Development of the Curriculum for the Subject IKT/ICT

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Diploma Thesis
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ZADÁNÍ DIPLOMOVÉ PRÁCE

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Jméno a příjmení:	**Bc. Jakub ŠNEVAJS**
Studijní program:	**N 3902 Inženýrská informatika**
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Téma práce:	**Projekt zpracování učebních osnov předmětu IKT/ICT**

Zásady pro vypracování:

1. **Formou literární rešerše vysvětlete základní pojmy spojené s tvorbou učebních osnov a rámcovým vzdělávacím programem (RVP).**
2. **Analyzujte možné přístupy k výukovému procesu se zaměřením na výuku předmětu IKT/ICT a proveďte analýzu současné podoby učebních osnov předmětu IKT/ICT pro druhý ročník, obor technické lyceum na SPŠS Vsetín.**
3. **V souladu s doporučeními přiděleného konzultanta vypracujte návrh učebních osnov předmětu IKT/ICT pro druhý ročník, obor technické lyceum, splňujících požadavky RVP.**
4. **Na základě návrhu vypracujte komplexní studijní opory formou výkladových prezentací se vzorovými řešenými příklady, včetně úkolů, zadání samostatných prací, výstupních testů a písemných prací k daným tematickým okruhům.**

Rozsah práce:

Rozsah příloh:

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Seznam odborné literatury:

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2. **PASH, M. et al. Od vzdělávacího programu k vyučovací hodině: jak pracovat s kurikulem. Praha: Portál s.r.o., 1998. 424 s. ISBN 80-7178-127-4**
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ABSTRAKT

Tato diplomová práce se zabývá tvorbou funkčních osnov pro výuku předmětu IKT/ICT ve druhém roce studia oboru Technické lyceum na SPŠS Vsetín a to se zohledněním všech změn, které nastaly zavedením nových rámcových vzdělávacích programů (RVP). V teoretické části práce jsou popsány veškeré důležité informace spojené s tvorbou učebních osnov a výukou obecně, praktická část se pak zabývá samotnou realizací osnov předmětu IKT/ICT a vývojem komplexních materiálů do výuky, které by zohlednily také individuální učební styl žáků.

Výstupem práce jsou pak nové osnovy pro výuku druhého ročníku předmětu IKT/ICT navržené v souladu s požadavky RVP a komplexní materiály do výuky pokrývající celý druhý ročník studia tohoto předmětu. Materiály jsou vytvořeny v podobě výkladových prezentací, video tutoriálů, zadání prací s ohledem na řešení problémových situací skutečného života, a ověřovacích testů. Celá struktura učiva je navržena tak, aby nenásilnou formou docházelo k rozvíjení všech klíčových kompetencí studentů, a zároveň byl obsažen co možná největší počet průřezových témat.

Klíčová slova:

Vzdělávací program, učební osnovy, kompetence, průřezová témata, cíle, vyučování, tématický celek, učivo, vyučovací hodina, výukové metody, motivace, organizační formy, zapamatování, ověřování vědomostí, hodnocení, klasifikace, didaktické vybavení, výzkum, prezentace, tutoriál, test, SPŠS Vsetín, Wink 2.0

ABSTRACT

This diploma thesis deals with development of functional curriculum for education of subject IKT/ICT in second year of study in Technical lyceum field of study at SPŠS Vsetín, with consideration of all changes made due to launch of new framework education programmes (FEP). In theoretical part there is described all the necessary information connected with development of the curriculum and the process of education generally, practical part then deals with concrete realization of curriculum for the subject IKT/ICT and with development of complex materials for the education process, which would keep in mind also the individual learning style of students.

Results of this work are the new curriculum for education of the subject IKT/ICT, which has been proposed according to requirements of FEP, and complex materials for education, which entirely cover the second year of study of this subject. Materials are developed in form of explanatory presentations, video tutorials, assignments of work with consideration to real-life problem situations, and examinational tests. The structure of entire subject matter is developed in way which ensures that students will spontaneously develop all their key competencies, and that there will be contained as many cross-curricular subjects as possible at the same time.

Keywords:

Education programme, curriculum, competence, cross-curricular subjects, goals, education process, thematic unit, subject matter, lesson, teaching methods, motivation, organisation forms, remember, examination, assessment, classification, didactical equipment, research, presentation, tutorial, test, SPŠS Vsetín, Wink 2.0

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But people I am grateful the most are of course members of my family and my girlfriend, who had given me great support and expressed great amount of valued comprehension not only during the time I have been working on this diploma thesis.

Motto

“

Tell me something and I will forget. Show me something and I would remember. Let me to try something and I will understand.

