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ICT, DIGITAL LITERACY, DIGITAL INCLUSION AND MEDIA EDUCATION IN POLAND

Abstract: The chapter presents the conditions related to the use of ICT in the didactic process in Polish schools and the phenomenon of e-inclusion. It contains references to the most up-to-date and relevant resources showing how digital media are being used by students and teachers. In this context, the advantages and disadvantages of introducing digital media into Polish education system are discussed. The important part of the text is the presentation of the financial aspects of media pedagogy as well as the challenges concerning the introduction of new didactic methods and means based on the new media.

Keywords: media education, digital literacy, inclusion, learning, Poland

ICT in education — an overview

At each stage of education the contemporary schools have an important task of preparing their students to live in the information society – a society of "knowledge producers", where knowledge becomes a process and learning is the integral part of production, a new form of activity. In such society, almost all forms of activities taken support Information and Communication Technology (ICT) treated as the key technologies in modern civilisation. The reality of the digital age presents constantly changing and

growing requirements for students and teachers, focusing on developing certain areas of information literacy. These requirements set the directions of development and the activities introduced in and out of schools (Baron-Polańczyk, 2018).

Computerisation of Polish schools began in the 1980s. During the last decade of the 20th century Polish students began to learn IT at school. IT laboratories got equipped with computers and the Regional Teacher Training Centres were offering courses to prepare teachers to teach the new subject. At that time, the curricula and the frameworks of IT classes were developed. A very important change in IT education in the Polish schools was the launch in 2012 of the pilot programme called Digital Poland (Polska Cyfrowa). The purpose of the programme is to strengthen the competencies of students and teachers in the area of ICT use (Marzantowicz, 2016).

According to studies conducted by prof. Marlena Plebańska and her team (University of Warsaw), teachers complain about quality of school equipment, outdated hardware and software. However, accessibility of the Internet is evaluated as good in 42% and very good in 27% of schools. One in three respondents points out that their school offers free wireless connection. It is most often in upper-secondary schools (up to 50%). It is also important that 48% of schools have only access to wired Internet. This is promising in terms of Internet infrastructure transformation in educational establishments. Teachers also emphasize that they use their own ICT hardware during classes (depending on a region, it is even 30%) (Plebańska, 2017). School ICT hardware has been purchased within previous EU programmes, for example Sector Operational Programme Human Resources Development 2005-2008, so these ICT resources may not be outdated but are low-efficient, based in Windows XP, 7 or 10 operational systems and free Linux distributions. In the context of developing new ICT solutions addressed to educational sector ad requiring efficient hardware, this is a technically important aspect

The problem of insufficient availability of high-speed Internet access will be solved within next several dozen months. In 2017, as part of eliminating the gap in Internet access, the Council of Ministers decided to form the National Educational Network (OSE, OgólnopolskaSiećEdukacyjna), thanks to which school will be provided with connectivity of at least 100 Mb/s According to data by the Ministry of Digital Affairs, only about 23% of Polish schools have connectivity of 100 Mb/s or more. OSE program will be managed by Scientific and Academic Computer Network — National Research Institute (NASK, Naukowa i Akademicka Sieć Komputerowa – Państwowy Instytut Badawczy). As emphasized by representatives of the Ministry of Digital Affairs, "launching OSE program will level educational opportunities for students in Poland, in particular those loving in low-populated regions and learning in small schools, for whom access to knowledge and modern technologies is a main contributor to the increase of their educational potential" (NASK, 2017).

About half of teachers evaluate their computer laboratories as very good (14%) and good (41%). It is interesting that 75% of computer rooms are equipped with multimedia

projectors, and only 45% have multimedia boards. In most cases, teachers use ready-to-go applications. They are not so fond of developing their own programs, websites or cloud-based resources. They most often use: movies, applications, online presentations (81%), graphics (77%), games and exercises (57%), digital texts (53%), e-textbooks (38%). ICT is most often used in primary schools (Plebańska, 2017). Thus, primary schools could be the first ones to receive offers regarding latest educational products, both in line with the core curriculum and exceeding standard and known ICT solutions (Plebańska, 2017). Unfortunately, governmental solutions such as Scholaris platform and e-textbooks, despite relatively large investments from central bodies, are not very popular among teachers. This has been noticed during an audit performed by the Supreme Audit Office (NIK, Najwyższa Izba Kontroli).

Most teachers positively evaluate new technologies as a method to increase attractiveness of their classes (more than 70% say it is a good or very good way), but at the same time, only slightly more than a half believe digital technologies increase the effectiveness of learning. The vast majority of educators, use technology as a substitute for traditional teaching methods, that is, as knowledge transmission tools (e.g. by showing multimedia presentations, movies). About 42% of teachers declare they use multimedia presentations. Interactive boards are used by 27%. Online games, remote learning platforms or more advanced solutions like tablets, measuring interfaces, coding cubes and other are used very rarely. Teachers very rarely use digital content such as e-books. Pedagogues who declare they integrate ICT into learning process, do not use those solutions during IT classes only, by in almost all fields, including ethics, religion and visual arts. 40% of teachers use digital technologies at least several times a week (Plebańska, 2017).

There is also a noticeable correlation between a taught subject and use of ICT. Teachers of: mathematics, IT and technics use new technologies most frequently. IT teachers, due to the specifics and range of their subject, are not only expected to have higher competencies but also to be more active in this area. In addition to read-made materials, they should design and construct their own multimedia didactic content. Teachers of environmental sciences, geography, chemistry and physics use ICT on an average level. Physical education, foreign languages and social sciences teachers use ICT the least frequently (Baron-Polańczyk, 2015).

Teachers point out that ICT use entails a risk that students will treat classes with new media as non-compulsory and resort to other activities, not connected with given educational objectives, e.g. entertainment. Teachers are most discouraged by such the following factors that prevent integration of ICT into educational process: poor Internet access or lack of it, low quality or no hardware, outdated software, lack of funds to buy equipment and applications, no technical and methodological support, and time-consuming preparations of digital teaching resources. It is worth to point out that teachers most often learn how to use ICT during trainings (73%) that are usually present only certain options Retrieved from applications. These trainings do not include methodological

or pedagogical issues. Other sources of knowledge is self-education from the Internet (65%), peer-to-peer support (58%) or conferences (45%) (Plebańska, 2017).

The above declarations are strictly tied with opinion of students who think that more than half of schools do not use any ICT solutions in learning and teaching process. 21% of students think ICT-related tools are used during classes every day, whereas 40% say they are used several times a week. Typical lesson with new technologies involves multimedia presentations (41%) and interactive boards (27%). Every fourth student is obliged to prepare a presentation as a homework (most often in Power Point or its free substitutes) which is then presented during classes. 18% of students use their smartphones as didactic tools. The vast majority (81%) utilise only given information sources and have no possibility to create their own educational resources. In most cases, students think multimedia increase lesson effectiveness (81%) and attractiveness of classes (91%). Also, most of them (80%) say that introduction new technologies to classes increases their engagement. At the same time, they have problem with describing the most interesting lessons with ICT (Plebańska, 2017). Implementation of ICT is very schematic and does not cause lasting, model memories.

Parents are sceptical towards new technologies in didactic process. They do not trust solutions supporting effective learning. This is probably because they do not know good solutions. They associate ICT mainly with entertainment. However, they recognize the role of proven and familiar solutions, such as multimedia boards or computers. They evaluate use of tablets and smartphones less positive. Parents also emphasize the meaning on ICT in education in the context of including these solutions into the process of developing key future competencies (Plebańska, 2017).

Considering the results of a report on saturation of schools with new technologies, we need to point out that "both, very well and very poorly equipped schools participated in the study. In the first group, excellent quality hardware can be found in every or almost every classroom. Such schools are less than 10% of all studied facilities. The least equipped schools have not enough hardware to meet the needs of teachers and students, and available IT infrastructure is out-of-date and prone to failures. The number of such schools is much bigger, up to 30% of all investigated facilities" (Grynienko et al., 2013). The situation depends also on the type of school. For example, schools that specialize in programming education use much more modern hardware and applications (Strzecha, 2012). Schools gradually update their IT resources. According to NIK report, "audited schools had infrastructure necessary to teach information and communication technology: on average, there were on computer per eight students, and four interactive boards and nine multimedia projectors per school. All schools had computer laboratories used according to needs not only during computer and IT classes, but also other subjects. About 76% of teachers in audited schools had personal computers" (NIK, 2017). Unfortunately, auditors did not include qualitative aspect of the audit, that is, analysis of technical parameters of school equipment.

Despite different levels of hardware saturation, teachers most often use paid and free software with didactic materials, provided by popular publishers (for example Oxford Press, Longman, Nowa Era, WSiP, Operon). YouTube and general teacher-dedicated portals, such as Scholaris, are popular education resources (Grynienko et al., 2013). We should also mention that "the value of the book market in Poland in 2014 was PLN 2.48 billion, given the prices publishers give distributors. As for type of books, the biggest share in revenue was generated by school textbooks, and scientific and specialist publications — almost 70% of the market." The leading publishers of educational resources are: Wydawnictwo Nowa Era (annual revenue of PLN 261 million) and Wydawnictwa Szkolne i Pedagogiczne (annual revenue of PLN 243.8 million) (AnalizaRynku, 2016). Despite demographic changes, Polish education resource market is stable. However, it can be limited to some degree by intervention programmes introduced by the state, for example Digital School (Cyfrowa Szkoła) (Strycharz, 2013; Łysek, 2013; Czerski, Wawer, 2014). Considering the total investments in education, analogue solutions are still main resources used in schools.

Use of new technologies is strongly related with financial and non-tangible factors in a given school - as noticed by authors collaborating with the Cities on the Internet Association (operator of many national education projects). Material factors, namely the amounts in school budgets provided for retrofitting or percentage share of own funds necessary to participate in funding projects, are extremely important. In many cases, other material factors that limit the use of ICR are still poor quality IT equipment. However, intangible aspects of using digital education resources become equally relevant: teachers' motivation, attitude towards ICT and level of digital literacy which in some areas if insufficient to face some challenges of information society, for example digital safety (Tomczyk, Srokowski, Wąsiński, 2016).

Despite relatively unfavourable conditions of still low saturation of good quality ICT equipment and low motivation and digital literacy among teachers, teaching patterns change. Teachers more and more often recognise possibilities of multimedia or network resources, that facilitate learning. An example may be schools for Polish children living abroad, where educational objectives of curricula are realised by means of remote education tools. Due to data confidentiality, we do not know the exact number of students, but such solutions are more and more often found as model examples.

