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Selected course content of technical education and information technology in primary and secondary school based on core curriculum

Introduction

The Program Basis includes requirements that teachers must know in the learning process. This document contains a set of skills and content that must be included in the teaching and allows to lay down of criteria for school grades and examination requirements. This document is the basis on specific curricula and textbooks created. The teacher is obliged to observe the curriculum implemented in terms of content [5, 12].

The teaching process is realized in schools and it is continuously improved. New methods are being implemented to the learning and development of pupils and the increasingly innovative teaching aids [3, 4]. Today we no longer have enough classic maps, diagrams and tables. More often, interactive educational programs are widely used which can assist in many areas of science [4, 6, 13]. They are being a more common source of knowledge, which is used by both teachers conducting lessons and pupils learning at home [1]. Nowadays, the development of the Internet significantly increased the availability of multiple sources of information, facilitating the data flow, which affects the intellectual development of young people, and thus the whole society [14, 18]. Practically every student has Internet access, regardless of his stage of education [10]. The introduction of new technologies into schools and teaching aids, as well as the rapid development of the Internet allows for the development of students' general knowledge, improving the effectiveness of teaching, and encourages further, often self-learning. Another factor that has been found in the educational process is called e-Learning. This interactive learning method uses the Internet, at any time and any scope of the present, without leaving home. At a time when the mass media play an increasing role in people's lives and the learning process, more and more information are being provided in the form of multimedia. This applies both to school practice as well as professional life.

Selected content of technical education and information technology in primary school

The basis in primary school education is general education, where students are progressively introduced to the world knowledge, having in mind their intellectual, ethical and emotional basis and social aspects [7, 17].

General education is divided into the following stages of education:

- Stage I, Class I–III of primary school and early school education,
- Stage II, Class IV–VI school.

Technical content elements in classes I–III

In addition to the core curriculum content related to the individual objects, there are those that relate to the technical content. Pupil after graduating technical classes, with different upbringing to the technology (learning equipment, operation and care for it):

1. In the field of technical education:
   a) knows how people have used the forces of nature in the past and today (water, wind),
   b) tinkers, for example. kites, windmills, rafts,
   c) meets the general principles of operation of appliances (e.g. a flashlight, vacuum cleaner) and uses them in a safe manner and without damaging them,
   d) uses a variety of objects from their environment to build e.g. a tent, obstacle course, a birdhouse.
2. In terms of taking care of their safety and that of others:
   a) maintains order on their table, play room, locker room, home and garden, and cleans up after themselves and helps others to maintain order,
   b) is aware of what dangers can result from improper use of tools and technical equipment,
   c) knows the rules of safe travel on the road, and uses the means of communication; knows how to behave in case of an accident (e.g. notifies adults, knows the emergency calls).

The student at the end of III technical classes:

1. Is familiar with technical environment so that he:
   a) has a knowledge of the manufacturing methods of everyday objects, e.g. furniture, houses, cars, home appliances,
   b) knows what the types of machines are: transport (cars, boats, planes, trains), manufacturing (tools, instruments), computer (PC, laptop, mobile phone),
   c) knows the types of buildings (residential, office, industrial, bridges, tunnels, towers) and an electrical equipment (flashlight, bicycle generator),
   d) is able to determine the value of technical equipment in terms of its functional (easy or difficult operation), economic (cheap or expensive to buy and use), aesthetic characteristics (nice or ugly).

2. Understands the process of creating objects from an idea to its production:
   a) presents his ideas and technical solutions: planning steps in the correct order, selecting the appropriate materials (paper, wood, metal, plastic, textiles) and tools,
   b) can organize team activities for the needs of individual and group work,
   c) has skills in: measuring the amount of material needed, cut paper, cardboard, etc., assembling of models from paper and plastic parts, using simple instructions and drawing diagrams, building e.g. kites, models of houses, bridges, car models.
3. Provides appropriate security for himself and the others:
   a) keeps law and order in the workplace,
   b) knows how to safely use the tools and technical equipment,
   c) knows the rules of safe travel on the roads and uses the means of communication; knows how to behave in case of an accident (e.g. notifies adults, knows the emergency calls).