”

Kchung-fu-c' (552 - 479 BC)

I declare that I have worked on this diploma thesis alone and the used literature I have cited. If the results of this work are published according to licence contract, I will be presented as the co-author.

In Zlín …….

Bc. Jakub Šnevajs

CONTENT

INTRODUCTION

We live in the world where everything changes. In time of globalization and ever-growing information technologies, the speed of grow is multiplied than ever before. People who don't want to learn new things and are not interested in new technologies are hardly acceptable by current market and must be retrained in order to succeed in the competition. This carries lots of difficulties for many people and often can ruin their lives. And therefore we need to be able to challenge these changes and have to keep up with the evolution.

In the old saying there stays that the best defence is offence. We can not and particularly don't want to use any kind of force but strength. The way is not in resisting the progress, but keeping up with it. We must be able to learn how to remain in spot of employers and be able to teach to assure that the up-coming generation will be able to grow and live in this world.

And this is the point in which this work will be interested in: "*How do we assure that new generations of students will be able to learn the way to be useful for future practice?*" Key for this answer is in developing and using new teaching methods, new inventory, taking care of students themselves and not only their marks, and last but not least making flexible changes in the educational content. The main goal of school and teachers is never more to teach the students and pupils as much information as possible, but to show them where they can find what they need, help them to recognize which information is credible and which is fake and give them concrete basics of knowledge how to learn.

To partially fulfil these requirements there are now developed new rules in form of framework education programme – a kind of reformation. These rules specify what content will be educated dependently on the type of school and what kind of information is necessary to teach the students. But the main change and substance is not in the educational content but the form of education. New framework education programme specifies the subject interconnection in form of cross-curricular subjects and key competencies, what is a kind of new phenomenon.

This is also the reason why all schools need to upgrade their current curriculum. It is necessary to develop new school education programmes and the whole new syllabus in order to fulfil new requirements. And now we get to the point of this work. So, what is the goal of the work?

Among many others, the SPŠS Vsetín is also rebuilding its curriculum and currently working on new school education programme. The lower level of this programme will be the concrete syllabus/curriculum of each educated subject.

As the first step of this work, there will be made a literature analysis of school system, present approaches and teaching methods. In this part there will be also explained new and key terms connected with school system and education. Briefly said, the first part of this work will offer the theoretical information primarily necessary for the practical part, but also useful for teachers themselves.

In practical part the main goal is to develop a curriculum for education of subject IKT/ICT in second year of study in Technical lyceum field of study, which will fulfil all necessary requirements of new framework education programme. According to this point there will be developed concrete materials for education process, with possible use of non-commercial software during the education process.

These complex materials will contain following appurtenances:

- Explanatory presentations for all educated themes
- Assignments for individual work or teamwork
- Sample outputs of the assignments
- Examinational tests

I. THEORETICAL PART

1 STRUCTURE OF THE EDUCATION SYSTEM

Every civilized country with developed education system, including our republic, has several education programmes, which differ in the level of complexity.

There are three basic categories:

- National education programme (NEP)
- Framework education programme (FEP)
- School education programme (SEP)

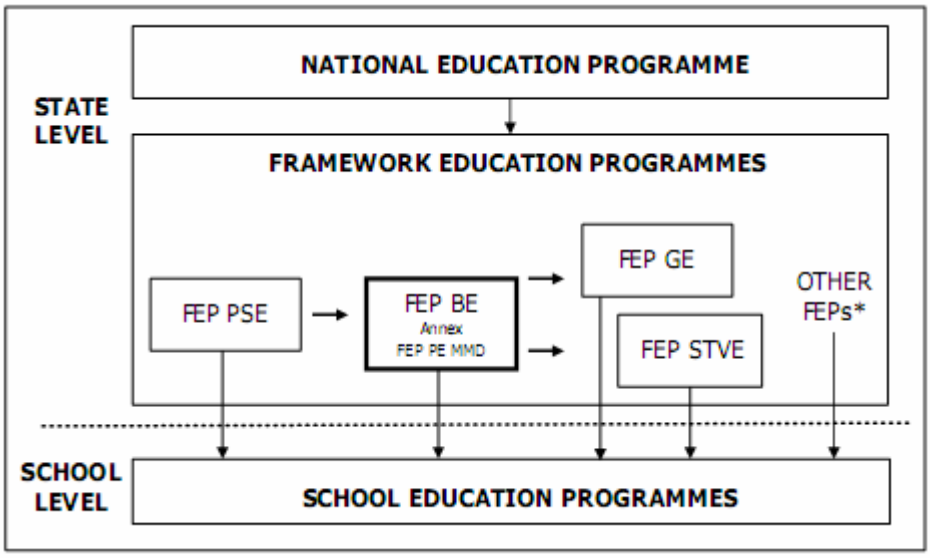

Fig. 1. The system of curricular documents [1]

In the (Fig. 1) above there is a scheme of entire education system of Czech Republic. As the reader can see, it is some kind of level structure, which could be represented also by pyramidal chart. Dependently on this structure the schools can only affect their school education programmes and lower levels, which are not in the scheme, like the curriculum or the teaching units (lessons).

