Virtual and Technological Learning Enviroments

Educational Spaces 21.
Open up!

Vol 2.

EDUSPACES21

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EDUCATIONAL POTENTIAL OF NEW TECHNOLOGIES

LEARNING CAN BE MORE AMAZING

EFFECTIVE USE OF EDU TECHNOLOGIES

INTRODUCTION

Teachers and school principals are often unaware of the value of online education and e-learning. Why should we consider virtual spaces as important part of the learning environment in the 21st century? What more do we need to know about the relationship between how people learn and the use of digital technologies to enable us to design, plan, prepare and construct learning environments which will enable learners to be prepared for the 21st century life? What small steps can we currently take to use technology in a more innovative and creative way to develop synergy between formal and informal learning?

In schools, the simplest defence mechanism against the unknown is the statement: *we must forbid it*. Ideas to prevent students from using the Internet and mobile devices brought from home in schools are very common. It's forbidden, and that's that, even for learning purposes. It would not take long to find examples in school regulations; a web search will quickly reveal such restrictive schools among the results displayed on the first page. The situation is common for many countries in the European Union, to the great detriment of students' education… and teachers' professional development.

A teacher who doesn't know and doesn't use new educational technologies in teaching cannot work in my school, the principal of one of the Polish schools confessed[1]. Furthermore, he would expect that his teachers not only know how to use communication and information technologies (ICT) tools, but that they use them in a smart way. So that digital and social competences of the students and the teacher could really develop. Is it difficult? If one is determined to avoid the abundance and advantages of online learning resources, it is indeed very complicated. Perhaps we should observe how others work with students using ICT tools, copy their ideas and try to do something our own way, to learn and grow?

 In this part, when discussing virtual technological aspects of learning environments, we will touch upon questions of infrastructure, networks and computer devices. We will also report on less tangible, but equally vital matters – learning processes that occur partly in the classroom and partly in the 'invisible' virtual space. We will also pay attention to the

> **The introduction of information and communications technology is changing the way we live, work, teach and learn. It is also challenging the notion of traditional institution-based learning.**
>
> - 21st Century Learning Environments, OECD, 2006

changes that need to be introduced in the attitudes of educators. *The most important 'teaching technology' in the school is the teacher*, says Prof. Maciej Sysło from the Nicolaus Copernicus University in Toruń (Poland). Every technology needs to be updated after a certain time – therefore teachers must grow constantly. With this in mind, schools need to provide their teachers with opportunities for training, and testing new teaching methods in new learning environments. Thanks to the Internet, we now have at our disposal the most powerful educational tools ever created by man. We should therefore look for synergies in order to better teach and learn in diverse educational spaces of the school: physical, virtual and social.

Virtual educational space

Thanks to the development of the Internet and new technologies, the virtual space became the new environment for work and cooperation between learners. In should be understood as broadly as possible. What we talk about here includes both

synchronous learning (with the use of such interactive tools as e.g. blogs, Wikipedia, chatrooms, collaborative documents) and asynchronous learning (communicating via e-mail, instant messengers, online discussions and projects, using educational applications). The principal feature of this space is its fluidity. Virtual environment does not have physical dimensions, it emerges whenever people log in or out of it, new relationships are created, knowledge is exchanged and sharing occurs[2]. It is a dynamic space, 'invisible' to the eye and undergoing constant changes. Therefore, an immense advantage for education is the fact that the learning process can currently occur in the physical and virtual spaces simultaneously.

Introduction of technology into the learning space is an evolutionary process, and a rather lengthy one. The place of educational technologies and the virtual space must be well planned, both in an existing school and in the schools currently being designed. Thus we can maximise the benefits of including ICT in the learning process. It would be easy to imagine errors made in the design phase, which would make mobile technologies inaccessible in certain places in the school, even if those places should be suitable for the purpose (for instance, due to an insufficient Wi-Fi signal strength or insufficient number of power outlets). Technological infrastructure and the virtual space should be designed together with the physical space and stem directly from the objectives and educational concepts adopted for the school..

How to maximise the benefits of e-learning?

CTs properly used in class encourage students to think, create and solve problems in a new, and innovative way – to think outside the box. How then should we organise appropriate learning environment in the virtual technological space?

Learning is deeper, enhanced and relevant if technological and virtual learning spaces provide[3]

- **active and interactive participation,**

- **opportunity for team work,**

- **searching for and sharing information,**

- **opportunity for discussion and presentation,**

- **building knowledge,**

- **activities conducted both by the teacher and students,**

- **connectivity, access to experts,**

- **access to local and global networks,**

- **personalised learning mode.**

This is when we can speak of *ICT-rich learning spaces* which really support the learning process[4]. In other words, learning spaces in the school must be flexible enough, so that students and teachers can freely use new educational technologies. It constitutes another challenge for the designers of educational spaces. The first and the most important step is an appropriate network organisation in the school. The network should:

- be accessible to all members of the school community, in all the school buildings and their vicinity,

- enable Internet and intranet access via any mobile devices or computers and other stationary devices,

- provide access to resources from the outside for students who are ill or who work from home (e.g. individualised education programme) as well as for parents, to a relevant extent.

As a certain minimum, we can assume that in such a smartly organised learning environment[5]:

- students and teachers are provided with legal and constant access to relevant digital school resources, databases, online tools for analysing, processing, modifying and creating knowledge as well as to information resources, tools for researching, evaluating and storing educational content, and interactive tools which enable online collaboration with their peers;

- teachers, parents and students share information and resources in real time, on an ongoing basis, during and outside school hours;

- school management understands and manages: access to data related to the educational process, data flow and its use in popular formats, while protecting intellectual property rights, rights to privacy and providing online data security; decision-making process based on facts and evaluation which aims at continual improvement of the learning environment performance; constant knowledge and information flow between school servers and the outside world.

Learning spaces, both physical and virtual, are the planned environments in which learning takes place. 21st century learning requires new spaces that connect school, home and community learning, increasing flexibility and supporting learning outside the boundaries of school buildings and beyond the conventional school day.

Learning Spaces Framework: Learning in an online world, MCEETYA - Ministerial Council on Education, Employment, Training and Youth Affairs (Australia and New Zealand), 2008

**MARCIN POLAK,
Think! Foundation & Edunews.pl, Poland**

FOUR PILLARS OF THE TECHNOLOGICAL SPACE

The digital space in the school should rest on four pillars that are discussed in this chapter. The network needs to be professionally organised in such a way that learning can take place not only in the school building, with all its classrooms and corridors, but also in its immediate vicinity. How to prepare the school well for effective application of educational technologies?

The use of technology in the school should be smart and well planned. It should not be an end in itself, but rather its main objective should be supporting educational processes. The role of technology is to create new development space for students – complement and enhance their presentation, activation, and cognitive capacities, support young people's creations and creativity. In order for technology to really fulfil this role in the school, it is necessary to properly plan its implementation. A school digitization programme should constitute an element of a long-term school development strategy. Within this strategy, we should clearly specify where we are and where we are heading to. In our school, this process relies on four pillars: **infrastructure, services, education and management**. Each of them must be evenly developed and each is equally important.

Infrastructure

This element is often believed to be the most essential. After all, without the hardware, there is no technology. However, the issue of infrastructure cannot be considered only within the meaning of purchasing equipment for end-users, which is the case for many schools. What is of the utmost importance here is preparing a suitable digital educational environment, a comprehensive and well-organised space in which the learning process can take place.

Such an environment consists not only of computers or tablets, but first and foremost, of devices ensuring the integration of various equipment, their management, access to the local network and the Internet. The infrastructure must be based on pro-

fessional solutions, as the school is a professional institution in which reliability and stability of technological solutions is vitally important. In a school equipped with educational technologies, a very unique set of conditions exists. A relatively limited surface of a classroom houses a significant number of devices, with just as many of them in the room next door. Thus the network and access infrastructure should enable managing a large number of devices. The practice in our school shows that each day there are more wireless devices working in our space then the combined number of students and teachers. Everyone carries a mobile phone in their pocket and also uses a laptop or tablet in class. It's only natural. A properly designed network enables access in every place in school: not only in classrooms, but also in corridors, in the gymnasium or in the yard. Such an umbrella of wireless network provides accessibility and transparency of various educational services, which constitute the second pillar of our process.

Services

We should treat technology at school in terms of access to various educational services. And there are many. For instance, e-textbooks, videoconferences, the e-register, educational platforms, digital museums, laboratories, science parks, documents repositories, digital libraries, the VOIP telephone system, as well as remote administration or data archiving services. However, we often look at services from the perspective of the infrastructure. The question repeated time and time again is: how fast a connection should we have at our school? The answer is simple: a connection that ensures the

highest level of execution of educational services currently required in the school. We should not expect hard data in the form of megabits, as it is a variable difficult to estimate. However, it is certain that the necessary condition for providing a basic array of educational services is a broadband Internet access provided for the school building via a fibre-optic cable (see more in: *Fibre Optic Network* chapter). Then it is possible to adjust service parameters to the ever-changing reality.

It is precisely the infrastructure that would guarantee the reliability of this and many other educational services. This factor is particularly essential, and unfortunately often underestimated. Success cannot be achieved when even the best prepared lesson turns out to be a failure due to reasons as mundane as a faulty cable, lack of Internet access or dead laptop battery. Skilful implementation of services in the school secures proper operations of digital educational environment, enabling the creation of new spaces for the community of students,

parents and teachers; for project and task groups. Thanks to them, it is possible to foster key competences, such as creativity, responsibility and ability to group working.

Education

It is the third, and quite an obvious element. Everything we do – the entire infrastructure together with various services – is intended to efficiently fulfil the school's educational goals. This is why it is so crucial to remember that technology has an ancillary function, and that it should reinforce and support educational processes. The idea should always take the principal place. What do we want to do and how can we achieve it? Never the other way round. The worst situation is when we have the equipment and then we wonder for what we should use it... Our activities involving technology should not replace anything else. Tablets will not replace textbooks, and electronic notes will not replace handwritten ones. What would be the point? Technology that only replaces something else in the

school is not really necessary. What could provide excellent assistance in shifting the thinking paradigm with regard to using technology in education is the SAMR model analysis**[6]**. The last two stages – modification and redefinition – are models to which we should aspire. We should also remember that these levels can't be reached if previously discussed pillars are neglected. In this area we should also pay attention to the cooperation with parents and the local community. We are the ones who can provide services, organise classes, educational projects, involve parents and the local community in their execution, e.g. Internet courses for senior citizens, in which students can serve as excellent guides to the 'digital realm'.

Education means also training and self-training mechanisms for teachers. Competences of the teaching staff are of no small importance in the implementation of technologies. Even the best prepared communication and information technologies (ICT) implementation programme for the school cannot succeed without the support of the teaching staff. Teachers' training should be properly tailored, in order to respond to a particular problem in school and show how, with the use of technology, obstacles can be removed, and certain processes streamlined.

Nowadays technology is not a factor in itself, but an effective everyday work tool for a teacher, educator and headteacher. For a teacher, using technology is not a privilege, but an obligation. Even if personally they are not technology enthusiasts, in an official capacity they are obliged to use it. It is a requirement for a nominated teacher, and certified teachers must additionally prove their ability to apply such skills in everyday educational and teaching work. According to rules adopted in the EU, the ability to use technology is a key competence. Whether we want it or not, there is no turning back. An appropriate level of digital competences can be ensured also by organising informal teachers' cooperation networks in the school. Sharing knowledge and experience, and learning from one another, are particularly valuable and desired abilities.

Management

It is the fourth pillar that enables using technology in the process of school administration. It includes both the computerised operations of the school front office, HR and accounts, and stable functioning of such areas as the e-register, which is an excellent management tool. It is incredibly important to select the tool that will ensure this pillar's functioning on an adequate level. The crucial element here is the proper communication within school. It should be efficient and organised in such a way that each employee has access to a professional e-mail account, records repository, regulations, opinions issued by educational advisory and counselling centres, etc. Integrated services should be linked to a calendar and notes system. Thus, calling a staff meeting takes only several clicks or taps on a tablet. The meeting date is immediately entered into the teacher's calendar, and a set of electronic documents can be attached to the event entry. The condition for efficient school management via technology is providing stable access to this technology for teachers. They should be equipped with appropriate devices – a laptop or a tablet which can guarantee the ability to immediately send or receive messages, and swiftly access e.g. appropriate documents from anywhere via the Internet.

DARIUSZ STACHECKI,
Feliks Szołdarski Middle School
in Nowy Tomyśl, Poland

SOLID
FUNDAMENTS

BROADBAND INTERNET CONNECTION

Many schools in Europe face the challenge of accessing online educational resources. In order for the learning process to take place also in the virtual space, we need fast Internet. How can we secure it for all students and teachers in the school?

JACEK ŚCIBOR

School Complex in Chrząstawa Wielka, Poland

Opening this publication with such a fundamental issue as providing the school with Internet access may be surprising. It is, however, justified, if we consider the fact that still an astounding number of schools, even in large cities, have enormous difficulties with Internet access.

Using the online educational space and its digital resources depends on four technical factors: the school's access to the external broadband Internet connection; distribution of the network signal inside the school while maintaining the quality of the connection which enables simultaneous operations of multiple devices; acquisition and preparation of devices for teacher's work; and the implementation of a tool which integrates teacher's community in a network.

The school of approximately 300 students in Chrząstawa Wielka set itself a task of making the Internet accessible in every classroom and implementing a tool which would enable teachers to use it in their daily activities. During the two months when students were away for summer holidays, the school Local Area Network was restructured and modernised. Its routing was simplified, unnecessary switches were eliminated and network devices were replaced with uniform equipment of one brand producer. A cable LAN was developed to include all classrooms, by installing network sockets in each of them. A subnetwork was allocated to the school administration. A new service provider was acquired for the network free of charge, in exchange for installing a transmitter on the roof of the school. Furthermore, the capacity of the connection was increased five-fold for the teacher's computer network and computer classrooms. Each classroom was equipped with a desktop computer for the teacher. Projectors were permanently installed and connected to the teachers' computers, interactive boards and speakers in eight classrooms. An e-register was introduced as the only and principal record of teacher's work and student's accomplishments. A separate, scalable Wi-Fi network was designed and built (initially only for one floor), administrated remotely by a solution provider.

After the holidays, changes were noticed and approved by both students and the teaching staff. Since classrooms had reliable Internet connection, it quickly turned out that teachers wanted to use online educational resources. Therefore, they requested stationary projectors and speakers for the computers installed in every classroom. The lessons started to be conducted in a more interesting and varied manner. Students gained the opportunity to create their own resources to present in class. Computers that had been sufficient thus far turned out not to be powerful enough for teachers' and students' rapidly increasing demands. Teachers requested the installation of an Internet connection with a higher throughput and a professional Wi-Fi network, to be used by students. In grades from 1 to 3, a BYOD (Bring Your Own Device) model was introduced. Pupils could use tablets on loan from the public library. Furthermore, the school purchased 15 tablets intended for educational use and students

started to attend classes supported by these devices, connected to the new, dedicated Wi-Fi network.

Good advice

There are many entities on the market that offer Internet access for schools. In Poland, after the transformation of the national telecommunications operator TP S.A. into Orange S.A., the obligation to provide telephone or Internet service to schools ceased to be the company's statutory objective. Market diversification admitted also other entities to the backbone network overtaken by Orange[7]. However, price lists still feature a commercial subscription service for cable Internet broadband access for schools. It is most likely the first solution to look at, but it would be advisable to research as many offers as possible. Among them (especially in the cities) there will certainly be many instances of very fast and easy to install LTE connections. These should rather be avoided as such services are not suitable for the school's needs.

TIME:
1-3 months to upgrade the Internet connection, 1-3 years for an effective use of the connection in teaching.

FUNDS:
In Poland PLN 4,300-7,500 (the estimated cost of connecting classrooms to the Internet and purchasing Wi-Fi network equipment) plus monthly subscription cost.

RESPONSIBILITY:
headteacher, school computer network administrator (computer science teacher, school digitization leader), and external installation company or school maintenance staff.

