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Použitie materiálnych didaktických prostriedkov vo vyučovaní

Use of material teaching aids in teaching

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Abstract

The contribution focuses on material didactic means. We described the material didactic means in the work as teaching aids and technical devices. Subsequently, we outlined the possibilities of using material didactic tools in practice. In the end, experimental research on the use of material teaching aids is processed. In the conclusion, the possibilities of using material didactic aids in teaching at secondary industrial schools, secondary vocational schools and primary schools in Slovakia and the Czech Republic are shown.

Keywords: Material teaching aids and their use in practice. Technical devices.

Introduction

Material didactic means are means of a material nature and are an important component of education. They serve as a means to achieve educational goals. They are part of the didactic means. Before we start thinking about creating and choosing a method of inclusion in the classroom, we need to know the content of the education for which it is intended. The main criteria for the selection of didactic means are the goal pursued, the content of the teaching, the nature of the phenomena demonstrated, the age, level, level of education of the pupils, the purpose of the teaching and the level of the teacher and his ability to use the intended didactic means.

Different authors define material didactic (teaching) resources differently. According to Průcha et al. (2009), the term "material didactic means" narrows the class of didactic means to material carriers of information, to technical devices, equipment of schools and classes that serve educational purposes. Didactic aids accompany teaching since the beginning of cultural history, e.g. when familiarizing with objects and phenomena when using tools, etc. According to Turek (2010), material didactic resources are divided into teaching aids, didactic techniques and teaching macro-interiors and micro-interiors. Didactic tools according to Švec (1989) are material didactic tools for

managing the teaching process. About the mission of didactic processes, he states that MDPs enter into teacher-pupil interaction. They affect the teacher's work, but also the student's cognitive learning activity. Didactic means are divided into didactic technique and didactic content. Didactic technique is a set of technical means. The didactic content is a set of signals with the subject matter. Teaching depends mainly on the quality of didactic contents. Even the best-prepared teacher cannot apply the didactic technique unless he has a high-quality didactic content.

1. Current state of material didactic resources

Material didactic means are a means of achieving the goals of the educational process and are part of Engineering Pedagogy. According to Driensky (2007), engineering pedagogy is a frontier scientific discipline that transforms the knowledge of pedagogy and psychology into technical sciences. Its purpose is to increase the didactic effectiveness of engineering education. Material didactic aids are part of didactic aids. We divide the material didactic resources into technical equipment and teaching aids, which increase the clarity of the teaching and bring the subject matter closer to the student. Integrated didactic workplaces are part of material didactic workplaces.

When creating integrated didactic workplaces, it is necessary to take into account the principles that apply to any classroom, workshop, regarding e.g. intensity of light, heat, colour of rooms. For these workplaces, the content and volume in the room per person must be taken into account from the point of view of OSH principles, work hygiene principles and ergonomic principles. When working, it must be taken into account that students work on machines, devices and equipment that have a valid revision and have undamaged tools, tools and accessories.

1.1 Didactic resources

The tool serves to achieve educational goals. It complements the word of the teacher, which is a very powerful argumentative tool. The term material-didactic means narrows the class of didactic means to material carriers of information, to technical devices, equipment of schools and classes that serve educational purposes (Průcha et al., 2009). The most important part of them are aids, because they ensure immediate participation in classes. Didactic means as an element of teaching occupies a fixed place in the structure of system links teacher → content → student and teacher → didactic means → student. When learning the subject, there should be an interaction between the teacher and the student - feedback. According to their nature, didactic means are material or immaterial. Didactic tools have an irreplaceable place in the educational process. They became necessary not only in the work of a teacher, but also in the work of a student. The results of use do not only depend on the technical level and ability of the teacher, but especially on the level of didactic content (Kučerka, 2011). Part of the teaching aids are non-material teaching aids,

among which we classify forms and methods. These ensure the professional component, while the teaching methods are focused on the thought process of the teacher and the pupil, on the other hand, the forms ensure the teaching-educational process, i.e. the external side.

Organizational forms of teaching are most often divided according to the number of pupils participating in the teaching process together with the teacher (individual, collective and mixed), the place of implementation of the teaching process (school and extra-curricular) and the degree of independence of pupils' work in the teaching process (individual work of pupils, group work of pupils and students' frontal work).

We understand the methods of the teaching process as a deliberate arrangement of the curriculum, activities of the teacher and students, which are aimed at achieving the goals of the teaching process while respecting didactic principles (Turek, 2010).

Průcha et al. (2013) state in the pedagogical dictionary that organizational forms of teaching in general didactics are understood in connection with the management of the teaching process and with specific teaching methods. It is differentiated according to the environment: teaching in the classroom, in specialized areas of the school, in the natural environment. According to the type of teaching, it is differentiated into frontal teaching, group and team teaching. Due to the differentiation of the students' role, a distinction is made between: cooperative teaching and forms of individualized teaching. The basic form of school teaching in the time dimension is the lesson.