The abbreviations here mean:

- PSE – Pre-school education
- BE – Basic education
- GE – Secondary general education
- STVE – Secondary technical and vocational education

1.1 National Education Programme

This document is also well-known under name The White Book [10]. The national education programme is the highest, compulsory for all types of schools, which are active on the market of education, and represents the most general strategy of the whole country. NEP and FEPs define the desired level of key competencies, and general and technical basics of education on the state level. With this there are set the rules and framework content for development of school education programmes.

Often the NEP depends on the economic and industrial position of the country and also on available resources. Simply, if a country has a lot of resources and good industrial base, the national education programme will be aimed to train new technologists and industrial workers, because they will possibly be useful for the wealth of the country. It is because one of the goals of all programmes is on one hand to prepare the students for lifelong, individual or system study and on the other hand particularly to make them useful for a practice. And because of changing demands of the market and society, there is need to change the content of education, what is task of education programmes.

1.2 Framework Education Programmes

Dependently on the NEP, there is built a certain amount of framework education programmes. These programmes are categorized into three groups dependently on the level of education. The main categories of the FEP are following:

- Framework education programme for pre-school education
- Framework education programme for basic education
- Framework programme for secondary education

In this work we will be particularly interested in the last mentioned programme – for secondary education. These programmes vary dependently on the type of school. So there will be another programme for general school and another for industrial school. But this is not the only differentiation, because also each field of study has its own framework education programme.

Generally the framework programme specifies obligatory frames of educational content and gives some instructions how to lead the process of education. In the point of our interest there is the framework programme for technical lyceum.

The title of this programme is "*78 – 42 – M/01 Technické lyceum*" and it is available in zip archive in [23].

1.3 School Education Programmes

The school education programmes are totally in competency of respective schools. Content of these programmes and methods used in the process of education can be developed in order to fulfil the school education strategy. Mostly there are teams of teachers on each school, which have to develop the complex school programme with built-in key and technical competencies and cross-curricular subjects. But every school education programme must have a base in respective framework education programme, because the FEP is a compulsory directive, which must be fulfilled. All remaining matters are up to the teams, which have responsibility of the SEP on respective school.

This principle of school programme development is schematically shown in (Fig. 1). Everything what is above the school level is a strict directive, which must be contained in the school education programme. Better and more complex schematic interpretation shows the (Fig. 2), which also contains the curriculum and education unit (lesson). The structure of the scheme is pyramidal with the base turned upside-down. Figuratively said this scheme represents the funnel – everything what is contained in upper parts must be contained on the bottom.

