

# Annales Universitatis Paedagogicae Cracoviensis

Studia Technica VIII (2015)

*Aleksandra Knych, Piotr Migo, Henryk Noga*

## Computer programs in technical and information technology education

### Introduction

It is a teacher's responsibility to choose a multimedia program for the subject, because he is a competent person to make the right decision which software that will be used in the classroom [6]. The amount of multimedia teaching aids is growing really fast, and it made the existing programs often become outdated and sometimes it does not have elements that are consider today as the standard, which before have not existed.

While choosing a multimedia program, the teacher should know to which age group of students it will be headed and what equipment will be used [6, 3]. Multimedia educational programs should be compatible with the core curriculum, as well as the individual requirements of the students. The teacher should take into account that some students may not have had access to a computer before, and opportunity to work with the program by himself. The program used should develop students interest and show its usefulness, not only in the classroom, because the knowledge gained is quickly forgotten outside the class [7]. If it is not used and practiced outside the class, students will forget it. Today, we are able to use more effective methods of preservation of knowledge. Destined for this purpose are computer programs that teachers can use for their lessons. There are benefits of computer-aided learning, like the ability to acquire knowledge faster, higher efficiency and greater motivation.

### Computer program in Education

Not all computer programs can be qualified as cognitive tools. These are just the ones that have been adapted or designed for teaching at the school with the principles of teaching, psychology and development of young people [11].

Currently, the role of the computer is growing, and has become the primary measure used in education. The biggest benefit of multimedia programs is that they are involving students participation which enriches the lesson and inspires pupils

to newly-known subject [5]. Working with computer involves choosing the most appropriate programs and tools. Most often these are completely new programs and are unknown to students that had been using other programs. The teacher should be familiar with a new program that will be used in their classes [6]. Only then should they accurately convey knowledge to his students. At different stages of schooling much depends on the subject of which we can use the various multimedia programs. These programs can be divided according to their destination [6]:

- designed to exercise and extend courses and trainings,
- for stimulation and demonstration,
- for corrective activities,
- for helping and resolving problems,
- for teaching,
- educational games.

Practice programs are those which start with the questions, to know what extent of the difficulties a student wants to learn. In these programs, there is an interaction between the learner and the computer and the principle of stimulus-response. The demos are helping the teacher to explain the various phenomena of nature. These programs often replace traditional teaching aids at school. Teaching programs are in a similar manner to the teacher, transferring knowledge from a specific range of material, and then asking questions to test the students' knowledge [15].

The current software market gives wider possibility of their use not only in science lessons. The program helps the teacher to work and gives satisfaction and a sense of fulfilling his duty. In contrast, students are given a different perspective on the newly learned facts and motivated to take action.

## **History and definition of multimedia educational programs**

To define multimedia educational software, we need to refer to the definition of teaching and the definition of the media. In Polish school we use the definition of the most educational measures proposed by Vol. Kupisiewicz. According to the author, "teaching aids are items that are providing the children specific stimuli affecting vision, hearing, touch, etc. to help them direct knowledge of reality" [4].

The theory of educational media term is being used in relation to the impact of media and teaching aids. According to Wenceslas Strykowski, "media are the different type of object and device, supplying customers with specific information (messages through words, images and sounds, as well as enabling them to perform certain actions intellectual and manual" [8].

The scope of the term "media" includes the following elements [14]:

- messages understood as a set of information provided by sensors,
- substrate material, or media statement, also known as the centre of didactic material or soft (software),
- medium, which is a technical device for the transmission of a message, called an asset (hardware).

