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## **Proposal for the Breakdown of the Objectives of Technical Education in 3. Cycle of Primary School in the Light of the New School Reform**

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### **Abstract**

In relation to the aims and objectives of the ongoing curriculum reform in Slovakia, the study presents a possible approach to working with the newly conceived educational objectives of technical education in primary schools in Slovakia, based on an analysis of the educational area of Man and the World of Work.

**Keywords:** technical education, educational objectives, primary school, curriculum reform

### **Introduction**

As part of the curriculum reform in Slovakia, new objectives and new educational content were set for technical education in primary schools through the State Educational Programme (SEP) and educational standards.

The educational area of Man and the World of Work (M&WW) is characterised in the new curriculum as follows. The basic building blocks of the field of HR and WL are three components: Technology, Entrepreneurship and Initiative and Career Education. All three components are interlinked so that the emphasis is on the development of technical, creative and critical thinking in the educational domain. Emphasis is placed on developing students' technical and career literacy. The term technical literacy refers to pupils' ability to use, manage, evaluate and understand technology.

The content of the learning area of M&WW is linked to the solution of practical tasks, which are procedurally linked to planning, active experimentation and learning from experience. Pupils should be able to navigate the world of

technology, to understand trends in technological development and the context of scientific progress, but also the impact of human activity on the world. Emphasis is placed on the creative and innovative use of technological tools to achieve a goal, or to draw conclusions based on evidence (SPP, 2023).

### **The subject matter of the study. Educational standards of the educational area Man and the world of work for the 3rd cycle**

The curriculum sets the Educational Standards of the educational area of HR and WORK separately for the 1st to 3rd cycle of education (grades 1 to 3, 4 and 5, and 6 to 9 of primary school) and separately within each cycle for the individual components of Technology, Entrepreneurship and Initiative and Career Education in 3 parts: performance standard, content standard and activities.

The learning objectives and content in the Technology component largely replicate the objectives and content that have been set by the learning standards from 2015 to date. What is new in the SPP is that, in contrast to the educational standard of the previous teaching subject Technology, which partly included objectives and contents related to entrepreneurship and initiative and to a large extent also to career education, the SPP sets a new separate educational standard for both the Entrepreneurship and Initiative (PaI) component and the Career Education (CE) component.

It is not the purpose of this study to present a complete analysis of the educational domain of M&WW. The aim is to present a proposal or analytical guide on how technology teachers can approach working with the new educational standard of the educational area M&WW set for Cycle 3.

**The main aim of the 3rd cycle** is to learn about and work with materials and technologies for their processing. Pupils learn not only to use technical devices and objects, but also to design, make and evaluate them. They learn to analyse their creative and technological abilities and thus develop their technical literacy. Pupils are able to apply basic strategies and methods of career planning, thus developing their vocational literacy. (SPP, 2023)

The curriculum introduction sets out the main learning objectives for Cycle 3 of the M&WW learning area for all 3 components (Technology – Career Education – Entrepreneurship and Initiative) and Years 6 to 9 of Primary School in one block. In the same way, the specific (concrete) objectives for each component are given in the blocks for grades 6 to 9 of the third cycle of primary schools. It is not clear from this block-by-block breakdown which of the component objectives belong to each grade in Cycle 3. At first glance, this form of elaboration seems to be in order, since the contents, objectives and activities of the learning domain M&WW are to be implemented and fulfilled during the 4 years of education of the 3rd cycle. The problem, however, is how teachers approach the development of the Thematic Education Plans (TEPs) for each year of Cycle 3 – haphazardly or analytically. The only tool that can guide technolo-

gy teachers to a serious and justifiable breakdown of the stated objectives of the Technology component (and other components) into grades 6 to 9 of primary school is the existing and still valid Educational Standard of the subject of technology for lower secondary education from 2015.

**Development (analysis of research results). Proposal for the breakdown of the objectives, learning content and activities of the Technology component of the educational field of M&WW in the 3rd cycle of primary school**

The starting point for the creation of Table 1 was the curriculum for the educational area M&WW (pages 11 to 14) – the Technology component. Table 1 does not incorporate the performance and content standards set out in the SPP for the Career Education and Entrepreneurship and Initiative components. Their specific breakdown into the different grades of Cycle 3 is left to the Technology teachers themselves. In breaking them down into grades, they should apply the requirements of age-appropriateness, challenging objectives and learning content, logical and graded sequencing, appropriate and correct interrelationship of the specific objectives of all three components of the M&WW learning area, etc.

The breakdown in Table 1 presents an analytical proposal for the possible inclusion of the new performance objectives, learning content and activities set out in the SPP in Years 6 to 9 of primary school (Cycle 3). The proposal takes into account the existing breakdown set out in the 2015 Educational Standard for the subject of technology. The proposed breakdown enables teachers of technology to be significantly better oriented to the requirements set out in the curriculum (M&WW) for Cycle 3 and thus more consistently and qualitatively to develop the SPP curriculum for each year of Cycle 3 of primary school. It should be noted that in a number of cases in Table 1 the subject headings are assigned to more than one year of cycle 3, e.g. year 3 of cycle 3. 6th to 9th Primary School – thematic area Processing of technical materials. Further elaboration of the above-mentioned subject area is left to the teacher, who sets specific objectives, learning content and activities for specific years 6 to 9 of primary school, taking into account, for example, the difficulty and number of work operations, their age appropriateness, time requirements, etc.

