Problems of Meeting the Goals of Technical Education at Primary Schools in the Czech Republic

Marie Hubalovska, Stepan Hubalovsky

***Abstract*—**The common problem of the Czech primary education is the lack of interest of pupils on technical education. The Czech primary curriculum defines goals and competencies of technical education that are responsible for child's positive relation to technics and development of pupil's technical thinking and creativity. Unfortunately, the real status of technical education in Czech primary schools is different. The way of teaching in primary schools does not fulfill the goals of technical education. The problem is in insufficient hourly subsidy of technically oriented learning. The paper presents the results of the research discovering the percentage of hourly subsidy of technical oriented education in Czech primary schools. The paper present the possibility for development of technical and science literacy using construction kits as well.

***Keywords*—**Primary education, technical literacy, technical education, technical thinking, creativity.

I. Introduction

Technical education is a concept that is used very often. What is understood within this concept? Technical education is defined from different perspectives. The term technical education and technical training is used in the school environment

The word "Technique" comes from the Greek word techne (craft, art) "is a basic understanding for the human culture that concerns the ability or skill in any areas. From the beginning, it had been used in artistic activity in the beginning and is had been gradually expanded to all human activity [1]. Nowadays, the term Technique has broad meaning:

- All human activities and work processes based on the application of the natural sciences;
- Development and use of tools, machines, materials and processes in human activities;
- Science of material's production and products from the raw materials;
- Set of all technical sciences.

The Department of Technics of the University of Hradec Kralove has accredited study program "The teaching of technical subject". The goal of the study program is development not only students' technical thinking and creativity, but also the students learn the methods for development of the technical thinking and creativity of the pupils of the primary as well as secondary schools.

The academics of the Department of Technics realize the problem with unsatisfactory situation of technical education in Czech primary schools. They feel that the pupils' technical literacy is not sufficiently developed. To confirm this assumption the research focusing on hourly subsidy of technically oriented lessons in Czech primary schools was carried out. The results of the research are presented in the paper.

II. Theoretical Background

A. Technical education

The technique evolves with the development of humanity and scientific knowledge of the world. It applies knowledge in the natural sciences. The technique is defined as "a process in of human's changing of the nature to satisfy his needs and aspirations" [2]. "In the educational concept, the technical education is systematic, deliberate and purposeful process of shaping an individual's personality so that the pupil / student acquires the right attitudes to the technique and its use in everyday life." [3].

Activities belonging to technical education are defined e.g. in [4]. Pupils acquire knowledge of technology, perform various activities with technology, develop manual skills (so-called craftsmanship), create a positive relationship to work as the highest human value, develop their interests, professional orientation and develop the personality of the pupil. [4]

In general, technical education is a controlled dynamic process implemented within pre-schools, basic schools and further education. This process enables children, pupils and

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students to learn the processes and learn the current knowledge related to the technology needed to solve problems and to enhance human abilities. "Technical education includes:

- General training conducted within general education;
- Narrowly specialized training conducted within the educational areas preparing specialists for the specific technical professions at all levels of qualification."

Following this broad definition of technical education, it should be noted that some authors distinguish between [2]:

- Theoretical (scientific) technical education involving applied science and modern technology.
- Practical technical education focuses on achieving manual skills (https://www.britannica.com/topic/technical-education).

The paper focuses on the possibilities for the development of practical technical learning of pupils in basic education

B. Technical education

1) Technical literacy

The term **Technical literacy** is increasingly used in recent years. Some authors tend to be more general in defining this term, e.g. [5] defines technical literacy as "Eligibility to use technical knowledge and information in everyday life or work." The technical literacy is acquired during technical or polytechnical education. Authors Kropáč et al. [6] emphasize that "the definition of technical literacy should include a knowledge, skill, and attitude component." The author Dyrenfurth [7] defines technical literacy as "Summary of competencies, including awareness of key processes in technology, ability to master technical skills to develop their own technical knowledge, skills and habits, ability to use and evaluate technical information." [6]. Another definition of technical literacy is as follows: "The ability of individual to understand technical processes, the ability to use, assess and establish the right technologies and approaches". [8]. The technical literate pupils / students should understand the meaning and characteristics of traditional and modern materials, the importance of energy and natural resources [7]. The most important aspects of technical literacy include basic orientation in various fields of technology, knowledge of technology history, knowledge of nature, function and construction of technical object, knowledge of used technologies and materials, ecological, economic, aesthetic and security knowledge, ability to process information stored in electronic form. Technical literacy also includes spatial imagination and basic logical thinking [9].