General data show that PCs can be found in 75.2% and laptops in 63% of Polish households. Most of these devices are connected with the Internet, out which 56% through broadband connections. Only 2% of computer owners have no Internet access. 9.8% have game consoles, 32% — printers, 95.7% — mobile phones out of which 53.4% are smartphones (GUS, 2017). Having children in pre-school or school age is a factor that significantly determines possession and use of new media in a family. This refers to Internet access and use of smartphones, tablets or game consoles. Over 90% of households with children have computers with Internet access (GUS, 2016). According to data gathered by

the foundation Dbam o MójZasięg, 25.7 million Poles are active Internet users, 13 million are active social network users and more than 9 million have smartphones. The percentage of smartphone users increases with age. Save for typical communication purposes, smartphones are used by young people to: use social media 70.6%, communicate with other through applications 59.2% (e.g. Messenger, Viber), listen to music 54.2%, take photos 49.4%, support learning 47%, entertainment e.g. games 45% or develop interests 32% (Dębski, 2016). This is confirmed by the analysis conducted by the Educational Research Institute, based among others on PISA results. The data indicate that "students with no access to technological advancements receive lower grades, however, those who use their computers, tablets, mobile phones or Internet excessively, are also lower in ranking" (IBE, 2014). This dependency is long discussed in Polish publications on media pedagogy. The relation is shaped as a reversed U. The more "wise", that is intuitive and intentional use of ICT, the better school results. However, the use of every didactic tool has its critical point that, when reached, leads to lowering school achievements (Potyrała, 2017).

The general data would be incomplete without references to young people — students. The majority of this group use Internet multiple times a day. About 93.4% is non stop online. Shorter and longer Internet connections to log into e-services are most often made via mobile phones. This is an important information in the context of designing software that should be purpose-build for the most popular devices. Peer-to-peer communication through media is very important for students — over 67% do it on daily basis. In the context of using personal devices for education: 16.3% use ICT to prepare for tests, 36.6% do their homework, 24.2% extend their general knowledge needed to complete school assignments, and 6.2% use e-learning platforms. ICT are used most frequently (very often and often) to learn: informatics (over 60%), foreign languages (over 31%), Polish language (over 25%). The majority of students use Wikipedia, Google, YouTube and Ściąga.pl everyday (NASK, 2017). The most popular educational websites are (from the most to the least popular): librus.pl (administrative systems for schools, supporting learning and teaching), sciaga.pl (ready-made essays), pwn.pl (educational resources), edupage.org (learning and school management supporting app), bryk.pl (ready-made school assignments).

An important aspect connected with entering educational services market is to identify where young people look for information about IT products, such as digital devices or software. The most important Internet sources are: blogs dedicated to certain technologies and recommending certain solutions (64.3%), detailed product specifications on producer's website (60.1%) and analysis of posts in specialist Internet forums (52.6%). Another important source of information about IT products are online offer repositories, for example ceneo.pl. About 47% of respondents use these platforms. For young people, advertisements are the least reliable — only 18.8% of young respondents chooses their technologies based on information found in promotional messages (Siuda et. al. 2013).

Polish school reality (curricula overloaded with content, big classes, competition) do not facilitate the individualisation of learning. Using modern technologies allows to meet the individual needs of the students and create working environment that fits the individual learning styles (Prashing, 2006). Thanks to the use of ICT in learning, students are more engaged and independent. They are more willing to perform the tasks which require technological support. Technologies motivate, provide positive stimulation and are most often associated by the students with entertainment. According to the studies, learning in such conditions is much more effective than in the traditional circumstances dominated by control and stress (Żylińska, 2013).

For many teachers, using digital resources means saving the time, both during preparation and implementation of the classes. Using different education tools, applications or platforms reduces the time needed to prepare didactic resource. Some of these solutions, for example Canva, combine several functions, thus enabling approach to the subject taught from different perspectives. Saved time may be dedicated to support the students who struggle with school failures (Instytut Nowoczesnej Edukacji, 2019). More and more methodological and teaching resources are available free of charge as e-books. Teachers may browse them easily (open educational resources, OER) and download them to their PCs. They can also connect through blogs and share their experiences in online forums. This way, the community of digital educators may integrate and grow.

Developing digital and information literacy among the students is undoubtedly the investment which will bring profits in the future. First of all, it prepares the students to participate in lifelong education, especially informal one. The ability to search for information, critically select and re-edit it is a sought-after skill in the labour market. The ability to work in an online team will be useful in almost any profession.

The analysis of the research results shows that school students are the enthusiasts of the new technologies. They can use them actively and effectively for education purposes (doing homework, searching for additional information, preparing materials – presentations, videos etc.). Teachers, in turn, even though they recognise the attractiveness of using ICT-supported teaching methods, do not necessarily believe these methods to be effective. This means that they are most likely not prepared to use ITC effectively within the formal education system. Even if they apply the new technologies, it is most often instructive (student are not involved). The research results show that teachers do not use such digital resources as applications, databases or e-books. Another barrier which hinders application of new technologies in schools is the lack of proper equipment. This is the biggest obstacle to using ICTs in the classes.

Lack of equipment and low methodical competencies of the teachers are the reasons why students acquire their digital literacy outside the school or not at all. Giving up using ICTs or using them occasionally and ineffectively during classes results in lower digital literacy among the students and, consequently, problems with their functioning in the labour market and the global information society, that is, modern Europe.

ICT for disadvantaged people in different countries & Universal Instructional Design

The terms *digital gap* and *digital divide* refer to the access to new technologies in the physical and literacy context. These groups include seniors, individuals with a lower level of education, the poor, ethnic minorities and people with disabilities (Plichta, 2017).

New technologies are a very important contributor to active social functioning of people with disabilities. The inclusive character of ICTs is noticeable in the two complementing areas: technological and social (Masłyk, Migaczewska, Żuchowska, Stojkow, 2016). Technological application of ICTs helps to level the opportunities and reduces the barriers of biological dysfunctions caused by disability. This is thanks to, for example, speech synthesisers, replacing verbal communication with written messages and other facilities removing the barriers resulting from physical limitations (including sensory) of people with disabilities. The social aspect of the new technologies is related with facilitating participation in the social life (see Barnes and Mecer, 2008).

Due to many barriers: architectural, infrastructural, communication and economic, people with disabilities are at risk of exclusion and discrimination, which means difficulties or even lack of opportunities to develop social and professional life. So far, one of the most effective activities focused on supporting activation of the disabled is the implementation of the universal design. Universal design involves planning and designing the public space in way that ensures its full availability to all its users, to the most possible extent. This idea promotes the society inclusive for all the citizens, regardless of their abilities and skills (Todys, 2013).

There may be different sources of digital divide among people with disabilities. First, individuals with reduced abilities may lack access to the latest technologies because they do not have proper devices and specialist software. They may also lack competencies which would allow them to use widely understood network functionality. In Poland, people with disabilities have reduced access to technologies as they lack the financial means to buy them. The socioeconomic status of the disabled is low, which is a serious barrier to accessing the modern technologies. People with disabilities are the group which is most stricken by poverty, what is confirmed by the so called monetary indicators of poverty. This refers to themselves and their families. Individuals with physical deficits significantly increase the risk of poverty for their families (Bartkowski, 2014). According to the research by the Central Statistical Office (2018a), families with a disabled member have much lower income than families without disabled members.

Based on the report "Diagnoza Społeczna 2013" (Social Diagnosis 2013)[14,] Tomasz Masłyk and Ewa Migaczewska (2014a) developed a *Portrait of active, disabled Internet user*. The study was conducted among 26,307 respondents out of which 11% had some

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[14]   Since 2014, there were no studies comparing the use of ICT by people with and without disabilities.

form of disability. The authors of the report claim that only one in three persons with disability declared they use Internet (32.9%), while the percentage of Internet users among the fully-abled respondents was twice as high (67.3%). Disabled persons use Internet mainly for information and communication purposes, using web browsers and messengers. As they refer to the results of their analyses, the *Portrait's* authors say that disability creates barriers to participation not only in the physical world but also the virtual reality. Even though the Internet is the tool which allows to overcome numerous limitations related to the motor and perception (as well as mental) dysfunctions, it is not a substantial daily support for most of the disabled people. The differences in the scope of using the Internet among the people with different degree of disabilities confirm the above conclusion. The more limitations the disabled individuals face in their everyday life, the less they participate in the online community (Masłyk, Migaczewska, 2014a, 2014b).

Many online activities people with disabilities engage in are social or leisure (forums, social media) and institutional (connected with studies, work or search for information in institutions' websites). The research results indicate that the disabled rarely engage in creative activities in the cyberspace, such as website design, blog posts or development of original resources. Also, the scope of using Internet functionalities is smaller than among non-disabled users. In the "Social Diagnosis 2013" study the respondents were asked to select which of the 26 Internet functionalities have they ever or recently used. The average number of online activities performed by the fully-abled users (ever or recently) was more than 15 whereas for the disabled respondents it was 12 (see Masłyk and Migaczewska, 2014). The results of the analyses show that Polish Internet users with disabilities do not use the full potential of online network — both, to facilitate their daily functioning and in the area of fighting for equal treatment and full social inclusion. A very important fact is that disability itself (regardless of the socio-demographic characteristics) does not limit the chance to be an Internet user. Of course, lack of relation between the disability and the use of the Internet does not mean that the representatives of both categories – persons with and without disabilities – are alike in terms of the history, intensity and functionalities used.

Migaczewska and Masłyk (2014a, 2014b) noticed some significant differences when comparing the fully-abled and the disabled online users. People without disabilities spent 12.5 hours weekly online, while for the disabled users it is two hour per week less (10.4). Educational background is the factor which supports the use of the new technologies. According to Migaczewska and Masłyk (2014a), each year of education increases the chance a person will fall into the "Internet users" category by over 40%. Thus, disabled students or university graduates use the new technologies more often. Karolina Włodarczyk (2013: 34) says that one of the means to increase the low availability and, in some cases, lack of access to life-long education are ICT-based e-learning tools. Thanks to e-learning people with dysfunctions may acquire competencies in different fields while staying home, using their own, individually adjusted computer equipment

(Włodarczyk, 2013). Virtual learning environment facilitates the development of cognitive flexibility and digital agility, which are extremely important from the perspective of how the disabled people are seen by others (including other professionals). If they are digitally agile and technology literate, they are less often treated as helpless victims of exclusion (Plichta, 2013).

