of classes. Undoubtedly, natural plastic materials, salt dough and other products contribute to, and have a significant impact on the improvement of the quality of education, since their diversity and number caused great interest and stimulated involvement, willingness to act, and activity among the group. Learners with intellectual disabilities do not work well under the pressure of time during the last class of the day.

Conclusions on the use of ICT

1. The variety of software and technical solutions stimulates and motivates learners to engage in activities in class, reinforces their focus on the task, makes them involved in an activity, which results in a visible increase in their motivation for learning.
2. Simultaneous use of multimedia and practical activity enriches learning through experience, develops and strengthens collaboration skills.
3. The interactivity of software develops talents, ingenuity and self-reliance especially in learners with a moderate degree of intellectual disability.
4. The interactivity of applications does not provide learners with significant and deep intellectual disability with full autonomy.
5. The degree of intellectual disability enforces the involvement of a support person in the task.
6. The use of the multimedia board does not allow the simultaneous involvement of a team of learners, which results in a decrease in the activity and interest of all its non-users. The example of a sandbox shows that learners' simultaneous participation in an interactive venture maintains their interest and activity.

7. The range of ICT devices and software on offer dedicated to the intellectually disabled is unable to replace learning and acquiring new skills through practical activities.

Final remarks

Limiting the use of teaching resources in class only to multimedia would be possible if they were specifically dedicated to the intellectually disabled, i.e. if the programs provided an opportunity to work with a digital device simultaneously for several people and the program were characterized by rich software producing video, sound, motion, 3D images and dynamic interactions with the device user. Due to the lack of such programs, the idea of mixed activities is well proven and works at the moment.

It is not about creating a virtual world for people with intellectual disabilities, but about making it possible for them to function freely in a digital society. In order to improve the quality of functioning in society of people with intellectual disabilities, personal interaction and the opportunity to participate in social life are of particular importance, as confirmed by integration classes with students at the Centre for Natural Education, the Institute of Geology and the Institute of Geography and Spatial Management of the Jagiellonian University. The benefits were mutual, with the students becoming aware of the great cognitive abilities and social competences of persons with intellectual disabilities, as well as of the ability to collaborate and communicate actively with them. Learners with intellectual disabilities quickly established positive relationships with the students and willingly undertook tasks supported by them.

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The use of media for educating the intellectually disabled – for and against

Abstract

The aim of the study was to explore the possibilities of using advanced information and communication technologies in the process of educating individuals with moderate to profound levels of intellectual impairment. In the process of education three patterns for organizing classes were applied: with the use of multimedia, multi-sensory perception of the world and blended learning. The study was conducted with the participation of middle school students with moderate and severe intellectual disability from the Special School for Children with Disabilities. Co-participants in the study were students of the methodology course from the Jagiellonian University. We observed intensity of engagement, length of concentration on a task, degree of autonomy, ingenuity and interpersonal relations. We found that the diversity of syllabus and technical solutions stimulates and motivates students to take the initiative to become engaged in activities in class, it reinforces their concentration on a task, and it engages them in an activity, resulting in a visible increase in motivation to learn. The assortment of equipment and software dedicated to the intellectually disabled is not able to replace learning and acquiring new skills through practical activities.

Key words: intellectual disabilities, education, ICT, multimedia classes, sensory classes, blended-learning

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