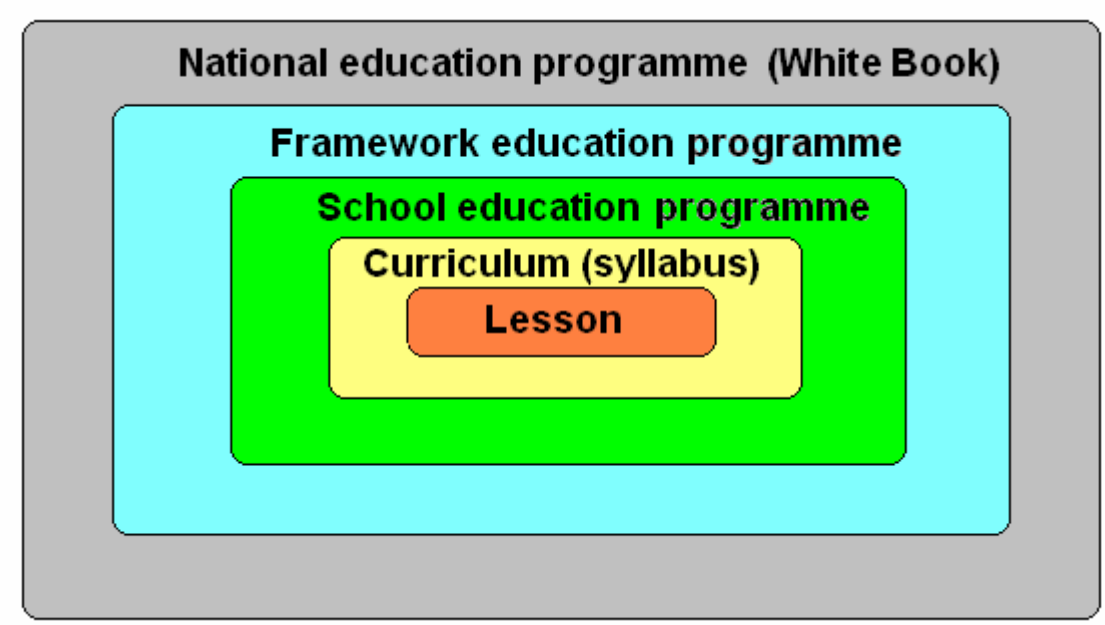

Fig. 2. Funnel-structure scheme of levels of the education system

1.3.1 Curriculum – Two Possible Interpretations

The term curriculum has two different meanings. The first is that the curriculum is assembled from three connected parts and in accordance with [20] means:

1. Education programme, project, plan
2. Progress of the education process and its content
3. Content of the entire knowledge, which students gain during the education and activities somehow connected with the school and education process, its planning and evaluation.

The second interpretation in English language [24] is that curriculum means only one of the following things:

- subject matter
- school programme
- syllabus

In this work we will talk about curriculum in connection with the syllabus for the subject IKT/ICT for 2nd class of Technical lyceum.

In accordance to this, we can define the curriculum. Figuratively we can imagine the curriculum as the complete content of subject matter. The curriculum describes which information will be taught to students in respective year of study. The curriculum is ordinary made for one entire subject, where it describes the complex knowledge the students will have after they finish the school. This complex knowledge is separated into terms and thematic units, where every unit has its time donation – the period of time in which the students must understand the problem and fulfil the requirements.

1.3.2 Education Unit (Lesson)

The lesson is the lowest part of the curricular documents. Style of education is determined by the teacher and also the used methods and interactive or aid tools. The teacher can freely choose what kind of strategy will use and what information students will have after the education. The teacher also specifies the requirements and evaluation of students.

Every lesson should have its plan and teacher has to be well prepared. It is very recommended that teacher informs students about upcoming content and uses interactive tools to motivate students and help them to understand the currently solved problem.

To aspect of motivation, aims, teaching and teaching methods and strategies there will be dedicated separated parts of this work.

2 FEP FOR TECHNICAL LYCEUM

The purpose of new framework programme is to change the entire process of education in the way of modernization and enhanced quality of education. According to these changes the students will be able to find employment in the 21st century after they finish their education. The great part plays also a fact, that the subject ICT is not considered as a technical subject anymore but the general one, everyone will gain at least the basics necessary for practice.

As has been mentioned in part dedicated to FEP generally, it presents a set of directives, which are compulsory and must be respected by each school which the FEP is made for. It dictates the output of the education at the end of the school attendance together with supportive tools. Parts which can be influenced directly by the school and developed on the preference of each teacher are the means of realization of the defined requirements [23].

Briefly it can be said that the question: "*What to teach?*" is defined by the FEP, but the second important question: "*How to teach?*" is completely up to the teacher, who has to have an interest on future assert of students in their further life. The educational content is no more only a goal but the mean to reach the desired output. Dependently on this the students should gain ability to:

- **Learn how to learn and discover** – developing the memory and concentration and ability to make analysis, synthesis, induction, deduction, generalization etc.
- **Learn to work and negotiate** – forming the creative stance of students to problem solving and to analyzing possible solutions, and building the adaptability on new conditions, enhancing the individual and teamwork to show students that the work is an opportunity for their self-realization.
- **Learn to be** – deepening of ability to make self-reflection and self-evaluation, teaching students to bear responsibility of their deeds.
- **Learn to live together** – respecting the identity of other people (cultures) and guarding the own identity, developing communicational abilities which are necessary for the full-value life.

This is only an extract of the most important points (by meaning of the author) of the goals of the secondary technical education. Complex content can be found in [23].