School is a professional institution, which needs professional equipment. Organising an Internet network should not rely on devices intended for home use, which sooner or later fail.
Photo: Jacek Ścibor
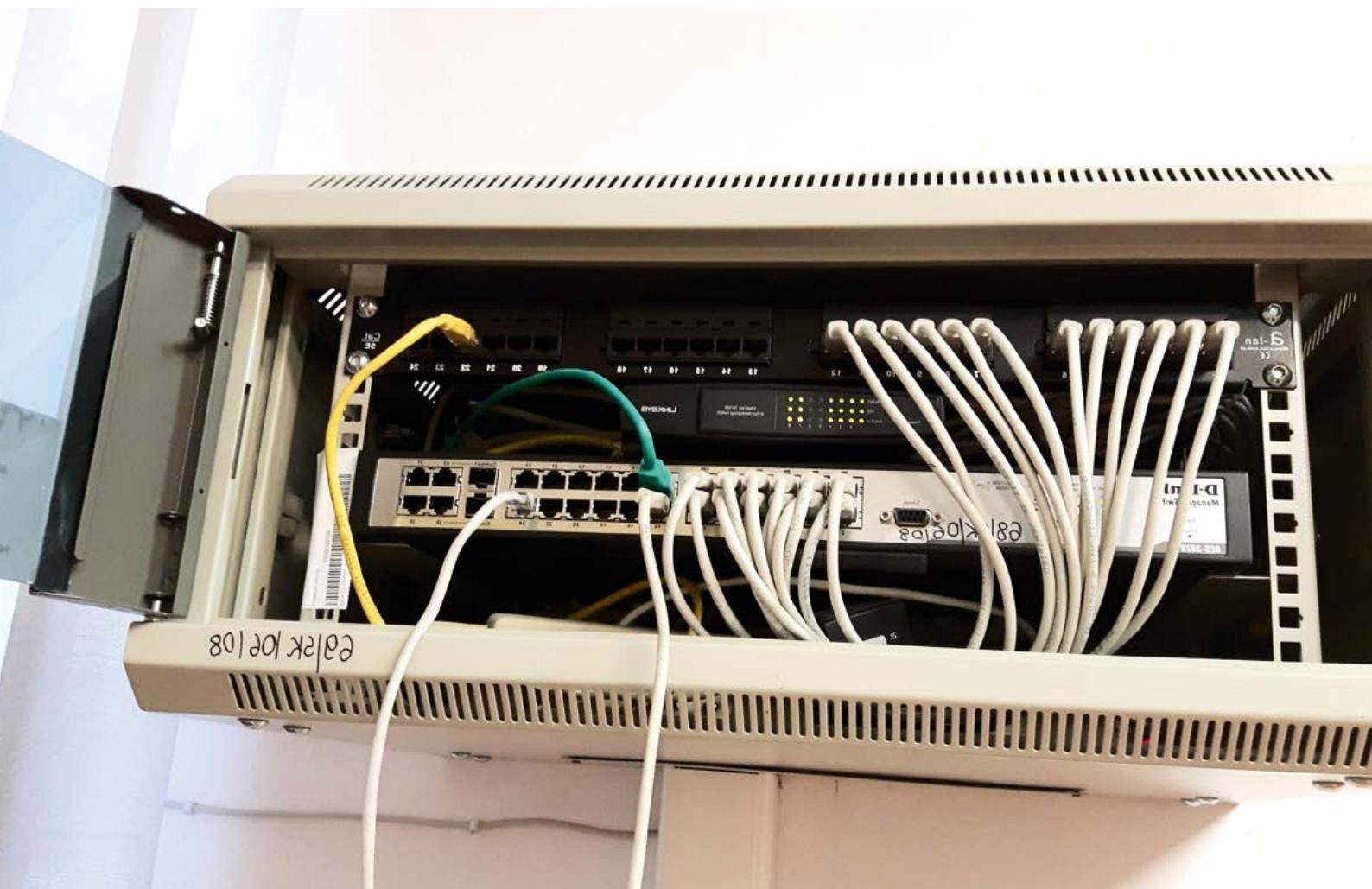
FIBRE-OPTIC NETWORK

Academic institutions often use the fibre-optic backbone network connecting major academic centres in the country. Can schools be connected to this network as well? How can it be achieved?

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Every school should have a high speed broadband Internet access. Determining definitive needs with regard to the necessary transfer is different for each institution and it would be difficult to calculate a uniform standard for such a connection, as for each school current requirements may vary.

These needs are estimated not only on the basis of the number of current and future students and teachers, but they should also take into account rapid development of the technology itself. The connection which currently meets the needs of the school, may turn out to be insufficient in the near future. A fibre-optic based network can provide the

solution to this predicament. Virtually unlimited data transfer speed, dependent only on the increasingly efficient end-user devices, is an excellent remedy for such problems.

In Poland, backbone fibre-optic networks are accessible mainly for over twenty academic centres connected by fibre-optic cables to the PIONIER network. Operators offering fibre-optic backbones include also PKP (Polish Railways) and Orange. A connection to all fibre-optic backbone networks is performed by external companies (there are approx. 3,500). At present, they have no business incentive to supply fibre-optic cables to economically inviable places, which include the locations of the majority of Polish schools (rural areas and small towns). In this situation, there are three known ways of acquiring a fibre-optic Internet access for a school.

Firstly, the initiative of a body managing the school (in Poland this task belongs to local governments), which performs a comprehensive installation of fibre-optic network in facilities it governs, seeing also to the internal network (e.g. schools in Września, Ząbki, Uniejów). Secondly, the initiative of the body managing the school which installs a fibre-optic network only for the school building (such a solution

Schools could be connected to fibre-optic networks that are operated by universities and scientific institutions. How could this be achieved?

was implemented by the municipality of Szczecin for all its schools). Thirdly, the school's own initiative to connect to the fibre-optics network possible due to its location, e.g. a large housing estate (the Middle School in Nowy Tomyśl). If the government undertakes appropriate steps to ensure the connection of schools across Poland to a fibre-optics network, the situation can soon change for the better, due to large financial means from European funds being put into action.

Thanks to the professionally installed fibre-optic network and application of tested technical internal network solutions, schools in Nowy Tomyśl, Uniejów, Września and Ząbki had the opportunity to purchase and use devices dedicated for multiple students. In Uniejów, approx. 250 of almost 600 computer devices owned by students and teachers are permanently connected to the network, while the server of the Middle School in Nowy Tomyśl shows on average over 400 devices logged in at once.

The aforementioned schools have become undisputed leaders of digital didactics in their respective regions. Internet accessibility and data transfer speed in the Middle School in Nowy Tomyśl resulted in the creation of classes equipped with tablets, which are main technological learning devices for students. Students of e-classes are recruited from the most accomplished students leaving Primary Schools. Students' interest in learning involving new technologies conducted by teachers especially trained for this purpose (who have personalised mobile devices for work use, about which you can learn more in *Personal Laptop or Tablet for Every Teacher* chapter). The school uses educational clouds as well as free and paid learning software.

The students at the Primary School no. 6 in Września also use tablets and prove their undeniable usefulness for gathering and processing information. Devices are treated as tools of a modern student, with particular attention paid to the purpose of usage and its advisability.

Meanwhile, the Primary School in Ząbki based its development on Microsoft cloud technology. Students use network storage and online applications for learning all subjects. Technology enables conducting classes with the use of cutting-edge tools and IM software which 'digital students' enjoy a great deal.

Good advice

Installing the fibre-optic cable for the school building does not guarantee a qualitative technology leap without an appropriately designed internal network, prepared for large data transfers (more on this subject in School Network Administrator chapter). Equally indispensable are devices capable of processing such data, relevant training of the teaching staff and students in preparation for the use of digital tools, as well as providing teachers and students with access to the specific catalogue of educational services (more on this subject in next chapter – Organisation). Thinking about the quality of Internet access, we need to simultaneously launch a discussion among the teaching staff and plan the work on the school development programme, in which we would determine how the institution could use the technology for education and management.

TIME:
several months or more (depending on procedures, on which schools have little impact).

FUNDS:
if the financing comes from external (public) funds – the cost for the school is minimal. If a telecommunications operator provides the service – the cost amounts to a monthly subscription fee.

RESPONSIBILITY:
headteacher, computer network administrator, managing body officials.
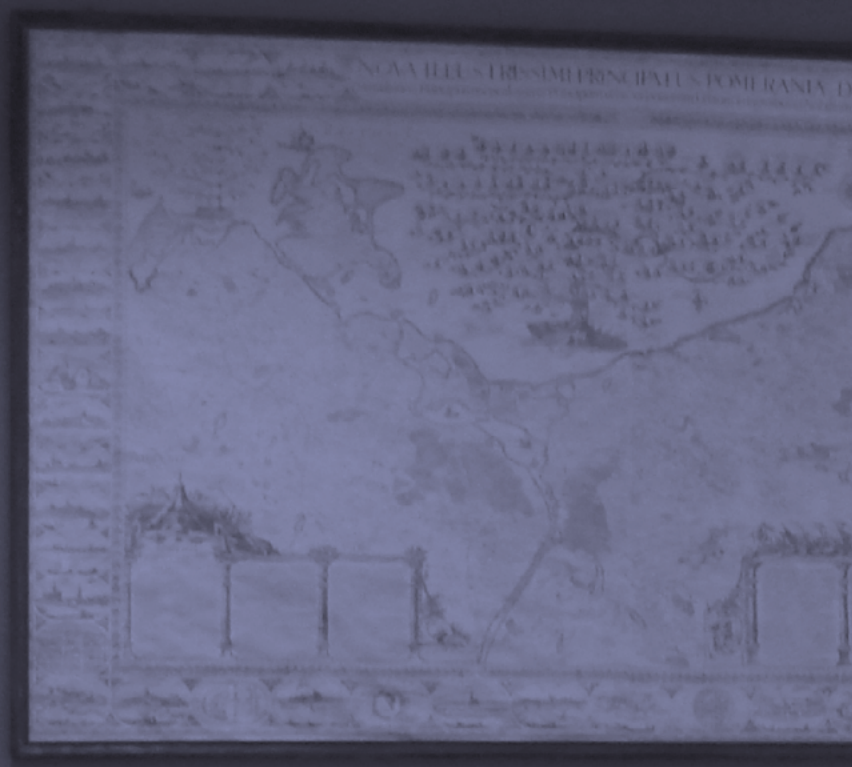
ORGANISATION

E-LEARNING PLATFORMS

The school can use multiple resources addressed to students and teachers, stored on virtual educational platforms. They enable downloading and uploading documents useful in the learning process

DARIUSZ ANDRZEJEWSKI

John Paul II Public Primary School no. 6 in Września, Poland

The key to the development of the school online educational space is a free access to educational resources for teachers and students anywhere and anytime, at school and at home. There are several solutions, which often coexist in schools. These are either commercial or free licence solutions that enable uploading users' own educational materials in order to store and share them with other users. Such methods are often local, involving a school server. However, more and more often schools are also using external platforms, which are provided on service providers' servers and based on the SaaS *(Software as a Service)* model. Alongside the service, users get access to the application via a standard web browser, without the necessity to install any additional software on local computers.

In the school in Września, teachers and students access documents and multimedia files via the local school network. In the school space, users can benefit from their own network share for data sharing. The local server hosts and stores documents and multimedia content which the institution uses in its daily teaching activities. Each user has an allocated password-protected disc space to store their files. Data can be accessed from any computer workstation in the school, after user authentication in the network. Given the inconvenience resulting from the limited access to remote

There is a virtual e-learning platform in the school where teachers and students can upload and use documents for learning purposes

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services outside the school (e.g. from home), all users received access to the Microsoft Office 365 service, which for schools is free of charge.

Implementation of the school e-learning platform is a process which should be executed gradually, especially when the school creates this type of educational space for the first time. In our school, we expected difficulties at first, when teachers were preparing interesting, attractive teaching materials. This is why we used services offered by commercial platforms. They enabled us to use of-the-shelf educational materials (films, display charts, podcasts, animations or other multimedia resources) with the possibility to freely compile them, according to our current needs. In this model we could set up accounts for teachers on the platform and assign tasks to students. With time, we started to make new, free services available to all users in the cloud. Then teachers began to upload materials they created. At present, our school operates a mixed model: teachers can access e-register modules, commercial platforms – depending on their subject, published materials, government-issued e-textbooks and locally collected resources, which they can create themselves using various types of applications and devices, and share them with others. Thus, the educational content available in the school virtual space became significantly richer.

Good advice

We are looking for the simplest and most functional solutions. If we are considering only data sharing and document circulation, virtual storage in the cloud may suffice. If our purpose is teaching – we should first look into solutions available online for free. In a modern school, which effectively uses computer devices as well as information and communication technologies, it would be beneficial to invest at least in the simplest educational platform. Teachers and students should not only use educational resources available online, but also create resources themselves and share them with others. By creating, we learn more and more efficiently, and the results of our work can help others understand a certain problem or issue.

TIME: One school year is a minimum for the first implementation of an educational platform. Teachers must learn to effectively and skilfully use e-resources in class.

FUNDS: professional educational platforms can be quite expensive, since their cost is usually calculated as a monthly or annual payment multiplied by the number of logged users. However, the competition on the market is strong and prices are decreasing. Numerous platforms are available to schools for free, e.g. Google Classroom or Edmodo.

RESPONSIBILITY: headteacher, teachers (they must understand the benefits of an additional educational space existing in the school and outside of it), support from external companies.

PERSONAL LAPTOP OR TABLET FOR EVERY TEACHER

If we want teachers to be well prepared and use resources stored in the virtual space, each of them should have a laptop or tablet for their personal work use. How to provide equipment and motivate them to use IT tools?

DARIUSZ STACHECKI

Szołdarski Middle School in Nowy Tomyśl, Poland

Even the best idea for the digital school cannot succeed without the approval of teachers. If we want to work with students using new technologies, we should first reach out to the teachers. Nowadays a computer, an iPad or a tablet is a basic tool of any teacher's work.

In the Middle School in Nowy Tomyśl, we created the so-called teacher personal workspaces as far back as 12 years ago. Since the school does not have a separate staff room, teachers use back rooms of classrooms. One is intended for maths teachers, another for history and civic education teachers, yet another for Polish, foreign languages, biology and chemistry teachers, etc. This is where we set up computer workstations. In reality, many schools give teachers comput-

er equipment leftover from replacements made in computer science classrooms. We, however, chose a completely different approach. If teachers are to use technology effectively, their equipment should be high-end, modern and reliable. So we made sure that their computers are new, functional, highly comfortable to use, and with a permanent Internet access.

In the following years we started to equip our teachers with laptops that belonged to the School Information Centre (more on this subject in Chapter 6). Every teacher could use a portable computer and projector. Moreover, a group of teachers who used technical devices very often during their classes received a laptop as their permanent equipment. It was made possible due to a properly

Using virtual space and technology in school education is connected to equipping all teachers with computer devices. Thus they will be able to discover useful tools and plan educational activities anytime and anywhere. Photo: Feliks Szołdrski Middle School in Nowy Tomyśl

drafted school assets entrustment agreement, on the basis of which teachers were entitled to use the devices at school and at home.

Thus, step-by-step, we equipped teachers with computer devices. Scheduling this process over time was of course dictated by the insufficient amount of money we could spend on devices. But such a solution had also an upside, since it translated into an increased interest on teachers' part. No one needed to be convinced to use the computer in his or her class or to prepare materials. Now teachers readily participate in training courses, because they realise that using technology in school has a point, it is a significant element of education, and it fulfils an important role in communication and school management.

Equipping teachers with computers is also an element of using information and communication technologies (ICT) as one of the forms of executing long-term school development programme. Simultaneously, we undertook actions that consisted of building a digital educational environment. We installed computers in every classroom, we implemented an e-register and e-learning platforms, we covered the entire school premises with a Wi-Fi network, launched the school cloud, giving each student and teacher access to the entire range of educational services. All these actions were driven by a conviction that access to modern technology is indispensable in the school and it brings notable educational benefits. Thanks to such an approach, we can now boast high level of digital competence of our teachers.

Since 2011 we have been conducting in our school the original project called "iPad for education", which involves equipping all teachers with modern tablets. Thanks to an excellent network access infrastructure, an iPad has become a tool used in every teacher's daily work. At present, no one can imagine work without it. The device the size of a notebook contains a personalised workstation with access to the full portfolio, school records, e-register, music, films, textbooks and books from the students' reading list, and the entire range of high-end applications. The teachers can freely and easily design their classes.

Good advice

We should bear in mind that, above all, what we need is to show the benefits of using technology in teachers' work and provide them with a suitable environment in which to use these devices effectively. As our budgets will always be limited, such a process should be spread over time. But the time is required also to understand and learn how to use technology effectively. The purchase and distribution of devices alone, without changing teachers' mindsets and approach to modern didactics, will not change a thing. Nowadays we should also consider the type of equipment entrusted to the teachers. A good solution is an investment in mobile technologies, which offer enormous possibilities, while the price of a good tablet is lower than the price of an average laptop. The purchase of high-end devices is crucial. It guarantees stability, reliability and long life of the device. In our school, iPads purchased 4 years ago are still fully operational.

TIME:
long-term school development program, executed year after year.

FUNDS:
the action requires a financial investment from the school. Money could come from school's own funds, external grants or other forms of school income.

RESPONSIBILITY:
a great challenge for the school headteacher, but teachers need to become involved in the modification of teaching practices as well, by using ICT.

THE SECOND LIFE OF OBSOLETE COMPUTERS

Schools have many obsolete computers. Many of them can no longer perform complex operations. However, they can often still be used for Internet research. Such equipment can be set up in school corridors, which would enable students to use them for educational purposes.

