Content Analysis of the Subject of Technology at Basic Schools in Slovakia within the Context of the Upcoming Education Reform

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Abstract **– Since 1989, various initiatives aimed at supporting humanity, linguistic, information, technical or polytechnical education in basic schools in Slovakia (i.e. at primary and lower secondary schools according to ISCED) were announced and implemented. At the end of 2020 the Ministry of Education, Science, Research and Sport of the Slovak Republic announced its intention to carry out a curricular reform on the level of ISCED 1 and ISCED 2. The article presents starting points and conceptions of both the previous as well as the announced curricular reforms, and subsequently the authors focus on the impact of these reforms on the content of the subject of technology, in frame of which technical education of students at lower level of secondary education is carried out. From the authors' point of view, the curricular reform of the subject of technology should increase students' interest in technically oriented fields of study. In this context, they present results of a research study, the purpose of which was to determine how students evaluate the current content (before the announced reform) of the technology subject.**

Keywords **– Education reform, curricula, primary and secondary schools (ISCED 1-2), technical education, content analysis, students' interest in technical study programs.**

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1. Introduction

Formation of a personality through the processes of training and education belongs among the critical functions of school in society.

However, training and education are always tied to the specific content of the curriculum, which is embedded in the school curriculum. The school curriculum can be seen as the result of finding a balance between the societal demands placed on the individual and the individual's educational needs. Curricular reform should therefore support such transformation of education that would introduce more effective ways of personal development of pupils and students. However, analyses of school reforms implemented over the last three decades in various countries worldwide point to a strong link between state ideology and curricular innovation [1], [2], [3], [4]. Porubský et al. [5] point out that issues of education reform, school reform, or curricular reform have become more political and economic than pedagogical in recent years, not only for Slovakia but also for the broader international context.

The quality of education and training is considered an indicator and crucial determinant of the maturity of economic systems and society. On the one hand, this brings many positive impulses for developing education, schools, teaching and learning processes, and educational sciences. On the other hand, however, it also brings such tendencies that do not respect the traditionally understood value of education by narrowing it down to a person's qualifications as a prerequisite for employment in the labour market [6], [7], [8].

According to the analyses presented, the reform is never an isolated modification of the curriculum but a philosophical and ideological change that must be accepted by all the actors involved in its implementation. On the one hand, the reform, to a certain extent, accepts the demands of the teachers themselves, who oppose the traditional approach to the mediation of the curriculum, aimed at creating the most optimal conditions for implementing the school reform.

However, on the other hand, it is also a means of implementing the social and political intentions of the founding entities. Currently, in addition to these intentions, efforts to strengthen the economic stability of states through individual components of education systems are increasingly being promoted. While in primary education, the starting point of quality education is the development of reading, writing, mathematical and scientific literacy, in secondary education, the emphasis is placed on practical training and increasing the proportion of students who graduate from secondary school with a high school diploma [5].

2. Resources of the Slovak Education Reform after 1989

A characteristic feature of education development after 1989 was the effort to transform it from a centrally managed area to an open system compatible with the education systems of the developed European countries, respecting the principles of humanization and diversification of education and training [9]. The creation of several projects related to the reform of the school system [10], [11], [12] was supposed to contribute to change education in Slovakia, but these projects were not subsequently implemented. According to Humajová and Pupala [13], the concepts of changes in individual areas of the educational system did not clearly define tasks, did not indicate time horizons, and did not address the issues of organizational, material and financial security of the proclaimed goals. As for the curricular reform, Humajová and Pupala [13] emphasize, that during its preparation students´ achievements, reported either in the international measurements of the IEA - International Association for the Evaluation of Educational Achievement (PIRLS - Progress in International Reading Literacy Study, TIMSS - Trends in International Mathematics and Science Study) or OECD international research (PISA - Program for International Student Assessment), and the experiences of neighbouring countries (mainly the Czech Republic) with transformation were not taken into consideration either.

The effort to transform regional education from a centrally managed area to an open system was immediately reflected in the first amendment to the Education Act adopted after 1989 by codifying the legal subjectivity of secondary schools. The unified education system was disrupted by establishing non-state primary and secondary schools. Other amendments gradually introduced other corrections to the functioning of the education system.