2.1 Competencies in General

In the framework education programme we can come across the term *competence*. There are two basic types of competencies, concretely the key competencies and the technical competencies. The technical competencies create the professional profile of the graduate and are based on the qualification requirements of the future employment, dependently on the type of school (industrial, general, mechanical, medical etc.) the student attends. The key competencies are also very complex and are common for every type of school, because have a lot to do with the everyday life. Because of the complexity both of the competencies will be explained and described in following parts of this work. Although the terms of technical and key competencies are used separately, there are not independent but blend together. But now we shout give an answer on question: "*What the competencies are?*"

The framework education programme for technical lyceum specifies the competencies as complex of:

- Abilities
- Skills
- Stances and postures
- Value orientations

The competencies specify what students will know and will be able to do after the lesson or entire education process in the meaning of school attendance. In the past the competencies were written from the side of the teacher, so they had a meaning like: "*Teacher will demonstrate…*" or "*Teacher will explain…*" and so on. Now, after the reformation, the competencies will be written from the side of student like: "*Student will be able to demonstrate…*" or "*Student will be able to explain…*" possibly "*Student will be able to develop…*" and so on. It is because in the past there was almost no interest if the student understands or not. The teacher sometimes only came into the lesson, told students what he wanted and did not care if they understand or not. This was the main thing to change in the process of education – lesson will be no more managed strictly by curriculum and teacher respectively, but the teacher will use the curriculum as a linkup and adapt the process of education according to students' needs and preferences, because if student does not have

a motivation and comes into the lesson only to hear something, it is useless This opinion state also authors in [26], [31] and [12] and many other publications.

2.2 Key Competencies (KC)

Key competencies are characteristic with one thing and so that they are not seamlessly joined to the concrete subject of education process. It is because they are connected also with supplement school activities like optional subjects, after-school projects and so on.

Dependently to the purpose of this work we will concentrate only on the parts of each competence, which are most connected with the subject ICT. The description follows.

2.2.1 Learning Competence

Students will be able to make use of the information sources, effectively search within them and be able to recognize the difference between credible and incredible sources and information.

2.2.2 Problem-solving Competence

Students will be able to determine the root of the trouble and suggest its solution. During this they will use their knowledge gained in previous education and will be able to work as a part of the team.

2.2.3 Communicational Competence

Students will be able to clearly, comprehensively and seamlessly express their thoughts and attitudes. In expression they will respect the language stylistic normative and technical terminology. With this is closely connected the ability to use by word and writing at least one of the foreign languages. In IT and ICT this is the very important thing, because without ability to read and understand English-written texts they will not be able to work in this branch.

2.2.4 Professional and Social Competence

Students will know the importance of verifying the information. They will be also able to work in teams and accept the attitudes of their work and life partners. Accordingly to their abilities and skills they will be able to set real goals of their work.

2.2.5 Civic and Cultural Awareness

Students will act independently and responsibly in the interest of themselves but also the other people. They will be actively engaged in the political and civic events on domestic ground but also in connection to the entire world. Students will understand the importance of environment for the human beings and will know the environmental-friendly ways to handle the waste. They will also be able to determine the environmental-friendly products and technologies and at least partially use them.

2.2.6 Competence to Labour-assert and Business Activities

Students will have a view about the possibilities of their further assert in respective branch on the labour market. They will also be able to imagine the real salary and working conditions on the respective post, to find out the requirements of employers and last but not least compare them with their own visions, demands and preconditions. In order to achieve above mentioned points, they must be able to communicate with their employers adequately.

2.2.7 Mathematical Competence

Students will know how to correctly convert the basic units and they will also be able to read and develop various forms of graphic representations in order to suggest and construct transparent tables, charts, figures and other graphics.

2.2.8 Competence to Use the Tools of ICT and to Work with Information

This competence is the most important for the purposes of this work. Although all competencies are used as inter-subject connection, the main part of this competence lays in the subject IKT/ITC.

Students will be able to use the PC and other tools of ICT. They will be able to gain information from open sources and become aware of different reliability and credibility of respective information sources.

The above points dedicated to key competencies are an extract based on [23]. In comparison with [1] we can see that competencies of second level of education are much more complex than on the basic level of education.

2.3 Technical Competencies

Technical competencies are not the same in every type of education, but differ accordingly to the type of the school. So the technical competencies for general school, medical school or industrial school will vary. The technical competencies are also characteristic for the second and higher level of education [23]. On the basic lever there are no technical competencies [1], because the basic education gives only the most needed basics of important subjects on the general level.

In following subchapter we will aim on the technical competencies characteristic for the Technical lyceum. They are not as many as in case of key competencies, but also very contribute on the profile of the graduate, because form his technical skills dependently on the orientation.