Pecina [7] emphasized that pupils should not only have technical and technological knowledge, but it is also important to have the necessary manual skills. Last but not least, it is important to develop pupils' / students' technical thinking and creativity. It is necessary to create the relationship of children to technology from the earliest age [10].

2) The Goals of Technical Education

The goal of technical education can be generally defined as "the achievement and development of an individual's technical literacy" [2].

The goal of the technical education is creation of [2]:

- knowledge about technology;
- basic user skills;
- good attitudes towards technology;
- working habits and skills.

The goal of technical education is to shape and develop the personality of pupils / students, to develop their moral traits such as purposefulness, endurance, continuity, autonomy and conscientiousness. Technical education in accordance with document Initiative Industry 4.0 has to educate motivated, enterprising and creative graduates of schools, with critical thinking, problem solving and decision-making [11]. Technical education and technical training aims to prepare graduates for a professions - craftsmen or engineering and scientific professions. Technical professions are important in every sphere and areas of human life. Technically educated people is needed more and more. The current situation is that technically-educated experts are still missing in all areas of the human life [12].

The main goals of technical education are as follows [13]:

- Creating of positive relationship to technical education and creative attitudes towards their own activities;
- Acquiring practical skills and habits;
- Orientation in materials and their properties;
- Ability to use tools and aids properly;
- Accept compliance with the principles of health and safety at work;
- Creating of positive attitude towards technology;
- Provide space for independent creative work;
- Develop sensory perception, intellect, sensomotoric skills, creativity, technical imagination, sense of cooperation and mutual help, character and will.
- Develop inter-subjects' relations and links via technical education;
- Support and interconnection of technical and natural education - selected science are considered to be an integral part and condition for the implementation of technical education. [2].

C. Basic Education

The technical literacy as well as fulfillment of the goals of technical education has to be built up from childhood, the school education has to be able to provide and reflect new trends in technical development.

The national educational strategy of the Czech Republic includes competencies for development of technical education of the basic education.

Basic education builds on family's education, preschool

education and school education. Basic education is the only the stage of education in the Czech Republic, that all pupils have to graduate. Basic education is in the Czech Republic divided to primary education and secondary education [14].

1) Characteristic of Primary School Education

Primary education in its conception is based on learning, respecting and developing individual needs, capabilities and interests of each pupil. Primary education has to motivate pupils to search, discover, create and find suitable ways of solving problems [14].

The Educational Framework for Primary Schools [14] defines besides other competence for solving the problems and working competence that are the competencies responsible for child's positive relation to technics.

The primary education is split to two levels:

- First level: $1^{st} – 5^{th}$ grades;
- Second level: $6^{th} – 9^{th}$ grades.

2) Characteristic of Secondary School Education

Commonly, the secondary education in the Czech Republic has to create challenging and motivating learning environment in which students have opportunities acquire a specified level of their key competencies, i.e. learn some important knowledge, skills, attitudes and values. Besides other, the pupils should learn procedures and methods that support their creative thinking. The pupils has to learn to solve the everyday life problems. The secondary learning has to developed student's creativity in all areas of the learning. The Educational Framework for Secondary Schools [15] defines besides other competence for development of technical thinking, discovering and creativity.

D. Current Situation of Technical Education in Basic School in the Czech Republic

However, the real status of technical education in basic schools in the Czech Republic does not correspond to goals of technical education. The basic technical education does not develop pupils' technical literacy sufficiently [16].

1) Technical Education in the First Level of Primary Schools

The technical education in the first level of primary education is carried out only in the subject "Working Education". The content of this subject consists of following sub-subjects:

- Working with tiny material;
- Constructional activities;
- Growing works;
- Food preparation.

The document "Framework educational program for primary schools" [14] determines the weekly hourly subsidy of subject "Working Education" only 5 hours of from the 1^{st} to 5^{th} grade of primary school. There is, in each grade, only one hour of working activities taught weekly. It is less than 5% of total hourly subsidy. Moreover, the technical education is supported only by two of four sub-subjects (working with tiny material, constructional activity) the percentage of technical lessons is much lower than 5%. Selection and distribution of the sub-subjects depends on schools according to their educational intentions and their school equipment.

The elements of technical education appear also in the subjects Mathematics and Physics in solving world tasks and in the subject ICT in programming of robotic kits. Taking into account that technical education is developed even in Mathematics, Physics and ICT at the first level of primary schools, the technical education is subsidized by less than 22% of all teaching lessons. However, this percentage is actually much lower, because the technical education is not implemented in all lessons of Mathematics, Physics and ICT.