We can see that at present, young people in particular have the need to be constantly online regardless of the place or time of the day (or night). This need may be satisfied using smartphones or tablets with Internet access. Here too, we can notice significant disproportions between the Internet users with and without disabilities. One in three fully-abled individuals (33.7%) uses these opportunities whereas among the disabled it is one in five persons (20.8%). The users of mobile devices with Internet access are more active online: they use more functionalities available. This relation applies to both types of Internet users. The fully-abled users of mobile Internet engage in about 19 activities and those who do not have access to mobile network – little less than 13, and it is a statistically significant difference (Masłyk, Migaczewska, 2014a).

People with various disabilities may use many assistive technologies which facilitate better functioning in the society, thus not using new technologies or limited use of ICT may mean failure to realise own individual potential in the social life. People with impaired hearing may participate fully in the society thanks to e-mail messaging or online communication tools. The blind or visually impaired may overcome the barriers thanks to assistive technologies like Braille displays or screen readers (Włodarczyk, 2013). One of the solutions is the OCR (Optical Character Recognition) software to convert printed or handwritten documents into digital formats. By means of special screen readers information from the computer or smartphone screen is interpreted and communicated to its blind users. Other solution are speech synthesizers – the software to convert text into human speech. This may be done using screenshots or self-voicing applications. People with disabilities may also use individual (FM systems) and collective (induction loops) solutions to communicate messages from a microphone directly to hearing aids (Zadrożny, 2019). There are speech simulators available online. They can be accessed for free but many of them reads only limited number of signs in single entry so the text must be entered in parts (Procesor.pl, 2019). Thanks to the Internet which is free of architectural barriers, people with motor disabilities may visit numerous institutions online and handle various administrative issues from home (Włodarczyk, 2013).

There are organisations and foundations that focus on removing the barriers to ICT use. Here, it is worth to mention the activities undertaken by Polish entities from the first and third sector, aimed at digital activation of people with disabilities. The example of such activities in the public sector are the initiatives by the State Fund for the Rehabilitation of the Disabled (Państwowy Fundusz Rehabilitacji Osób Niepełnosprawnych, PFRON). For example, the activity "Customer Service System for Support Financed by PFRON" (System obsługi wsparcia finansowanego ze środków PFRON) implemented within the

Digital Poland Operational Programme for 2014-2020 serves to provide the disabled with modern technologies. In addition, PFRON offers support in acquiring digital and information literacy through trainings. The Fund also supports people with disabilities in purchasing new technologies which help them to overcome the physical barriers: speech synthesizers and other modern solutions supporting communication and mobility (*Portal informacyjny Systemu Obsługi Wsparcia finansowanego ze środków PFRON*, 2019).

The example an NGO focusing on e-inclusion of the disabled is Fundacja Aktywizacja (the Activation Foundation) which for almost 25 years has been promoting information and communication technologies and is a forerunner and expert in using ICTs to activate people with disabilities. Foundation activities focus on promoting and describing the ICT solutions useful in many areas of life, assistive technologies, tools and software for users with limited mobility or sight or hearing dysfunctions (Włodarczyk, 2013).

Other group at risk of e-exclusion are seniors. Despite the fact that, according to the Central Statistical Office (Główny Urząd Statystyczny, GUS), in 2018 computers could be found in 80% of Polish households, seniors lack sufficient IT competencies to become safe, effective and active participants of the virtual world (see GUS 2018a, Batorski, 2013; Tomczyk, 2013; Niemczyk, 2016; Gacka, 2017). According to GUS statistics (2018b), only a little more than 25% of the citizens aged 60+ use online resources on regular basis. To prevent digital divide of the elderly, the programme Digital Poland of Equal Opportunities (Polska Cyfrowa Równych Szans) was launched. Its project "Digital Lighthouse Keepers" (Cyfrowi Latarnicy) aimed at increasing digital literacy among the "digital immigrants" is carried out by the Ministry of Administration and Digitisation and the Cities in Internet Association (Stowarzyszenie Miasta w Internecie). The name refers to the lighthouse keepers who light the way for ships navigating through unknown waters, often in difficult conditions. This metaphor pictures the struggles people aged 50+ often experience as they learn to navigate the virtual (in their opinion often adverse) environment. Today, there are 2,942 certified Lighthouse Keepers of Digital Poland (*Kim są Latarnicy?,* 2019).

A very popular form of senior education in Poland are the Universities of the Third Age (U3A). Their number grew rapidly in the years 2007-2012. Developing digital literacy among seniors is a relatively new trend in the U3As' educational activity, as it is in the academic research and work. The focus on new technologies fits into the area of activities minimising the intellectual exclusion of the oldest generation (Marcinkiewicz, 2012). According to diagnoses, almost 90% of the U3As offer computer classes (Zoom na UTW, 2012). Computer courses are almost as popular as language classes (21-28% of the respondents), right after cultural and recreational activities (Urząd m.st. Warszawy, 2013). IT classes are most often part of inter-generational learning. The representatives of the young generation share their practical knowledge on the use of technologies while seniors share their life experiences with the young people. This inter-generational exchange enriches both parties and adds a new value to the knowledge developed through such dialogue (Silver code, 2018). According to the authors of the "ZOOM na UTW"

(ZOOM on U3A) report, *there is no better way to learn from one another and to use one another's life, professional or social experience than engage in different tasks together* (Gołdys, Krzyżanowska, Stec &Ostrowski, 2012:73). ICT classes are often led by amateurs (like Lighthouse Keepers of Digital Poland of Equal Opportunities) who organise workshops for adults aged 50+ together with a U3A (UTW UJ, 2019) or by students as part of their internships (Jakimowicz& Nalepa, 2012).

The report "Jak korzystamy z Internetu" (How do we use Internet) (2018) indicates that in 2017, 16% of the households in Poland had no access to virtual network. There are many more households without the Internet access if there are no children in the family. The difference is significant and amounts almost up to 30%. This results perhaps from the fact that it is the youngest family members who use Internet most frequently. The biggest group of Internet users in Poland are children aged 12-15. Among them, almost all use the Internet (97.1%) We can assume that online activities are absolutely natural for them, it is something they cannot image living without.

Manuel Castells (2009) says that Internet is not another technology gadget but innovation leading to significant social consequences. More and more, digital literacy determines individuals' multi-dimensional activity in today's society. Social inclusion is extremely important because thanks to assistive technologies and Internet access people with disabilities may fully participate in the social life, use educational resources and engage in professional activity. Thanks to the ICT development, individuals who several years ago were totally excluded from the social, vocational and digital life, have now become active in many areas.

Despite large efforts taken up by foundations and organisations towards supporting e-inclusion in Poland, there are still groups at risk of digital divide. According to Łukasz Tomczyk (2018), about 12 million Polish citizens still experiences digital gap. In addition, digital literacy of people at risk of e-exclusion is still insufficient. Failure to use ICT is less and less the result of limited Internet access – it seems that the greatest hindrance to using new technologies in daily life is the lack of motivation and sufficient competencies (which may also result from the lack of motivation). Groups which use online resources the least are seniors (in families where there are no children) and people with disabilities (intellectual disabilities in particular). Today, as new technologies determine our activity in many areas of social life, the problem of e-inclusion of these vulnerable groups has become the priority of social policy. Thanks to the activities of different organisations, associations and foundations, digital gap has reduced significantly, however, there is still much to do – not only in terms of inclusion but also regarding the increase of digital literacy among people who use Internet to a small extent.

Education for educators

The contemporary social changes caused by the rapid development of ICTs forced the shift of the existing paradigms in education (Robinson, 2013) and generated the need

of practical implementation of the assumptions of constructivism and connectivism. Teachers must be prepared to work with a new category of students for whom ICT is the natural habitat (Prensky, 2001). They must be equipped not only in skills enabling them to use ICT and e-resources (critical selection and modification) but also able to create their own digital didactic materials. Modern teacher should be: a guide, a creator and an expert in the ICT-supported didactic process (Koncepcja realizacji projektu, 2019).

Increasing teachers' competencies in the area of new technologies has become the key element of educational policy. One of the activities in this area is "Poland 2030. The third wave of modernity. Long-term National Development Strategy". Its priority is to improve the quality of human capital and the state's responsibility is to level the educational opportunities at every stage of education and improve the quality of educational services (Ministerstwo Administracji i Cyfryzacji, 2013). The activities within the second element of this strategic area – Digital Poland – include dissemination of digital and media education at every stage of formal education (increasing competencies of the teaching staff) and using digital technologies throughout the education process (Ministerstwo Administracji i Cyfryzacji, 2013). The activities are further specified as part of two strategic objectives. Objective 3 *Better access and quality* involves the following tasks: introduction of new models of educational and vocational competencies and professional career including, for example, obligatory competencies in using new technologies in teaching all subjects. Objective 5 *Creating Digital Poland* is the answer to the demand for effective system mechanisms of developing digital literacy (in formal, informal and non-formal education). It will be implemented, among others, through developing digital literacy among educators (teachers and employees in all educational and cultural institutions) and implementation of common digital education in the Polish society. This objective will also involve launching academic specialisation connected with digital education (MAiC, 2013: 94).

Activities towards the improvement of digital literacy are also one of the specific objectives of the Human Capital Development Strategy 2020. It provides for the development of digital literacy of teachers in order to increase the frequency of using interactive teaching methods and high-quality didactic e-resources, as well as equipping schools and institutions with devices enabling wide application of ICTs (The Act No. 104 of the Council of Ministers of 18 June 2013).

As part of operational programmes at the central and regional level, many projects are implemented to increase teachers' ITC literacy. One of them is the Operational Programme Digital Poland for 2014-2020. Projects financed within this programme are divided into three groups:
– planning and development of broadband infrastructure providing access to high-speed Internet
– extending the scope of public services available online
– promoting the use of Internet and improving digital literacy.

Academic units are among the institutions entitled to receive the grants (www.pol-skacyfrowa.gov.pl 2019).

In the years 2012-2013 the governmental programme "Digital School" (Cyfrowa szkoła) was carried out. It focused on developing teachers' and students' competencies in using the latest information technologies. It had 4 components: e-school (providing schools with proper hardware), e-student (purchasing digital devices for students), e-teacher (trainings in ICT use for 40 "e-coaches", 1,200 "e-moderators" and 19,000 e-co-ordinators) and e-textbooks (developing 18 free e-textbooks and 2,500 open educational resources) (Journal of Laws of 14 April 2012, Item 411).