Another organizational form of teaching is project teaching. Project teaching is carried out individually or in groups and allows for the combination of some organizational forms. Short-term projects solve simpler, often narrowly focused tasks, but force students to work independently or collectively. Long-term projects are one semester long at universities, half a year at high schools, or year-long projects.

Material teaching aids have an important position in the educational process. They are a means of achieving the goals of the educational process. They include teaching aids and technical means, which inseparably include integrated didactic workplaces.

Material teaching aids are teaching aids and those technical aids that perform didactic functions (Driensky & Hrmo, 2004). Driensky & Hrmo (2004) define a teaching aid as a material means that is a direct carrier of information and can provide content directly (e.g. a model) or through a technical means (e.g. a data projector).

We must know and respect certain requirements for the selection, creation, use and appropriate inclusion of teaching aids in the teaching process. Such requirements are didactic requirements, ergonomic requirements, aesthetic requirements, technical requirements and economic requirements (Hlásna et al., 2006). Driensky (2007) ranks the information, transformation, activation and regulation functions among the basic functions of material teaching aids.

1.2 Technical devices

Technical devices are basic devices, auxiliary devices, technical aids and machines and devices. Appropriate equipment of the school with technical equipment is a basic condition for ensuring the quality of the educational process. Here there must be harmony and agreement between the school management and the school's teaching staff. Basic facilities include classrooms, specialist classrooms, language classrooms, laboratories, school workshops, etc. Kindergarten students' classrooms are basic classrooms for the educational process, where, as a rule, some re-educational subjects are taught or, when the capacity of professional options is insufficient, and their equipment is basic school furniture, among which we include school desks, chairs, a chair for the teacher and a green or white board, or their combination. In addition to the mentioned equipment, if the schools have the funds, the classrooms are additionally equipped with a PC, a data projector, a projection screen and possibly speakers.

In vocational classrooms, vocational subjects are taught according to the nature of the study or teaching field. Such classrooms are, in addition to basic, or extended equipment supplemented by the necessary material didactic means according to the character of the subject or group of subjects taught in the given classroom. Here can be pictures, models, real objects in section, functional machines, etc.

There are laboratory tables in the laboratories and school workshops, in the chemical laboratories there are special sinks, water, distribution systems for a special cooling liquid for machine tools, sewerage, etc. For auxiliary equipment, we recommend heating, cooling, air conditioning, darkening, electrical distribution, water supply, etc.

Technical aids are such material didactic aids that create the conditions for passing on the prescribed curriculum to pupils. They are only an intermediary who fullfil a secondary function in relation to the content of education, e.g. data projector with PC.

Technical aids include display surfaces, projection surfaces, projection technology, sound technology, television technology and video technology, teaching machines, computers and multimedia devices. We also call this group of aids didactic technique.

Audiovisual technical aids include projection technology, sound technology, television technology and video technology.

Teaching machines also belong to the group of technical aids. They can download learning information according to the embedded program. Furthermore, they can assign tasks for practice, repetition, to consolidate the learning material, evaluate the achieved knowledge and manage learning using feedback.

As a rule, special classrooms are equipped with instruments and measures. The equipment of special classrooms is usually extended by machining and forming machines, welding aggregates or their combination in school workshops. There

are secondary schools that have classrooms equipped with machines and devices.
Both the machine tool and the didactic machine tool serve to separate small parts of the material from the blank (workpiece), and the mutual movement of the blank and the tool is defined as a method of machining.

1.3 Learning aids

According to Driensky & Hrmo (2009), we divide teaching aids into auditory, visual, audiovisual and cybernetic. The way they are made depends on the function (information, transformation, activation, regulation, etc.) and the task in teaching (motivational, application, demonstration, simulation, descriptive, repetition, examination, etc.). If we want to achieve the best possible didactic effectiveness, we need to know in what form we will make the curriculum accessible using a teaching aid. When preparing it, it is necessary to take into account the educational goal, forms and methods, the subject, its nature and the focus of the material covered, the target group, the level of knowledge, skills and experience of the participants, the type and level of education of the target group.

2 Use of material teaching aids in education

Material teaching aids are used at all levels and types of education. Specialized texts, workbooks, various types of presentations, videos, construction kits, real aids or other aids are used to bring the students closer and better understand them (Voltík - Figure 1, Figure 2; Boffin - Figure 3), Merkur and others are used in the subjects of technology and physics at elementary schools in thematic units of electricity or in electrical engineering subjects at secondary vocational schools. different levels of difficulty.