**Table 1. Breakdown of the requirements of the Technology component for Years 6 to 9 of Primary School (Cycle 3)**

Grade	Performance standard The pupil can:	Content standard	Activities
<i>Thematic area Patents and Inventions</i>			
6.	– independently search for and use knowledge about various inventions, discoveries and patents,	– history of technology – making a project on the topic of Slovak and world inventors and the theme of remarkable technical solutions in the life of urban and rural man in the past,	Discovery Resolution, inventions and patents. Application of examples of the use of Slovak and world inventions in practice.

<i>Thematic area Graphic communication</i>			
<b>6. and 7.</b>	<ul style="list-style-type: none"> <li>– draw a simple technical drawing, select a suitable view to display the body in 2D view (front, top, side view), create technical documentation for your own simple product in electronic form,</li> <li>– simulate and compare the roles of a designer, engineer, designer and worker,</li> <li>– use artificial intelligence to solve specific tasks, evaluate work with artificial intelligence, validate AI responses with other sources and critically evaluate them,</li> </ul>	<ul style="list-style-type: none"> <li>– creating a technical drawing,</li> <li>– graphic communication – application of line types and orthogonal projection in the creation of a technical drawing drawing,</li> <li>– displaying objects in 2D,</li> <li>– assessing the difference between an engineer, a designer, a worker – their main tasks, activities and differences between them.</li> <li>– Independent creative activity of pupils (design, creation of products).</li> </ul>	Creation of technical drawings.
<i>Thematic area Technical materials, properties, practical applications</i>			
<b>6. and 7.</b>	<ul style="list-style-type: none"> <li>– compare, distinguish and investigate the properties of different woods, metals, plastics, ceramic and composite materials, glass, rubber, textiles, being able to give examples of their use and to carry out a simple experiment to compare selected properties of different types of materials,</li> <li>– demonstrate the possibilities of recycling, separating and disposing of selected technical materials from a technical point of view,</li> </ul>	<ul style="list-style-type: none"> <li>– technical materials (wood, metals, plastics, ceramics, rubber, glass, etc.),</li> <li>– basic properties of technical materials, recycling of technical materials,</li> </ul>	
<i>Thematic area Processing of technical materials</i>			
<b>6. to 9.</b>	<ul style="list-style-type: none"> <li>– to implement selected work procedures of manual and machine machining of materials on the product according to a technical drawing and justify the choice of machining when creating a simple product,</li> <li>– behave as a conscious consumer and use digital tools in a variety of work to work in a variety of activities and team projects, applying the principles of occupational health and safety at work,</li> </ul>	<ul style="list-style-type: none"> <li>– activities in manual processing of technical materials (measuring, contouring, cutting, shearing, bending, straightening, filing, rasping, rasping, chiselling, drilling, soldering, structural joining of wood, surface treatment of wooden and metal materials, etc.),</li> <li>– machine and progressive methods of processing wood, metals, plastics,</li> </ul>	Independent manual processing of technical materials and manufacture of technical products. Work on small lathes, with a hand drill and machine processing of technical materials (wood, non-ferrous metals and plastics). Assessment the importance and use of simple machines and mechanisms in practice.
<i>Thematic area Simple electrical circuits.</i>			
<b>6. and 8.</b>	create your own simple electrical circuit using a virtual electronic kit and visualise it using digital technologies,	simple electrical circuits (connecting an appliance to an electrical circuit, diode and transistor in an electrical circuit),	Wiring simple electrical circuits. Connecting semiconductors (diode, transistor) to an electrical circuit.
<i>Subject heading Simple machines, gears</i>			
<b>6. and 8.</b>	apply the principles of simple machines in practice and define the types of gears in equipment used in the home,	simple machines, mechanisms in the household – the use of simple machines and mechanisms in practice with regard to their consumption and financial costs according to the energy label	

<i>Thematic area Residential installations</i>			
<b>8. and 9.</b>	using artificial intelligence to create a list of rules and procedures to eliminate simple faults in the residential installation while observing OHS.	– residential installation (plumbing, sewerage, gas installation, wiring, heating, cooling, recuperation),	Work with kits focused on residential and house installation.
<i>Thematic area Machines and equipment in the household.</i>			
<b>7. and 8.</b>	identify potential hazards when working with machines, equipment, robots and, for example, using artificial intelligence to create a list of rules and procedures to eliminate simple malfunctions in a residential installation while maintaining OSH.	– mechanical, gas, petrol and electrical appliances and equipment in the home – operator and maintenance of household appliances and equipment, their impact on the environment,	Retrieved from minor maintenance of household appliances and equipment.
<i>Thematic area Saving costs in the home</i>			
<b>8. and 9.</b>	calculate the consumption and financial cost of running the machinery and equipment used in the home on the basis of the energy label, justify the collection, sorting and disposal of hazardous electrical waste, distinguish between machinery and equipment different types of powered equipment and consider their impact on the environment, and find information on renewable energy sources energy and their use, – work collaboratively in a shared working environment.	– mechanical, gas, petrol and electrical appliances and equipment in the home – renewable energy sources and their use.	