Detailed percentage of technical oriented lessons in the first level of primary education is one of the result of our research presented in the paper (see next chapter).

2) Technical Education in the Second Level of Primary Schools

The situation is similar in the second level of primary education.

The subject "Working Education" is split to following sub-subjects:

- Work with technical materials;
- Design and construction;
- Growing and breeding;
- Household operation and maintenance;
- Food preparation;
- Work with laboratory equipment;
- Usage of digital technology;
- World of work;

Subject "Working Education" is subsidized by 3 hours, which must be divided between the 6^{th} and 9^{th} grade. If we divided the grades equally between four grades, it is less than one lesson a week, which is less than 3% of the total hourly subsidy of the second level of primary school education.

Moreover, the technical education is supported only by four of eight sub-subjects (Work with technical materials, Design and construction, Work with laboratory equipment, Usage of digital technology) the percentage of technical lessons is much lower than 3%. Selection and distribution of the sub-subjects depends on schools according to their educational intentions and their school equipment.

Assuming that technical education can be implemented in other subjects like Mathematics, ICT and Science (Physics, Chemistry, Biology, Geography), the technical education is subsidized by less than 34% of all teaching lessons. These numbers are indicative, because schools have optional lessons and they can increase or reduce the number of technical and scientific oriented lessons, is whether they use them for technical and science subjects. Moreover, this percentage is actually much lower, because the technical education is not implemented in all lessons of Mathematics, ICT and Scientific subjects.

Detailed percentage of technical oriented lessons in the second level of primary education is one of the result of our research presented in the paper (see next chapter).

The consequence of this unsatisfactory situation is the fact, that the pupils of the basic schools are not motivated and their interest of technical and science education is not developed. The technical as well as creative thinking and skills of pupils is insufficient [16].

This unsatisfactory situation has to be changed. Pupils should **create and discover**. Pupils should feel success from their creativity and discovering [16].

E. Building Kits

There are different method how to develop the technical competency. One of the possible ways to increase the level of technical literacy in primary schools is to use the building kits. There are three main types of building kits:

- *The construction kits*: improve pupil's motor skills; develop perception, memory, imagination, thinking, and spatial orientation. It helps the child discovers and begins to understand the basic principles of mechanics.
- *The electro-technical kits*: improve pupil's understanding electro-technical machines and equipment; develop understanding of principles of electricity and magnetism.
- *The programmable / robotic kits*: develop pupil's algorithmic thinking; support learning the basics of programming and robotics [16].

"Playing" with building kits can be spontaneous, without any supervision, or it can be controlled by a teacher, who can influence and direct that play into a certain direction for a particular purpose [10].

The most commonly used kits are wooden blocks, mosaics, Lego, Merkur, Seva, Cheva, Fischertechnic [17].

III. Research

A. Research goals and methodology

The research was carried out at basic schools in the Hradec Králové Region in the Czech Republic. There are two goals of the research:

1. **Goal 1**: Determine percentage of hourly subsidy of technical directly oriented lessons in both levels of primary school education.
2. **Goal 2**: Determine percentage of hourly subsidy of technically supported lessons of other subjects in both levels of primary school education.

The research was carried out at the first level of primary school (1st grade - 5th grade) and at the second level of primary school (6th grade - 9th grade). The research was carried out by questionnaire survey. The surveys were addressed to 415 schools. We received 383 responses in total (180 teacher of the first level of primary school, 203 teacher of second of secondary school).

B. The Research Results – Goal 1

Hourly Subsidy of Technical Directly Oriented Lessons:

To determine the percentage of hourly subsidy of technical directly oriented lessons, the distribution of the sub-subjects within the subject "Working Education" was found out. This distribution enables determination of percentage of hourly subsidy of technical directly oriented lessons within the subject "Working Education".

1) The First Level of Primary Schools

To determine the distribution of the sub-subjects "Working Education", the teacher were asked to response how are distributed the sub-subject of the subject "Working Education". The total results are summarized in the Table 1.

Table. 1 Distribution of sub-subjects within "Working Education" in the first level of Primary Schools.

	Class					
	1st	2nd	3rd	4th	5th	Total
	Number of lessons					
Working with tiny material	20	58	42	59	28	207
Constructional activities	51	54	65	87	42	299
Growing works	13	34	32	23	15	117
Food preparation	33	38	45	77	84	277

The technical oriented sub-subjects are "Working with tiny material" and "Constructional activities". These sub-subjects represents 56% of hourly subsidy of the subject "Working Education".