However, none of them had the character of a fundamental systemic change with a clearly defined strategic continuity for further development of a comprehensive concept of education reform. According to Kosová and Porubský [14], these amendments were diffusion innovations rather than education reforms or comprehensive school reform. The legislative framework for curricular reform was created only with the approval of the new school law, Education and Training Act 245/2008 Coll. in May 2008. In the article, we further analyse the starting points and impacts of changes in technical education content in basic schools (what in Slovakia are integrated primary and lower secondary schools, but divided into two stages – first and second stage of a basic school, grades 1 – 5 and grades 6 - 9). For the purposes of the content analysis, documents as school laws, curricula, state and school educational programs, content and performance standards of technical subjects were used.

3. Impact of the Education Reform Introduced in 2008 on the Content of Technical Education at Basic Schools

The School Act of 2008 was a prerequisite for successfully implementing the curricular reform, which changed the previous historical and cultural contexts of the content and forms of school curricula and introduced a new concept of subject selection and curriculum design. The introduction of two-level pedagogical documents – state and school educational programs for individual levels of education – was supposed to create a platform for content-based school reform, according to which the creation of school curricula depended on the schools themselves, their management and the teaching staff. This philosophy was supposed to strengthen the atmosphere of freedom, professional decision-making and co-responsibility for the results of pedagogical activity in schools. This co-responsibility should consider local needs and the requirements of specific participants in education and ultimately increase the addressability and effectiveness of the provided education [15].

Another innovative element was introduction of the so-called educational areas. There were introduced nine educational areas which corresponded with the key competences defined for basic (primary and lower secondary) education. These were: Language and communication, Nature and society, Man and nature, Man and society, Man and values, Mathematics and work with information, Man and the world of work, Art and culture, Health and exercise.

Technical education was included in the educational area Man and the world of work. Objectives of the educational area were to be achieved by means of three school subjects - manual training taught at the first stage of the basic school, and world of the work and technology taught at the second stage of the basic school. Technical education of pupils started in 3rd grade of the basic school, one lesson of manual training per week, continued in 4th grade, as well one lesson per week, and then two to three year pause followed. Consequently, technical education was scheduled in 7th and 8th grade of the basic school, through the only school subject *technology* taught with the lesson allocation of 0.5 lesson per week.

Later, several authors [14] pointed out that the method and dynamics of the introduction of "reform measures" were not quite adequate for the readiness of the main actors of the change (pedagogical and professional staff, school management), and the reform concepts themselves were not entirely conceptually balanced. The reform turned out to be unsystematic and, in many ways, even controversial. Most criticised was the low quality of the teaching content [16], [17], poor preparation of teachers for the creation of the school educational programs [18], [19] and low emphasis on educational effects required in standardised international measurements of the quality of education (PISA, TIMSS) [20], [21]. Over time, sketchy criticism became systematised, forming strict requirements for innovation of the reform curriculum, as a result of which the State educational programs ISCED 1 and ISCED 2 were updated in 2014 [22]. By innovating the State educational programs the situation with time allocation for technical education was improved to 2 hours a week at the first stage and 5 hours a week at the second stage of the basic school.

However, according to the current representatives of the Ministry of Education, Science, Research and Sport of the Slovak Republic, neither the existing innovated State educational programs for basic schools contribute development of the quality of the Slovak education and the application of the principles of inclusive education. The following facts are considered to be the main shortcomings in the educational programs:

- Acquired knowledge lacks anchoring in broader contexts and its relation to life skills and experiences. A significant imbalance has arisen between acquired knowledge and abilities, which are significant and determining for the current life of children, their world and culture.
- The existing content does not provide a broader space for value education, thinking in more complex contexts, does not sufficiently support digital skills, does not anchor the balance of mental and physical development of students and forgets about their satisfaction and overall well-being.
- Most of the previous challenges and sub-activities to strengthen reading literacy, value education, support of critical thinking, science education, and support of digital skills were not systematically incorporated in the previous sub-modifications of the curriculum.
- A limiting severe problem is that the existing State educational programs for individual levels of education do not lead to comprehensive education. They are not sufficiently interconnected; they do not follow the same line and common goals.
- At the level of creation of the State educational programs, coordination of educational goals and content was not ensured across areas, the educational system and the entire educational path of the student.
- The long-term unsolved problem is the internal coherence of the educational content. The subjects taught in basic school are not sufficiently harmonised with each other, and the isolation of the individual subjects within the grade, but also across grades, is typical. The content of education is thus a mosaic of isolated subjects and unrelated knowledge rather than a comprehensible whole. Students feel they do not see the meaning of what they are learning, and teachers complain about poor inter-subject coordination of the educational content.
- State educational programs prescribe the organisation of education in individual subjects in a very detailed and binding manner. Schools and teachers are then oriented to the fact that they have to teach the precisely prescribed curriculum in a precisely determined time and cannot take into account the real needs and learning possibilities of the students; they have no space left to support the students' individual activity in the classroom and create conditions for developing their complex abilities.
- Programs set by the state make it impossible to adapt education to students' individual needs, weaken the possibilities of inclusive education and differentiated approaches, and expect the same outcomes from all students in short stages, regardless of their situation and capabilities.

For many students, this approach causes a feeling of educational failure, the futility of learning and is responsible for the severe problem of many students repeating their grades. This is mainly because the educational program does not sufficiently consider students' individual needs, abilities, and learning pace. Because of this, education is not flexible enough.

For these reasons the Ministry of Education, Science, Research and Sport of the Slovak Republic has set the priority of creating and introducing a new program of the State Education Program while also including the creation and implementation of this program in the framework of the *Recovery and Resilience Plan of the Slovak Republic*, by which the Slovak Government directs and activates reforms for the near future years [23].

4. The Concept of the Upcoming Curricular Reform

As part of the solution to the Recovery Plan project, the State Pedagogical Institute has already started working on creating a new framework for the State educational program for primary and lower secondary education in 2021. At the same time, the Ministry announced that as part of the planned curricular reform, there would be adjustments, changes, removal or addition of educational standards within the existing educational programs, and a new overall vision of the goals and objectives of primary and lower secondary education will be defined (regards education at Slovak basic schools in which the stated two levels of education according to ISCED are integrated). According to the Ministry, through the implementation of the upcoming curricular reform, the following will be achieved:

- improvement of students' education results in the primary areas of literacy (dominantly reading, mathematics, science and finance) above the average level of OECD countries;
- reduction of the proportion of students at risk levels in the field of reading literacy in national and international tests of 15-year-old students by 10%;
- reduction of the influence of socio-economic status on results in basic literacy in national and international tests of 15-year-old students to the level of the average of OECD countries;
- increasing motivation to learn science subjects and mathematics and motivation to read to the level of the average of OECD countries.

The main innovative element of the upcoming fundamental education reform is the introduction of three consecutive educational cycles.

The educational cycle represents a part of the State educational program, within which the goals and content of education are defined, the achievement and adoption of which are evaluated after the completion of the individual cycles. The educational cycle is longer than one year, and the goals set for individual cycles can be adapted to the pace and capabilities of individual students [24]. If this innovative element is approved, the objectives and content of education prescribed by the Ministry will no longer be tied to individual grades but according to the proposal of the State Pedagogical Institute to three educational cycles. According to the proposal, the first three basic school grades should fall into the first cycle, the fourth and fifth grades into the second, and the sixth to ninth into the third. Proposal for the new structure of the basic school based on its division into three cycles instead of the previous two stages is presented in Figure 1.