In 2015 the Ministry of Administration and Digitisation together with the Ministry of National Education initiated the project of the National Education Network (Ogólnop-olska Sieć Edukacyjna, OSE) the purpose of which is to provide schools with fast, secure and free Internet access (there are about 30,000 schools in Poland). NASK, the national research institute, is the project operator. The purpose of the project is to promote the use of new teaching tools, increase the competencies of students and teachers, and level the educational opportunities among the Polish students. We need to remember that there are still households in Poland, which lack access to the global network. First schools joined the National Education Network as from 1 September 2018. More school will join gradually until the end of 2020. The initiative was recognised by the UN agenda, International Telecommunication Union and received the WSIS Prize 2018 (https://ose.gov.pl/). In March 2019, during the II Digital Literacy Congress in Tarnów, "Tarnów Declaration for Digital Transformation of Polish Schools" was signed by the Ministry of Digitisation, the Ministry of Science and Higher Education and NASK. The declaration is open. It states, among others, that "Digital transformation of Polish schools requires support and mobilisation of many partners, organisations and institutions, which have already been active in this field. Let us join our efforts in developing an 'educational ecosystem of the National Education Network' – a natural, well communicated school environment which responds to the challenges of the 21st century and supports local initiatives and exchange of experiences. An environment that promotes innovative use of digital teaching resources and didactic methods, stimulating students' cognitive appetite" (Deklaracja 2019). The declaration addresses the issue of digital literacy among teachers: "Teachers of all subjects should constantly develop these competencies by participating in trainings providing them with practical skills which are as important as their subject knowledge. We postulate creating a system within the existing Integrated Qualifications System for recognition of the qualifications of teachers in the area of methodical and digital competencies" (Deklaracja, 2019). Simultaneously, the Ministry of National Education is carrying out another governmental programme, Active Whiteboard (Aktywna Tablica). The purpose of the programme is the development of school infrastructure and ICT literacy among students and teachers by equipping primary schools in interactive boards, projectors, speakers and interactive touchscreen monitors (www.aktywnatablica.org, 2019).

On of the regional initiatives in the area of life-long learning projects developing digital literacy among the teachers was the Digital Didactics Laboratory (Laboratorium Dydaktyki Cyfrowej, LDC) addressed to schools in Małopolskie region. The main purpose of the project was to improve the quality of teaching in the region by June 2015. The specific objectives included:

– increase teachers' competencies in digital didactics
– create conditions favouring the development of qualifications in ICT-supported teaching. The Centre for Digital Didactics is to ensure these conditions
– prepare a resource database and a contact network, which will help to create a system for the improvement of digital literacy among teachers in Małopolskie region (Laboratorium Dydaktyki Cyfrowej, 2019).

The Digital Didactics Network (Sieć Dydaktyki Cyfrowej, SDC) will be a highly effective tool to implement the postulates of popularisation of ICT-based teaching. The new system consists of the following: online information database, Centre for Digital Didactics, 4 information points, 72 Digital Teaching Specialists, Digital Education Leaders, trainings for teachers, trainings for school directors, mentoring, contests and Local ITC Excellence Groups (Grynienko, Srokowski, 2015:91-92). The project was addressed to the teachers and directors in the lower- and upper-secondary schools in Małopolskie region. The main final product was to be the Centre for Digital Didactics (Centrum Dydaktyki Cyfrowej, CDC) – the most innovative space for professional testing (didactic experiments) and development of the new model solutions based on the results obtained. At present, the Centre is located in the Centre for Professional Development of Teachers in Tarnów. It provides substantive support for the teachers and schools all over the country. In order to improve digital literacy of all the project participants and teachers interested in the initiative, an online education service was launched. It supports the non-formal life-long learning, that is, enables the exchange of teaching resources such as publications, multimedia files or presentations.

Other interesting initiative was the programme "Active Education" (Aktywna edukacja) executed by the Centre for Citizenship Education (CCE). The objective of the programme was to equip school directors and teachers in competencies necessary to integrate ICT into their work. The participants learned about the most effective methodical and organisational solutions to integrate modern equipment into teaching and learning process (Ulotka CEO, 2019). One of the activities was the "Digital Path" (Cyfrowa ścieżka) dedicated to school teams (a director and a group of teachers). It involved an online training and team meetings dedicated to the exchange of experiences, through which the participants could extend their knowledge and learn how to effectively introduce technologies to schools (CEO, 2019). The year-long online training addressed the principles of effective teaching and introducing ICT during classes. It was Retrieved from two versions to tailor it as much as possible to the functions performed by the teachers. Thus, there were courses for school coordinators and subject coordinators. The school coordinator training covered the following issues: selection and management of

equipment, and effective organisation of work. The subject coordinator course had as much as 12 versions. The organisers wanted to ensure that their content was the most possibly adequate to the specifics of the teaching methods applied for certain subjects (CEO, 2019). Coaching sessions consisted of six thematic modules, each lasting for about a month. Each module ended with practical implementation of the theory taught. Program moderators provided assistance to the teachers during the programme. One the most important expected outcomes is the initiation of collaboration between teachers in the offline and online space. This collaboration will be the key element of life-long education in this professional group. To meet the needs of certain schools, the organisers also prepared the additional offer of trainings within the "Active Education" programme. Courses IDĘ DALEJ (I keep on walking), NA SKRÓTY (Shortcuts) and IDĘ SAM (I am walking alone) complement the "Digital Path" trainings (CEO, 2014).

Improving the level of digital literacy also involves preventive activities. One of them is the programme "Bezpieczna+" (Safety+) launched by the Ministry of National Education and executed in the years 2015-2018. One of the programme components is dedicated to safe navigation in the cyberspace (Bezpieczna+, 2019). The media prevention activities were implemented within two projects: "Cybernauts" (the institution responsible was the Modern Poland Foundation) and "Digitally Safe" (Cyfrowo Bezpieczni) (Cities in Internet Association from Tarnów). Their purpose was to improve digital literacy and raise the awareness among the stakeholders of education process taking place in media environment (Tomczyk, 2017:226). Within the first project, a diagnosis of the level of literacy regarding safe use of ICT among students, teachers and parents was conducted. The results helped to design trainings for each of the investigated groups and create a repository of educational resources on digital safety. The repository is the first catalogue of this type (FNP, 2017). The "Digitally Safe" project involved organisation of school events dedicated to digital safety, during which workshops for students and meetings with teachers and parents were held. 2,200 mentors of digital safety (one in every school) received methodical supervision. Another element of the project was the contest titled "We are digitally safe!". The rewards were mobile digital laboratories and the participating schools organised original classes dedicated to digital safety. The project also involved launching a special consultation point for school directors, teachers and parents, and a series of national scientific conferences (Tomczyk, 2017). The programmes presented above have contributed significantly to the paradigm shift in media pedagogy (Tomczyk, Wąsiński, 2017).

Digital literacy increase is the key element of teacher training standards. The Polish Information Processing Society (Polskie Towarzystwo Informatyczne, PTI) supervised the development of teacher training standards in the area of ICT. The standards combine two complementing trends in using ICT in education: integration of technologies with different fields of education and using computers for educational purposes. A special team also developed the standards for preparing teachers to teach separate IT classes, designed a training curriculum and criteria and tracks for applying for a didactic computer

skills certificate (PTI, 2019). The standards are an important reference point during designing teacher training curricula in universities and teacher professional development frameworks. The curricula list the ability to use modern IT as one of the necessary competencies. These competencies can be developed during dedicated academic courses like: information technology, media in education or modern technologies in education and counselling. They are taught during both, first (bachelor's) and second (master's) cycle.

The paper presents the most important initiatives in Poland, dedicated to the improvement of digital literacy and media prevention. Apart from the above mentioned activities, there are many other regional and local initiatives.

CHALLENGES AND USE OF TECHNOLOGICAL INNOVATION

DIGITAL STORYTELLING

Digital storytelling (DS) has developed in Poland thanks to, among others, the availability of free multimedia editing software (www.dobreprogramy.pl, www.instalki.pl, www. komputerswiat.pl) and the growth of the level of technical skills connected with online activity. More and more often, Poles use YouTube channel to communicate with the networked community, sharing amateur and professional materials. First mentions about this form of media communication were published in Historia i Media (History and Media) website http://historiaimedia.org/. The author of the text described the workshops organised in the Centre „Brama Grodzka – Teatr NN", which referred to Digital Storytelling. He introduced the definition and reflected on the usefulness of this form of communication (Wilkowski, 2009). With time, DS has become a successful tool used in Polish formal and informal education. This form enables introduction of new content, synthesis of large parts of materials, conduction of qualitative studies, gaining experience and new competencies in using digital communication tools or recognition of students' talents (Monte Christo, 2014).

In 2013, the Ad Hoc Foundation from Warsaw executed a project financed from the Civic Initiatives Found (Fundusz Inicjatyw Obywatelskich, FIO), aimed at supporting NGOs in the following areas:
– searching for ever more effective and innovative methods of work with the beneficiaries
– improving the competencies in ICT use.

The objective was the systematisation of knowledge and experiences, as well as training special educators who would be capable of *using various forms of digital narrative, according to the context, target group and objectives of activities* (ADHOC, 2019). The final product of the project was a textbook available off- and online and a training (5-day workshop) in combining the narrative and digital techniques. The evaluation of the learning outcomes involved preparation and production of original scenarios of classes using digital storytelling. The textbook titled "Digital Storytelling. Educator's textbook" covers the theoretical, practical, technical and methodological issues related to the application of digital

narratives. The valuable component is the presentation of good practices, case studies and comprehensive list of publications and online resources (ADHOC, 2019). The textbook is available at https://ec.europa.eu/. Other projects are regional or local.

As part of the EU project "Valuing All Languages to Unlock Europe" (VALUE), the University of Social Sciences in Łodź organised a training and workshops for teachers in using Digital Storytelling in intercultural/multilingual education (SAN, 2019). The final product was an e-publication in PDF. Unfortunately, readers who are not familiar with the issues presented therein, may find it hard to comprehend.