Regarding the fact, the hourly subsidy of the subject "Working Education" is 5% of total hourly subsidy, the **direct technical education represents only about 2,5% of total hourly subsidy of the first level of primary education**.

2) The Second Level of Primary Schools

To determine the distribution of the sub-subjects "Working Education", the teacher were asked to response how are distributed the sub-subject of the subject "Working Education" (similarly as in the first level of primary education). The total results are summarized in the Table 2.

Table. 2 Distribution of sub-subjects within "Working Education" in the second level of Primary Schools.

	Class				
	6th	7th	8th	9th	Total
	Number of lessons				
Work with technical materials	7	12	3	7	29

Design and construction	8	9	10	0	27
Growing and breeding	15	10	15	17	57
Household operation and maintenance	15	23	14	26	78
Food preparation	34	23	15	25	97
Work with laboratory equipment	13	9	19	12	53
Usage of digital technology	41	37	45	29	152
World of work	25	27	32	29	113

The technical oriented sub-subjects are "Working with tiny material", "Design and construction", "Work with laboratory equipment" and "Usage of digital technology". These sub-subjects represents 43% of hourly subsidy of the subject "Working Education".

Regarding the fact, the hourly subsidy of the subject "Working Education" is 5% of total hourly subsidy, the **direct technical education represents only about 1,4% of total hourly subsidy of the second level of primary education**.

C. The Research Results – Goal 2

Hourly Subsidy of Technical Supported Lessons:

To determine the percentage of hourly subsidy of technical supported lessons, the frequency of usage of building kits within the lessons of other technically oriented subjects were found out.

1) The First Level of Primary Schools

To determine the frequency of usage of building kits within other technically oriented subjects (Mathematics, Physics and ICT), the teacher were asked how often are using the building kits in their subjects. The total results are summarized in the Table 3.

Table. 3 Frequency of usage of building kits within other technically oriented subjects (Mathematics, Physics and ICT).

Frequency of usage of building kits	Weight factor	Number of responses	Relative number of responses	Percentage of technically oriented lessons
Never	0%	35	18%	0%
1 time a month	5%	58	31%	2%
2 times a month	10%	45	24%	2%
1 times a week	25%	30	16%	4%
2 times a week	50%	15	8%	4%
Every lessons	90%	7	4%	3%
			Total	**15%**

The building kits as support of learning of technically oriented subjects are used in 15% of lessons. These lessons can be understand as technically oriented lessons.

Regarding the fact, the hourly subsidy of the technically oriented subjects (Mathematics, Physics, ICT) is 22% of total hourly subsidy, the **technically supported education represents only about 3,5% of total hourly subsidy of the first level of primary education**.

2) The Second Level of Primary Schools

To determine the frequency of usage of building kits within other technically oriented subjects (Mathematics, ICT and Science – Physics, Chemistry, Biology and Geography), the teacher were asked how often are using the building kits in their subjects. The total results are summarized in the Table 4.

Table. 4 Frequency of usage of building kits within other technically oriented subjects (Mathematics, ICT and Science).

Frequency of usage of building kits	Weight factor	Number of responses	Relative number of responses	Percentage of technically oriented lessons
Never	0%	26	13%	0%
1 time a month	5%	76	37%	2%
2 times a month	10%	52	26%	3%
1 times a week	25%	35	17%	4%
2 times a week	50%	9	4%	2%
Every lessons	90%	5	2%	2%
			Total	**13%**

The building kits as support of learning of technically oriented subjects are used in 13% of lessons. These lessons can be understand as technically oriented lessons.

Regarding the fact, the hourly subsidy of the technically oriented subjects (Mathematics, Physics, ICT) is 22% of total hourly subsidy, the **technically supported education represents only about 4,4% of total hourly subsidy of the second level of primary education**.

IV. Possibilities of Development of Technical Thinking in Physics

One of the most appropriate subject that indirectly develops technical thinking, technical literacy and creativity is physics. The development can be carried out using construction kits – see above. On the other hand using construction kits in learning of the physics can develop both science thinking as well as positive relation of pupils to science.

The case studies presented in the following paragraphs demonstrates the using of the construction kit Merkur in the physics lessons, specifically in the learning of momentum theorem.

A. Construction kit Merkur

There are plenty of construction kits on the market for all ages. However, they are a kit that is "traditional" and the most

widespread in households and schools. According to the survey, see [17], the most widely used construction kits in the Czech Republic are Merkur and Lego. For the purposes of the paper, the Merkur construction kit will be briefly mention.