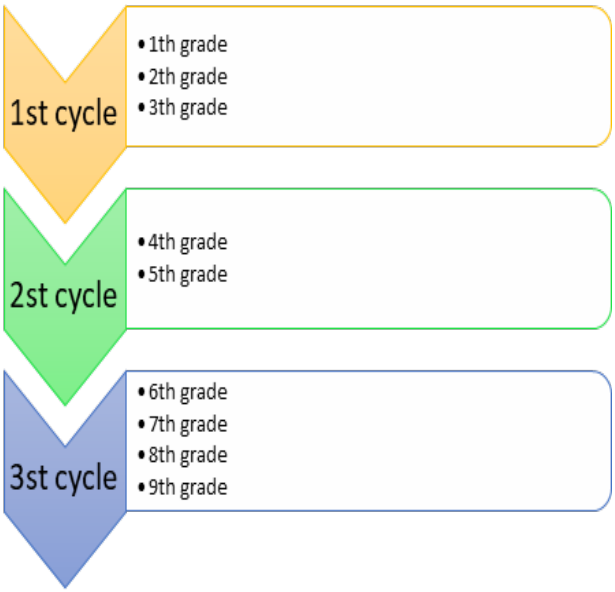

Figure 1. Proposal for the new structure of the basic school - division into cycles

The division of primary education (primary in meaning of the education carried out in Slovak basic schools) into cycles should ensure students have more space and time to achieve the goals set for the educational field of *Man and the world of work* for individual cycles to comprehensively develop technological and career competence and lead pupils to initiative and entrepreneurship.

5. Evaluation of the Current Content of the Subject of *Technology* from the Student's Point of View

From our point of view, the curricular reform of the teaching subject of technology should strategically contribute to increasing students' interest in technically oriented fields of study [25].

At our workplace, even before the announcement of the Ministry's reform intentions, a research survey was carried out, aim of which was to find out opinions of students on teaching of the particular thematic units included in teaching the subject of technology in grades 6-9 of a basic school [26].

The research survey was carried out in three basic schools of the Nitra region (two urban and one rural) with a research sample of 101 students (39 students of the eighth and 62 students of the ninth grade; representation of boys and girls 63:38).

As part of the questionnaire survey, the respondents had to choose a maximum of three of the thematic units taught within the subject of technology in the grades 6-9 that they enjoyed the most. An overview of the evaluated thematic units for the given grades and the relative number of respondents who rated the relevant unit as attractive is summarised in Table 1. All respondents evaluated thematic areas taught in grades 6-8. Topics taught in the 9th grade were evaluated only by ninth graders [27].

As can be seen from the data presented in Table 1, students identified the most interesting topics as those related to practical activities:

- in the 6th grade, it is making things from wood, metal or plastic,
- in the 7th grade, making 3D models,
- in the 9th grade, drawing in graphic programs.

The exception is the 8th grade, where the most attractive topic is the world of the household. This choice is probably related to the fact that in this grade, students are already intensely interested in where they will continue their studies after finishing the basic school.

Table 1. Results of the questionnaire survey

Thematic units taught in the particular grades	**[%]**
6th grade	
technology and product development	11
handicrafts	8
work with non-traditional materials	8
technical drawing, pictogram design, drawing	12
production of things from wood, metal or plastic	25
cultivation, transplanting, planting flowers	12
electricity, household appliances	7
7th grade	
production of 3D models	19
animal husbandry	15
kitchen work, essential food ingredients, food preparation, dining, menu production	11
technical materials and their properties	10
woodwork	18
household machines	6
choice of profession	10
8th grade	
family and housing	9
electrical appliances and technical electronics	12
household economics	5
technical documentation	18
world of work	23
9th grade	
history of technology, inventors	3
graphic drawing	19
battery sources, electrical marks, diagrams	13
household appliances	13

The graph presented in Fig. 2. summarizes the relative numbers of respondents for whom no thematic unit was interesting, entertaining, or engaging. In this way the column graph provides information about the number of students for whom the content focus of the technology subject is essentially uninteresting.