Elements of the programming content in technical classes IV–VI

Aims of education – general requirements:

I. Identification and description of the technical elements.
II. Planning and implementation of practical activities (from concept to a done element).
III. Efficiency and safe use of technical equipment.
   1. Describing the technology in the proximal and distal environment. Pupil:
      a) can describe the technical equipment within their surroundings and explain their functions,
      b) lists the advantages and disadvantages of the solutions used in material and workmanship.
   2. Modelling schemes to solve technical problems. Pupil:
      a) sees construction materials (i.e.: paper, wood, metal, plastic), examines and compares their basic properties (hardness and strength) and finds the possibility of using different materials in the art depending on the properties,
      b) develops technical solutions in graphic form; is able to perform manual and technical drawings, simple projective drawings (rectangular and axonometric); develops technical drawings contained in catalogues and manuals,
      c) creates models of technical devices, using ready-made kits for the assembly of electronic and mechanical.
   3. Formulation and implementation of practical technical activities. Student:
      a) determines the order of actions, i.e. technological operations and estimated duration and organizes the workplace;
      b) uses the basic tool used for manual processing (sawing, cutting, grinding, drilling) of different materials and assembly.

4. Fast, agile and safe handling of technical equipment. Student:
   a) is able to use and adjust the technical equipment being at home, school and public environment, maintaining safety rules and reading the devices' manual,
   b) as a pedestrian, passenger and rider safely participates in traffic.
5. Explanation of the solutions to the technical development of the environment. Student:
   a) formulates rules for sorting and waste processing capacity of different materials, i.e. paper, wood, plastic, metal and glass,
   b) interprets the rational management projects of recyclable materials in the immediate environment: at home.

Elements of the program content in computer classes in grades I–III

Information technology classes should be understood as computer activities linked to other areas of education. The school is required to equip the computer rooms with the necessary hardware, software appropriate to the age, abilities and needs of students. In classes I–III, hardware is used as an enrichment process of teaching and learning of texts, drawings and animations created by students. Shaping their activity through games consolidates their skills based on education programs on CDs and the network. At the lesson, students should have at their disposal a separate computer with Internet access. In the spare time, the school should allow students to use the school computer lab.

The student graduating first class is able to:

1. Use the computers in the fields of: running the program, using the mouse and keyboard.
2. Safely use the computer, without damaging it and without risking their own health.
3. Observe restrictions that result from the use of a computer.

The student graduating third class is able to:

1. Use the computer:
   a) using mouse and keyboard,
   b) can identify basics computer elements.
2. Correctly use programs and educational games, developing their interest and use of the options in the programs.
3. Can use search options:
   a) analyzes websites recommended by the teacher (e.g. the page of your school),
   b) can indicate active elements on the website and properly navigate within a specified area,
   c) knows how to play the animations and multimedia presentations.
4. Can create drawings and texts:
   a) can properly use keyboard creating full texts,
   b) with help of a simple graphic program can create simple figures.

5. Is aware of the risks arising from the use of a computer, Internet and multimedia:
   a) knows that the work on the computer is hurtful for the eyes, strains the spine, limits the social contacts,
   b) knows what dangers may arise from the anonymity of contacts and giving their address,
   c) follows according to the restrictions related to the use of a computer, Internet.

Content of classes computer classes IV–VI

The core curriculum of computer classes in the classes IV–VI includes:

I. Proper and safe use of the computer and its software. The student is aware of the risks and limitations associated with using a computer and the Internet.
II. The ability to communicate with a computer and ICT.
III. The process of finding and using information from various sources and the development of a computer using texts, animations, drawings, multimedia presentations, themes and figures.
IV. Efficient approach to problem solving and making decisions using the computer.
V. Increasing the knowledge and skills in various fields and developing interest in using the computer.

During the course, the student should have at his disposal a separate computer with Internet access, depending on the needs arising from the nature of the course, the objectives and the topics during the work on the project (individual or team sports).