MARCIN POLAK
Elementary School no. 58 in Poznań, Poland

For many public schools, investment in new computer equipment is an enormous expense. Usually a large amount of computer equipment is purchased when the school carries out additional projects, financed e.g. from EU funds. Quite often, after a few years of use, computers cease to fulfil their function, as they become too slow to perform more complex operations. Sometimes system software providers withdraw technical support for older operation systems. It could seem that many of the school computers cannot be used in the school anymore. This is simply not true, as students can still use them effectively and safely.

In an era of rapidly growing online resources, these computers could be dedicated to online research. Therefore, they should be appropriately configured. In such a setup, even an old and no longer supported OS (e.g. Windows XP) does not constitute an obstacle – on most computers it could probably be replaced with a free Linux OS. It is based on an open licence and guarantees high functionality, safety and possibility to freely use Internet browsers (e.g. Firefox, Opera, Chrome).

Having a certain number of such computers at our disposal, we should consider their best placement in the school space. They should be set up in openly available spaces, so that students who need to use the equipment, e.g. in order to find information online, have free access. For instance, in the Primary School no. 58 in Poznań, workstations for students were placed along school corridors. Screens of desktop computers were mounted on the walls at a height suitable for students. Further down the hall, a dedicated space for using laptops was organised, with foldable desks, which can be turned into workstations for students. After the work is finished, chairs can be folded and hung on special hooks mounted to the wall..

Good advice

Increasingly often schools require students to use online resources in their learning process. Internet access should be provided not only in computer classrooms, but also in spaces openly available to all students. Of course, such equipment must be used for educational purposes (according to the established rules, about which you can read more in Chapter 6) and safely (Chapter 5), which should be ensured by school network administrators. A good idea would be to purchase post-leasing equipment – it will be much cheaper than new computers (more on this subject in the next Chapter).

Workstations created for students in school corridors, intended for work with computers and accessing online resources. Photo: Anna Cieślarczyk. Primary School no. 58 in Poznań.

TIME:

1-3 months

FUNDS: workstations may require some funding to purchase furniture. Computer configuration may require certain amount of work on the part of school IT specialists (if these are externally provided services, certain modest costs may arise).

RESPONSIBILITY: headteacher, teachers, network administrators.

POST-LEASING EQUIPMENT

The school cannot always afford to purchase new computers. So if we have a limited budget at our disposal, we can look into post-leasing equipment. Banks often replace their management's computers, transfer the used ones to companies that refurbish and resell them (even with a warranty) at prices much lower than market prices. It is a good opportunity to purchase equipment for the school.

JACEK ŚCIBOR
School Complex in Chrząstawa Wielka, Poland

The purchase of new computers is a great expense for every school. Popular self-assembled PCs are offered at lower and lower prices. But computers from leading brands, intended for high-performance use, are still very expensive. But there is another way – it is possible to purchase computers decommissioned from corporations or large institutions, with parameters exceeding solutions offered to schools, and at a much lower cost. They are available in companies specialising in selling and servicing post-leasing computers, and can be easily found online. We are talking about desktop computers, because in Poland schools can purchase them with zero VAT tax rate, which is not possible in the case of laptops (23% VAT)[8]. 23% of the purchase value is a significant amount for any school.

Introduction of an e-register in schools requires equipping all classrooms with reliable computers, so that data can be entered systematically and without any delays. It constitutes a change in the quality of teachers' work, which facilitates and automates the reporting process in teaching. After extending the network (LAN of Wi-Fi) to each classroom, the most important task is purchasing computers with suitable parameters. In the School Complex in Chrząstawa Wielka, after Fujitsu-Siemens (overheating) and HP (frequent AC adapter failures), an entire fleet of small (more room on the teacher's desk!) and modern Dell OptiPlex computers was purchased: in slim desktop cases, with sufficient technical parameters and WIN7Pro licence as well as good post-warranty maintenance service provided by the vendor. The cost of purchasing post-leasing devices in a perfect technical and visual condition with legal software amounted to 30% of the cost of the same new computers and 50% of new self-assembled PCs.

The implementation of post-leasing computers in the school naturally means additional work for the network administrator. It often requires updating each of operating systems as well as installing software suitable for teachers. These computers are of course connected to the interactive board or a projector, ensuring the possibility to conduct classes using online educational resources. For teachers, they provide instantaneous access to all data collected in the e-register and virtual cloud storage.

Such a solution has already proven successful in several Polish schools: the School Complex in Chrząstawa Wielka, Primary School in Kamieniec Wrocławski, Public Middle School no. 1 in Czernica and Technical Schools Complex no. 6 in Jastrzębie Zdrój.

💡 Good advice

The purchase of computer equipment should be made consciously, and take into account the needs related to the school's teaching activities. What the computers should be used for and the plans for their application should be discussed directly with teachers.

The offer of companies specialising in the distribution of post-leasing equipment includes a wide array of computers and generally it is possible to request any equipment configuration, including software configuration.

🕐 **TIME:**
month at the most (depending on the availability of computers with required parameters)

▭ **FUNDS:**
PLN 300 – for a computer with Windows 7/8 OS. Depending on financial capabilities, additional funds could be secured for replacing mice and keyboards or purchasing PS2-USB adapters (considering the lack of PS2 ports in modern motherboards, which are mostly based on USB solutions).

✋ **RESPONSIBILITY:**
headteacher, school computer network administrator or computer science teacher.

Limited financial means should inspire schools to look for high-end used computer equipment. There are many companies on the market which could help to equip all classrooms relatively fast.
Photo: Jacek Ścibor

MAINTENANCE

SCHOOL NETWORK ADMINISTRATOR

In a school with a well organised technological space, several hundred devices can be connected to the network at the same time. Someone has to oversee this process. It should not be the computer science teacher. A good solution is to secure the services of a school network administrator.

DARIUSZ ANDRZEJEWSKI

John Paul II Public Primary School no. 6 in Września, Poland

Maintaining an efficiently working virtual and technological learning environment in the school is impossible without a proper professional supervision. We were looking for an effective and inexpensive professional or a company to manage the IT infrastructure and network. We decided to work with an IT specialist who became the administrator of our network. The choice was to a large extent dictated by economic factors. Analysis of the prices offered by companies in the IT services sector argued strongly against them. An important criterion in this choice was the flexibility with regard to time and the ability to quickly respond to reported requests. When choosing a candidate, we also paid attention to their knowledge of educational environment specifics.

In an advanced and properly configured network environment, and with a complex hardware infrastructure, it is very important and effective in facilitating school operations to use solutions for remote services management. In the initial phase, the cooperation was hindered by commu-

Network administration – for the purpose of communication with units, there are two visible Internet links: WAN1 and WAN2, as well as two VPN tunnels for each link, working in the automatic switching mode in case of a failure. There are separate network interfaces active for the network: to manage devices; to manage computers; and to manage Apple devices, in order to guarantee their proper functioning. Photo: Dariusz Andrzejewski.

nication limitations between people who required assistance and the person responsible for IT infrastructure management. The result was delays in responding to requests. For instance, in order to remotely diagnose or repair a malfunction, the administrator needs to learn about it. At the beginning it was difficult for the school personnel (teachers, administrative staff) to properly describe the type of problem and send the appropriate information to the IT network administrator. The headteacher and digital leaders among teachers had to provide assistance to the rest of the staff. With time, the problem was eliminated, due to the improvement of communication channels.

The result of the change that occurred in our school is, above all, ensuring the working comfort for all users of the school IT environment. Devices excluded from use due to a malfunction, currently constitute only a fraction of the equipment. We also use the system of replacement devices that can be used when defective ones are undergoing repairs. The sense of security among users has increased. Response time in the case of reported malfunctions is limited to a minimum. Software is regularly updated, the equipment properly maintained and catalogued, and teachers gain new competences. The implementation took us two years in total, and we could say it is still ongoing. But now, that time could be shortened dramatically, because there are newer technologies available which facilitate our work even more.

Good advice

Due to the noticeable deficit of competent professionals on the market and schools' limited financial capabilities, we can recommend employing one IT administrator to support several schools. On the one hand, the cost of employment of such a person will be shared, and on the other hand, the offer will be more attractive financially for the administrator, which will enable finding a suitably qualified specialist.

In the process of introducing a school IT administrator, the decisive role falls on the headteacher, who should realise the importance of the support the school and its staff receives. At the beginning of the cooperation, it would be advisable to select a group of more tech and Internet-savvy teachers to assist the rest of the teaching staff in contacts with the IT administrator.

Support for such actions will of course be provided by the approval from the authorities responsible for running the school. The local government could also be persuaded to finance the employment of an administrator. The role of a school IT administrator can be fulfilled by an individual performing similar tasks for the authorities, who also employ specialists. It is the means to enhance financial satisfaction of such an employee and using their familiarity of the local environment. Another argument can be used as well – since we invest in expensive and advanced technologies in the school, these technologies must run efficiently and need to be professionally managed. Ensuring personal data security and protecting students from accessing unsuitable content are tasks which should be performed by competent personnel. In order to finance such support, the school can also use means obtained from leasing classrooms out for external projects.

TIME: from several months to 2 years

FUNDS: cost can be shared between several schools

RESPONSIBILITY: school management, authorities responsible for running the school.

POWER IS THE PRIORITY

The quiet assassin of educational technologies in the school is... the extension cord. Schools and classrooms were not designed for the simultaneous use of several dozen IT devices. If we want to use online resources effectively, our devices need to be powered. How to deal with this issue?

JACEK ŚCIBOR

Complex in Chrząstawa Wielka, Poland

Usually there are only a few electrical outlets in each classroom. Most schools were built several decades ago, so these sockets are not designed according to modern ergonomics standards, and they are often hidden behind the furniture. Electrical installation in most schools relies on old, aluminium cables. Usually all of the outlets in the classroom belong to one circuit secured with a separate safety fuse with overload protection. It is a problem just waiting to happen. When extra devices are suddenly plugged in and used simultaneously, the power is cut in the entire circuit. We will never be able to use new technologies in school effectively if we won't plan for an interrupted power supply.

For this purpose, it is necessary to change our habits and behaviours concerning electrical devices. We have introduced such actions in our school. In all classrooms, devices that are plugged in permanently are connected to power strips with an off switch. Power is cut when classes end. No devices are left on standby. The use of electric kettles is prohibited, and instead, coffee machines and hot/cold water dispensers are provided. All fuse boxes were replaced as a result of an electrical audit. The safety of sockets' circuits was enhanced. Each computer system (projector, computer, screen, speakers, printer) replacing an audio-video system (TV, VHS, DVD players) was plugged in to a surge-protected power strip, to be switched off after classes end. Devices with 200W PSUs replaced computers with 350W power supply units. One computer classroom was decommissioned (10 desktop computers, server, switch, laser printer). In its place, 15 tablets were purchased for students in grades from 1 to 3. Laser printers were replaced with higher performance ink printers. Three printers were decommissioned after connecting a xerocopy machine to the computer network. Students' use of freely accessible electrical sockets for charging their personal devices significantly decreased. They are used only in an emergency.

The school is no longer plagued by sudden power outages in classrooms. The safety of computer work increased significantly – no computers protected by power strips were affected after a lightning strike. Unprotected computers were damaged. Electricity consumption did not decrease due to a larger number of computer devices in use, but the attention to environment-friendly and energy efficient use improved. The network is always available for the computers (laptops) of the headteacher's and administration office, even if the power is off. For two years, no data has been lost due to a power network failure.

Good advice

Such actions are especially recommended in older schools located in buildings constructed in the second half of the 20th century. If we plan to use numerous devices (e.g. brought

in by students) in a classroom, additional extension cords may come in handy. It would be advisable to install them permanently (mount them on the wall) within the reach of the teacher, who can always switch them off. Power strips (with 5-6 sockets) should be equipped with surge protectors, and more expensive models – with EMI/RFI filters (important while plugging many devices into one electrical circuit).

TIME:
actions were conducted on an ongoing basis. The entire process, including the purchase of new equipment, took under 2 years.

FUNDS:
school's own funds, low cost.

RESPONSIBILITY:
school network administrator and external electrician.

Even a school equipped with the best educational technologies will have difficulties fulfilling its potential, if it won't first ensure proper organisation of the electrical network. Photo: Jacek Ścibor.

SECURITY

RESPONSIBLE INTERNET USERS

In virtual educational environments, both teachers and students must make sure their use of the Internet is safe. How to foster responsible Internet use?

DARIUSZ ANDRZEJEWSKI
Primary School no. 6 named after John Paul 2 in Września, Poland

Student safety is usually regulated by the law. In Poland, according to Article 4 section a of the Education Act, schools and other educational facilities that provide Internet access must take the necessary steps to protect students from accessing content that might put their development under threat. Specifically, schools must install and update proper security software. Nevertheless, having schools foster proper student attitudes and behaviour seems to be more important than legal provisions, as it will result in good habits outside the school environment. Even the best protection mechanisms are futile when faced with the lack of responsibility and awareness of Internet threats on the part of the users. Students must be aware that each person is responsible for their actions and that no one is anonymous on the web.

Teachers are supposed to be organising preparatory sessions and introducing preventive measures in class with the use of the available technology. School competitions, exhibitions and meetings covering Internet security measures and technology use are regularly organised by the school. The school also participates in various awareness building campaigns focused on threat identification and proper Internet behaviour, such as: *Akademia Bezpiecznego Internetu* [Safe Internet Academy], *Pomyśl Zanim Wrzucisz* [Think before you post it], *Szkoła Bezpiecznego Internetu* [Safe Internet School], or *1..2..3..Internet*. It also organises meetings with experts and police officers concerning security issues. Parents are offered a consultation path. We aim at building awareness among Internet users. We focus on organising classes in a way that makes students learn as many positive aspects of Internet use as possible, and at the same time be able to identify threats.

On the investment side, when organising online educational spaces, the school needs to be equipped with an efficient server and a professional disk array that provides Internet security and performance levels corresponding to the levels provided by medium-sized companies. The cable network should include all the schools computers. In this way it is possible to implement antivirus software at the level of the server. Consequently, users (teachers and students) are not involved in antivirus monitoring. Additionally, full user profile mobility and authorised access functionality are enabled, both when connecting to the local server and during online use.

The school's main access gate uses a UTM router. UTM is an integrated solution that provides network firewalling, network intrusion prevention, antivirus software, content filtering and a limited access to applications utility. The device has a set of predefined web page categories and enables limiting the type and number of pages to be accessed via the school network. In addition, it enables creating web page lists to be blocked so that children have no access to them. The router makes it possible to supervise all network devices, including teachers' and students' wireless equipment. Each of the school

computers undergoes regular updates and has antivirus software in place. The virus risk has been minimised for all school devices and tablets. It is also worth mentioning that three different wireless networks are currently in place in the school. Two of them are password-protected and dedicated for school equipment use. The third is a hotspot for school guests.

Good advice

Securing the network is a complex task. It should be taken into account already at the level of investment planning. If we opt for a functional, secure virtual space, we should not be choosing the cheapest solution that is typically dedicated to home users. Substantial costs have to be taken into consideration. It is possible, however, to find a company that needs to replace its devices due to the fact that they do not fulfil the latest business requirements. In such a case, good quality used equipment can be purchased for a lower price. It is also worth including the costs of network development into the financial plans forming part of externally-funded digitization projects.

Teaching and educational projects of all kinds should be based on a well-thought strategy that is known to and accepted by all the parties involved. Whenever new technologies are used, safety and security issues should be discussed. If we do this in an attractive way, include competitions, exhibitions and other undertakings that require active student participation, the benefits will multiply. Students need to be able to identify threats and understand the consequences of dangerous or unauthorised Internet activity.
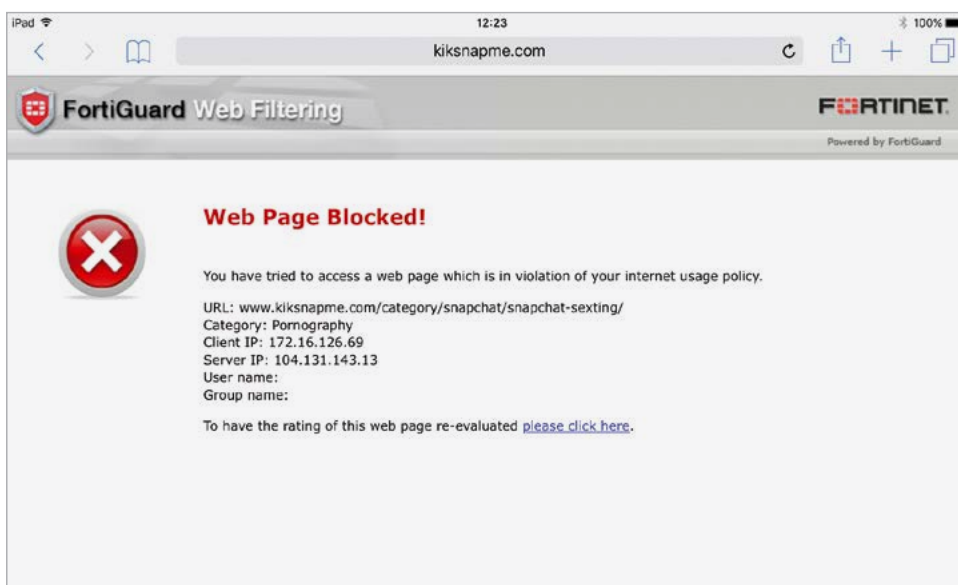
UTM router functioning after a student enters a page with inappropriate content. More attention should be paid to making students aware of Internet threats and fostering appropriate responses as web page and Internet content blocking by category is not always effective.
Photo: Dariusz Andrzejewski.