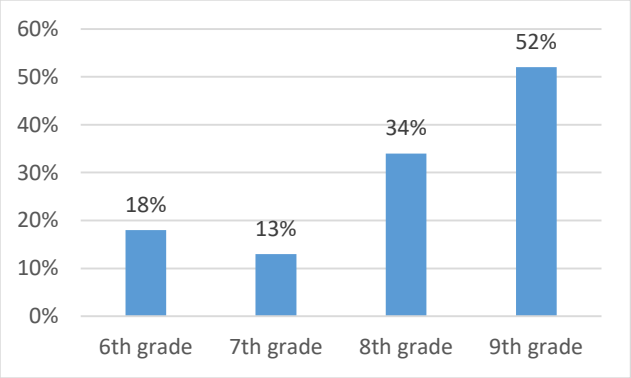

Figure 2. Relative number of respondents evaluating the content of the subject of technology as uninteresting

In all four grades, the percentage of respondents who did not mark a single thematic unit is quite the most significant. In the case of the eighth and ninth grades, these are significantly the highest shares. This fact confirms the previously said statement that students' opinions on the subject technology are negative.

At the same time, it also indicates that the current content focus of technology is essentially uninteresting for students. However, the statement about the lack of interest in the subject matter must be considered not only in relation to the content but also in relation to teaching methods used in teaching the subject of technology and the relevant thematic units [28].

The above stated is also related to the fact that the respondents did not use the possibility to mark more thematic units at all. All of them unanimously marked either none or at most one - except for the only respondent who, in the case of the thematic units taught in the 7th grade, marked two thematic units.

6. The Concept of the Prepared Curricula Reform of the Educational Area Man and the World of Work

As it was above stated the curricular reform in 2008 introduced two new phenomena in education – state and school educational programs and educational areas.

According to this reform, technology education has been carried out at basic schools within the educational area Man and the world of work dominantly through the subject of technology.

Within the currently prepared curricular reform concept of the educational area Man and the world of work should be radically changed. The new curricular reform is introducing within the educational area new phenomena which calls components.

By educational area, we mean the basic content unit of education, which divides education into stable structural parts expressing essential components of human culture. In general education, the academic areas are the same, from pre-primary to upper-secondary education. Educational areas are defined in the State educational program. In the school curriculum, educational areas are transformed into teaching subjects. The educational area is represented by the subject of the same name, Man and the world of work [29]. The subject will be taught in each year of a basic school, one hour a week, i.e. a total of 9 hours for the entire school year.

The content standard of the educational field of Man and the world of work should be designed for three basic components. In contrast, the name of the subject, or the subjects that will represent the educational area in-school educational programs, has yet to be determined by the committee of experts preparing the reform. The basic components of the educational area are Technology, Entrepreneurship and initiative, and Career education (Figure 3).

Figure 3. Components of the educational area Man the world of work

The main goal of the Technology component is to "acquire basic skills in working with selected technical materials and tools and learn the basic ways of processing them" [24]. An important part should be the acquisition of practical skills necessary to master work techniques and technologies and the ability to work according to the teacher's instructions. Students will perform practical exercises during classes, work with various natural and technical materials, and use creative methods to implement practical tasks.

Emphasis should be placed on the sequence of steps necessary to implement a practical task. The Technology component was also part of the passing content of the technology subject.

The content standard of the Entrepreneurship and initiative component should be aimed at developing entrepreneurship education and understanding the values that people create through work. The main goal of the Entrepreneurship and initiative component is to develop students' teamwork and the ability to understand that a person creates values through his work that can be practical and useful or otherwise beneficial to an individual or society. The component Entrepreneurship and initiative was part of the content of the subject of technology in the previous State educational program, but not as a separate thematic area.

The content standard of the Career education component should be aimed at planning the student's future in connection with his application to the labour market. This area was included in the previous curriculum, but not with such a clear view and connection to the development of technical literacy, which we perceive as a pillar of many future career positions (vocations). In the previous curriculum of the subject of technology, career education was part of the subject as a separate thematic unit in the 7th to 9th grades of primary schools.

The goals and contents defined for individual education cycles are as follows:

The first educational cycle

The technician component is focused on acquiring basic knowledge about various natural and technical materials and work procedures. Students learn to use the acquired natural science knowledge in solving a technical issue and are led to implementing simple projects using appropriate techniques, technologies, and natural and technical materials, to maintain order, cleanliness and safety requirements at work.

As part of the Career education component, students gain knowledge about mutually related work activities and professions in the past, pointing out the possibilities of using the acquired work skills and habits in various areas of human activity in the present. Students are led to evaluate and respect their own work as well as the work of others.