Mercury is a Czech metal construction kit that has been produced since 1925. Its predecessor was the Inventor construction kit manufactured from 1920. The metal parts of the kit were hooked together. Since 1925, the metal parts of the kit have begun to be connected by bolts and nuts, and the kit has begun to be called Merkur. The kit was gradually expanding with new parts and components. The kit was very popular for its resemblance to real constructions. Around 1930, the kit was extended by rails. Merkur has become popular. Currently, the Merkur is developing other types of Merkur kits to keep pace with the current trend. Besides the classic construction kit, the company also develops robotic and mechatronic kits [18].

The base of the kit is flat metallic perforated sheet of various dimensions and sizes. These basic components, which are connected by bolts and nuts, are complemented by other components such as wheels, gears, shafts, belts, pulleys, ropes, electric motors, control and programmable boards and RC transmitters and receivers. Different sets of kits are compatible with each other and can be combined with each other. Children practice fine motoring, learn to construct simple objects (spade, chair, toy, etc.), and gradually can reach higher levels up to complex cranes, large machines that can be moved by gears and engines (see Figure 1). The kit allows the design own children's projects [18].

Fig. 1 Crane - constructional model made of Merkur kit [18].

The kit from the electro series is aid for introduction of electromagnetism principles in physics lessons. The experiments on electrostatics, electricity, magnetism, electromagnetism and electrochemistry explain in comprehensible and entertaining way the principle of experiments and electromagnetism phenomena. The kit contains a small instruction manual explaining how work stair switch, telegraph, diverter motor, ammeter, etc. [18].

Mechanical series of kits are designed for assembling various mechanics experiments at primary and secondary schools. Pupils can make simple experiments in the area of kinematics, dynamics, oscillation and waves. In the area of dynamics, the construction kit enables demonstrate uniform motion, circle motion, average and instantaneous velocity, equally accelerated motion, acceleration of the free-falling body, basic equation of dynamics and Newton's laws. In the area of oscillation, the kit enables demonstrate pendulum vibration time, cylindrical and flat spring vibration, harmonic oscillation, pendulum resonance, pendulum resonance from cylindrical and flat spring, dynamic spring constants. In the area of waves, the kit enables demonstrate standing transverse and longitudinal waves and reflection of waves [18].

In addition, the construction kit Merkur is expanding with robotic models. Currently, the company is developing a new teaching aid for mechatronics, robotics and digital control. This new project will enable students design their own construction model of automated manufacturing processes and verify the accuracy and functionality of their solutions. Within the project supported by Technology Agency of the Czech Republic the construction kit integrated the Industry 4.0 is t be developed. The kit enables pupils and students learn programing and managing their own production processes and related activities [19].

Similar kits based on the Merkur construction kit are the German Eitech, Meccano. Construction kits suitable for preschool children are the Czech wooden construction kit Combi, plastic kit Variant or German wooden kit Alextoys.

B. Case study – Demonstration of Momentum Theorem of Double-Reversible Lever

1) Motivation

Every person has ever swung on a two-armed swing. Pupils have the experience of swinging on this swing; they can intuitively answer the questions: "Can you swing on a swing with someone who is heavier than you are?" "Can swing on one side of the swing two person and the other side of the swing only one person?" Can pupils answer these questions so their answers are physically correct?

2) Content of Physics Curriculum

The swing is example of a simple machine based on the force moment equilibrium. It is example of double-reversible lever. In the textbooks of physics [20], the equilibrium of the double-reversible lever is demonstrated by graphical model (see Figure 2) and a mathematical model:

$$M_1 = M_2;\ r_1F_1 = r_2F_2. \quad (1)$$

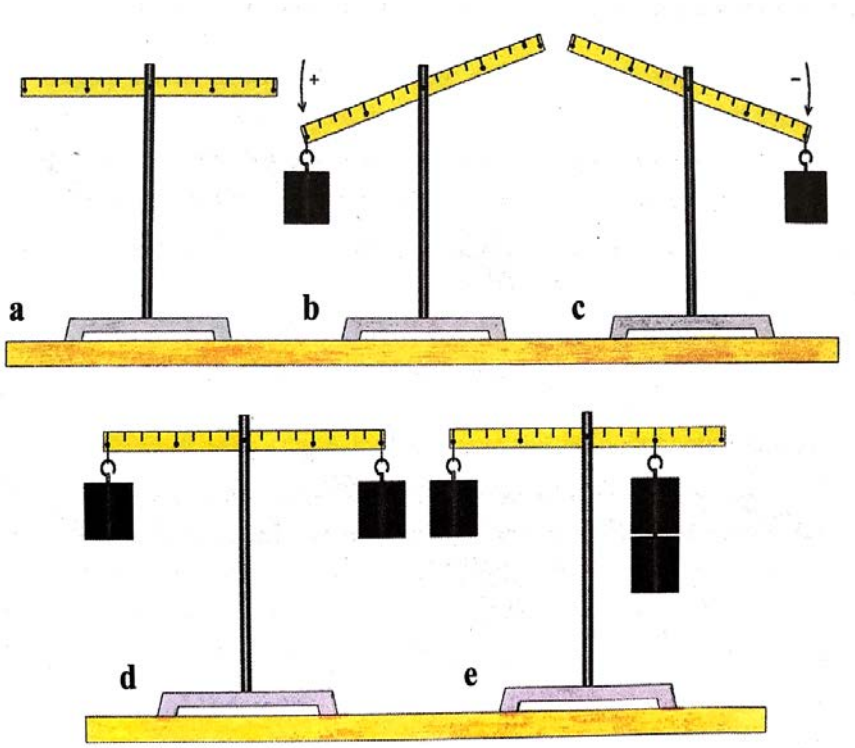

Fig. 2 Graphical model of demonstration of the equilibrium of the double-reversible lever in textbooks of physics [20].

3) Construction model of the double-reversible lever designed form Merkur kit

Using a demonstration of a two-armed swing, pupils become more familiar with the rotating effect of forces on the rigid body. The pupils create the two-armed swing from construction elements of the Merkur kit. The important element of the two-armed swing is the axis of rotation. Pupils must realize that the swing should be constructed so that the axis of rotation is sufficiently raised over the pad.

During construction of the model pupils should realize following technical requirements:

- The axis of rotation must be placed on the relatively stable pedestal;
- The pedestal with the axis should not overturn when the weight is loaded;
- The two-arm swing beams must be construct from relatively rigid material;
- The axis of rotation of the two-arm swing should be placed directly in the middle of the beams, otherwise the lever will be unbalanced;
- The axis should be located in upper part of the beams that ensures a stable balance position with the non-loaded lever. Otherwise, the beams are in semi-labile position.

To demonstrate the rotary effect of forces on a two-arm swing (double-reversible lever), pupils will use the weights. Pupils first check the rotational effect of the force (represented by the gravity force of the weight) when placing the weight on one side of the swing arm - the force has rotating effect relative to the axis of rotation. It is also possible to demonstrate balancing of the swing using two weights of the same weight. Pupils will find that the swing is balanced when the weights are placed at the same distance from the axis of rotation. This is the case when the same forces are at the same distance from the rotation axis. The sizes of the forces and the distance of the forces from the axis of rotation are written to the table. The experiment can be repeated with different forces (different weights), with different distance from the rotation axis. From the table, the pupils derive the balance relation of the double-reversible lever. It will prove the momentum theorem in form of mathematical model – see (1).

This construction model demonstrating the momentum equilibrium of the double-reversible lever will enable pupils to answer the above questions, and their answers can be substantiated by physical justification.

The construction model of the two-armed swing - the double-reversible lever created from Merkur kit by pupils and confirming the momentum theorem is shown on Figures 3 and 4. Figure 3 shows the equilibrium position of the double-reversible lever; Figure 4 represents the non-equilibrium position of the double-reversible lever.