TIME: about 1 month (if all devices and software is already in place)

FUNDS: PLN 25,000-30,000 (UTM router plus antivirus software)

RESPONSIBILITY: headmaster, network administrator, third party support (network concept and project implementation)

THE SCHOOL NET USE CODE

In a common virtual space, each student and each teacher should have access to educational tools and resources available on the Internet. Lots of teachers think it is detrimental, because students tend to use the Internet for play and not for studying. This may indeed happen if teachers fail to show students how valuable the Internet can be from the point of view of learning. Rules of conduct need to be established for the school network. These have to be agreed upon by students, teachers and the headteacher, so that everyone understands what is meant by the use of the Internet or educational purposes and what each of the users is entitled to.

BARBARA MYSŁEK
Primary School no. 23 in Gdynia, Poland

The following may sound as the biggest cliché ever, but it is true: Internet is both an opportunity and a potential threat. On the one hand, it offers us unlimited access to information. On the other hand, however, it may involve a security threat for its users. Such concerns are well justified: studies suggest that young people do not always use the Internet responsibly. Students are usually unable to cross-check or verify the source of information, they are too trustful in their contacts with other people, and they rarely consider such things as copyright.

The school can react to these types of behaviour in many different ways. Sometimes the use of the Internet stays in the hands of the users, without any code or regulations. The most typical solution, however, involves restricting students' access to the Internet at school. This results in all kinds of bypasses, such as the use of personal networks on students' personal devices, etc.

We decided that our school wouldn't be such a place. We wanted to introduce some rules, but include students in the process of creating them. How to do that? We think there is no better way than letting students take part in the decision-making. We opted for a joint decision-making procedure concerning the rights and obligations of both students and teachers using the school network. We called it Code, version 2.0. We made it – and so can you!

In our case, a school debate was the beginning of it all. We wanted to make sure that students understand what the purpose and motivation of the changes are. During the debate, we announced that students would be discussing the contents of the code and thinking about the importance of each rule. We started with spontaneous student comments on their experiences with the Internet. Students had no problem with providing examples of Internet use, which we noted down on the blackboard. They mentioned file download, messaging, studying, get-

Let the students co-decide about IT educational use at their school. When they contribute to the internal school's IT Code of Conduct, children will be more aware and careful about use of Internet websites and applications.
Photos: Center for Citizenship Education Foundation, Poland.

ting information, and entertainment. The fruit of our efforts, Code 2.0, consists of seven major rules. All of them were discussed together with the students and then approved by the teachers' board.

The 7 rules of Code 2.0

1. **Teach and learn with the use of ICT.** How to conduct online lessons? TO what extent is Internet, computer and mobile devices use allowed at school tests and exams?

2. **Be critical and independent when making use of information.** When is downloading materials from the Web a good thing, and when isn't it? How to recognise reliable sources? How to react to racism, antisemitism, xenophobia and lack of tolerance on the Internet?

3. **Don't steal and don't let others steal from you!** How to use materials available on the Web (videos, photos, text) in accordance with the law? How to cite authors and sources? How to "read" and respect information concerning copyrights? When and how should we use free licenses?

4. **Communicate!** How to use ICTs for teacher-teacher, teacher-student, and school-parent communication (e-mail, social media, etc.)? What is public and what is private? (21st century savoir-vivre)

5. **Make computers easily accessible!** How to make computers and the network accessible at all times instead of enclosing them in a computer room? How much entertainment should be allowed on school computers?

6. **Be safe on the Internet!** How to ensure safe Internet use? How to use social media risk-free? What should be allowed for students to do on school computers, and what shouldn't?

7. **Teach the adults!** Can students teach others (e.g. their parents, grandparents, neighbours, etc.) how to use ICTs? How? Who should be responsible for supervising such sessions?

Good advice

There is one rule of thumb when introducing changes in any school: discuss things before you implement them! It is worth including students in the process, so that they feel the established rules were their idea. In this way, students will be more willing to obey the rules and defend them when necessary. It should be remembered that Code 2.0 is a document whose contents is respected by the whole of the school community. There shouldn't be more than a dozen to twenty rules in it. A few simple rules are enough in primary schools.
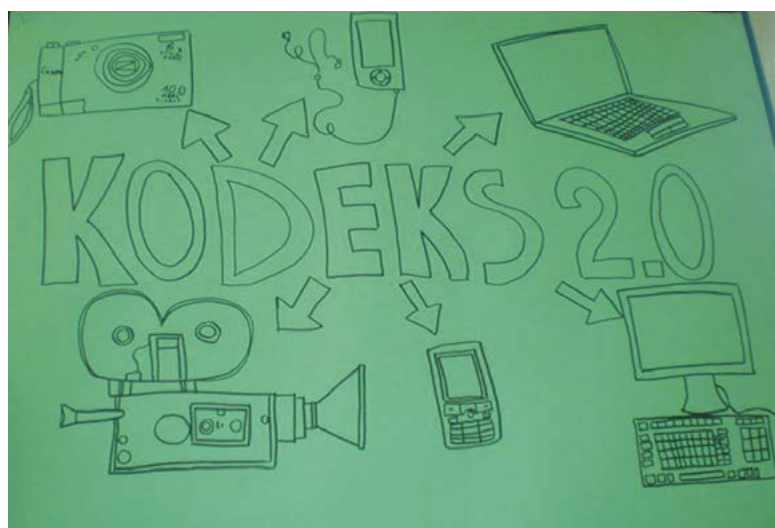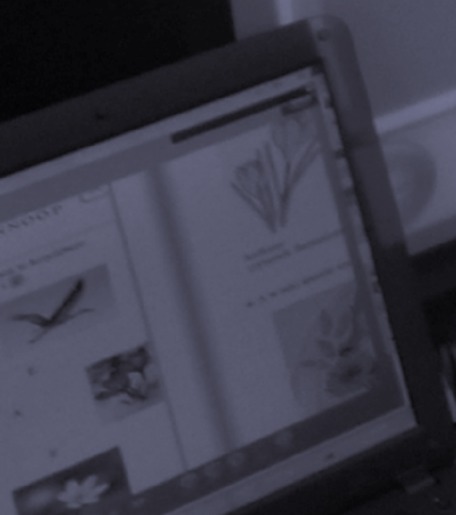
TIME:
about two weeks

FUNDS:
no cost

RESPONSIBILITY:
teacher, students (especially the student board), headmaster, parents

RSŚTUWYZŻŹ

4. Wpisz nazwy zwiastunów wiosny we właściwe miejsca w krzyżówce. Dla ułatwienia wpisano już w niej wszystkie litery ż i ź.

E

EDUCATIONAL POTENTIAL OF NEW TECHNOLOGIES

CODING KIDS

Thanks to the use of technology and programming, children can acquire valuable skills and competences already at the beginning of their educational path, and later use them when studying. How to organise educational space for small children?

MARCIN POLAK

Primary School no. 55 in Szczecin, Poland

We learn how to code – this sounds serious. Our first connotations with the topic are IT geeks looking at their computer screens and creating multiple lines of code. And what if we start coding together with the youngest schoolchildren?

Computer programming (coding) is not just about writing code. The Coding Masters programme has shown[10] that coding develops various skills, such as analytical and logical thinking, cooperation and creativity, ability to understand the digitized world, and other competences that are now crucial both in learning processes and on the job market[11].

How to start? What do we need? Teachers' imagination and courage is indispensable in this case. We also need computers or mobile devices with an Internet connection. In this way we can use online courses, seek inspiration on the Internet and publish the results on servers. Fortunately, there are dedicated programmes and tools for conducting such courses available online (e.g. Scratch[12] or Code.org[13]). Krystyna Kuźmin-Smalc, a teacher from Primary School no. 55 in Szczecin, started from a simple coding course available at Code.org. The course was addressed to literate children over six years old. Krystyna practices coding with children during her computer class, in a computer lab, twice or three times a month. Everyone works online and the results are not saved, so that technical problems with signing in on the website are avoided.

At first, teaching coding may seem hard as 6- or 7-year-olds may find it difficult to understand what a code sequence is, or what words such as pixels, rotations, degrees or loops mean... *"We solve problems step by step. It always helps to put theory into practice. We walk around the classroom, spin around, jump and perform other movements that help us acquire new, virtual skills. We always go in a particular order: from action, experience and concrete thinking to abstract thinking."* says Krystyna. Sometimes it is necessary to improvise, especially if a given topic is introduced for the first time.

How can we help children understand the very idea of programming? It is worth starting without computers. A game in pairs can be introduced: one student provides verbal commands to another, e.g. *Take two steps. Jump. Close your eyes. Turn.* Then we can translate those commands into the language of programming by writing them down on the computer. Changing directions on the screen can also cause problems. To solve them, students may stand up and go around the classroom: *Go straight ahead. Straight ahead. Turn right. Straight ahead. Straight ahead.*

Another problem may arise when different commands are repeated in a loop. *"We started out with a command sequence: blink, take two steps and jump, repeated four times. The commands where hanged into pictographs drawn vertically on the blackboard. When I asked what I could do in order not to repeat the procedure four times and draw the same symbols all over again, children suggested that I put everything into parentheses and write: Times four. That's how we arrived at the loop."* says Krystyna.

What effects can we expect among the youngest students? *"Students' emotions are at a very high level. Sometimes they spontaneously applause themselves after they manage to perform a task successfully. They are glad to be learning something and not just playing".* As a result, many things that were difficult at other lessons are no longer a problem in the computer lab (e.g. directions). Children are also very happy to be learning logical thinking. They can accelerate and learn more efficiently during programming lessons. They perform their tasks individually and at a faster pace, and they are passionate about discovering the answers. They also spontaneously offer to help those who have problems with the assigned tasks. Sometimes those children that have problems in adapting to the style and pace of teaching/learning at other courses really spread their wings in the coding class. Computer programming makes them more enthusiastic and motivated, inspires them and teaches logical thinking.

Good advice

Computer programming courses can be organised at any primary school even among the youngest children. The teacher involved does not necessarily have to be an IT specialist. For the purposes of the course, a computer lab with Internet access is needed. At the same time, some space in the middle of the room for movement exercises should be provided. In this way children will be able to connect movement and directions to commands and transform them into code (with the use of such platforms as Scratch or Code.org). The designated teacher should prepare the class properly and go through the courses available on the abovementioned platforms. It is best if the teacher tries to perform the tasks that are available on those platforms.

TIME:
at least one semester

FUNDS:
computer and Internet access

RESPONSIBILITY:
headmaster, teacher (not necessarily IT specialist)

Computer programming develops analytical and logical thinking skills. There should be no problem in introducing programming courses already in the kindergarten or early in primary schools. If well-planned, the course will be both useful and fun for the youngest students. Photo: Coding Masters Program, Poland.

THE COURAGE AND CAPABILITY TO FOLLOW THEIR DREAMS

Our school has chosen "Entrepreneurship" as its profile but we are lacking the methods and tradition. We would love to devise a more creative learning environment. What are the cornerstones we need to put in place?

FRIDA MONSÉN

Rektorsakademien Utveckling AB, Sweden

Situation

"The courage and capability to follow their dreams" – who wouldn't want to go to a school that works according to that adage? Skapaskolen south of Stockholm opened its doors in the autumn of 2013 with just this motto. The impetus for founder Christer Holger was to create a school that would be fully adapted to new conditions with modern technologies and communication tools at its core, combined with a focus on health and motion.

"The Internet has certainly revolutionised learning and as yet we have only glimpsed the beginning of this evolution. I don't believe that we have fully comprehended the socially transformative power of the Internet or how it has fundamentally changed our entire way of communicating and learning," says Christer Holger. "We are all connected and that's fantastic!

As we prepare students for the future in a digitalised society, the greatest change is the access we now have to data and information. Previously schools had two primary information bearers; teachers and textbooks," continues Holger.

Digitalisation is fundamental. Through digital media you can quickly exchange information between people, creating and producing in collaboration or alone, communicating with people who are experts in the field you wish to immerse yourself in. The Internet makes it possible for anyone with a dream and the drive to bring their ideas to fruition and it is the school's task to create the conditions and instil the necessary courage and self-belief in its pupils. They must be given the space to explore and test new ideas and working methods. By being there to offer support when things don't go as planned we can also show that failure is no disaster but merely a lesson along the way.

When both information and the creative energy to do something with it is placed directly in the hands of students, demands are placed on the design of the physical learning environment:

"The traditional classroom with 25 pupils in rows next to one another signals a helplessness which leaves the student dependent on someone else to decide the rules of the game. This is an environment that models a situation in which everyone learns in the same manner, quite contrary to the needs of the entrepreneur who is dependent upon having the opportunity to develop unique ideas powered by their own initiative."

By changing the physical environment so that the student instead becomes the subject in their own learning situation, we encourage an entrepreneurial approach to learning. An environment that stimulates creative methods needs to offer a variety of learning areas. At Skapaskolen the traditional classrooms have been replaced by learning studios with space for 48 pupils. The space is twice

the size of a traditional classroom allowing two or more teachers to work together. This provides an excellent foundation for collegial learning. In these learning studios it is possible to gather all of the children in one place, divide them into two classes or organise tasks in smaller groups. The entire facility breathes creativity and fantasy with its varied furnishings, while at the same time it offers ample opportunities for pupils to find a secluded corner for some peace and quiet. The environment is designed around architect Peter Lippman's ideas about collaborative learning environments and is intended to provide the school with the necessary prerequisites for both learning and social interaction. According to Lippman it is important among other things for the environment to contain well-defined spaces and to offer clear pedagogic ideas about what should take place in each individual area.

"If I were to offer any advice along the way it would be to begin with a prototype learning environment to be tested and altered as required. The environment should both stimulate creativity and offer security. Our environments do not look the same now as when Skapaskolan was built but have been influenced by the teachers who work in them. Sometimes it is the students themselves who have created so-called 'break-out zones' that have become an integral part of the learning environment. It is all of us in unison who create the school," concludes Holger.

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https://www.teachermagazine.com.au/article/crafting-collaborative-places

SCHOOL INFORMATION CENTRE

In order to improve the virtual space of the school, we decided to create an information centre in which various sources of information are available to students.

DARIUSZ STACHECKI
Feliks Szołdrski Middle School in Nowy Tomyśl, Poland

At the very beginning, when the school was opened, we converted the traditional school library into the School Information Centre. It has now become the heart of the school in terms of multimedia use. In this space, each student and/or teacher can find a place for themselves, use the book and journal collection (both printed materials and electronic documents), as well as computer desks with Internet access. We make sure that the best, high-end technology is available at the centre, and that different operating systems are supported (Windows and Mac OS X).

Since 2006, the Information Centre has been providing laptops and projectors for educational purposes to teachers. The staff employed at the Centre makes sure that the software is regularly updated and charged. Ever since we launched the "iPad in education" project at the school (2011), the Centre has also had iPads. They are used to create multimedia labs (three at the moment). Whenever a teacher wants to use iPads during lessons, they report the need to the Centre and this information is incorporated in the schedule.

The Centre is also involved in preparing and cataloguing collections, both printed and digital. The books and manuscripts collection is fully digitized. Printing and copying works are also undertaken in the Centre (invitations, diplomas, certificates, congratulations letters, school documents). A copy centre is also available. Documents can be printed, copied, bound, framed and laminated.

A multimedia lab of the school's patron (Feliks Szołdrski) forms part of the Information Centre. It includes various souvenirs and documents belonging to the founder of Nowy Tomyśl. There is also a replica of an original aristocracy outfit, which could have been worn by our patron. The outfit was elaborated as a part of the "Creative student" project during the second edition of the eSchool Greater Poland undertaking. There is also a portrait of Feliks Szołdrski in the room. Although no images of the patron could be found, a digital portrait was elaborated on a supercomputer at the Gdańsk University of Technology based on the patron's parents' portraits and information on how Feliks looked like.