Combining these two terms we can define a multimedia educational software as: Computer programs that help students explore reality through the use of visual messages, sound and word in order to perform certain activities and exercises to develop their skills. Man always seeks knowledge, it is his need as natural as his other daily activities. As a result, among other things, we can talk about the development of modern civilization. When we look at this development from the perspective of time, it turns out that in the twentieth century, the pace has began to grow rapidly. Twenty-first century is the age of knowledge, social transformation, new challenges and the development of the computer industry. In 1985, the Ministry of Education approved the program of the computer education for secondary schools. This date is the beginning of the development of the information technology subjects in Polish schools [12]. This means that our workbooks, our educational program and the process of teaching, are already behind. Teaching aids such as programmed instructions, manuals and teaching machines today have only historical and sentimental value [4]. To this day, what survived is only an idea that was reborn at a time when personal computers appeared in a mass scale in schools. With this idea, and multimedia support of educational programs (MPD) it is possible to support process automation and individualization of teaching in Polish schools [4]. However, it is known that science as a school subject in such a form has only been present for several years, and the computer in the Polish school is primarily used in subject associated with it. Its participation in other subjects is still negligible.

The first computers we have had encountered, had low performance in comparison to today's computers. Modern computer re called multimedia powerhouses with a friendly interface and simplified service. The computer in this form is in our lives since the beginning of the 21<sup>st</sup> century. This may be time to talk about multimedia programs designed to support learning processes [4]. MPD story begins with the advent of computers in schools on a large scale. From the beginning, you can see the potential of these programs, resulting in the development of new and continuous updates of the ones that exist.

### **MPD in a modern school**

The development of technology, especially computer programs, entails far-reaching changes in human awareness, which is also a test for the present school. Use of available computer technology in various fields is a new task set for the teachers in the core curriculum:

The use of information technology as an aid in learning and teaching other disciplines ... [1]

The programming framework also determines the level of assimilation of knowledge of every teacher in the use of information technology:

Every teacher should be prepared to use the information technology in his work and with the work with students ... among others by using information technology as a medium for teaching, according to their science field and stage of education [1].

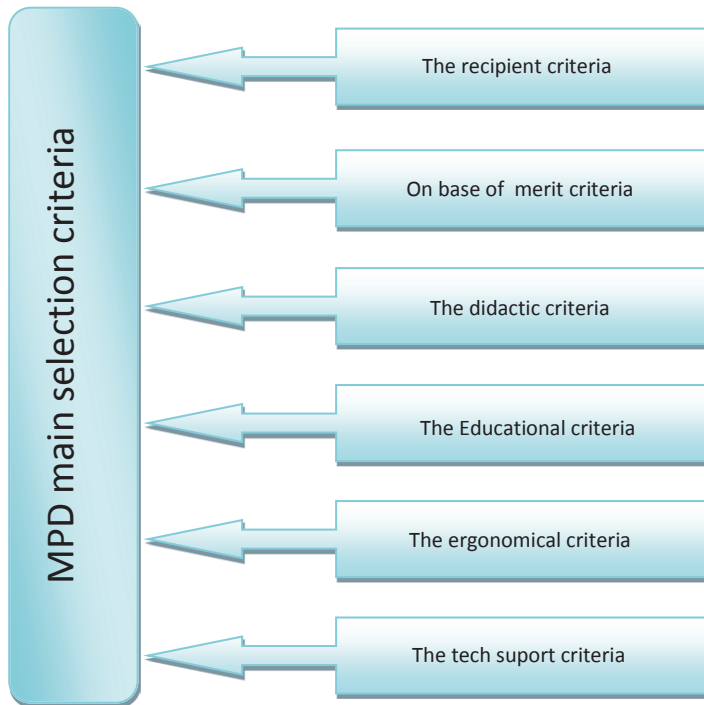
Every teacher should use a computer, as:

- a source of information,
- a tool for communication (e-mail),
- a tool that supports the teaching process (multimedia).