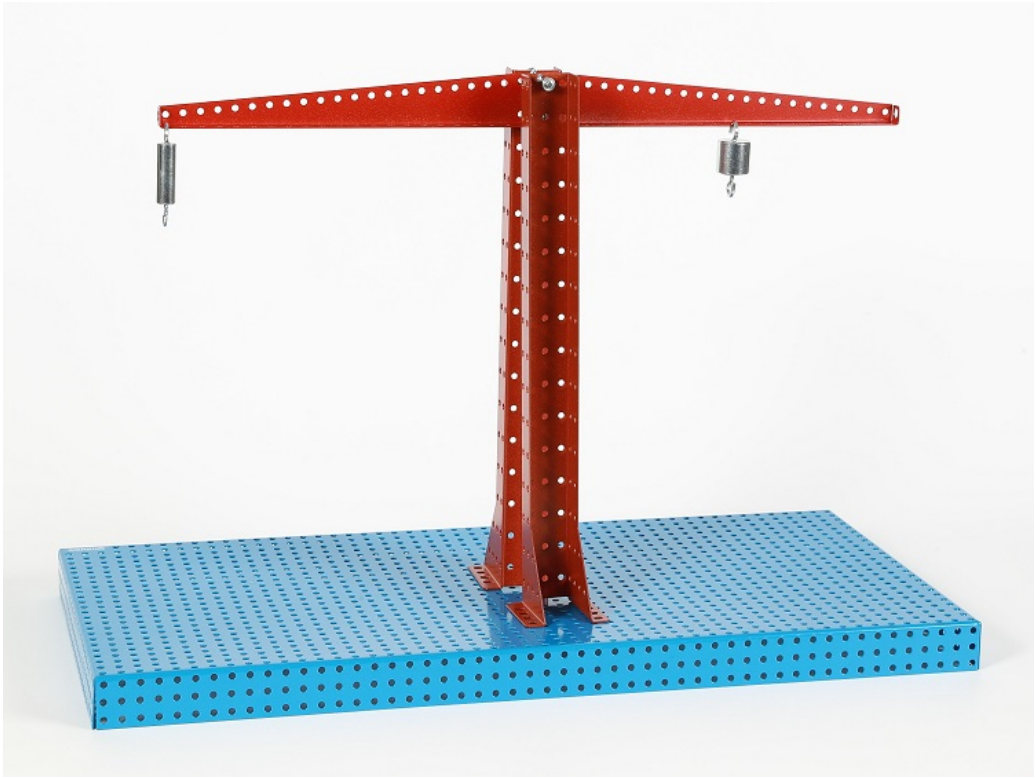

Fig. 3 Construction model made from Merkur kit demonstrating the equilibrium position of the double-reversible lever.

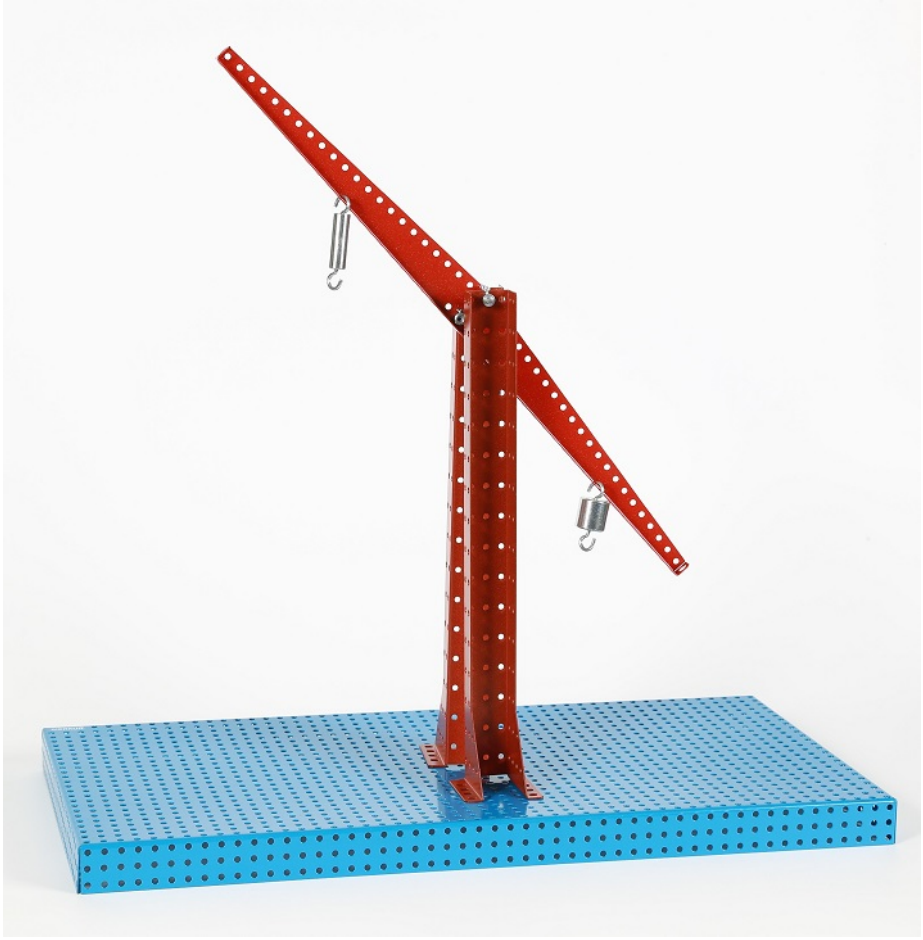

Fig. 4 Construction model made from Merkur kit demonstrating the non-equilibrium position of the double-reversible lever.

4) Analysis of educational goals according to the Bloom Taxonomy

Creation of the construction model as well as experimentation with the construction model during lessons of physics develop pupil's knowledge and skills corresponding to different domains of Revised Bloom's Taxonomy. The presented example of the construction model of double-reversible lever develops Bloom's Taxonomy domains that are listed in the Table 5.