The School Information Centre undertakes many project-based activities using new technologies. This is enabled by the Centre's infrastructure. The main lab is equipped with 36 workstations that can be used even by the most numerous class at the school. Apart from computers (16 laptops and 3 tablets), there is an interactive Smart board, a projector and a sound system. There is also a big LCD screen with a cable TV connection. We also connected an Apple TV to the system. This makes it possible to watch Internet materials directly or via iTunes, and at the same time to display multimedia content wirelessly from any computer or mobile device.

The School Information Centre is visited very often. The teachers working at the Centre are very helpful in technical matters. The space created in the Centre facilitates learning and creative time spending, as well as relaxation

Good advice

If we want to create a school information centre, it is important to remember about its role and needs in the context of the school's ICT infrastructure. This will be the heart of the school in terms of multimedia use, so proper equipment and resources are crucial. Quality hardware that is reliable and available to everyone, as well as Internet access and technical support are indispensable elements of such a centre. Comfortable working and learning conditions should also be provided. Workstations should be suitable for student needs and armchairs may even be provided for greater comfort.

Training library staff is also of utmost importance. They will make the information centre thrive. Apart from library preparation, the staff should be also highly qualified in terms of new technology. At the same time, they should be helpful and willing to assist students in the choice of the optimal solution when needed. The latter part is probably the most difficult, but proper staff training should be seen as an essential element of centre building.

TIME:
1 school year

FUNDS:
financed from the school's budget as well as external means gathered in the course of various projects undertaken by the school.

RESPONSIBILITY:
deputy headmaster, library teachers/staff

A well-organised information centre allows many students to work in front of the computer at once. This fosters information processing skills and competences related to identifying sources of data. The centre can be devoted to the school's patron and e.g. gather information on the famous person.
Photo: Feliks Szołdrski Middle School in Nowy Tomyśl, Poland.

SCHOOL RECORDING STUDIO

To better organise the school's virtual space, we decided to create a recording studio in which students can create their own music and videos. In this way, we help them develop their interests and support their creative work.

DARIUSZ STACHECKI

Feliks Szołdrski Middle School in Nowy Tomyśl, Poland

The idea of creating the School Recording Studio was born 10 years ago. At that time, we had a school discussion forum (and no Facebook was available then) that was extremely popular among the school community. Students and teachers would meet in the school's virtual space in their free time and discuss school issues. They would point out the good points and areas for improvement, as well as present ideas concerning new school activities. One of the ideas was to create a music band. Then the idea of creating a recording studio was born. In this way, we thought, everyone would be able to try composing their own music, creating lyrics or singing.

One of the initiators of the idea was our school psychologist, Tomasz Raginia. He decided to use the new space for pedagogical and psychological purposes. His class included training in substituting aggression. The idea was simple and extremely effective. Whenever there were students with problems in managing their emotions, their ener-
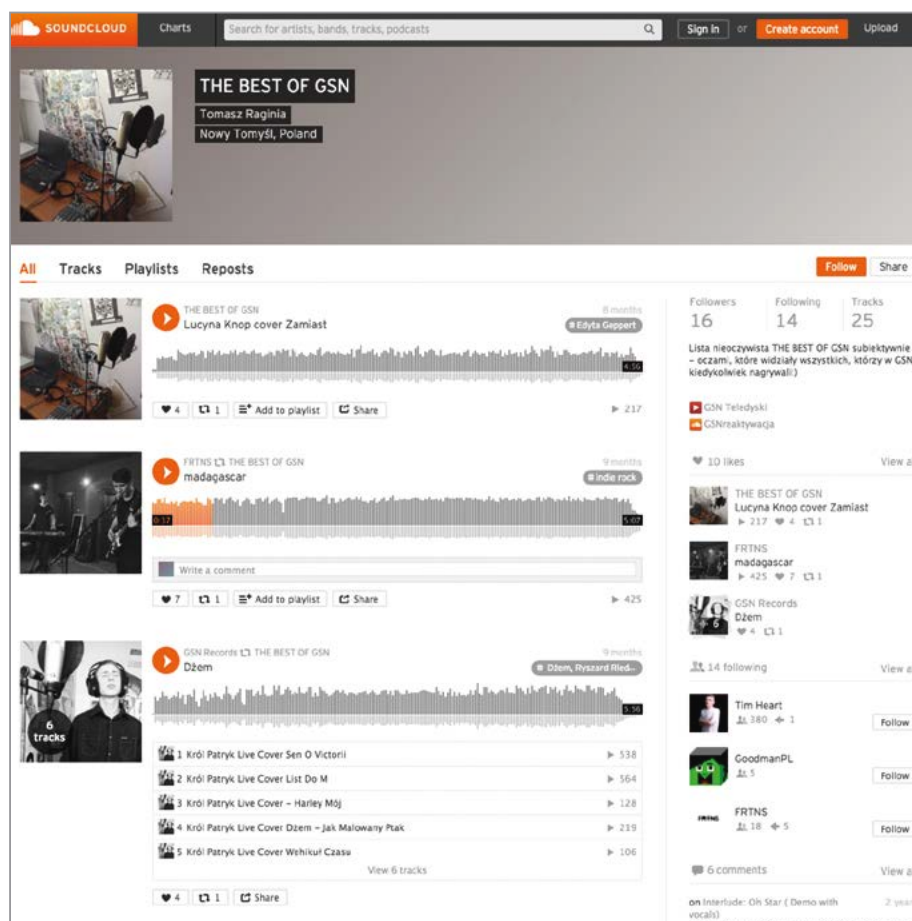
Student creativity can be put into practice via music. Today, every tablet or smartphone can play the role of a mobile recording studio. It is therefore worth providing students with opportunities for creative expression. The photo presents a website with the songs created by Nowy Tomyśl students.
Photo: Feliks Szołdrski Middle School in Nowy Tomyśl, Poland.

gy was transferred to the realm of artistic activity. We found out that there are many emotional students in the school whose energy could easily be refocused on something else, e.g. song writing or singing.

Of course, the first recordings were not of the best quality, both in artistic and in technical terms. But it was important that they were made. There was something to work on and progress was visible in time. The recordings were later published online and became very popular. The students were overwhelmed when they discovered that their creations had been played a few thousand times. Although publishing recordings was not that easy at first and the website on which recordings had been posted ceased to exist, most of the recordings were saved and transferred to: **https:// soundcloud.com/fantasmagorian.**

At first, we used the equipment we already had and adapted it for new purposes. We had no specialised devices. We used school microphones, a mixer and an amplifier. In time, we managed to collect money to buy a simple studio microphone, a more professional mixer, a computer, a sound recorder, file converters, cables, headphones, etc. The School Recording Studio gained in quality when we introduced iPads for general use. We also started to use the GarageBand application. The wide range of instruments it offers allowed for new music arrangement. Various working modes made it possible to create individual compositions and look for new sound patterns. iPads became sound mixing devices with the help of which different instruments can be recorded separately, voice

can be added and new beats can be created. Video recording and film editing were facilitated by the use of tablets. Inbuilt cameras allow for both motion picture recording and still images taking, as well as for using various recording effects, filters or time lapse VCR making. Thanks to the iMovie app, students' creativity can be used to the full and old recordings and songs can be reshaped, rearranged and edited. Students can create their own music videos. Students started to use the new tools with enthusiasm, discovering new possibilities every now and then. This, in turn, motivates them to engage in more and more artistic projects. Their music videos have been presented at numerous competitions and met with success.

Good advice

There are many ways of using student creativity and combining in with new technology. The success of the School Recording Studio is due to the dedication of our school psychologist, whose passion and creativity became contagious. He showed students how to create something unique and original with limited means. Such a leader is an indispensable part of the project. Good quality equipment is a secondary matter. Today, a good smartphone or tablet can easily become a recording studio. A website or other type of space on the Internet for publishing student outputs is crucial. We use the school's virtual space (Office 365 service) for this purpose.

TIME:
a few days. It must be noted, however, that out studio has been evolving year by year, with the addition of new technology, devices, ideas...

FUNDS:
a few thousand zlotys for good quality equipment is enough. Students' devices can also be used.

RESPONSIBILITY:
project manager. In our case, the school psychologist plays the role. Headteacher's support is necessary.

NEW PURPOSE FOR THE SCHOOL LIBRARY

In schools with limited access to educational technology, libraries are important spots on the virtual space map. They become places where students can easily access the resources they need to study. Technological advances require a critical overview of the available materials on the part of the library. New content and services should be added, including the use of new technology to manage lessons and projects involving teachers and students.

AGNIESZKA HALICKA
School Complex no. 2 in Konstancin-Jeziorna, Poland

The library of the School Complex no. 2 in Konstancin-Jeziorna used to be a very traditional place. Most of its activity was focused on gathering collections and preparing them for use, as well as on reading education and the organisation of events (e.g. meetings with writers, etc.) Nevertheless, with the current technological advances, it has become indispensable to change the way the library functions. The educational needs of students have changed. In order to engage students in the library's activity, foster active participation on the part of the school community, and develop new media competence among children and teenagers, we decided to start introducing changes. These include an extended use of the Internet and ICT.

We have also expanded the content of the course in using and creating media we had in place. Many of the new activities we introduced were agreed upon together with the students. We also launched: a Book Discussion Club (which organises night reading and film watching sessions, and created an educational project entitled *Fantasy literature - the magic of imagination*), international eTwinning projects, ICT courses for six-graders and an ICT innovation course for first-year middle school students. Currently, media education

is regularly provided for first-year middle school students. We also participate in national-scale projects, such as *Włącz się. Młodzi i media [Switch yourself on. Young people and the media]* organized by the Centre for Citizenship Education, in which both teachers and public library staff participate. We also have a special School Information Agency room for developing various projects. The room is equipped with 8 PCs, and an iMac, a laptop, a projector, a screen, film screening and photo equipment, and a graphic tablet. There are several sections for the students to work in: photography, film (Żeromski *TV*), school promotion and journalists.

Thanks to the changes we introduced in our library, its staff were also able to develop their skills and creativity in the field of media education. Because the role of the library has changed, the educational offer of the school was also expanded. Student projects started to be implemented, which definitely boosted their self-esteem. The above activities increased the level of social and media competence among the students. They acquired new skills: critical analysis, creating media coverage, cooperation and teamwork.

Good advice

What is important is that the library's offer should be attractive for students (it is worth consulting them and taking joint decisions). Activities should also be scheduled adequately, so that students have time to participate in them. When a library changes its role, new undertakings are in place. These should be fully supported by the headteacher and by the school teachers (especially form teachers), as well as by the parents' council.

A fast Internet connection, appropriate computer equipment and software, as well as photo and audiovisual devices are needed to implement such changes. There should also be enough space to run the new activities. It is also worth thinking about additional financial means for educational outings, teacher training and new materials.

TIME:
at least one school year.

FUNDS:
computer equipment, software, photo and filming equipment, funds for additional courses, outings, teachers' training.

RESPONSIBILITY:
headteacher, library staff, and parents' council.

Today's libraries serve more purposes than before. More specifically, they can engage in teaching readers how to use the new media and boost other competences than traditional reading skills. Photo: Agnieszka Halicka.

WEBQUEST: PROJECT-BASED LEARNING

Internet is a tool that is not always used to its full potential at school. There is too much generic, non-creative use of it. We don't teach active information gathering and resource use that is necessary in order to perform more complex tasks. WebQuests (WQ) constitute a new method that allows for physical and virtual space education[14]. An extended use of this solution may contribute to new digital knowledge and skills acquisition by students. Using the WQ methodology in class is a good idea. WQ projects can be implemented once a week.

MARCIN POLAK

Janusz Korczak Middle School no. 24, Wrocław, Poland

Students often fail to notice the connection between what they learn at school and their real lives. Practical knowledge application is therefore crucial, especially in the context of the latest scientific achievements and new technology. It is worth thinking about how to make use of the available tools and teaching methods to boost learning effectiveness, facilitate practical use of the acquired knowledge, and make lessons more attractive. WebQuests are about presenting students with appropriate, interesting problems to solve. As a part of this method, students get a quest from the teacher, but it is for them to decide how to embark on it, what methods and materials to use, etc. This makes it possible to give up the traditional, physical limitations of any given school subject (lessons, notebooks, desks). Instead, we are using the virtual and technological space. Students acquire knowledge on their own. The teacher is only there to provide learning and cognitive opportunities.

There are many ways in which WQs can be used at school. They can be implemented en bloc by one and the same teacher, or planned jointly by teachers of different subjects. The duration may vary between a few lessons and a few months. Everything depends on the goal we want to achieve. In our school, we organise the so-called WQ Fridays once a month. The full name of the undertaking is *WebQuest Fridays: learning in action in English*[15].

Natural science and math teachers supervise the project. All the tasks are planned at the beginning of the school year.

A special room was designed for the purposes of WebQuest implementation. The desks were arranged in a U-shaped fashion, comfortable seats were provided, and the walls were covered in paint on which students can write. We also gathered some funds to buy tablets. How does a webquest session look like? Lessons are scheduled differently that day. Difficult subjects are erased from the timetable and physical education is a must. We focus on social competence. Students are divided into teams (at random). They meet at 8.00 and implement a project that takes about 5-7 lessons' time. The teams may be working on the same or on different projects. At the end of the day, students present the results of their work. Every semester comes with quests from different fields. This results in changes in the class schedule (an additional lesson is added, e.g. IT, math or geography). Students like this undertaking as it makes them develop their skills and competences in many different areas.

We often use the school's virtual space during project implementation. Students are asked to analyse sources and look for information on the Internet before they embark on solving the problem they were assigned to. They make use of tablets and laptops. In the past, there were some problems with fast Internet access, which resulted in delays. For this reason, we decided to invest in Internet infrastructure.

The quests to be proposed as a part of the project can be of various kinds, e.g. *Apartment renovation* (planning and design skills), *Math in the kitchen, The mysteries of the Universe, Radio, Cinema history*... Each such class is evaluated. Both students and their parents take part in the process. Based on the joint assessment, changes are introduced in the WQ methodology. After three semesters of WQ work, we noticed that students started to have better results at natural science and math exams. Team-based projects also contribute to the development of soft (social) skills: teamwork, communication, planning, and critical thinking. The WQ project also serves as a source of inspiration for the teachers.

WebQuests are suitable both for physical and virtual space. As a part of this method, students meet and think about tasks to be implemented in class with the use of Internet resources. A special room was designed to facilitate student cooperation as a part of WebQuest projects at the Wrocław Middle School no. 24.
Photo: Janusz Korczak Middle School no. 24 in Wrocław

Good advice

Students are usually not used to work in teams. It is worth starting with projects to be implemented in pairs, and then make the groups bigger. Reliable Internet connection is crucial. Students must be able to collect information necessary o solve the problems at hand in real time. Besides, the results of their work are usually recorded online.

Zdzisława Hojnacka, a teacher working at the Electronic, Electric and Mechanical School Complex in Bielsko-Biała, who also uses WQs in her class, says that mini-webquests should be used at first (small challenges, short deadlines, narrow domains) as students need to get used to the method. It is also worth thinking about the evaluation criteria and about making them clear (students must know when their score will be lowered or when they might be disqualified in the case of cheating, not respect-

ing copyrights or deadlines). We also highly recommend introducing quests that require both practical or manual skills (measurements, construction, building, etc.) and the use of new technology. In this way, virtual reality can be combined with real life and the physical: devices we use on an everyday basis.

TIME:
at least one school yeary

FUNDS:
the existing school infrastructure can be used, but a separate space should be dedicated to such projects; reliable Internet is a must (all students must be able to use the Internet at the same time).

RESPONSIBILITY:
headteacher, teachers involved in the joint school project undertaking.

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E-QUIZZES

The vast array of educational tools accessible online is inspiring. There are many options we can use. For instance, instead of organising regular written quizzes or tests, we may use Kahoot, Quizizz, Quizlet or similar applications. This will make students more active and willing to participate.

MARTA FLORKIEWICZ-BORKOWSKA

Public Middle School no. 3 in Pielgrzymowice, Poland

Quizzes are used very often in schools. They are usually stressful and may very easily become boring and schematic. To make learning more attractive and motivate students, I decided to introduce interactive quizzes twice a month. They take place in the computer room or in the classroom (with the use of smartphones or tablets, in accordance with the BYOD, or Bring Your Own Device method).

Before introducing such an evaluation measure, I explained how Quizizz, Kahoot and Quizlet work. I devoted two lessons to it (the first to explain Kahoot and Quizizz, the second for Quizlet). During these tutorials, students could test the applications and say which of them work best with computer use via browser, or which work better when downloaded and installed. Then I explained the idea of organising interactive quizzes in class. The next few classes were devoted to repeating the procedures and making sure that everyone got and understood the rules. After that, I told the students that we would be using such online quizzes twice a month and we agreed on the topics to be included in them. Kahoot and Quizizz make it possible to create an online test, while Quizlet allows for introducing some elements of play into the class.

Thanks to the use of interactive quizzes, my students have become more engaged in learning.