Trainings in this area are also carried out by other organisations, for example the New Media Academy (Akademia Nowych Mediów). The trainings are online and free of charge, and participants receive confirmation of the competencies obtained after submitting an assignment (narrative). The training consists of 6 parts: explanation of the term, presentation of the narrative creation process, guidance and tips for organisers, case study analyses, assignments and external resource database (Akademia Nowych Mediów, 2019). Training offers can be also found in the Education Centre EST website. They are addressed to teachers of different specialisations, trainers, educators, occupational therapy instructors, therapists, teachers in various care institutions, culture animators, volunteers and employees of organisations engaged in adult education. Teaching materials are archived in an online platform (www.artescommunity.eu/storytelling). For foreign resources, users can use the "Polish subtitles" option. The platform is part of the project T&D Stories – Theatre and Digital Storytelling for Teaching and Training Development co-financed by the European Union within Erasmus+ programme. The project coordinator is the Bielsko Artistic Association Grodzki Theatre, the partners are: FondazioneNazionale Carlo Collodi (Italy), DúnLaoghaireInstitute of Art, Design and Technology, (Ireland) Alþjóðastofan/Intercultural Centre, (Iceland), Education Centre EST, (Poland) (TDStories, 2019).

The online resources include different types of education portals (e.g. media education, media-based school) containing ready scenarios using this narrative form or PDF textbooks about its application in school practice.

The KARTA Centre represents the Polish social archives and its role is to provide free tools and expertise to archivists and promote bottom-up independent archiving initiatives. The centre has published a textbook "Digital storytelling – why create digital stories based on archive collections. Tools – technologies – inspirations". The document describes different types of presentations and Digital storytelling tools (Archiwa społeczne, 2019).

Several key projects in Poland targeted young people.

A project worth mentioning is the one implemented by the Association of Creative Initiatives "ę" (Towarzystwo Inicjatyw Twórczych "ę") and Evens Foundation. The project named Praga.Lab http://pragalab.e.org.pl/w was carried out as part of the "Media" programme by Evens Foundation and was addressed to the young people (13-18 years old). The teenagers took part in a workshop held in Warsaw district Praga, and created a story about their neighbourhood using new media (photos, stop motion, photocasts) (2019).

In 2011 in Gdańsk, Orange Academy launched the project "Films and pixels. Visual Education", which combined visual and cultural education with search for local identity. Young people aged 12-18 prepared film and photo materials (Platforma kultury, 2019).

The educational project organised by the Centre for Citizenship Education titled "Filmowe pogwarki" (Movie chats) also targeted this age group. It aimed at discovering local language traditions and expanding the knowledge about local folk culture (legends, tales, songs, history of places and rituals). The project involved a series of workshops held in public libraries all over the country. The project blog blogiceo.nq.pl/filmowe pogwarki was launched, becoming the platform for communication between the participants and experts and presentation of their work (Stowarzyszenie, 2019).

Other similar project was called "The Film Collection of Borderland Fairy Tales" (Kolekcja Filmowa Opowieści Pogranicza), by the Borderland Foundation (Fundacja Pogranicze). The goal of it was: *to create an environment for creative cooperation of children and youth from different national, cultural and religious backgrounds.* It resulted with the collection of stop-motion animations. The collection is Retrieved from the online Polish film database (FilmPolski.pl, 2019).

Teachers and students in Wrocław took part in the project "The Stories of the Displaced". The goal of the initiative was to record "the monuments of the spoken word" of people displaced after the II World War from the East to Lower Silesia region (Podręcznik, 2019).

Poland has quite numerous Digital Storytelling resources. The Oral History Archive of the Karta Centre is the biggest collection of biographical relations from the 20th century. It consists of over 4 thousand audio recordings, 100 videos and other historical testimonies. More information can be found at: http://www.audiohistoria.pl.

The above mentioned projects are mostly local. There are no nation-wide initiatives addressed to wider groups of beneficiaries Workshops organised within the certain projects do not last long and thus, the topics may be covered only to some, limited extent. Trainings are free but they lack effective promotion. They are advertised on the organisers' websites which are not visited by many ordinary Internet users.

We lack conferences and seminars to share the insights, experiences and good practices. Digital Storytelling is only discussed during single presentations. In 2017, Adam Mickiewicz Institute organised the Digital Cultures conference during which Polish authors and producers met with culture managers from abroad. The program of the conference addressed four areas of digital activity: computer games, immersive storytelling, digital archives and modern museology. The meetings are now cyclic and are the platform for forming international partnerships and promoting Polish cultural achievements. Since 2015, the Institute develops the area of digital culture and supports Polish artists who operate at the juncture of digital technology and art (IAM, 2019). There are also single events, for example meetings with foreign experts.

To summarise, Digital Storytelling has been popularised in a rather narrow scope, thanks to the efforts of single media education leaders. It has its advocates among the highly-competent teachers and educators. Others are not familiar with this method or do not know how to use it. Surely, there is a need for more reliable methodological and didactic resources and trainings addressed to a wider audience.

Blockchain

This technology is used mainly in the business sector. Polish media deemed 2018 the blockchain year. In December 2018 Fintech Committee of the Polish Chamber of Information Technology and Telecommunications published the report "Blockchain in Poland Opportunities and applications" edited by Marcin Chruściel. The report presents business implementation of the blockchain system. It shows the possible applications, analyses business results and provides recommendations. The report was developed by experts who use this technology in practice and was published to provide *a reliable description of the technology so that blockchain is no longer present only as newspaper and Internet headlines and becomes one of the projects that bring transformation in many business areas (Comparic.pl, 2018).* Unfortunately, so far blockchain has not been widely used in the Polish public sector.

The Ministries of Development, Digitisation, Finances, Infrastructure and National Education have introduced a joint programme "From paper to digital Poland" (Od papierowej do cyfrowej Polski) aimed at the development of e-state, building awareness of the possible applications of blockchain and development of thedigitall currency exchange markets (Dudek, 2017). At present, there are 9 working tracks: "Digital Public Services", "E-reporting", "Distributed Registers", "e-Transportation, e-Flows", "Development of Cashless Payments", "e-Invoice, e-Receipt", "e-Teaching", "Artificial Intelligence" and "Internet of Things". The tracks "Digital Identity", "IT Architecture", "National Framework", "e-Donations and e-Benefits", "e-Health" and "Cyber Security" were completed or changed their formula (Ministerstwo Cyfryzacji, 2019). In 2018 the Chamber of Blockchain and New Technologies was established. One of its strategic objectives is education of society and institutions.

One of the important initiatives in Poland is the Blockchain Technology Centre operating by the Lazarski University (it was the first research and education unit in the Central-Eastern Europe). Its mission is to supply the market with the necessary interdisciplinary knowledge about the blockchain technology and obtain grants. Its activity covers four areas: economics and finances; law and regulations; security and information technologies. The Lazarski University also launched postgraduate studies in legal issues related to this technology (Uczelnia Łazarskiego, 2019).

Polish administration gradually implements the solutions supporting secure online processing of various administrative affairs, however, there is still much to be done.

In the education sector, blockchain technology enables *storing digital certificates and signatures, thus ensuring secure and open platform for cooperation and access to*

educational resources (Dudek, 2017:60). Compared to other countries, Poland has little experience in using this technology in education.

A Polish-Canadian company Educhain developed new solutions for institutions to streamline instant issuance and verification of digital documents. At present, in Dubai, the company has been introducing the world's biggest pilot project. Students and graduates will be able to generate blockchain-enabled documents from academic systems and add them to their personalised "Academic Passport" (Kopański, 2018).

Polish universities use electronic administration, however digital documents are not always recognised as official. They are not properly secured either. In order to reduce the fairly common practice of producing false university diploma, Polish Accelerator of Blockchain Technology has been introducing the Dokuchain project (http://www.do-kuchain.com/). The tool is dedicated in the first place to universities but due its agility, it can serve in many other applications. The advantage of the tool is that is can be integrated with the existing systems (Akcelerator.tech, 2019).

The above mentioned initiatives are just a drop in the ocean of needs, especially in the education sector. Digitisation of schools and universities generates the need to deploy modern technologies, in particular those ensuring safety of all participants of the education process. Fast user identification and document validation will surely streamline the functioning of the whole system. Activities promoting the development of new solutions and improvement of literacy of Polish citizens in using these technologies are the strategic objective for the next years.

So far, implementation of blockchain technology in education in Poland is at the pilot or testing stage. What is noticeable, is the widening gap between the willingness to apply the distributed database technologies and the actual scope of deployment of these applications (Dudek, 2017: 64). Experts notice that implementation of blockchain technology is necessary for the development of education in the 21st century and a warrant of open and transparent education system. First of all, a wide scope of activities should be undertaken to raise the awareness of the social benefits and potential of this technology (Dudek, 2017) among the education authorities and institutions responsible for its implementation within the education sector. All solutions should be promoted already from the very initial stage of their development.

Global sharing pedagogy

Universities are usually the main computer nodes. Computer networks may be local (several buildings) or global (world wide computer network). Most often, universities provide access to their open repositories of scientific publications. These networks serve to support the exchange of intellectual achievements between the users. Sometimes, universities offer shareware applications which require paid subscriptions after the free trial period. They also provide access to their libraries.

According to the Webometrics Ranking (Ranking Web) by CSIC, which serves mainly to promote the so called Open Access, the best Polish university (University of Warsaw) was located at 349 position among over 24,000 investigated institutions. The Jagiellonian University was 387 in the ranking whereas Warsaw University of Technology was 436. These results should mobilise Polish academic centres to expand their online presence. Poland faces many challenges, such as:

– university authorities should define the strategy of online presence of institutions and individual staff members
– universities should ensure professional management of their e-marketing ecosystem
– data repository (books, papers) development and management should be the top priority
– academic staff members should be obliged to active contribution to their profiles in Google Scholar, ResearchGate, Wikipedia, Academia, personal websites etc.
– the role of virtual space in building school status in every field should be strengthened (Mazur, 2017).

Only a small group of ICT enthusiasts and teachers associated in specialist groups like the Superteachers, uses selected components of global sharing pedagogy. Guidebooks on open educational resources translated from English list some Polish (still very few) and global repositories with direct links to the materials (Pędzich, 2011). We still lack Polish initiatives and practical materials within the global sparing pedagogy.

The most important questions to deal with in the nearest future are the transformation of awareness of Polish citizens and a thorough, accurate diagnosis of needs in this regard. The next step is a complex promotion of the good practices from other countries. For typical Internet users, specific solutions and opportunity to test them are the most convincing.