Table 5. Bloom's taxonomy domains developed by creation of the construction model of double-reversible lever.

Knowledge dimension	*Domains of cognitive process*		
	Remember	Understand	Apply
Knowledge of facts	1	2	
Conceptual knowledge		3	4
Procedural knowledge			5

1. The pupil remembers the concept of a double-reversible lever and the mathematical model of equilibrium of double-reversible lever;
2. The pupil understands rotational effect of the force acting to rigid body;
3. The pupil understands the basic law of the rotational effect of the forces and the equation for calculating of the moment and the balance on the double-reversible lever;
4. The pupil can apply conceptual knowledge – he can demonstrate lifting of heavy bodies by double-reversing lever. Pupil realizes the fact the scales are double-reversible lever;
5. The pupil can calculate physical examples based on momentum theorem.

V. Discussion

The paper deals with the technical education at primary schools in the Czech Republic. The goal of technical education is development of technical literacy, development of technical thinking, development of positive relationship to technology and development of creativity. Despite the fact that Educational Framework for Primary Schools [1] defines competence for solving the problems and working competence that are the competencies responsible for child's positive relation to technics, the real status of technical education in primary schools in the Czech Republic is much different.

The research presented in the paper confirm this fact. The goal of the research was found out the actual percentage of hourly subsidy of technically focused subjects in primary education. Technically oriented subjects are understand subjects that develop technical literacy, technical thinking and creativity.

Educational Framework for Primary Schools [1] implement subject "Working Education". Within this subject are defined sub-subjects that directly develop technical thinking and creativity. Unfortunately, technical sub-subjects represent only a part of hourly subsidy of subject "Working Education". Schools have option create study program and increase or reduce the number of technical oriented subjects.

The presented research confirms that in both levels of primary education in the Czech Republic the hourly subsidies of direct technically oriented subjects are very low. The hourly subsidy of the technically oriented subject is only:

- 2,5% in the first level of primary education;
- 1,4% in the second level of primary education.

The technical thinking and creativity can be developed indirectly in other subjects. The subjects that support development of technical literacy and creativity are Mathematics, ICT and other scientific oriented subjects (Physics, Chemistry, Biology and Geography). The development is carried out by using of construction kits as supporting tools in learning of those subjects. The problem is that the using the construction kits depends on curriculum of given subject (it is not always appropriate to use the kit), on school (school has not appropriate construction kits) and on teacher (teacher is not able use construction kit as supporting tool for teaching in other subject).

The presented research found out, how often the teachers are using the construction kits in other subjects. The results are unsatisfactory. Hourly subsidy of technically supported education is only:

- 3,5% in the first level of primary education;
- 4,4% in the second level of primary education.

The total hourly subsidy of technically oriented education or technically supported education is:

- 6,0% in the first level of primary education;
- 5,8% in the second level of primary education.

The results are alarming. The development of society relates to development of technology. The technology development depends on technically educated people. Positive relationship to technology and technics has to be developed from primary education. Unfortunately, the presented research confirms that primary education has insufficient hourly subsidy of technically oriented learning. The pupils are not sufficiently motivated and developed in technics and technology. Their technical literacy is on low level.

The academics of Department of Technics of the University of Hradec Kralove realize this unsatisfactory

situation. Their goal is support technical education. The university students of study program "The teaching of technical subject" develop not only their technical thinking and creativity, but they learned the methods for development of the technical thinking and creativity of the pupils of the primary as well as secondary schools.

The problem must be solved systemically. The academics of Department of Technics highlight to the necessity for change primary school curriculum towards the raising the hourly subsidy of technically oriented education. The optimal hourly subsidy should at least 15% of total hourly subsidy at primary education.

One of the possible way for solution of above-mentioned problem is using construction kits during learning in other subject, particularly in lessons of physics. The working with the kits is interesting for pupils, it develop their manual skills, creation and technical literacy. On the other hand, the using of the construction kits in the physics increases pupils' interest in learning of the science and their science literacy can be developed as well.

VI. Conclusion

The issue of the development of technical education needs to be study constantly and deeper. It is necessary to determine the level of technical education in elementary schools, to identify pupils' interest in technical subjects, to identify causes that affect pupils' lack of interest in technical subjects. It is necessary to conduct research, analyze research data, and propose solutions.

The paper presents the results of the research discovering the percentage of hourly subsidy of technical oriented education in Czech primary schools. Moreover, the paper present the possibility for development of technical and science literacy using construction kits.

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