They are more willing to participate in lessons. In this way, a positive change in the learning environment has been introduced, which is beneficial for teachers as well: the programme automatically evaluates interactive quizzes. The time saved in this way can be therefore spent in a more creative way. The students got used to the new applications very quickly.

I also noticed that they are less stressed and more willing to take tests. Students from other classes have been asking about the possibility of using these quizzes in class. They make lessons more dynamic and spontaneous, and add positive energy[16].

Good advice

The principles of using such applications should be explicitly stated. Students should be able to get to know the application and test them several times in class. It is also important that each student knows what steps to take in order to participate in the quiz. In this way we can avoid repeating the same rules lesson after lesson. Internet access is required to enable interactive use of such applications. We should be using either a computer room or mobile devices (local or personal), provided that Internet access is of good quality.

What do students think about this solution?

Such quizzes are simply more convenient. I have multiple choice questions, I can think a bit and then choose the answer that suits best. They add diversity. (Kajetan)

It's something else than a regular quiz. I definitely like it more. I can see the incorrect answers and then take the quiz again to have fewer mistakes. (Sandra)

Such quizzes take you far away from the reality...This is more conducive to learning. (Klaudia)

⏰ TIME:	💳 FUNDS:	✋ RESPONSIBILITY:
1-2 lessons	no financial means required	teacher, possibly also network administrator/ headmaster

A lot of programs that may increase students' interest in learning can be found on the web. First of all, we can change the way we organise quizzes and exams and make them online. Photo: Public Middle School no. 3 in Pielgrzymowice.

FACEBOOK FOR TEACHERS

**Quite often there is not enough time in class to develop certain topics with students.
In the teacher community, it is also difficult to arrange a meeting and discuss school issues or suggest solutions to the encountered problems due to the lack of time, short breaks and different working schedules. Can the social media address this challenge?**

MARCIN ZARÓD

Janusz Korczak Secondary School no. 5 in Tarnów, Poland

I decided to create closed groups for each class I teach English to. Facebook is a great cooperation tool and can be used for educational purposes by any teacher. As a result, we were able to create a virtual space that makes it possible to extend learning time. But nothing is imposed on the students. They participate in groups voluntarily.

I created a separate group on Facebook for each class I teach. A first, 90% of the students participated. Now it's almost 100%. I post resources that help deepen the knowledge of a certain topic discussed in class. In this way, students can engage in interactions and e.g. jointly decide what the topic of the next class will be.

What is the added value for students?

- **Access to additional materials:** they can use a repository providing links to interactive exercises, video lessons and web pages.

- **More individualised learning:** by using the additional materials those students who have problems with the topics introduced in class can focus on basic skills, and those who want to learn more can expand their knowledge on the subject. Students therefore adjust their learning pace individually.

- **Possibility of asking questions:** students can ask questions about technical/organisational issues (e.g. review of the material before the test), and about the content of the course (additional explanation of a given grammatical issue, etc.). Interestingly, I noticed that although at first I was the one to provide answers, now other students tend to provide assistance more often.

- **Cooperation opportunities:** apart from making use of the materials provided by the teacher, students share the resources found on the Internet with each other. This includes e.g. links to interesting websites. When working on a project, the FB group is also a good place to assign tasks, exchange information or organise a brainstorming session.

- **Exerting influence on school topics:** surveys can be organised online to make it possible for the students to choose a song to be analysed in class or make any other contribution. Students can also suggest particular issues to be discussed in class.

Thanks to running the virtual sessions parallel to the regular class, students can learn at their own pace and use additional materials at their convenience. They can also become more aware of their needs and possibilities, and ask for the teacher's support outside the school. They can also develop cooperation skills and awareness of other people's need for support: they help each other, exchange materials

and answer questions asked by other students. And, most importantly, in this way, they devote much more time for learning. Thanks to the ubiquity of mobile devices, they are connected to Facebook at all times.

But there is more to it. Facebook also provides cooperation opportunities to teachers. For this reason, we created a dedicated group for our school's teachers and for our headteacher. At first, only 10 out of 30 teachers participated in the group discussions. Now the number of active teachers rose to 20. What is the added value for teachers?

- **Teaching materials exchange:** teachers can provide links to interesting pages or videos that may inspire others.

- **Sharing pedagogical experience:** teachers can inform others about their undertakings, training courses they participate in, etc. In this way, everyone at the school is informed about the most important issues.

- **Presenting ideas:** teachers can suggest changes or present ideas concerning the functioning of the school, e.g. promotional events. They can also get feedback from the headteacher.

- **Informing about successful undertakings and assisting others:** teachers can inform others about a successfully implemented lesson or undertaking, heir students winning a competition, etc., and also provide assistance to other teachers in pedagogical matters.

Creating FB groups does not require any financial resources. The groups can be managed and frequented from the students' and teachers' personal devices. Among other tools that provide a similar functionality and educational value, I would mention Edmodo (more information on the tool is available in the Chapter: Social Media as a Learning Opportunity).

Good advice

Nobody should be forced to use Facebook. It is worth presenting good practices and advantages of the social media, however. If not all the students use FB, information flow should be ensured otherwise, e.g. a student should be assigned to forward FB posts and messages to others via e-mail. Resources can also be uploaded on Google Drive.

TIME:
up to 1 month for creating a group on FB, establishing rules and launching the initiative.

FUNDS:
no cost. Anyone over 13 years of age can create an account on FB.

RESPONSIBILITY:
Teacher. In teacher-teacher cooperation, the headteacher should be an active participant and supporter of the initiative.

Closed groups in the social media, such as Facebook groups, constitute a great learning opportunity. They can be established for each class and used for both learning and communication. Such tools are also great when it comes to teacher-teacher communication. A sample student group during English class. Photo: Marcin Zaród.

DON'T BE AFRAID OF COMPUTER GAMES

Computer games are still rarely used in education. Nevertheless, they constitute good pieces of virtual space that can be designed specifically for educational purposes or incorporate educational components in the plot. Students learn while they play. How can we use games in education?

PIOTR KOZAK

Community Middle School no. 2 in Warsaw, Poland

Regardless of the generation, the rule is simple: students like to play games. Whether you are a parent or a teacher, you probably want to say the following in response: *gaming is a waste of time!* or: *education first, then playing!* But let's be realistic. If we have young people decide whether they want to study or play, the second option will always prevail. This either-or choice, however, is not the only option. They can play and study at the same time. Not all games are pure fun with any educational content. Studies have shown that games, if chosen adequately, can teach strategic, critical and abstract thinking, independence, as well as negotiation and interpersonal skills. It is therefore worth forgetting about all prejudice and including games in educational processes. In our case, one of teachers was a huge fan of strategic gaming. It is highly probable that such persons can be found in any school.

Which games should we use? Typical school games are not always the most appropriate educational tool. Those games that have nothing to do with learning at first sight can be good enough. In our school, we used *Starcraft: Brood War* – a popular online strategic game. We wanted our students to learn strategic thinking and cooperation skills. Serious topics are not the only option when we want students to acquire those skills. The form in which students learn is more important than the topic.

The project we implemented in the school was an interdisciplinary one. We wanted students to use their competence in various domains. For instance, negotiating concerning the way gamers should be divided into groups can be introduced in civic education class. Before it is done, however, the students have to evaluate their competence in terms of equipment use and game rules (IT class), as well as the use of game instructions written in English (English class). How are such lessons organised? In IT class, the teacher puts students in pairs. They play one on one. They can also learn about possible strategies and negotiate the best moves. In English class, students study basic vocabulary. All of the activities are implemented in a friendly environment that has already been known to students.

Good advice

Such programme requires the teacher to know a given game, understand its rules and decide how it can be used to teach particular skills according to the class content (or syllabi of several different school subjects if an interdisciplinary project is being run). Most importantly, however, teachers should forget about all stereotypes concerning gaming and express willingness to give up traditional teaching methods. The advantages of such an approach include methodological development and closer connection with the students' world.

TIME:
2-3 weeks

FUNDS:
no cost or low cost

RESPONSIBILITY:
teachers and students

Thanks to computer games we learn, but also develop
social interactions. It is why we should play educational
games at school computers and mobile devices.
Photo: Primary School in Kamieniec Wrocławski, Poland.

LEARNING CAN BE MORE AMAZING

TABLET CLASS

A well-organised virtual space makes it possible to employ a variety of educational applications available on tablets and smartphones. Some of them can be launched on mobile devices, and others may be displayed on an interactive board or a multimedia screen. How to provide such a tablet class?

JOLANTA OKUNIEWSKA
Primary School no. 13 in Olsztyn, Poland

Multimedia boards had been used in my classroom for a few years. Nevertheless, the software did not provide all the necessary tools and functionalities. Open Sankore software was then installed on a laptop, which definitely extended the use of the multimedia lab. Tablets appeared quite unexpectedly.

In March 2013, one of my classes won a European competition. Their eTwinning project was deemed the best in their age category and they received a set of 23 tablets as a result. This prize was definitely a surprise, but also a challenge! I was faced with a new situation: a BYOD (Bring Your Own Device) model of working with children. (The tablets became the students' personal property.) I devoted two months of vacation time to learning how to use these devices. I tested various educational apps on them, read Polish and foreign blogs by teachers working with tablets, and I started to write my own blog concerning early school education with the use of these devices. When the new school year started, our educational space was much bigger.

Tablets need access to fast Internet. A separate router was therefore installed in my classroom, and additional extension cords were provided to enable device charging. I also sent a list of applications to be installed on the tablets to my pupils. During the first class, we established the rules for tablet use and decided on days when tablets could be brought to class. I suggested using freeware apps, but also took into account the suggestions made by the pupils. As a result, we installed some of the apps proposed by the students, after their educational value was confirmed.

I noticed that the students started to work more actively and engaged in finding additional uses of the installed apps. Thanks to the jointly established rules, there were no rule violations. The students immediately became mature, responsible mobile device users. At first we used tablets twice a week, and after a few months we switched to three times per week. This does not mean that we only use tablets on a tablet day. In early school education, it is very important to provide children with diverse educational experiences. Most of the time was therefore devoted to traditional methods, such as drawing, writing, painting or cutting. Whenever we wanted to achieve something more elaborate and we needed technology, we would switch on the tablets. At the same time, thanks to the multimedia board, each student was able to present his/her works on a bigger screen.

Thanks to this learning method children can acquire skills that help them combine studying with technology also at later stages of their education. The use of electronic devices was intentional and well planned, and did not replace any other school activity. The students were engaged in their work, shared their outputs and co-created the class by preparing quizzes or tasks to be performed by their peers. They were also willing to make use of the installed applications at home and perform additional tasks of their own mak-

ing. They often invented new games and exercises. They also willingly helped their parents and siblings in everyday tablet use. They now use critical thinking when it comes to new technology and its advantages.

Good advice

If we plan to use mobile devices in class frequently, we need to think about a proper network infrastructure. Secure, wireless Internet should be available at the school or in the lab. Apps should be installed at home to save time in class. Although some programmes are available in English only, children will easily adapt and learn how to use them. It is also a good idea to present the output of the students' work (posters, maps, comics, recordings, drawings) to parents and to the school community. A class blog or a separate page on the school's website is also useful. Students' works should not be one-time experiences. On the contrary, they should be reused as often as possible, e.g. a comic story / cartoon prepared on a tablet might be used as a point of departure to write a story or stage a small play, a poster might be used to add an audio narrative story, a description or a riddle, or to create a puzzle.

Which applications are valuable for early school education?

Tablet apps: PicCollage, Clarisketch, KidsPaint, MathDuel, ComicsHeadLite, WeeMee, CoolReader, QR Droid, NGOdkrywca, Tellagami, Picasso, Photo Mirror Effect, Penguin Jump Math, 10 Monkeys, PicSay, Sharp Mind Map, Kahoot, DiceRoller.
Multimedia board: Learningapps, Zondle, Jigsawplanet, ClassTools.net, Realtimeboard.
Internet apps that can be used on a tablet: Learningapps, Kahoot, Quizes, Quizalize, Duolingo, Quizizz.

TIME: it would be good if the teacher prepared for tablet use during his/her vacation time. Working with tablets should be ongoing. The first 1-2 months can be devoted to familiarisation with the devices and testing the apps.

FUNDS: if children bring their own devices, the cost will be low: a good router/Internet connection in the lab and additional chargers and extension cords.

RESPONSIBILITY: headteacher and teacher. Tablet use is an innovative method that requires a change in approach to teaching and teacher-student cooperation. The biggest responsibility is to be taken by the teacher. The educational process should be well-planned and constant improvement in the field of mobile education is expected. Parents should also support the initiative: they must be aware of the fact that the use of tablets boosts learning efficiency.

The tablet class is not about having children spend all day long in front of a tablet. Methodological diversity is the foundation of this project. A tablet is just another element of a pencil case. Apart from tablets, we also use a range of other tools and aids. Photo: Jolanta Okuniewska.

INVOLVING PARENTS

The school's educational space should go beyond the school building and make it possible to use educational resources at home. Tablets serve this purpose very well. It is worth training parents in mobile technology. In this way, they will assist teachers in educating children from home. How to convince parents that tablets are not just toys?

ALEKSANDRA SCHOEN-KAMIŃSKA
School Complex no. 3 in Piła, Poland

It all started in the first grade. Both the teacher and the students wanted to use tablets during lessons. The form teacher e-mailed parents, asking whether they agree to such a learning method. Children were supposed to bring their own tablets to class. He got a 'yes' from everyone. In response, the teacher also got a series of questions about the learning process. That's why he decided to organise a meeting with the parents. The parents were invited to an open study session. In this way, they were able to see how children use tablets in class, how such use motivates them and how well they work in teams. But watching was not the only thing they were doing. They also became students for a moment. At each meeting, the teacher would present selected educational applications and the parents would make posters, create avatars or scan QR codes. They would also partici-

pate in quizzes (children were the ones who created them). This would incite a lot of positive emotions. In this way, the parents were able to discover the educational value of modern devices. They understood that tablets serve not only for gaming and the like, but also for writing, counting, audio and video recording, photograph taking and animation.

These parent sessions were a huge success. The parents could learn about the advantages of the devices their children used and about the ways in which they could expand their children's educational space. They even started asking about the implementation of certain applications on their own smartphones and tablets. The teacher got full support from the parents, who allowed their children to go to school with their personal devices. The number of tablets in class increased (all students have them at the moment), which confirms that parents do appreciate the value of such devices. The parents also know that students use free, safe applications and study in a more attractive way. They also see how their children use the knowledge and skills acquired in class at home. The children are able to learn faster and in a friendlier atmosphere thanks to these useful applications. The parents can also follow their children's progress on a tablet-dedicated blog created by the teacher.

This change boosted both children's and parents' learning. Thanks to their cooperation with children, the parents now know of many other smartphone

uses than just making calls. They are also more willing to work together with their children on joint projects.

💡 Good advice

The awareness of new mobile technology's educational potential is quite low. Both among the adults (teachers and parents) and the young (students). For this reason, it is worth organising a series of meetings with parents to show them what the uses of mobile devices are and how these devices support their children's develop-ment. It is a good idea to organise a joint student-parent meeting at first, so that the parents can see how enthusiastic and motivated their children are when learning with mobile devices. Parents should get familiar with all the applications used in class. They should also be shown how tablets boost teamwork in projects involving 2-3 children. In this way, not every child needs to have their own tablet. The devices can be shared. Fast Internet connection is another important issue. An additional router should be installed if the regular school network is not good enough.

TIME:
2-3 months for meetings with parents, 4-5 hours of open training sessions.

FUNDS:
low cost or no cost if the school network is fast enough.

RESPONSIBILITY:
teacher (form teacher), parents, students, headteacher.

Today, parents can learn a lot from their children, provided that they let teachers educate them according to the modern methodology. It is worth showing parents how to use home electronic devices so that their child keeps learning even when using a tablet at home. Photo: Aleksandra Scho-en-Kamińska.

OBSERVING AND DOCUMENTING THE SURROUNDINGS

When discovering the world outside the school premises, tablets and smartphones prove to be very useful devices. It is worth remembering that multimedia presentations and films should not replace real-life experiments that can be easily organised by the teacher or students. They can, however, help observe the world and document this experience. In this way, we can build a new, endless virtual space for education that would be impossible to construct without the use of mobile devices.

JOLANTA OKUNIEWSKA
Primary School no. 13 in Olsztyn, Poland

I use tablets in class for documenting experiments performed by students at school and at home. Materials collected in this way can be later reused in the form of review material, preparation for class or presentation of results. I want to improve the learning process by employing modern devices and making students use their creativity, cooperate with one another, plan their activities, learn to be patient and draw on the knowledge and experience of others. Thanks to the diversity of activities undertaken at the subsequent stages of each experiment and documentation, students representing different learning styles can actively participate in class and use the lesson to the full.