Business aspect of ICT in education and inclusion in Poland

Average spend per student from the state budget is little less than PLN 6,000. The biggest subsidy per student is given to primary schools — over PLN 8,000. 42% of the total amount is teachers remuneration, the rest are investments, renovations and social expenditures (Sztanderska, 2013). Within the next years, there will be more programs supporting families with school-age children. The key element of social support is the continuation of 500+ programme (PLN 500 of monthly support for each children in a family, starting with second child). The government also plans to introduce other solutions such as school starter kits (PLN 300). The bigger school, the bigger opportunities to invest in innovative didactic tools. Except traditional solutions, connected with the so called educational-financial calculator per student, there are many programmes, financed mostly from the EU funds, that support technical retrofitting of schools. However, it is worth to mention some insight found in the report by the Polish Teachers' Union (Związek Nauczycielstwa Polskiego), according to which "annual expenses per student according to purchasing power at

all education levels in Poland mount up to USD 6948 PPP. This locates out country in the lower part of the ranking, below the OECD (USD 9760 PPP) and EU average (USD 9908 PPP) (Jakubowski, Wiśniewski, 2018). On the one hand, Poland is found near the bottom of the list, but considering the dynamics of economic growth, measured, among others, by GDP, or the growth of educational service market, our country has potential to increase its investment share. This assumption is supported, for example, by programs dedicated to upgrade technical infrastructure in schools. The vast majority of investments in ICT are made through programmes like: Human Capital Operational Programme (covering up to 100% of all expenses), Regional Operational Programmes, Digital Poland Programme, Operational Programme Knowledge Education Development or Erasmus+.

For example, in 2012-2013, the Ministry of National Education spent PLN 50 million for additional school equipment and improving digital literacy within the program Digital School. Another PLN 11 million was provided as additional support for the local government institutions. Project "E-podręczniki do kształceniaogólnego" (E-textbooks for general education) cost almost PLN 50 million. It involved production of 62 electronic textbooks which are now out-of-date due to already mentioned recent changes in education system (phasing out of the lower secondary level) (NIK, 2017). At present, another programme called "Aktywnatablica" (Active Board) is being implemented, that focuses on technical equipping schools in devices like interactive boards. Total budged for this program for 2017-2019 amounts up to PLN 279,428,000. It will be covered in 80% from the state budget and at least 20% from local funds (MEN, 2017). In terms of scale and budget, it is one of unprecedented national projects. Centrally managed programmes set the pace for modernisation of Polish schools through digitisation.

Expenditures on education are not only subsidies granted by the state, EU or educational programmes and other intervention initiatives, e.g. trainings, but they also include cost of education covered from family budgets.The government plans further increase of systemic funds for equipping schools. Investments continued within the programmes implemented in the years 2014-2020 are financed from Operational Programme Knowledge Education Development and Regional Operational Programmes. School digitisation programmes are currently financed from centrally managed programmes. For example, connecting one school to fast Internet is PLN 8,111 net per access point, whereas internal installation, including Wi-Fi access points, costs PLN 3,500 net. The national project of the Ministry of Digital Affairs provides 15 thousand schools with connectivity of at least 100 Mb/s (Woźny, 2017). These schools will soon have efficient infrastructure that will enable further investments in software solutions.

Despite low general values in national perspective, state institutions do not spent little on education. In Poland, this factor amounts up to 5% of GDP. In general, the EU countries spent 4.9% of their Gross Domestic Product on education. In 2017 Bloomberg report Poland was ranked as 22. in the world, one position higher than last year. As for amounts spent on education per citizen, we are near the bottom of European list.

Average EU expenditure is EUR 1.4 thousand per capita. In Poland, it is EUR 584 annually. This results mainly from the GDP value (Frączyk, 2017). In this area also, the trends are promising for Poland — expenses on education grew slightly but regularly. Despite relatively low GDP comparing to other EU states, Poland spent a lot on education. When we include costs supporting formal education incurred by parents or guardians, education becomes one of the priorities in the society.

General government total expenditure on education, 2015
(as % of GDP)

EU = 4.9%

ec.europa.eu/**eurostat**
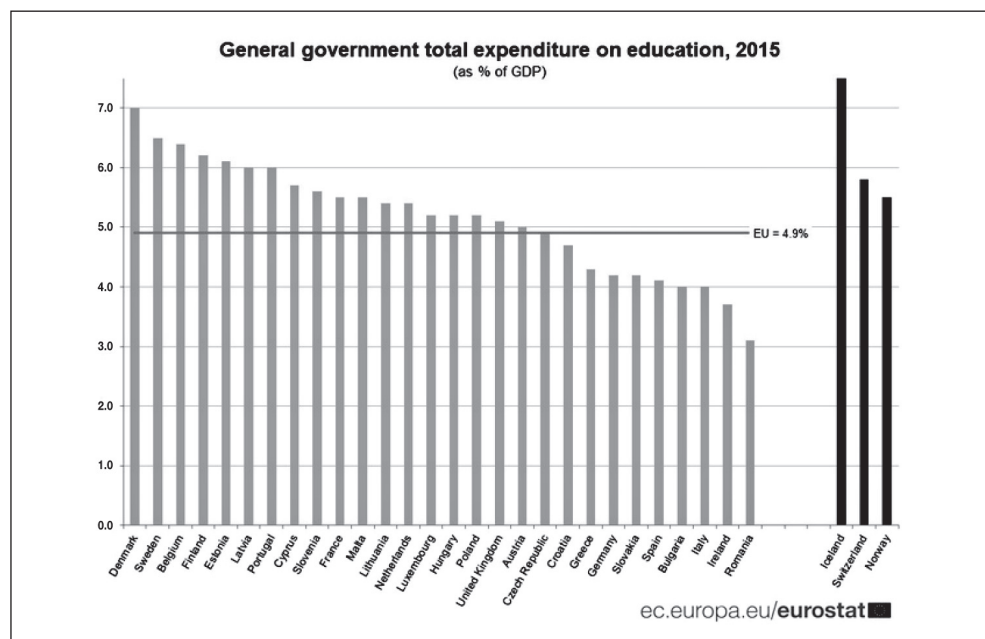
While analysing the issue of ICT in education, it is worth to remember that electronic devices market in Poland is already worth almost EUR 9 billion. Each year, it grows by at least few percent, sometimes even faster thanks to, for example, social programs like 500+. Consumers want to buy hardware and regularly spend more on it. As for average amounts spent on electronic goods per capita, we are at the end of Europe's tail, spending EUR 230 annually. In addition, it is worth to remember that Polish market is one of the cheapest regarding average prices of equipment (Mazurkiewicz, 2017). Most of it is purchased once every few years — in case of laptops or tablets, whereas mobile phones are mostly purchased as part of subscription agreement with mobile operators who include cost of the device into their monthly invoices. However, experts agree that electronic market in Poland is developing noticeably, because during the last decade expenditure on the purchase of electronic equipment increased by almost a half.

National recommendation to SELI project

At present, Poland is at the stage of intense implementation of ICT into educational processes. The outcomes are not only schools equipped with IT hardware (of different quality) but, first of all, the number of central projects and programmes increasing the scope and frequency of ICT usage. There are also many debates (conferences, expert meetings) related to the analysis of the positive and negative consequences of ICT implementation into the school life as well as discussions over the styles of ICT use among children and youth. Thus, we can say that the representatives of Polish school system, regardless of the level of education, are more and more aware of the possibilities digital media can offer, and consider both, the risk paradigm and the opportunities paradigm in their analyses. Improving digital literacy among the main stakeholders happens in many dimensions, mainly thank to external sources of financing (programmes co-financed from the structural funds to increase the level of human capital). These multi-level, complex training activities carried out during the last decade show the potential and opportunities of applying ICT in education. The process is also supported through regional conferences and comprehensive activities performed by NGOs, methodical centres or self-learning groups. Computerisation is a well established process in Polish education, a proof of which may be the electronic journals that in many schools have replaced paper systems of recording grades and frequency. This optimistic vision should be completed with several information about the negative outcomes of ICT implementation in schools. First, teachers often underestimate the potential of the new technologies, and their knowledge and attitudes vary. Failure to use ICT in a constructive way often results from poor infrastructure (old equipment, slow connection) and well-established teaching routines. At the same time, we need to emphasise that students of pedagogical directions have the opportunity to familiarise themselves with modern IT solutions which support learning and teaching during their academic training. In this context, a particular focus should be on the pedagogical faculties which should have modern IT laboratories where future teachers will improve their digital literacy to be able to respond to the challenges of the developing information society. A special reflection should also be given to the diagnosis of the level of digital literacy among teachers and pedagogy students in relation to both, technical use of the digital media and understanding the mechanisms of media influence of human behaviours. Polish media pedagogy is a sub discipline of the social (education) sciences and has been changing dynamically along with the emerging opportunities and threats of the digital world and intense development of IT infrastructures in schools.

Solutions designed within the SELI platform may turn out to be particularly useful for future teachers who – by participating in modern e-learning courses – will improve their digital literacy. Platforms like SELI enable introduction of additional content to academic curricula such as information technology or media in education. The important aspect of this process is the development trainings which will meet the needs of Polish

education system, with relevant content addressing the real challenges. When designing the platform, the diverse level of digital literacy among teachers and university students should be taken into consideration. The platform resources should be Retrieved from Polish, what will make them more useful and accessible to a wider audience.

In the context of e-inclusion, trainings available on the SELI platform may be of use for NGO, U3A or senior club educators who are not thoroughly prepared to teach adults and seniors. Many e-inclusion trainers base on their own didactic experience obtained outside the adult education institutions, and have no through methodological background in andragogy. Digital literacy coaches are often teachers who are prepared to work with children but have no methodological training based on andragogical or geragogical solutions. SELI platform provides the opportunity to increase the level of digital literacy in this group – educators in U3As, senior clubs or human capital development projects. Such courses may utilise the proven and well established Polish theoretical and methodological solutions developed within the didactic, scientific and academic projects. When generating these resources, we should also ensure they are practical and multimedia-based. The platform should be: innovative, practical and easily accessible. It should be the response to the challenges and needs related to the existing and future stages of e-inclusion.

References

Academia Electronica (2019). *Academia Electronica - Instytut Filozofii* UJ. Retrieved from http://www.academia-electronica.net/

Akademia Nowych Mediów (2019). *Storytelling.* Retrieved from http://szkolenia.ikm.gda.pl/course/storytelling/?course_type=content&course_page=1

Akcelerator.tech. (2018). *Dokuchain – system uwierzytelniania dokumentów.* Retrieved from http://www.akcelerator.tech/pl/dokuchain-system-uwierzytelniania-dokumentow/

Analiza Rynku (2016). *Polski Rynek Książki.* Retrieved from http://analizarynku.eu/polski-rynek-ksiazek

Archiwa społeczne (2019). *Wsparcie AS-ów.* Retrieved from https://archiwa.org/wsparcie

Barnes, C. & Geof, M. (2008). *Niepełnosprawność.* Tłum. P. Morawski, Warszawa: Wydawnictwo Sic.