In order to contribute to a higher level of development of primary school pupils in the area of career orientation, entrepreneurship and initiative, the creators of the educational standard for the educational area of M&WW put emphasis on these areas by setting new components for them Entrepreneurship and Initiative and Career Education and developed separate performance and content standards.

It can be assumed that teachers' techniques for formulating the performance standard of the PaI component, such as taking appropriate initiative and independently seeking opportunities to develop one's own idea or respecting intellectual property in the development and presentation of one's idea, and also the performance standard of the CT component, such as applying basic techniques, strategies, and methods of action planning with respect to one's own career direction, will pose significant problems in achieving the objectives of the Technique component. The problem will be not only to develop and plan the timing within the technology lessons, when and methodologically how the PaI and KV objectives are to be implemented, but especially with which technology component curricula to link (also multiple) the achievement of the objectives, and where to get the educational con-

tent for the PaI and KV components from, if new technology textbooks corresponding to the requirements of the 2023 curriculum do not exist.

The analysis of the documents *Renewal Plan – Component 7 (2021)* and *Feasibility Study on Generalizable Typical Solutions for Primary Schools (2022)* shows that the reform activities (e.g. construction of new primary schools and school libraries) do not envisage at all the construction and completion of school vocational classrooms for technical education (school workshops and vocational classrooms), including their material and technical equipment and retrofitting!

As it is generally known, the goals and objectives of technical education in primary schools have not been met to the required extent in the previous period (Hašková, Lukáčová, 2022; 2023). And here the question is raised: What was the cause of the aforementioned state of affairs? The main reason can be clearly identified as a long-term and unsystematic approach of state authorities, school founders and in some cases the management of primary schools to the creation of the necessary spatial, material and technical and personnel provision of technical education in primary schools. Several published works based on the results of surveys and researches repeatedly confirm that in many schools in the Slovak Republic, school workshops are located in inadequate premises in terms of the applicable OSH standards, workshops have mostly outdated material and technical equipment and the non-professionalism of technical education is at the level of approximately 53%.

Reform material Basis for changes in the educational areas... M&WW states:

- to promote pupils' ability to use innovative thinking, knowledge of science and technology and manual skills to implement their own designs,
- the development of pupils' ability to use and handle technical tools and apparatus as well as scientific data to achieve goals or make decisions, express opinions based on evidence, etc. (SEN, 2021).

If the educational field of M&WW is to move towards the above, then to achieve the desired effect of the reform changes, it is necessary to simultaneously provide dedicated financial support to schools to retrofit the material and technical facilities (MTF) for technical education. Innovation and upgrading of the MTF in schools should become a matter of course and should be related to provision:

- basic and diversified technical material (semi-finished products),
- basic and further content and the objectives of technical education adequate interior equipment of school workshop classrooms,
- basic and appropriate additional technical equipment with teaching aids, apparatus, equipment, technical kits, etc,
- basic equipment with digital resources and ICT.

The absence of the above-mentioned MTF in schools does not enable teachers and pupils, among others:

- to ensure knowledge of the types, properties and uses of materials in practice and thus to develop technical creative thinking, critical thinking, to draw conclusions based on evidence and to carry out interesting and motivationally effective experimental and exploratory activities,
- to carry out real practical activities of pupils with the equipment indicated, pupils are unable to learn about different professions and cannot make objective and self-critical decisions about their future career paths,
- to develop pupils' abilities to use and handle technical devices and equipment, to understand their function, significance and environmental context, to analyse the necessary data, to compare them and to draw conclusions or make decisions,
- to develop digital literacy and to know and communicate to pupils in a short time the 'just what is needed' from a vast amount of information in selected areas of technology.

On the basis of the above, we propose that, as part of the reform changes, the Spatial and MTF Standards for Technical Education for School and Pupil should be added to the reform materials for the educational area of M&WW. If the aims, objectives and content of technical education are changed and innovated, the normative that must be fulfilled in schools within a specified timeframe must also be changed (logically on the part of the state authorities) in an adequate and systematic way. However, the fulfilment of this requirement cannot remain with the schools alone. In this respect, the reform changes being prepared should and must be financially supported and secured by the state – even if additionally. Otherwise, the entire reform effort, its results and teaching in the educational field of M&WW will be implemented on a theoretical level and the reform intentions in the field (including in the Profile of the Primary School Graduate) will not produce the desired results.

## **Conclusion**

Work on the implementation of the school reform in the Slovak Republic is intensively underway and the implementation of the reform in practice has been underway since kindergarten. 2023/2024 is becoming a reality. It is not too late to take the additional measures we have outlined in the field of technical education in primary schools. Their early implementation in school practice can make a significant contribution to improving the basis for the forthcoming reform of secondary technical education and to orienting well-prepared pupils towards study in the secondary VET Centres of Excellence.

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