Of course, it must also be remembered that tablets will not replace real-life experience. In early school education, children should be able to experiment on real-life objects and develop their practical skills. Diverse educational experiences are a foundation of good education. For this reasons, tablets or smartphones may enrich the educational process: they allow children to document what they do by taking photos and recording videos. They can also add audio stories to the drawings they make or record instructions for other children to use when experimenting. Tablets can be taken along on a trip, when field experimentation takes place. This enriches the educational space in virtual terms: some of the resources we use are stored on our mobile devices and can be reused whenever needed.

In my class, students were very enthusiastic about every task they were to perform. One experiment involved putting a dianthus into water coloured with red ink. In the course of the next few days, students would document the subsequent stages of plant colouring. When doing this, students were thinking about the principles of good photo taking. Some of the resultant pictures were then put on a PicCollage poster and descriptions were added. Audio descriptions cold also be added with the use of the Tellagami app. Another task, checking what floats and what sinks, did not require any preparation on the part of the teacher. Students planned all the tasks to be performed and documentation work to do with the use of tablets. We do a lot of such experiments. Whenever we go out to have a lesson in the park, we also take mobile devices. Children love to take pictures of what they see and then discuss various types of plants, flowers, leaves, butterflies or frogs… anything they find on their way. Thanks to such documentation techniques, subsequent exercises can be performed in class. The photos and the videos prepared by the students gain a new educational life.

For children, tablets have become useful educational tools and the learning and working part are the most important in school life. The children are able to enumerate the apps they use when creating posters, editing films or elaborating descriptions or stories. They know how to use the devices on their own, without teacher assistance. They also help each other when needed.

Apart from the inbuilt camera and audio recording functionalities, the following applications are useful for documentation purposes: **Magisto** (film editing); **PicSay** (adding text to photos); **PicCollage** (making posters out of photos, adding text); **Glogster** (posters with photos, links to YouTube videos, text); **Thinglink** (interactive images with links and pictures); **Padlet** (virtual boards for experiment descriptions, photos, conclusions, links to videos, comments); **Clarisketch** (drawing on a photo, audio recording); **Tellagami** (audio recording); **Explain Everything** (robust app for drawing, presentations based on photos, pictures, audio recordings).

Good advice

First, children should be taught how to make observations about the world and document them in a traditional way. In the first grade, children will be illustrating subsequent stages of their work and talk about their observations. In the second grade, they may write their joint conclusions down and discuss them with the teacher. In the third grade, children will be able to use the applications they already know from different activities. It is worth remembering that a few useful apps should be demonstrated and children should be able to choose the one(s) that suit(s) them best. Also, it is not the app but the way the gathered information is processed, presented and shared with others what matters in the learning process. The latter activities are what boost memorizing facts and acquiring new skills.

TIME: the first effects can be expected after 1-3 months of testing the method.

FUNDS: no cost or low cost. Most of the apps can be installed for free on tablets supported by iOS or Android. Out of the abovementioned apps, only Explain Everything requires a small fee.

RESPONSIBILITY: the school management should make sure there is a reliable Wi-Fi service in the class and finance the purchase of applications if necessary. The rest is to be organised by the teacher. Most importantly, however, the use of tablets in education teaches responsibility also to the youngest participants of the process.
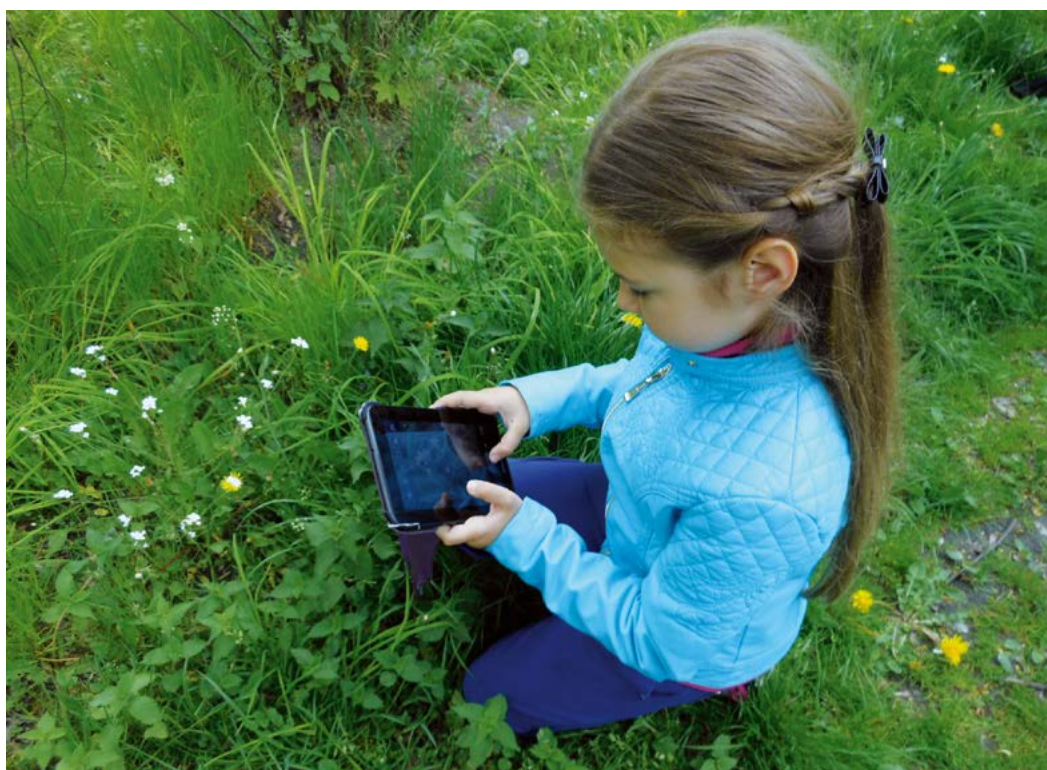
Modern technology helps us document what we observe in the natural world. It also develops awareness of the nature's beauty among children. Photographs taken by the children can be later used to discuss various topics in class. Photo: Jolanta Okuniewska.

INVITED TO LEARN – BRING YOUR OWN DEVICE

Not every school can afford to buy mobile devices for educational purposes. It is therefore worth asking students to bring their personal devices to class and organise lessons accordingly on a chosen day. This will definitely enrich the educational space of the school.

MONIKA WALKOWIAK

Primary School in Kamieniec Wrocławski, Poland

In many schools all over the world organising lessons with the use of mobile devices constitutes a problem: there is no equipment available. At the same time, students often have the needed devices at home. The school should use this potential. I decided to implement a BYOD (Bring your own device) scheme in my class. As a result, children bring their own tablets once a week and we use them for educational purposes.

There is a saying: if the shoe fits, wear it. I asked a simple question: *Who has a tablet at home and would like to use it in class?* I learned that more than a half of my students had such mobile devices and every one of them was willing to use them at school. The next task was to persuade parents that it's a good idea. I wrote a letter to each parent, explaining why it is worth employing tablets in learning. I also provided some links to blogs written by teachers who use tablets in class so that the parents could see that the use of tablets is practical and successful. I then introduced tablet Fridays. When planning lessons, I always remember that tablets are tools, just like scissors or pencil sharpeners. When used appropriately, they boost students' creativity and active development.

We use various types of devices, but this is not a problem. Some of the tablets run on Android, others iOS, others still use the Windows operating system, but the common denominator is free applications. Before each tablet class I write a post on our class blog with information on the apps to be installed on the tablet. Children come to class with fully charged tablets and the apps installed. As we work in groups, there is no need for everyone to have their own device. In this way, we also develop social competence. Interesting, colourful applications encourage students.

During our tablet class, we usually improve on our reading, writing and counting techniques. We work on reading comprehension, orthography and grammar. We create descriptions, stories, cartoons, posters and videos. We also do some coding with the use of Scratch Junior. We scan QR codes with links to games, websites, tasks and riddles. Once every three weeks, we visit children from the preparatory grade. My students become coaches and teach their younger colleagues how to code, by creating interactive educational games. Reports from such tablet lessons are regularly uploaded on the blog: **http://123tablety.jimdo.com/**.

It can be said, therefore, that we have added a new piece of space to the educational process. Students now see tablets as educational devices and not only interactive toys. They improved their digital competence. They are now better prepared for the challenged posed by the information society. During the tablet lessons, they are active and motivated. They are also cooperative and friendly when working in groups. They communicate well and know how to distribute tasks between one another.

💡 Good advice

If we want to implement the BYOD scheme, we need to have the parents on our side. For instance, we can organise a demonstration lesson for them (more on the subject can be found in the Chapter: Involving Parents), present reports on the works conducted by others with the use of mobile devices during our meetings with the parents, etc. Before the first class, we should also write down the rules of engagement together with the students. We will also need a wireless network in the classroom (a separate router is recommended). This will make it possible to use all the functions offered by mobile devices. On the other hand, many apps can work offline, so it is possible to organise tablet lessons even without a reliable Internet connection.

TIME:
about 1-3 months

FUNDS:
practically no cost

RESPONSIBILITY:
teachers, parents and students.

Whenever we plan group work, let's make sure that each group has one electronic device at their disposal. In this way, children will be able to cooperate and look for answers together.
Photo: Monika Walkowiak.

EFFECTIVE USE OF EDU TECHNOLOGIES

OVERCOMING BARRIERS

The virtual space cannot be used properly if blocked by teachers' skepticism. How can we encourage teachers to change their attitudes and successfully introduce changes?

JACEK ŚCIBOR

Institutions: School Complex in Chrząstawa Wielka, Poland
Primary School in Kamieniec Wrocławski, Poland

The use of new computer technology in schools requires a change in teaching methodology. Teachers must also learn how to use the technology that will be used in class, determine its usefulness for a particular subject and mentally adapt to the need of using IT tools in education.

Certain problems can be encountered when introducing ICTs in schools. These include:

- **technological limitations** (lack of broadband Internet – more information on this topic is available on page…, lack of an internal network distribution system, such as Wi-Fi for all students in all classrooms; lack of IT infrastructure in classrooms, e.g. computers, projectors, loudspeakers, etc.);

- **limited technical skills** (teachers lack basic IT skills, they cannot connect or disconnect devices, they are unable to change their settings, they are unaware of the safety and security issues related to IT equipment);

- **problems with IT equipment use** (lack of knowledge of the English language, lack of willingness to learn about IT tools on one's own, lack of flexibility in using tool interfaces, lack of creativity, lack of trust in the students technological skills);

- **methodological limitations** (teachers are unable to say which tools could be used for their purposes, they only passively use the available solutions, they are not familiar with the digital education models, e.g. SAMR);

- **mental barrier** (lack of motivation to change habits and forget about the old routine, lack of examples or reliable studies that would describe technological change in education, lack of willingness to experiment and discover new teaching opportunities, etc.)

It is highly probable that such limitations can be encountered in most Polish schools. This definitely inhibits their development. With these obstacles in mind, we decided that our school needed continuous effort. We gradually introduced the following changes: an electronic school register was created for everyone (teachers, students, parents); we put a computer with broadband Internet, a multimedia projector and loudspeakers, and integrated them with an interactive board (plus software and technical support) in each classroom; we established a reliable, high-performance network in the school, which also includes the possibility of using mobile devices (tablets) for group projects and tasks; we organised training courses in new technologies; we presented effective models of technology use in education based on the SAMR model: we showed its practical applications at each educational level.

The steps we took partially helped us overcome the technological barrier: all of our classrooms are now connected to the Internet and equipped with a projector, an interactive board or screen and

stereo loudspeakers. One of the school floors has an open-for-all Wi-Fi network. We bought tablets for classroom use. Internet signal distribution was diversified: different providers are responsible for the administration's network, the teachers' Internet access and the Wi-Fi. We have had a series of training sessions in the use of projectors and interactive boards, as well as in the use of tools accompanying multimedia devices and interactive boards, and in the creation of new interactive materials based on widely available free educational tools. We also presented effective technology use models based on the SAMR model: we showed how it is used in practice on every educational level. A change in the mental approach to technology was possible thanks to the introduction of the electronic school register and to the ongoing access to technology. Continuous, unlimited access to reliable, well-maintained IT devices placed in every classroom ensures greater "transparency" of the technology used at school. Teachers started to use all of the available devices and tools at most lessons.

As a result, we have witnessed a 'technological revival' of our schools. The use of technology in class and during school meetings and events has been increasing. Connecting and setting a projector or the school's sound system is no longer a problem. Basic computer functions, such as editing the elec-tronic school register, ceased to cause frustration. The number of school events announced by electronic means is on the increase, and electronic communication with parents is now obligatory and has even been mandated by the school's statute. Older students prepare interactive materials for their younger colleagues, supervised and inspired by teachers of non-IT-related subjects. The greatest opponents of computer use in education now send their reports by e-mail and communicate with children over the cloud (where they collect homework, etc.).

Good advice

School digitization must be a well-planned initiative that cannot be implemented in a short time. Even with sufficient financial means, buying equipment is not the end of the story, as it will not change teachers' attitudes. A long-term action plan and full support of the school's management are necessary ingredients of the whole undertaking. A few people should be chosen out of the teachers' board for more advanced training. They will become change leaders. After they are properly trained, they will help other teachers develop digital skills. Throughout the digitization process, new tools and training courses for all teachers should be gradually added.

TIME:
the process took 3 years

FUNDS:
planned investments from the schools' budget. The funds were needed to buy equipment, software, licenses and maintenance, as well as to organise training sessions.

RESPONSIBILITY:
the process affects all levels: head-teacher, school network administrator, IT teacher, school digitization leader, all teachers.

FROM PRESENTATION TO ENGAGEMENT

It often happens that teachers are not fully aware of the potential the Internet and IT tools offer. Sometimes it suffices to show them that a task to be performed with the use of new technology may be a better choice than a traditional lesson. The results of such an experiment may be surprising.

MARTA FLORKIEWICZ-BORKOWSKA
Public Middle School no. 3 in Pielgrzymowice, Poland

Recording films on particular topics or preparing student adaptations of famous literary works are good ways of using modern technology in education. This chapter is about creating such projects, and more specifically about making film adaptations of Grimm tales in German.

Project implementation is not a new topic at school. The project-based method has been used for many years now. New technology, however, gives an added value to such undertakings. We can add modern devices, such as digital cameras, video cameras, mobile phones and smartphones, as well as sound and image editing software to make the project more complex and entertaining. This meets student expectations concerning modern technology use, and makes them more willing to participate. Thus, technology opens a whole new world of learning opportunities. It helps students develop their IT skills and learn how to record, process and edit video footage. As a part of the project, students are also asked to write a blog[17], create interactions on the LearningApps platform or flashcards with new vocabulary on Quizlet. Besides, throughout the duration of the project, they also perform a series of tasks that develop social competence. Computer and ICT use teaches them cooperation, responsibility, helpfulness, punctuality, patience an assertiveness. These are often new experiences for them.

Public presentations of the implemented projects constitute an important part of the whole undertaking. The school community consisting of teachers, parents and invited guests is confronted with the fruits of students' work. It is also a new experience that students need to overcome their fears, timidity or stage-freight.

What effects can we expect of such projects in the case of foreign language courses? After the first project, which involved an adaptation of a Grimm brothers' tale of students' choice, the number of students willing to participate in such undertakings reached 100%. Students became more motivated and more interested in learning German. What is more, students also began to create similar projects with the teachers of different subjects (a film adaptation of *Alice in Wonderland*[18] was elaborated). They also started to participate in a variety of film competitions (a short film about Karol Miarka, Polish language promoter born in Pielgrzymowice, won one of such contests)[19].

Good advice

When implementing such projects, teachers' attitudes are crucial. They must be willing to include ICTs in their teaching methodology. Not only students can learn a lot from such an experience. The teacher will definitely appreciate it. Making a whole movie is not necessary at first, some fragments or short produc-

tions are absolutely sufficient. Short scenes can also be filmed before a larger project is undertaken. It is worth using both the school equipment (computers, digital cameras) and students' devices (smartphones, tablets, laptops). If no specialised equipment is available at school, there is no problem in using personal devices.

TIME: depends on the task. Short etudes may take up to 1 month, while bigger projects may require 6 to 10 months.

FUNDS: no cost if we let students work on their own devices.

RESPONSIBILITY: teacher, students, headteacher's support.

Implementing projects that involve educational video making is one of the most interesting and engaging activities for students with the use of new technology. This may involve a novel or fairy tale adaptation to film. "Puss in Boots" was prepared by a group of students from the German language class. Photo: Public Middle School no. 3 in Pielgrzymowice.

SOCIAL MEDIA AS A LEARNING OPPORTUNITY

With virtual spaces, we can make use of a lot more educational tools than in traditional classrooms. The social media are a good example. They make it possible to implement a variety of projects within the limits of the core curriculum. Edmodo or Facebook can be used, for instance, to foster student-student cooperation and teamwork.