As part of the Entrepreneurship and initiative component, students learn to come up with their own practical and useful ideas, which they will be able to implement and they learn to work in a team [24].

The second educational cycle

The Technology component is oriented towards solving technical tasks by students and presenting them. Students get to know the creation of utility and gift items and construction basics.

After completing the technology component, students should be able to identify a technical problem and competently propose its solution. In addition, they should consider the process of designing objects, the connection of their design with functionality, aesthetics and cultural traditions, and the impact of objects on the environment during the production process and after its completion.

Within the Career education component, students can present their abilities, interests and achievements concerning topics related to personal career orientation. Students should have an overview of the professions and occupations related to the field in the past and today, know possibilities of further study related to the area of their interests, and should know how to create a personal career portfolio.

As part of the Entrepreneurship and initiative component, students learn to understand the value of money concerning consumption and savings. Students learn responsible behaviour when managing all resources. Students can explain the concept of salary income for work, express the value of things as a result of work, and explain the importance of finances in the life of an individual, family and society [30].

The third educational cycle

As part of the Technology component, students get to know materials and technologies for processing them, implement creative ideas using appropriate techniques and materials, and learn to analyse their creative and technological abilities. Students learn to behave as conscious consumers, use digital tools in various work activities and team projects, and cooperate in a shared work environment. Students learn to select correctly appropriate technical materials and tools for implementing their ideas and making a helpful product, identify, propose and implement technically adequate and feasible solutions, and analyse related effects and dangers. Students develop their abilities to apply digital technologies in solving technical problems.

The Career education component focuses on the student being able to apply basic strategies and planning methods within the framework of career guidance. The student can identify his abilities and skills as part of self-development with a vision of the need for lifelong learning; he can independently search for, evaluate and use information important for creating the foundations of professional orientation. The student learns to apply online tools, services, and applications that help him make constructive career decisions.

Within the Entrepreneurship and initiative component, the student can objectively evaluate his abilities, possibilities, and possible failure and can learn from it.

The student can effectively manage his funds and create his budget. The student understands all basic economic concepts, the basic functioning of the market and market economy, and how to navigate financial institutions (banks, insurance companies, etc.). The student can use the acquired resources to transform his ideas into concrete actions and create positive value for himself and his surroundings. The student understands the difference between an entrepreneur and an employee and can give various examples of forms of business and business activities [24].

7. Conclusion

From a quantitative point of view, the announced and already into practice transferred curricular reform should be in the field of technical education the most successful one. Technically oriented subjects are supposed to have the most prominent space within the last 33 years of the history of Slovak education. However, the question remains - how high will be the time allocation which technical education will get after the division of the total time allocation among the particular subjects of the concerned educational area, as not all of them are of a technical nature. The contents of the individual components that were proposed and are currently being discussed are also debatable.

The concrete goals and contents of the particular educational areas were developed by the fall of 2022 and subsequently commented on again by the public. At the end of 2022, a public discussion of the new content standards of the given educational areas, subjects and components was held. Some of the comments expressed disagreement with splitting the basic school into three cycles. As for the technical education, external reviewers who commented on the curricular reform suggest strengthening the quality and content level of technical subjects (e.g. teaching the principles of operation of appliances, electrical circuits, home repairs, and PC skills) [30]. Topics related to financial literacy, for which the entrepreneurship and initiative component was created, should be included as a cross-cutting topic of the State educational program, as these are topics that can be interestingly taught only in connection with other (efficient) assignments, namely in several subjects (mathematics, computer science, etc.).

Starting from the academic year 2023/24, basic schools already can switch to teaching according to the new curricula voluntarily, according to their own decision. Expected obligated full-scale transition to the new curricula is from September 2026. Until then, a change in teacher training for individual educational areas and education cycles is also expected (among other things).

How this change will take place is not entirely clear, because the universities are currently under the process of accreditation of their study programs, including teacher trainees study programs. Thus the content of the teacher trainees study programs submitted for accreditation, which takes place regularly every six years, has been set according to the laws, rules and requirements currently in force.

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