2.3.1 Where the Study Goes

- Students will be familiarized with the importance of self-education and will have real imagine of the difficulty level during further university studies
- Students will also know the possible assert on the labour market after the graduation
- Previous points are dependent on the ability to gain and analyze data using the means of ICT
- The student should also be able to develop and update the webpage and use the graphical communication.
- The knowledge and respect of the law is also very important

- Students should accept the fact that the quality is the most important factor for professional success
- Students will be lead to using the normalized and standardized technologies and means of expressions
- Very important is if students know the prize and usefulness of their work and are able to spend their financial actives effectively
- One of the most important points nowadays is that students should act in way to protect the environment and minimize its pollution and destruction

2.4 Cross-curricular Subjects (CCS)

Cross-curricular subjects are another important part of the FEP. They are the formative elements of the basics of education and develop the opportunities for individual assert of students in single projects or teamwork. They also have a goal of forming the students' individuality and character, particularly in the area of the attitudes and worth. Roots of cross-curricular subjects are in actual world problems and therefore are built into the FEP directly [15].

Cross-curricular subjects must be implemented into the curriculum of each subject and connect the subject one to another. Together there will be a complex of linked knowledge, which is very important for students' future assert. The following subchapters represent an extract of the most important points for the purposes of this work, based on [23].

2.4.1 Citizen in the Democratic Society

Students will be able to orient in the multimedia and mass media content, make its analysis and critical evaluation and take advantage of mass media possibilities for their various needs. They will also be able to negotiate with other people, lead a discussion and find the optimal compromise and consensus solutions.

This will lead to their personal growth and enhance their communication abilities during the personal meeting or via mass media. To achieve this, the students must be positively motivated and there has to be an educational strategy based on experience in use.

It is also recommended to make use of activation methods, problem and project oriented education, cooperation and discussions. Ideal for the fulfilment of this cross-curricular subject is the medial education, which corresponds with ICT.

2.4.2 Human and the Environment

Students will gain a consciousness about the responsibility of the environment and preservation of its quality. Accordingly to their technical education the students will know the consequences of modern technologies and labour activities to the environment and health in the way of continually sustainable progress.

This cross-curricular subject will be in the entire school scale interpreted in separated specialized subject at the one hand and dispersedly in another subject, including ICT at the other hand. Concretely in ICT it can be adapted on the hardware chapter or any other students' project, which will be connected with this problem somehow.

2.4.3 Human and the World of Labour

This cross-curricular subject is very wide and complex and tops up the abilities and knowledge of students gained in the technical part of education. It covers the most important information and skills for the future assert on the labour market and should help the students in the process of decision about their further professional career. Students should also know their rights and duties following from the employment.

To fulfil this, it is necessary that students are able to search for information, analyze it, evaluate it and use it effectively. Dependently on the results of evaluation the students should be also able to make a right decision. For further assert it is also necessary that students have a good ability to communicate in the verbal and also the written form. This is extremely necessary in the entrance process and interviewing, where the students must be able to form their visions about their expectations, conditions and priorities.

According to the description above, the education process should be based on the practical applications. In this work we will fulfil this cross-curricular subject during the education of MS Office package, concretely the MS Word text editor and MS Excel spreadsheet and other applications.

2.4.4 Information and Communication Technology

The main part of this cross-curricular subject is contained directly in the curriculum of ICT, which is the subject of interest of this work. The abilities in using the means of IT have great support impact on all other subjects. The goal of second level of education is to erase the difference of knowledge among all students as much as possible. The difference is mainly caused by different level of ICT education during the basic education and also the students' preferences and family background in the meaning of property amount.

The reasonable standard of ICT education level is the European Computer Driving License (ECDL), which describes the basic level of skill every student or worker should have to be of use on the labour market. More information about ECDL is shown in [6].

Implementation of this cross-curricular subject expects the active use of multimedia computers and means of IT in the process of education. Because of this fact it necessary to have a well equipped laboratories. The concrete preconditions are in FEP for Technical lyceum defined as follows:

"*The enhancement of using the means of information and communication technologies in the process of education first of all supposes that the school is well equipped with respective information technology. It is necessary that school has the computer laboratories equipped with sufficient number of computer stations, built of modern multimedia computers connected into the high-speed local network, which allows sharing of the network components and devices (printers, scanners, DVD-ROM, discs…) and fast Internet access. In the education process there should be the corresponding number of station to the number of students. The laboratories must be built in accordance to hygienic and security rules of work environment.*" [23]

The following text in FEP for Technical lyceum underlines the importance of using office applications and educational software. The duty to use the commercial or non-commercial software is in FEP not specified, so here is the possibility of using the non-commercial software. The reason for it is that students won't be able to buy very expensive software for example for photo editing. If we presume that the significant part of the graduates will attend at the university [19], [21], they will not have time to work and so they will not have

enough money – and therefore they will use the non-commercial software, or what is worse, use the illegal ways to gain the software they are able to use.