MARCIN PAKS
Secondary School Complex no. 5 in Sosnowiec, Poland

The most important principle teachers should bear in mind is: be your students' friend, not enemy. Teachers should not be afraid of the social media. On the contrary, they should be willing to use them themselves, and employ them in class, e.g. to create project groups or send short messages via Snapchat, divide students into teams by age or topic, etc. Edmodo is even better at fostering in-group communication for educational purposes. The tool combines social media functionality with Internet resources designed for education. All this is enclosed in a friendly, safe environment.

It can be said therefore that Edmodo is an educational version of Facebook: it combines instant communication with quiz-making functions, activity creators and online resources management. The application is easily integrated with Google Drive, which makes it possible to engage in comprehensive projects that are not limited by space or time.

Once an account is created and the school is added to the platform, teacher connections are enabled for teacher communication, and students and parents can be easily contacted via the platform. Teachers can be grouped by subjects, and students can be grouped by class or project. Instead of assigning tasks in a traditional way, teachers can use the platform. Students can comment on their activities and perform their tasks with the use of various Internet apps. The results are then posted on their Edmodo walls. Teachers act as moderators, follow students' progress and evaluate them by assigning medals/marks (created by the teacher personally or integrated with the platform). This allows for the gamification of the learning process and for the introduction of competitive elements (who has the highest score?).

The platform makes it possible to introduce elements of formative assessment. Students communicate with one another via Edmodo, evaluate one another and participate in discussions thanks to the embedded communication mechanism. They are also able to collect all educational resources in one friendly place. Additionally, they can develop their foreign language skills (English is one of the available languages, the Polish version is still under development). It is also important to overcome the doubts student have concerning the additional duties involved by the use of the platform.

From my experience, I can say that students are more willing to take tests or quizzes (hence traditional assessment methods) if they are presented in a more engaging, modern way. When performing tasks on the Edmodo platform, students engage in educational interactions, both between one another and with the teacher. They treat learning as fun and ask for more rewards! They also spend more time learning: they log on the platform both in class and at home. This type of education is really attractive.
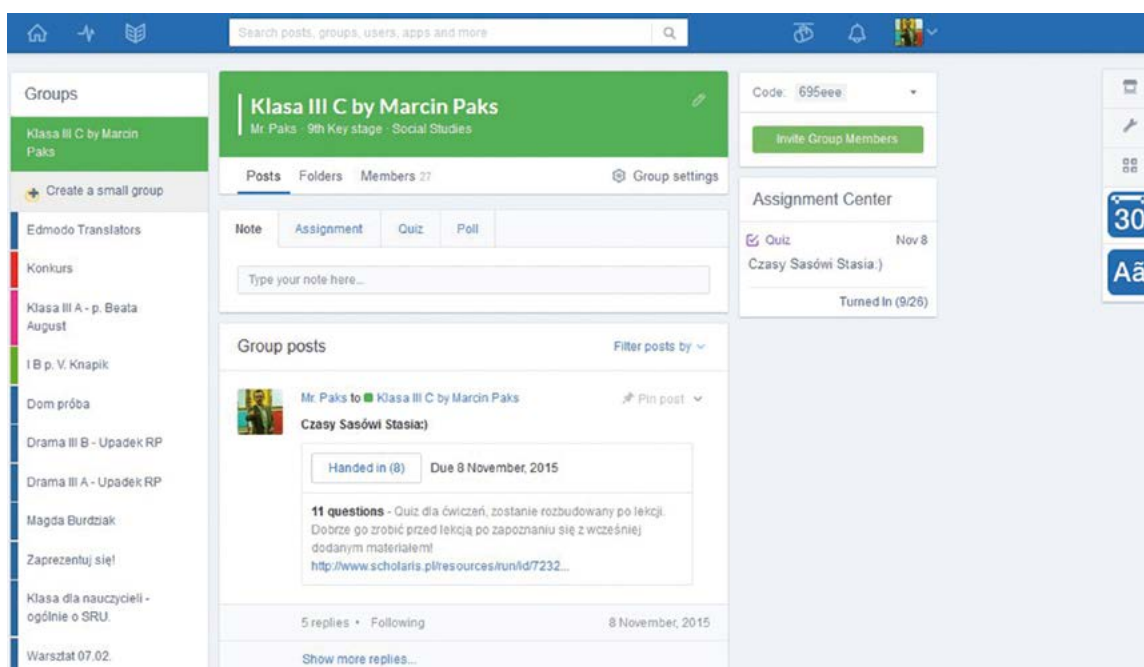
💡 Good advice

Edmodo is a great tool for introducing digital education to students, teachers and parents. The English language can be both an advantage and a hindrance, depending on participant skills (the Polish version is under development). It is worth starting with a few small project groups and introducing the mobile version of the applications. This shortens the implementation time. It is also a good idea to think of a personal reward system (e.g. medals adjusted to the type of tasks to be performed on the platform). If we want to use the pro gramme at its full capacity, a good Wi-Fi connection will be necessary. This will enable full access to Edmodo tools and resources within the school premises. If there are not enough computer devices at school, children should be allowed to bring their own devices with them (more information about this solution can be found in the Chapter: Invited to Learn – Bring Your Own Device). It is also crucial for the students to have Internet access at home, so that they can participate in Edmodo projects outside the school hours.

🕐 **TIME:** about 1 month

▭ **FUNDS:** no cost

✋ **RESPONSIBILITY:** teacher and students. The headteacher and the parents should be informed about the details concerning the use of virtual spaces for educational purposes.

Resources created by a third grade middle school teacher. Example of the 'flipped classroom' method: students are asked to look at the materials and take a quiz before the lesson starts. Photo: Marcin Paks.

VOCATIONAL DEVELOPMENT AND TRAINING IN SCHOOLS

We should try to constantly develop our competence and improve our digital tool use. This can be facilitated by organising conferences and workshops during which teachers can share their experiences, come into contact with new technological solutions and acquire new knowledge on the subject.

DARIUSZ STACHECKI

Feliks Szołdrski Middle School in Nowy Tomyśl, Poland

We started this kind of activity as far back as in 1998. At that time, I was responsible for organising small, informal meetings with IT teachers and showing them how to build school computer networks and make all teachers use them in their work. Soon after that, these small informal meetings with IT teachers became a national event which I called *Konferencja Administratorów Szkolnych Sieci Komputerowych* (KASSK) [School Computer Network Administrators' Conference]. The name was a little bit provocative as there was no function or post at school that would correspond to the role of a network administrator. It must be noted, however, that school networks are often robust, specialised structures involving hundreds of devices. Making all of these components work and perform well at all times is quite a challenge. Headteachers and bodies responsible for running schools are often unaware of this fact.

The conference was focused on using technology in everyday work. Conference participants were therefore asked to present their own methodology and experience with technology (although persuading them to do that was often a challenge). The conference was a success precisely because teachers had the courage to stand before the invited guests and say: *Look. This is how we do it. We are still learning, our skills require improvement, but that's how we work. It probably could be better, and that's why we are meeting here: to share our experiences.* The first

edition of the conference lasted one day, then we had a 2-day session, and now it's three days.

Together with the idea of introducing technology in school, we started thinking about creating a special type of library that would not limit itself to just book collections. And so we initiated the School Information Centre project focused on the technological aspects of education (more information on the Centre can be found in the Chapter: School Information Centre) We then learned that thanks to the conference the idea was propagated further and many other school libraries in Poland decided to introduce technology.

Why did we feel the need for organising such meetings? What made KASSK such a successful event? We are convinced that this is due to high quality lectures and workshops in terms of content and usefulness. Many different meetings concerning IT in education are organised n Poland, but these often take the form of commercial offers and marketing campaigns.

In Nowy Tomyśl, those interested in the use of technology in education can not only see how teachers in class use the products available on the market, but also listen to what the most important figures of the educational world have to say on the matter. And most importantly, our teachers' board can use this potential to further develop our digital competence.

The conference programme is very dynamic. The first day usually encompasses plenary sessions with presentations by experts in education. Two years ago we used the sports and entertainment arena for the purpose. It was difficult to prepare such a huge space efficiently, but we managed to impress the participants. We visualised it on a screen that was 8 meters long and 3.5 meters high. A digital cinema projector displayed HD images. We also invested in a big display consisting of 64 monitors, where presentations or camera captions could be seen. The second and third day usually consist of workshops. There are also around 15 parallel workshop sessions organised in classrooms (which gives a total number of 120 workshops).

This makes the conference a huge undertaking involving everyone: school teachers, as well as students who also engage in providing workshops for teachers. Besides, such an event is a great learning opportunity for children. Today, KASSK is considered to be one of the biggest and the most prestigious events of this type in Poland.

But we didn't stop at that. In 2011, we launched a similar initiative, entitled: "Mobile technologies in schools". This is a specialised conference during which both teachers and students present the ways in which iPads can be used for learning. We share our experiences and show how we organise lessons, how we use the available apps, e-resources, e-textbooks, etc. We also sow iPads as project-based learning tools, showing how to integrate them with other technological tools. As a part of this second event, we offer practical workshops organised by our teachers in cooperation with students. We already have quite a lot of experience in this area. Every day, 3 different e-classes (one per level) work with iPads in a 1:1 system (every student has an iPad). Also, all teachers have iPads in our school. Besides, there is an iPad lab in the natural sciences section of the school, and the School Information Centre has three mobile labs available for use by other teachers. More and more often, children also bring their own devices to school.

Good advice

There is no need to organise a big national conference. What we usually lack is experience and good practices sharing. This may include teachers working at the same facility or in several schools from the area. Local or regional meetings are a good place to start, and new technologies can be a common theme for them. Digital competence among teachers at school is still at a low level. For this reason, organising meetings that involve information exchange and discussions on the tools and methods related to the use of technology in the school's virtual space can substantially improve the quality of the educational process. Another important recommendation is addressed to the school management. We urge headteachers to send their teachers on good training courses organised by teachers who can share good practices in the field of technology use. Lots of new information and contacts will be gathered in this way. This, in turn, can be used to increase the quality of the school's offer.

TIME:
depends on the type of event. KASSK is organised once a year, but it takes a few months to organise it. The same applies to the "Mobile Technologies in Schools" conference.

FUNDS:
sponsors cover most of the costs and we try to spend as little as possible. In the case of KASSK, there is a conference fee that helps us cover some of the costs. *Mobile Technologies in Schools* is free of charge.

RESPONSIBILITY:
school management

SUMMARY

Ideas and solutions presented in this handbook are an attempt at forming a broad approach to the issue of digital learning spaces. Basically, they describe a certain ideal state in which everything has been properly planned and implemented. Do schools like this even exist in our world in the 21st century? It is doubtful, although many schools certainly head towards well-designed learning environments. Hence the idea was to present in this handbook such an "ideal state" (understood rather as a certain organisational minimum) through a mosaic of ideas and solutions from various schools.

Naturally, we have not described all possible ideas for the organisation of virtual-technological space in the school. We want to reserve some room for development and updates of the handbook's content in future. As I have emphasised at the beginning, this space is dynamic and ever-changing (mainly due to constantly evolving technologies). We can be absolutely certain that after this handbook is published, new information will emerge concerning the application of numerous other solutions and e-learning tools in schools that have not been discussed here. Such solutions add the virtual dimension to the traditional learning space (e.g. with regard to Augmented Reality or personal learning space management, like an e-portfolio).

Since we are one of the first authors who attempted to gather information on this particular learning space in school, we would like to draw attention to several aspects that are usually overlooked when discussing the so-called digital school, or the 21st century educational environment. This is why we have begun with obvious questions, such as the Internet and electricity. The Internet itself and computer devices operating in schools are not enough to form a well organised learning environment – it needs well-designed supporting pillars; solutions must be stable, up-to-date and safe, and system's users must know the rules of using this space. When we provide stable foundations, we can base on them and develop virtual learning space, practically without any limitations and in any desired direction.

If technologies were to be used in the school sensibly and really contribute to the learning process, it would be advisable to consider the so-called school digitization programme, which should be cohesive with the school development programme (it can constitute a part of this programme). It should present general philosophy, objectives and premises of high quality education involving new technologies, as well as an action calendar (including fundraising), which we plan to implement within the next few years. We must consider how we want to teach in the digital environment and what kind of teaching we particularly want to provide for our students. Computers and other devices can be quickly included in school activities, but their sensible long-term application is still a distant concept. Building a high quality-learning environment involving technologies is an action plan that requires spreading over three years, rather than a one-year execution. However, nothing stands in the way of the school introduc-

ing certain elements and practices, in order to gain experience and ideas for further development.

When designing educational space involving new educational technologies, we should pay particular attention to four features. Modern learning environments should be:

- **flexible with regard to many dimensions and to time**, allow a multitude of applications, capacities and layouts;

- **inspiring** for those working and learning within, as well as those visiting and realising organisational goals;

- **supportive of efficient teaching and learning**, containing a broad spectrum of experiences and activities;

- **inclusive** for its users and the broader community, as well as creating links to other learning spaces[20].

We have presented inspiring practices with regard to creating and using a learning environment that involve using ICT networks and tools. We would like to encourage you to use presented ideas in order to create and build a multidimensional, modern learning environment in school, in which every teacher and student has sufficient conditions for comprehensive development of key competences, including their digital and social skills.

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2   See: Malcolm Brown, *Learning Spaces*, Educause.edu, http://www.educause.edu/research-and-publications/books/educating-net-generation/learning-spaces. Access: 8.11.2015.

3   See: *Learning Spaces Framework: Learning in an online world*, MCEETYA - Ministerial Council on Education, Employment, Training and Youth Affairs (Australia and New Zealand), 2008, Page 5:http://goo.gl/4l2bKW. Access: 8.11.2015.

4   See: *Learning Spaces Framework: Learning in an online world*, MCEETYA, ibidem Page 10.

5   See: *Learning Spaces Framework: Learning in an online world*, MCEETYA, ibidem Page 15.

6   SAMR Model was developed by Dr. Ruben Puentedura, the Catalan scholar. It describes four levels of IT use at schools: from Substitution, through Augmentation and Modification to the Redefinition of learning process. On one hand this model shows various ideas on ICT use in teaching, but also, what is more important, illustrates a change, which is possible in classrooms due to ICT use: from a technology that is used occasionally with no broader didactic purpose, to a tool that stimulates a real transformation of learning. See: Marcin Polak, *Model SAMR, czyli o technologii w nauczaniu*, Edunews.pl,http://edunews.pl/badania-i-debaty/badania/2736-model-samr-czyli-o-technologii-w-nauczaniu. Access: 30.12.2015.

7   See: Fundacja Orange – Włącz Szkołę, http://fundacja.orange.pl/wlacz_szkole.html. Access: 30.12.2015.

8   0% VAT for laptops for schools would be in conflict with Directive 2006/112 of the European Union, See: Gazeta Podatkowa no 61 (998), 1.08.2013.

9   Elaborated on an article by Krystyna Kuźmin-Smalc entitled *Pierwsze kroki z programowaniem*, Edunews.pl, http://edunews.pl/nowoczesna-edukacja/ict-w-edukacji/2997-pierwsze-kroki-z-programowaniem. Access: 8.11.2015. She teaches computer programming to 6- and 7-year-olds as a part of the Coding Masters Programme.

10 See: the Coding Masters Programme, http://mistrzowiekodowania.pl. Access: 8.11.2015. The programme has been operational in Poland since 2013. 3,000 teachers were involved in teaching almost 100,000 children from 1,200 schools during the three editions of the programme.

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12 See: Scratch, https://scratch.mit.edu. Access: 8.11.2015.

13 See: Code, https://code.org. Access: 8.11.2015.

14 If you are looking for a comprehensive description of this method, see the didactic manual (electronic version only) by Sabina Furgoł and Lechosław Hojnacki, *Metoda Webquest. Poradnik dla nauczyciela* [The WebQuest method – Teacher Manual], Think Global, Warsaw: 2013, format: EPUB, https://edustore.eu/publikacje-edukacyjne/30-metoda-webquest-poradnik-dla-nauczyciela.html. Access: 11.11.2015.

15 More about the WQ Fridays can be found in Iwona Olbrycht's presentation given at the INSPIR@CJE 2015 conference in 2015: https://www.youtube.com/watch?v=S74SW-HN2pg. Access: 11.11.2015. All implemented webquests are published on the school's website: http://www.gimnazjum24.wroc.pl/nowoczesne-technologie/mobilna-pracownia-tablety-ipad/webquest-w-gimnazjum-24. Access: 11.11.2015.

16 More information can be found on the DeutschFun blog: http://deutschfun-pielgrzymowice.blogspot.com/search/label/Quizizz. Access: 30.12.2015.

17 See project blogs created by the students of the Public Middle School no. 3 in Pielgrzymowice:http://deutschfun-pielgrzymowice.blogspot.com/p/blogi-uczniow.html. Access: 30.12.2015 r.

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