Computer programs as a modern multimedia teaching tool should be used as a support of the learning process and for self-study and filling the gaps in the regular knowledge. Computer affects the development of the subject concept, particularly science and technology. Currently, the teachers use computers in their teaching, using multimedia tools often attached to the course book, as well as free software under the student's license. Hardware and software, which we can use, now gives you more opportunities to acquire knowledge and develop skills to use modern computer technology. Students at the school learn to use computer science programs to create graphics, text, multimedia presentations and learn the basics of programming languages. The lesson techniques are used to support education programs for design, modelling, and demonstration programs. Provision of information of phenomena distant in time and space, and often not accessible by direct observation becomes available through demonstration programs. Modern education, that grows on computers, now has a big impact on students' lives. The expectation of the current school is primarily to acquire education by students. Part of this training is to prepare them to live in the modern world, which cannot be imagined without computers. The education of children and young people must be taken into consideration, especially the basic knowledge and computer skills, which are associated with technical and computer classes. A computer is a tool to enrich the learning process of children. The computer's value as a teaching tool is increasing because more than 80% of the information reaches the man through his eyes [13]. Also, a computer can present processes or phenomena that can be observed in the wild, because some processes are usually difficult to observe and analyze. Effectiveness of teaching carried out using MPD shows that the acquisition of knowledge is increased by 40%, the speed of learning is faster by 60% and we can save 70% of our time [13]. Enhancing the learning multimedia resources makes sense when we have access to various forms of multimedia activities and exercises. Sometimes it is just computer programs used in education.

### **Criteria for selecting the multimedia educational programs**

The following diagram shows computer characteristics distributed, respectively, due to the criteria that are widely analyzed, for example, by Alexander Piecuch and others [5, 11]. These criteria are used in the selection of multimedia educational program (MPD) by teachers.



**Graph 1.** MPD main selection criteria [11]

### **The recipient criteria [11]**

The first and most important criteria that need to be taken into account during the selection and evaluation of MPD criteria is the recipient. This criterion ensures the correct flow of information between the learner and the MPD and vice versa, between the MPD and the learner. This means that properly designed educational program should be easy to use and compatible with the user's mental and physical progress, to allow him the correct way of communication, and thereby increase the efficiency of learning. Such program should use the language, icons, metaphors, examples and tasks understandable for people from a certain age group. Given these components, it is recommended that the MPD was directed to users in accordance with the following distributions of psychology introduced by [11]:

- 3–7 years – preschool age,
- 7–10(11) years – younger school age,
- 11(12)–17(18) years – pre-adolescence,
- 18–24 years – adolescence,
- 24 and more.

There is also another age-related breakdown of the psychological development of the user, which is based on the level of education. And so it is distinguished by the level of [11]:

- preschool,
- early school,
- primary school,
- secondary school,
- high school,
- university and Collage,
- people who already had occupation but are looking to change their profession.

The main problem arising with the criterion of adapting the program to the recipient is ability to chose the appropriate way of communication, so that the information goes correctly to the user. If the program is designed to work with the youngest (cannot read and write yet), you should not use the text mode. It is also very important to use the appropriate selection of examples of tasks according with the age and level of pupil education. The designers of multimedia educational programs should remember that what for them is obvious and easy, the recipient of this program could not handle.

### **The merit criteria [11]**

The second criteria taken into account when assessing the MPD is a merit criterion. This criterion should fulfil three following conditions [11]:

1. Compatibility with “The basis of the general education program.”
2. Compatibility with the curriculum of the subject.
3. Compatibility with law and scientifically accepted facts.

This means that the MPD should send a knowledge without any controversy. The computer software may contain any merit mistakes and introduce new information should be clearly explained. A well-designed computer program should present the additional knowledge that is partially beyond the scope of Core Curriculum, and allow to create the possibility of the development of the more talented students interested in extra data. This criterion is associated particularly with the teacher, for whom the most important thing is the proper transfer of knowledge.

### **The didactic criteria [11]**

The third criterion, which requires a special educational accuracy from the MPD designer. The designer must create a didactic program in accordance with the principles of teaching, so the teacher uses his knowledge passed from such program in accordance with the core curriculum of the subject. The creator of a computer program should bear in mind that the effectiveness of educational software is based on [11]:

- appropriate choice of components,
- design of the program,

- principle of gradation of difficulty,
- the possibility of user intervention in the program (create your own notes, charts, structures),
- its ability to implement its own course curriculum,
- block of self control.