The frame content of educated theme is given by the FEP. But the schools can influent the time donation of each theme. It is absolutely up to the schools and teachers respectively, what time they will dedicate to respective parts of the curriculum. However, the prescribed content must be kept.

Next important aspect in education process is that in theoretic lessons the students should have a possibility to practice – this is closely connected with previously mentioned requirement of one computer for one student. Practice assignments should not be missing in any lesson – does no matter if in the form of project, individual work or test on the computer.

The best approach for the practice is by meaning of the author the project oriented one. Because of this opinion the practice part of this work will be also primarily based on the project, which will guide the students during entire education process of ICT in 2nd class. And when it is all over, the students will have not only the knowledge, but also the tangible results, which can be of use in their further assert.

3 THE PROCESS OF EDUCATION

Now we have passed through the education programmes, so it is time to take a look on the education process itself. With the education process there are connected many terms, which often depend on the approach the teacher or organization choose in practice.

The approach itself can be lead in few ways, which will be mentioned in separated subchapter of this work. Furthermore, there are many other aspects influencing the entire process of education – we can name for example the suitability of the educated theme, used methods, means of evaluation and motivation and so on. All these terms will be explained in the following part of this work.

But one thing is unbreakable, no matter what approach or methods we use in the education process – there is no education activity, which will suit all the students perfectly.

3.1 Three Basic Philosophic Ways of the Education

As has been mentioned, there are few ways how to lead the approach to the education. These ways have been all in use during the history of education and time-to-time upgraded according to actual requirements of the society and the system. Nowadays one approach supplements the others in the process of education. But the basic philosophic ways are three as set in [17] and [30].

3.1.1 Progressivism

Progressivism has been mainly used in time of transformation from the agricultural and rural society on the industrial, city and partially impersonal society. In has influenced mainly the basic level of education – children between 6-14 years of age.

The members of progressivism state the attitude that the main goal of the education is to prepare the child (pupil, student) to adulthood and the life in democratic society. In nowadays school system the members of this way lay a stress on the civic education and preparation for the employment selection. The group of progressivism members is not seamless. There are two ways directly inside the progressivism – the social progressivism and personal progressivism [17].

According to the philosophy of social progressivism the education process should be sorted into four parts which describe that the students will:

1. Understand the actual life
2. Understand their selves and each other
3. Blossom into responsible adult humans
4. Build-up the self-activity

The second – personal progressivism – at the other hand states the opinion that the educational content should be suited to the needs of each student. One of the main members of the progressivism approach is John Holt, who has denounced the authoritarian methods in the education [17], [30].

3.1.2 Essentialism

Essentialism is little bit different of the progressivism. Members of this approach do not hold the attitude that the most important thing is to prepare students for a life in democratic society via stress put on the civic education, but they stance the opinion that school should give the students knowledge, skills and abilities necessary for the existence as the fully blossomed personalities. This definition is not very clear.

Simply, the essentialist stance the attitude that the traditional fields of study are more important than knowledge gained from another education sources. The traditional fields are for example mathematics, physics, biology, foreign languages and literature – the subjects, which have been approved by the time [17]. Significant member of this group is E. D. Hirsh.

3.1.3 Reconstructionism

Members of this approach are convinced, that present society is full of negative effects and it is necessary to make its reformation. Therefore they struggle to grow the students, who will be in the future able to become full-featured adult personalities, which should be able to initiate the activity leading to the better society and participate on their realization.

As is evident, the supporters of this approach look in the future and want to make the society more ecologic and fair and because the moral and fair society is nothing natural, it is necessary to build it up. This is also the meaning of one of the most important supporters of this approach – George Counts [17].

3.2 Organization Forms of Education

The philosophic approaches were not so much of our interest than the following themes. Much more interesting and important for the education are the teaching forms and methods of the education. Firstly we will have a look at forms of education.

The forms define the connection between teacher and students during the education process. It is all about the teacher's approach to the students and possibilities given to students to participate on the lesson. The aspects, which are influencing the forms, are following:

- **Teacher** – teacher can choose what organization form of education is the more suitable, dependently on the further points.
- **Students** – the form is chosen according to student's co-operability and morale.
- **Lesson theme** – a theme of the lesson often offers the use of only one of the methods. But it is often possible to upgrade the theme to be more suitable.
- **Lesson character** – the lesson character is very influencing the form, which can be used. It is up to the teacher, if he chooses the traditional approach or modern one.