Baron-Polańczyk, E. (2013). Czynniki różnicujące kompetencje informacyjne nauczycieli oraz wykorzystywanie metod i narzędzi ICT (doniesienie z badań). *Ruch pedagogiczny.* numer 1 | 81-95.

Baron-Polańczyk, E. (2015). Powody niestosowania ICT w praktyce zawodowej - w opinii nauczycieli. *Problemy Profesjologii,* nr 1.

Baron-Polańczyk, E. (2018). Przygotowanie się do zajęć lekcyjnych w hierarchii ważności działań dzieci i młodzieży w świecie ICT – w opinii uczniów i nauczycieli (raport z badań). *Ruch Pedagogiczny*, nr 2/ 2018.

Batorski, D. (2013). Polacy wobec technologii cyfrowych--uwarunkowania dostępności i sposobow korzystania. *Contemporary Economics*, vol. 7 SI.

Castells, M. (2009). *Communication Power*. New York: Oxford University Press.

Centrum Edukacji Obywatelskiej (CEO) (2014). *Folder szkolenia.* Retrieved from https://aktywnaedukacja.ceo.org.pl/sites/aktywnaedukacja.ceo.org.pl/files/folder_szkolenia_2014.pdf

Centrum Edukacji Obywatelskiej (CEO) (2014). *Ulotka.* Retrieved from https://aktywnaedukacja.ceo.org.pl/sites/aktywnaedukacja.ceo.org.pl/files/ulotka_cyfrowa_sciezka_net.pdf

Centrum Edukacji Obywatelskiej (CEO) (2019). *Cyfrowa Ścieżka. Opis programu*. Retrieved from https://aktywnaedukacja.ceo.org.pl/cyfrowa-%C5%9Bcie%C5%BCka-%E2%80%93-opis-programu

Comparic.pl (2018). Blockchain w Polsce. Możliwości i zastosowania – raport Komitetu

Czerski, W., Warer, R. (2014). *Cyfrowa szkoła" – szansa, czy zagrożenie dla edukacji?*.

Dębski, M. (2016). *Nałogowe korzystanie z telefonów komórkowych*. Gdańsk: Fundacja Dbam o Mój Zasięg.

Dokuchain (2019). *Bezpieczna i wiarygodna weryfikacja dokumentów oparta na technologii Blockchain*. Retrieved from http://www.dokuchain.com/

Dudek, D. (2017). Możliwości wykorzystania technologii blockchain w obszarze edukacji. *Informatyka Ekonomiczna*. 3(45). pp. 55-65. DOI: 10.15611/ie.2017.3.05

Edukacja Medialna (2019). *Lekcja: Narracje cyfrowe.* Retrieved from https://edukacjamedialna.edu.pl/lekcje/narracje-cyfrowe/

Film Polski.pl. (2019). *Kolekcja Filmowa Opowieści Pogranicza*. Retrieved from http://www.filmpolski.pl/fp/index.php?film=4224287

Fintech PIIT (2018) Raport „Blockchain w Polsce. Możliwości i zastosowania" Retrieved from https://www.raportblockchain.pl/

Frączyk, M. (2017). *Wydajemy na edukację ponad 5 proc. PKB. Więcej niż Niemcy i Wielka Brytania*. Portal Money.pl

Fundacja Ad Hoc (2019). *Digital Storytelling - warsztaty dla edukatorów.* Retrieved from https://comparic.pl/blockchain-w-polsce-mozliwosci-zastosowania-raport-komitetu-fintech-piit/

Gacka, J. (2017). Polscy seniorzy w Sieci: wirtualna złota jesień? Korzystanie przez osoby dojrzałe z Internetu i nowych technologii. *Konteksty społeczne*, 2017/ t. 5, nr 1.

Gołdys, A., Krzyżanowska, Ł., Stec, M.& Ostrowski, Ł. (2012). *Zoom na UTW. Raport z badania*. Warszawa: Towarzystwo Inicjatyw Twórczych „ę".

Grynienko, K. et. al. (2013). *Innowacyjne zastosowania rozwiązań i narzędzi cyfrowych w kształceniu na poziomie gimnazjalnym i ponadgimnazjalnym w województwie małopolskim*. Tarnów: Stowarzyszenie Miasta w Internecie.

Grynienko, K., & Srokowski, Ł. (2015). *Program podnoszenia kompetencji nauczycieli w zakresie wykorzystania ICT dla wdrażania modelu dydaktyki cyfrowej w gimnazjum i szkołach ponadgimnazjalnych*. Małopolskie Centrum Doskonalenia Nauczycieli. Retrieved from http://www.ldc.edu.pl/phocadownload/Nowe_produkty/poradniki/program_podnoszenia.pdf

GUS (2016). *Społeczeństwo informacyjne w Polsce. Wyniki badań z lat 2012-2016*. Warszawa: Główny Urząd Statystyczny.

GUS (2017). *Budżety gospodarstw domowych w 2017*. Warszawa: Główny Urząd Statystyczny.

GUS (2017). *Wydatki rodziców na edukację dzieci w roku szkolnym 2017/2018*. Warszawa: Główny Urząd Statystyczny.

GUS (2018a). *Mały Rocznik Statystyczny Polski*. Warszawa: Główny Urząd Statystyczny.

GUS (2018b). *Informacja o sytuacji osób starszych na podstawie badań Głównego Urzędu. Statystycznego*. Główny Urząd Statystyczny: Warszawa.

Instytut Adama Mickiewicza (IAM) (2019). *Konferencja*. Retrieved from http://digitalcultures.pl/pl/konferencja/o-konferencji

Instytut Badań Edukacyjnych (2014). *Nowe technologie mogą pomóc się uczyć, ale i mogą zaszkodzić*. Retrieved from http://www.ibe.edu.pl/pl/media-prasa/aktualnosci-prasowe/353-nowe-technologie-moga-pomoc-sie-uczyc-ale-i-moga-zaszkodzic

Instytut Nowoczesnej Edukacji (INT) (2019). *5 korzyści płynących z używania technologii podczas lekcji*. Retrieved from http://www.ine.com.pl/raporty/5-korzysci-plynacych-z-uzywania-technologii-podczas-lekcji/

Jachimowicz, D. & Nalepa, W. (2012). *Tworzenie Uniwersytetu Trzeciego Wieku krok po kroku*. Nowy Sącz. Retrieved from https://www.federacjautw.pl/alutw/images/stories/tutw.pdf

Jakubowski, M., Wiśniewski, J. (2018). *Wydatki, korzyści i dostęp do edukacji: polska a kraje oecd w świetle Raportu Education At A Glance 2017*. Warszawa: Związek Nauczycielstwa Polskiego.

Kopańko, K. (2018). *Blockchain w edukacji – Polacy robią największe na świecie wdrożenie. Szkoda, że nie u nas, a w Dubaju*. Retrieved from https://www.spidersweb.pl/2018/03/educhain-blockchain-polska-dubaj.html

Laboratorium Dydaktyki Cyfrowej (LDC) dla szkół województwa małopolskiego (2019). *Opis projektu*. Retrieved from http://www.ldc.edu.pl/index.php/opis-projektu.html

Łódzkie Centrum Doskonalenia Nauczycieli i Kształcenia Praktycznego (2019). *W otwartej Europie wszystkie języki są ważne*. Retrieved from https://www.wckp.lodz.pl/spoleczna_warsztaty

Łysek, J. (2013). Program „Cyfrowa Szkoła". *Nauczyciel i Szkoła*, 1 (53), 213-225.

Marcinkiewicz, A. (2012). Uniwersytet Trzeciego Wieku jako instytucja przeciwdziałania marginalizacji osób starszych. *Ogrody nauk i sztuk,* nr 2. DOI: 10.15503/onis2012-458-467

Marzantowicz, K. (2016). *Jak przygotować polskich uczniów na wymogi jutra? „Raport Edu-Tech 2016. Nowe technologie w świecie edukacji.* wyd. Edutorial.pl. Retrieved from https://edutorial.pl/wp-content/uploads/2016/09/raport-edu-tech-2016.pdf

Masłyk, T., Migaczewska, E. (2014a). Portret aktywnego, niepełnosprawnego użytkownika sieci internetowej. *Niepełnosprawność – zagadnienia, problemy, rozwiązania*. Nr III/2014(12).

Masłyk, T., Migaczewska, E. (2014b). Charakter użytkowania Internetu przez osoby niepełnosprawne i sprawne w perspektywie cyfrowego wykluczenia – analiza porównawcza. *Studia Socjologiczne*, 2.

Masłyk, T., Migaczewska, E., Stojkow, M., Żuchowska-Skiba, D. (2016). *Aktywni niepełnosprawni? Obywatelski i społeczny potencjał środowiska osób niepełnosprawnych*. Kraków: Wydawnictwa AGH.

Mazrukiewicz, P. (2017). Polacy chcą mieć więcej elektroniki. *Rzeczpospolita.* Retrieved from http://www.rp.pl/Analizy-Rzeczpospolitej/306069871-Polacy-chca-miec-wiecej-elektroniki.html

Mazur, G. (2017). *Webometrics – ranking dla uczelni doceniających „digital”.* Retrieved from http://grzegorzmazurek.pl/webometrics-ranking-dla-uczelni-doceniajacych-digital/

Ministerstwo Administracji i Cyfryzacji (2013). *Polska 2030. Trzecia fala nowoczesności. Długookresowa Strategia Rozwoju Kraju.* Warszawa. Retrieved from http://kigeit.org.pl/FTP/PRCIP/Literatura/002_Strategia_DSRK_PL2030_RM.pdf

Ministerstwo Cyfryzacji (2019). *Od papierowej do cyfrowej Polski*. Retrieved from https://www.gov.pl/web/cyfryzacja/od-papierowej-do-cyfrowej-polski

NASK (2017). *Natolatki 3.0. Wybrane wyniki ogólnopolskiego badania uczniów w szkołach*. Warszawa: Instytut Badawczy NASK.

NASK (2017). Projekt ustawy o OSE przyjęty. Retrieved from https://www.nask.pl/pl/aktualnosci/wydarzenia/wydarzenia-2017/800,Projekt-ustawy-o-OSE-przyjety.html

Niemczyk, A. (2016). Seniorzy wobec nowych technologii. *Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, nr 303.