A necessary condition for the recognition of a computer program as educational is the use of the self-education and self-control block. It's important that users enrich their knowledge, develop skills and were able to practically use the data content. Therefore MPD is often used by teachers as a way to enforce acquiring knowledge. The role of such programs is not simply to transfer knowledge. It is also designed to improve knowledge, interests and abilities of students. Multimedia educational software should serve the students to let them think more for themselves, analyzing known content and teach them to make their own decisions. It's possible for them by clear and legible introduction of a new knowledge.

The teacher is often placed in a situation where, because of not having appropriate educational computer program, he uses a program that will bring students only the subject data. The main goal, however, is to use such a program by a teacher in a thoughtful way. As an example we can cite the use of the 'Microsoft Office' software in many Polish schools [14].

### **The educational criteria [11]**

Educational criteria are to determine the educational role of the software that is not only limited to the information provision, but also has to fulfil an educational function. This applies mainly to younger users who are most vulnerable to assailable knowledge and patterns, then try to imitate them, believing it to be natural and appropriate. In the next phase of development patterns, these are becoming standards of behaviour. It is therefore expected of computer teaching program to employ native language, use correct Polish language and teach the desired behaviours. Therefore, the program should not use jargon in communication, and the messages can not offend the user. In conclusion, it is considered that the MPD has a significant impact on shaping the children and young people attitudes by giving them choice to chose the right moral, cognitive, aesthetic and utilitarian values. The educational role of the MPD fades with age and stage of student learning. This is happening due to changing of substantive content.

### **The ergonomic criteria [11]**

The ergonomic criterion is the one that takes into account comfort of using computer and software. Comfort is affected by two factors: physical and mental. Physical factor depends on the user, and more specifically a computer workstation. In contrast, psychological factor has a very little effect, because it is a consequence of faulty software construction. Graphic design has a direct impact on the psychological

comfort. It means that the MPD, in order to properly fulfil the ergonomic criteria, should follow certain aspects [11]:

- clear text,
- font size adjusted according to the user's age,
- correctly applied colour design,
- additional text zooming function for people with poor eyesight,
- proper mouse adjustment for right- and left-handed users,
- highlighting important information.

### **The tech-support criteria [11]**

Maintenance criterion is the last criterion taken into account in the evaluation process. Technical aspects are associated only with the handling of a multimedia educational program. The installation process is a main aspect of a multimedia program, so program installation should be quick and easy, and it should check the available disk capacity and whether it is sufficient to install the program. It is important to determine if any program is required for it to work correctly. For users, it is important to have an ability to save their work, make their own notes, charts and prints. The user should be able to test the program before buying, and the program instructions and documentation should be attached, which covers the teaching lesson plan. Before buying, the customer should be guaranteed technical support in case of problems with the program. This criterion is usually contributed with evaluation at the beginning of didactic classes.

Basic features of multimedia programs have already been defined. On the basis of their use teaching aids in the classroom are developed. For a computer program to be termed as a didactic tool, it should have some features listed below [14]:

1. Readable (paying attention to the font, graphics, animations, colouring pages of each program).
2. Actions must be fit to the age of the user.
3. The user must be aware of the program location and why it is there.
4. The program must be technically reliable.
5. It should be accurate in presenting the content.

### **Conclusion**

The purpose of this study was to isolate the criteria which should include a computer program used in the classroom computer science and technology in primary and secondary school. Programs, selected accordingly to certain aspects allow for more efficient operation both with children in primary schools and with young people in secondary schools. The use of computer programs greatly increases the students' assailable knowledge. Therefore it is important to isolate specific, essential features of computer programs. It seems that teachers choose programs



that fulfil the needs of students. For students, the most important features are: ease of use, information, accuracy, the ability to develop curiosity, self-education and self-control, the ability to multi-user work, no offensive messages, the ability to save the work [9, 10].