1. The correct and safe use of the computer and its software. The student is able to:
   a) communicate with the computer using icons, buttons, menus, and dialog boxes,
   b) read and correctly interpret the content of the messages that are displayed by programs,
   c) properly save the results of their work in the computer disk and electronic media and use them,
   d) use the help that is available in the programs,
   e) properly speak basic computer vocabulary,
   f) adhere to the basic principles of safe and hygienic work at the computer and explain the hazards of improper use of the computer.
2. Communicating with a computer and ICT. The student is able to:
   a) securely communicate via e-mail, using the foundations of the n-labels,
   b) use email for the implementation of school projects.
3. Search and use of information from different sources. Student:
   a) skilfully searches for information in a variety of electronic sources, e.g. dictionaries, encyclopaedias, library collections, Internet resources, technical documentation,
   b) properly collects, collates and selects the information found,
   c) according to the needs, uses the information in a variety of formats,

d) defines the characteristics of various forms of information, i.e. a multimedia text, audiovisual, video, sound.

4. Using a computer to create texts, drawings, themes, multimedia presentations, animations, and figures. The student is able to:
   a) create his own motives and drawings using the graphics editor, using the colours, shapes, image transformation and fragments of other images,
   b) analyze and edit texts (essays, pamphlets, invitations, announcements, letters) using basic word-processing capabilities in terms of paragraph formatting and page graphics can be combined with the text,
   c) perform simple calculations in a spreadsheet, interpret them and represent graphically,
   d) create simple animations and multimedia presentations.
5. Solve problems and make decisions with the use of a computer. The student is able to:
   a) write a series of commands that creates simple motifs or controls the object on the screen,
   b) smoothly and seamlessly work in a group, through communication with others and decision-making with regards to their tasks and powers.
6. The use of computer programs and educational games to extend his knowledge from different fields. The student knows:
   a) how to use a computer, its software and electronic resources (local and network) in order to support and expand the implementation issues of the selected objects,
   b) how to efficiently use resources (Internet, encyclopaedias, dictionaries) and multimedia (including education) of disciplines.
7. Developing interests in using computer and information and communication technology. Knowing the role of the computer in everyday life and defining the risks and limitations associated with using a computer and the Internet. Student:
   a) can specify and describe examples of computer and the Internet use in everyday life,
   b) knows how show respect to privacy and the work of others,
   c) apply to the ethical and legal principles arising from using computers and the Internet and assess possible risks.

The content of technical education course of information in secondary education

After ending primary school the pupil is faced with the next stage of education. General education continues on the third and fourth stages of education. Stage III is a secondary school, and stage IV is a high school.

On the third and fourth stages of education general education, although carried out in two different schools, is a coherent whole, and software is the foundation of

education that provides students with diverse skills [9, 15]. These qualifications can be modified and improved in the process of lifelong learning.

Elements of the program content in the field of technical activities

In addition to the general education core curriculum for middle school and high school there are the contents of technical education. The core curriculum includes technical classes for students and practical methods of technical activities. Classes should be conducted in suitably adapted and equipped rooms, in groups corresponding to the number of jobs. Technical classes allow to prepare students to obtain a bicycle card.

General requirements – the objectives of education on the third level of education:

I. Distinguishing between technical equipment and knowledge of their performance.
II. The ability to create solutions to technical problems and designing solutions.
III. Organize with various degrees of difficulty, with different forms of work organization.
IV. Safe handling with tools and instruments.

In school it is also possible to carry out a variety of technical activities, for example sewing, electronic tasks, or learning to ride a motorbike. Technical classes at school may lead to the creation of a local (municipal, county, the district) offer, from which students can choose courses that interest them.

Elements of the program content of computer technology

General requirements – educational goals on the third level of education:

I. The use of the computer and its software and the network in a secure manner. To communicate with a computer and ICT.
II. The ability to search, collect and process information from different sources and development using a computer: text, figures, pictures, themes, animation, multimedia presentations.
III. Effective problem solving and decision making using a computer and using algorithmic reasoning.
IV. Increasing the knowledge and skills in various fields and developing interests using computer programs or educational games.
V. Rational assessment of the risks and limitations, understanding the social aspects of the development and application of computer science.

During the courses, the student should have in its disposal a separate computer with Internet access, depending on the needs arising from the nature of the course, the objectives pursued and the topics during the work on the project (individual or team).

1. The correct and safe use of the computer, its software and a computer network. The student is able to:

a) describe the construction of the computer and its internal components and their functions, as well as the construction and operation of external devices,
b) use of multimedia devices for recording or reproducing picture and sound,
c) manage resources (files), install software using a simple operating system services and utilities,
d) find and launch programs, archive and organize data and programs, and use an anti-virus,
e) work independently and safely in local and global networks,
f) solve problems using computer assistance, documentation, hardware and software.