NIK (2017). *Cyfryzacja szkół. Informacja o wynikach kontroli*. Warszawa: Najwyższa Izba Kontroli.

OSE (2019). NASK o OSE i ekosystemie cyfrowym w szkole podczas Kongresu Kompetencji Cyfrowych w Tarnowie. Retrieved from https://ose.gov.pl/aktualnosci/nask-o-ose-i-ekosystemie-cyfrowym-w-szkole

Ostrowska, M. & Sterna, D. (2019). *Technologie informacyjno-komunikacyjne na lekcjach Przykładowe konspekty i polecane praktyki*. Warszawa: ORE.

Paprzycki, M. & Mitchell, T. (1996). *Globalne sieci komputerowe i ich rola w pedagogice*. Retrieved from https://repozytorium.amu.edu.pl/bitstream/10593/7215/1/15_Marcin_Parzycki_170-180.pdf

Pędzich, W. (2017). Przewodnik po Otwartych Zasobach Edukacyjnych (OZE). Warszawa: Koalicja Otwartej Edukcji

Plebańska, M. (2017). *Polska szkoła w dobie cyfryzacji*. Warszawa: Uniwersytet Warszawski & PCG Edukacja.

Plichta, P. (2013). Młodzi użytkownicy nowych mediów z niepełnosprawnością intelektualną - między korzyściami i zagrożeniami. *Dziecko krzywdzone. Teoria, badania, praktyka,* 12(1).

Plichta, P. (2017). *Socjalizacja i wychowanie dzieci i młodzieży z niepełnosprawnością intelektualną w dobie cyfryzacji*. Toruń: Wydawnictwo Adam Marszałek.

Polska Cyfrowa (2019). *Dla kogo jest Program?* Retrieved from https://www.polskacyfrowa.gov.pl/strony/o-programie/zasady/dla-kogo-jest-program/

Polska Cyfrowa (2019). *Koncepcja realizacji projektu w ramach konkursu w Działaniu 3.1 „Działania szkoleniowe na rzecz rozwoju kompetencji cyfrowych" Programu Operacyjnego Polska Cyfrowa Część A1.* Retrieved from https://cppc.gov.pl/images/uploads/za%C5%82.-nr8_Koncepcja_realizacji_projektu_cz._A.pdf

Polskie Towarzystwo Informacyjne (PTI). (2019). Standardy przygotowania nauczycieli w zakresie technologii informacyjnej i komunikacyjnej Retrieved from https://ecdl.pl/wp-content/uploads/2016/05/Standardy-PTI_v3.0.pdf

Polskie Towarzystwo Informatyczne (PTI) (2010). *Standardy przygotowania nauczycieli do prowadzenia wydzielonych zajęć informatycznych*. Warszawa: PTI.

Potyrała, K. (2017). *iEdukacja. Synergia nowych mediów i dydaktyki*. Kraków: Wydawnictwo Uniwersytetu Pedagogicznego.

Prashing, B. (2006). *Learning Styles in Action*. Network Continuum Education.

Prensky, M. (2001). Digital Natives, Digital Immigrants. *On the Horizon*. MCB University Press, Vol. 9 No. 5, October 2001)

Procesor.pl. (2019). *Syntezator mowy online – idealna propozycja dla osób niedowidzących i do nauki języków*. Retrieved from https://procesor.pl/news/syntezator-mowy-online-idealna-propozycja-dla-osob-niedowidzacych-i-do-nauki-jezykow

Program Bezpieczna+ (2019). Retrieved from https://www.gov.pl/web/edukacja/bezpieczna-

Program Operacyjny Polska Cyfrowa na lata 2014-2020 (2019). Retrieved from https://www.polskacyfrowa.gov.pl/media/55216/POPC_Program_3_0_17042018.pdf

Robbins, S.& Antoine, D. (2017). *Second Life w nauczaniu*. E-mentor 4(21). Retrieved from http://www.e-mentor.edu.pl/artykul/index/numer/21/id/473

Robinson, K. (2013). *Zmiana paradygmatu w edukacji.* Retrieved from http://kenrobinson.pl/kenrobinson-edukacja/

Rozporządzenie Rady Ministrów z dnia 3 kwietnia 2012 r. w sprawie warunków, form i trybu realizacji przedsięwzięcia dotyczącego rozwijania kompetencji uczniów i nauczycieli w zakresie stosowania technologii informacyjno-komunikacyjnych (2012). *DZ.U. z dnia 16 kwietnia 2012 r. Poz. 411.* Retrieved from http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WDU20120000411/O/D20120411.pdf

Silver code (2018). Kompetencje cyfrowe to kroki milowe do naszej przyszłości…. Warsztaty kodowania dla seniorów. Retrieved from https://www.silvercodeproject.eu/fls/doc/newsletters/silvercode_newsletter1-pl.pdf

Siuda, P., Stunża, G. D., Dąbrowska, A. J., Klimowicz, M., Kulczycki, E., Piotrowska, R., Rozkosz, E., Sieńko, M., Stachura, K. (2013). *Dzieci Sieci 2.0: Kompetencje Komunikacyjne Młodych.* Gdańsk: Instytut Kultury Miejskiej.

Społeczna Akademia Nauk (SAN) (2019). *Projekt VALUE: W otwartej Europie wszystkie języki są ważne.* Retrieved from http://www.dpm.san.edu.pl/wgrane-pliki/value_szkolenie-dst.pdf

Stowarzyszenie Pracownia Etnograficzna (2019). *Filmowe pogwarki.* Retrieved from https://etnograficzna.pl/filmowe-pogwarki/

Strycharz, J. (2013). *Polski rynek książek a interwencja poprzez program Cyfrowa Szkoła.* Warszawa: Centrum Cyfrowe.

Strzecha, J. (2012). Stan infrastruktury informatycznej w polskich szkołach plastycznych. *Dydaktyka informatyki.* 2012 | 7 | 168-179.

Sztenderska, U. (2013). *Koszty edukacji od przedszkola do gimnazjum.* Warszawa: Instytut Badań Edukacyjnych.

TDStories (2019). Retrieved from https://artescommunity.eu/storytelling/pl/

Tomczyk, Ł. (2017). *Nowe media a zagrożenia i działania profilaktyczne na przykładzie założeń programu Bezpieczna+*, In M. Górka (ed). Cyberbezpieczeństwo dzieci i młodzieży. Realnyi wirtualny problem politykibezpieczeństwa. Warszawa: Difin, pp.326-335.

Tomczyk, Ł. (2018). *Wolontariusze i seniorzy w programie Polski Cyfrowej Równych Szans: o siłach społecznych w procesie minimalizacji wykluczenia cyfrowego w Polsce.* Kraków: Wydawnictwo Naukowe Uniwersytetu Pedagogicznego.

Tomczyk, Ł., & Wąsiński, A. (2017). Parents in the Process of Educational Impact in the Area of the Use of New Media by Children and Teenagers in the Family Environment. *TED EĞİTİM VE BİLİM.* doi:10.15390/eb.2017.4674

Tomczyk, Ł., Srokowski, Ł., Wąsiński, A. (2016). *Kompetencje w zakresie bezpieczeństwa cyfrowego w polskiej szkole (Digital safety competencies in Polishschools).* Tarnów: Stowarzyszenie Miasta w Internecie.

Tomczyk, Ł., Szotkowski, R., Fabiś, A., Wąsiński, A., Chudý, Š., & Neumeister, P. (2015). Selected aspects of conditions in the use of new media as an important part of the training of teachers in the Czech Republic and Poland - differences, risks and threats. *Education and Information Technologies*, 22(3), 747–767. doi:10.1007/s10639-015-9455-8

Towarzystwo Inicjatyw Twórczych (2019). *Projekt PragaLab*. Retrieved from http://pragalab.e.org.pl/

Uczelnia Łazarskiego (2019). *Centrum Technologii Blockchain. Retrieved from* https://www.lazarski.pl/pl/wydzialy-i-jednostki/instytuty/wydzial-ekonomii-i-zarzadzania/centrum-technologii-blockchain/

Urząd m.st. Warszawy Wydział Badań i Analiz Centrum Komunikacji Społecznej we współpracy z Biurem Pomocy i Projektów Społecznych (2013). *Raport z badania opinii słuchaczy warszawskich uniwersytetów trzeciego wieku. Warszawa*. Retrieved from http://politykaspoleczna.um.warszawa.pl/sites/politykaspoleczna.um.warszawa.pl/files/artykuly/zalaczniki/raport_dot_utw_maj_2013.pdf

UTW UJ (2019). *Ulotka.* Retrieved from https://utw.uj.edu.pl/documents/6082181/c7219266-7d6a-427c-8506-39a241ead22d

Wilkowski, M. (2009). *Digital storytelling: nowa jakość opowiadania. Historia i Media*. Retrieved from http://historiaimedia.org/2009/11/12/digital-storytelling-nowa-jakosc-opowiadania/

Włodarczyk, K. (2013). *Wykorzystanie technologii informacyjno-komunikacyjnych w aktywizacji osób niepełnosprawnych*. Warszawa. Retrieved from http://umiejetnoscicyfrowe.pl/wp-content/uploads/2015/09/ICT_w_aktywizacji_Fundacja-Aktywizacja.pdf

Woźny, P. (2017). *Działania Ministra Cyfryzacji dotyczące zapewnienia szkołom dostępu do bardzo szybkiego internetu*. Warszawa: Ministerstwo Cyfryzacji (prezentacja PPT).

Wygotski, L. (1971). *Wybrane prace psychologiczne*. Wybór i przekł. E. Flesznerowa, J. Fleszner. Warszawa: PWN.

Zagrożny, J. (2019). Na styku niepełnosprawności i technologii informacyjno-komunikacyjnych. Retrieved from http://www.wdialogu.uw.edu.pl/images/Rezultaty/Dostepnosc_narzeedzi_IT.pdf

Żółkiewska, S. & Pankowska, M. (2019). *Digital storytelling - dlaczego warto tworzyć cyfrowe opowieści ze zbiorów archiwalnych Narzędzia – technologie – inspiracje*. Retrieved from https://archiwa.org/sites/default/files/files/digital_storytelling_instruktaz.pdf

Żylińska, M. (2013). *Neurodydaktyka. Nauczanie i uczenie się przyjazne mózgowi*. Toruń: Wyd. Uniwersytetu Mikołaja Kopernika.