Informed choice of computer programs based on specific characteristics of programs will contribute to a more efficient teaching process.

## References

- [1] Cwanek-Florek E., *Multimedialne programy dydaktyczne w nauczaniu języka niemieckiego*, Języki Obce w Szkole. 2003, 2.
- [2] Depešová J., *Multimédia v systéme prípravy budúcich učiteľov*. In: Mastalerz E., Pytel K., Noga H. (ed.), *Cyberuzależnienie*, Kraków 2007.
- [3] Gumuła S., Piaskowska-Silarska M., *Social, economic and environmental aspects of municipal waste treatment by thermal methods*. XXIV DIDMATTECH 2011. *Problems in teachers education*. Wydawnictwo Pedagogical University of Cracow – J. Selye University In Komárno, Cracow 2011.
- [4] Kupisiewicz Cz., *Podstawy dydaktyki ogólnej*, Wyd. PWN, Warszawa 1976.
- [5] Piecuch A., *Wstęp do projektowania multimedialnych opracowań metodycznych*, Wyd. FOSZE, Rzeszów 2008.
- [6] Pitula-Wilczyńska A., *Multimedialne pomoce dydaktyczne w książce Technologie informacyjne w warsztacie nauczyciela*, Jacek Migdałek (ed.), Wyd. Impuls, Kraków 2008.
- [7] Spitzer H.F., *Studies in retention*, Journal of educational psychology. 1939.
- [8] Strykowski W., *Media i edukacja*. Edukacja Medialna, 1996.
- [9] Tureková I., Depešová J., Bagalová T., *Machinery Risk Analysis Application in the System of Employee Training*, 2014. In: IV. proceedings from 4th International Conference, Hangzhou (China), July 26–27 2014 Advanced Design and Manufacturing Technology IV. – Pfaffikon: TransTech Publication, 2014.
- [10] Vargová M., *Technické vzdelávanie a informačné technológie*. In: Mastalerz E., Pytel K., Noga H. (eds.), *Cyberuzależnienie*, Kraków 2007.
- [11] Zakrzewski A., *Multimedialne pomoce dydaktyczne – kryteria oceny i wyboru*, Katecheta. 2004, 11, s. 16.
- [12] Historia informatyki: <http://enc.lo.bytow.pl/index.php?wpis=9&kategoria=przed>
- [13] Komputer w teorii kształcenia: [http://www.eid.edu.pl/archiwum/2003,101/luty,186/komputer\\_w\\_teorii\\_kształcenia\\_wielostronnego,1406.html](http://www.eid.edu.pl/archiwum/2003,101/luty,186/komputer_w_teorii_kształcenia_wielostronnego,1406.html)
- [14] Microsoft Office: <http://office.microsoft.com/pl-pl/>
- [15] Programy edukacyjne: <http://strefa-3d.pl/programy-edukacyjne.html>

## Abstract

Multimedia educational software is being increasingly used in teaching at primary and secondary school. This results in a faster growing market of multimedia teaching tools and computer hardware.

A teacher plays a key role in education, whose task is to select such programs that will positively stimulate intellectual development of young people [5]. One cannot expect the student himself to make the optimal choice of software because he lacks the knowledge

of teaching, psychology, and the more of substantial scope of a particular subject [5, 2]. The study presents the essential criteria for the selection of computer programs used by teachers of technical and information technology classes.

**Key words:** techniques, information technology, computer programs, selection procedures

Aleksandra Knych  
State Higher Vocational School in Nowy Sącz  
Institute of Pedagogy  
ul. Chruślicka 6  
33-300 Nowy Sącz, Poland

Piotr Migo, Henryk Noga  
Pedagogical University of Cracow  
Institute of Technology  
ul. Podchorążych 2  
30-084 Kraków, Poland