2. Search and use information from different sources and create resources on the network. Student:
   a) knows different ways of presenting and human information processing and computer,
   b) uses information retrieval systems in online data sources, directories, databases,
   c) uses a variety of sources (including the internet), processes the information and documents, assesses the content and form of their usefulness in the performance of their tasks and projects,
   d) is able to publish information in appropriate websites.
3. The ability to communicate with a computer and the use of ICT. Student:
   a) knows how to create an e-mail account on the web portal and customize its functionality to meet his needs,
   b) participates in forum discussions online,
   c) uses ICT to communicate with persons and cooperates on the project,
   d) communicates on the network using the n-label.
4. Perform with a computer: drawings, texts, themes, multimedia presentations, animations, and figures. Student:
   a) creates objects of the figures, fragments of other images and photos using a graphics editor; creates animations, create subtitles on the drawings, and changes the graphic file formats alone,
   b) writes several publication pages using a text editor using the tools headers and footers, graphics, tables, footnotes,
   c) adjusts the text in columns and writes text documents according to their different needs,
   d) performs spreadsheet accounting tasks with high school curriculum (e.g. physical or mathematical calculations), as well as from everyday life (e.g. planning expenses), using absolute, relative and mixed addresses,
   e) uses a spreadsheet to collect and report data in graphical form of different types of graphs,
   f) creates a table as a simple database and can perform basic operations on the database,

g) uses and collects a variety of programs and sources of objects (i.e. tables, charts, text, graphics) that is placed in the document,
h) uses multimedia elements, graphics, text, video and audio, to create and give presentations,
i) writes a simple website using the appropriate editor programme, which places the text, graphics, links, and active elements; can explain the basic features of HTML commands.

5. Solving problems and making decisions using a laptop computer, taking into account the algorithmic approach. Student:
   a) understands and explains the concept of the algorithm, uses them to solve problems,
   b) in a simple problem situation determines its accurate description, analyzing and presenting the solution in the form of algorithm,
   c) is able to solve algorithmic problems using a spreadsheet,
   d) describes how to search for a particular item in the disordered and ordered sorting algorithm and a set of elements,
   e) uses a computer to execute the selected algorithms.
6. The development of knowledge and skills in various fields using computer programs and educational games. Student:
   a) assists and simplifies the teaching of various subjects using computer programs (including education),
   b) analyzes the results of experiments using computer programs, special-purpose programs and educational programs,
   c) is able to use the software for modelling and simulation of phenomena (e.g. physical, biological, chemical), uses a web mapping,
   d) creates data sets and reports on lessons using appropriate programs.
7. Develop your interests using computer and information and communication technologies, the role of the computer in everyday life and define the risks and limitations of the use of computers and the Internet, the social aspects of the development and application of computer science. Student:
   a) has selected the use of information and communication technologies, taking into account their interests and their impact on personal development, labour market and economic development,
   b) knows the benefits and dangers for the development of information and public access to information, understands the risks of dependence on the computer,
   c) knows the ethical and legal issues related to the protection of intellectual property and the protection of databases and computer crime manifestations.

Stage III allows for the introduction of a programming language, i.e. Logo or Pascal, which provide educational skills and can help in the education of the concepts of information technology.

Conclusion

Technical classes, developed by the school, are presented to students, and their type and the program implemented should be adapted to the interests of the students. Implementation of activities can be organized in a regular weekly meeting or in the manner specified by the teacher or suggested by the students. A teacher who prepares the technical courses offer, should take into account the general requirements, while specifying specific requirements relating to the scope and the form of classes [6, 9].

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Abstract

At the Polish Schools the Program Basis is a document specifying the content of teaching different subjects at different stages of school. This document sets out the minimum knowledge that the student should learn while studying at a given stage of education [2, 3, 8, 11, 16, 19]. From 2009 it has been regularly changed, which means currently the core curriculum has been overwritten every time a new version came out. This happens in all types of schools [2, 19]. In the above study teaching content and technical information are shown which can be, and are at the moment also implemented using information and communication technologies [16].

Key words: teaching and learning methods, teaching curriculum

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