Figure 1: Voltík I

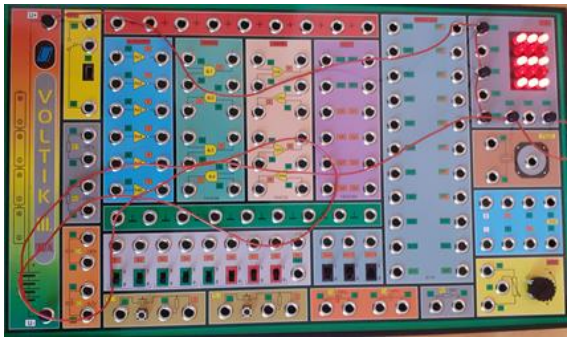

Figure 2: Voltík III

Figure 3: Boffin 750

In the subject of technology, students make various products from wood, plastic, paper, etc. They are products according to your own theme, e.g. from wood (Figure 4 or paper models from magazines, Figure 5 or glue from vehicle construction companies Figure 6, combat equipment and aircraft Figure 7 and others).

Figure 4: Chair

Figure 5: Paper models

Figure 6: Plastic model

Figure 7: Models of combat plastic techniques I.

Figure 8: Models of combat plastic techniques II.

The listed subjects are preparatory subjects for professional studies. There are more of these preparatory subjects, e.g. for engineering subjects as maths, chemistry etc is important. Pupils will use them in subjects such as Parts of machines, Engineering technology, Science of materials and others. These parts were produced based on a drawing and programming on a PC on a CNC machine.

Another practical example is 3D printers (Figure 8). 3D printers for the creation of three-dimensional objects began to be promoted in teaching as a didactic aid only in recent years, that is, only at the moment when they became financially available for wide use in industry and in households. Although the principle, the technology of 3D printing has been known for more than thirty years. The production process is very simple. It is this technology that has enabled a more massive spread of 3D printing not only in high schools, but also in elementary schools.
Introducing 3D printing into teaching is not an end in itself. On the one hand, it brings the world of new technologies closer to the pupils on a very simple and clearly functioning machine, at the same time it enables them (and the school) not only to create computer 3D models at minimal costs. Examples of student works from SPŠSaS in Tábor are the production of plastic whistles (Figure 9), the mechanical parts of a robotic hand, where all were made by 3D printing (Figure 10) and a design shelf, the connecting black parts of which are made by 3D printing (Figure 11).

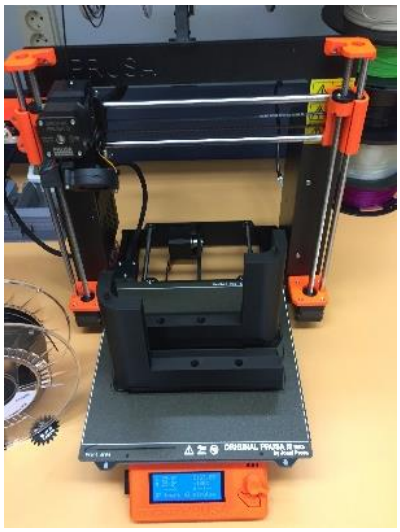

Figure 9: 3D printer

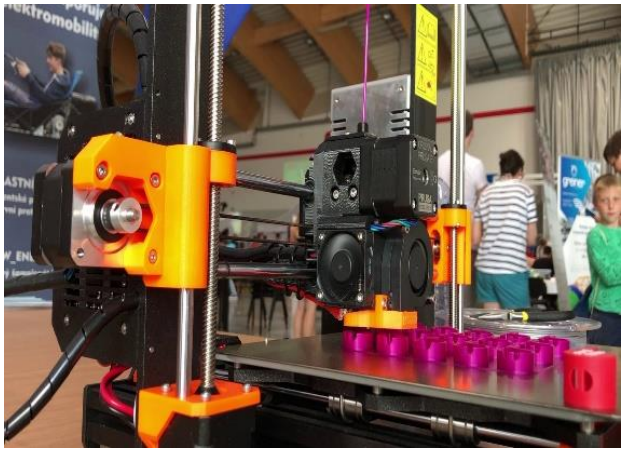

Figure 10 Detail of the print head of the 3D printer

Figure 11: Mechanical parts

With this procedure, student projects reach the level of practice, where the early detection of design errors has been solved in this way for several years, even before proceeding with the production of, for example, highly expensive steel molds for castings.

Conclusion

The educational system should ensure high-quality technical education, preparation and education of the individual in preparation for the future profession. Each individual needs to acquire the corresponding competences and key competences in his field during his studies and thus be prepared for future practice or higher professional training. In primary schools, preparatory subjects for future technicians are mainly mathematics, physics and technology. Material teaching aids play a key role in the teaching of these subjects and their visualization. Their task is to approximate and clearly show the principles, possibilities and other essentials of the approximated element, group of elements, or the activities of the entire e.g. technical systems.

The aim of the contribution was to bring closer the possibilities of using e.g. 3D printers in high schools and show students' products. At the same time, show the products of elementary school students on the subject of technology, or their skills at technical clubs and preparation for secondary schools

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