3.2.1 The Lecture

The lecture form is not very common on the ground of secondary education. It is used rarely, in most cases only as some kind of supplement of the education process. The lecture is usually led by some external person, it is aimed on concrete theme and its duration is usually longer than one education unit. It can take a place directly in the classroom, other schoolroom or in external facility. It is almost always one-time.

For the lecture it is characteristic that the main word has the lecturer. Dependently on the theme, number of attendees and the lecturer himself the lecture can be lead as a monolog, or the present persons can be connected to the lecture. In (Fig. 3) there is a scheme of lecture lead in the monologue way. The teacher or lecturer (blue) has a presentation to the students (white), but gets no response from them during the process. Time for questions is mostly dedicated in the final part of the lecture. Then the organization changes to frontal.

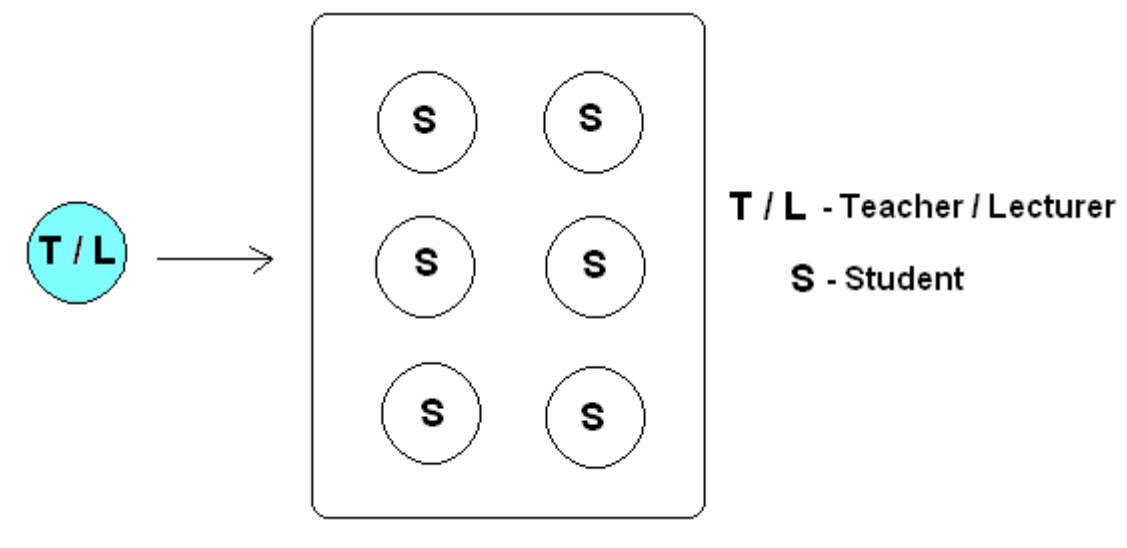

Fig. 3. Scheme of lecture form of education

3.2.2 The Frontal Education

Frontal education is the most common form, no matter on the educated theme or the subject matter. It is characteristic with the teacher's approach to the students, where the teacher communicates with all students complexly. All the students have a possibility to ask the teacher of any opacity and the teacher also communicates with all students almost simultaneously. (Fig. 4), based on [31], shows the scheme, where yellow are active students.

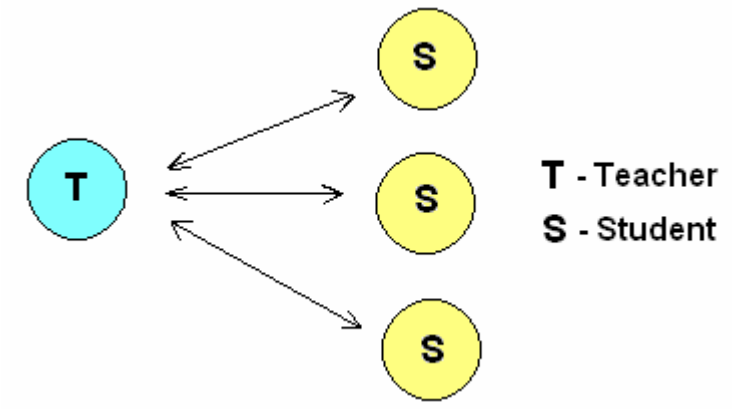

Fig. 4. Scheme of frontal education – based on [31]

3.2.3 The Individual Education

The individual education is absolute opposite of the frontal education or even more the lecture. In this type of organization the teacher works with each student individually or

with few students joined together – in this case the students may participate. This approach is typical for consultations rather than classical education, but it can be used inside the frontal education in work with upper-average students. (Fig. 5) shows the scheme of individual education, where two students have a possibility to participate and the teacher devotes them together. This figure is based on [31].

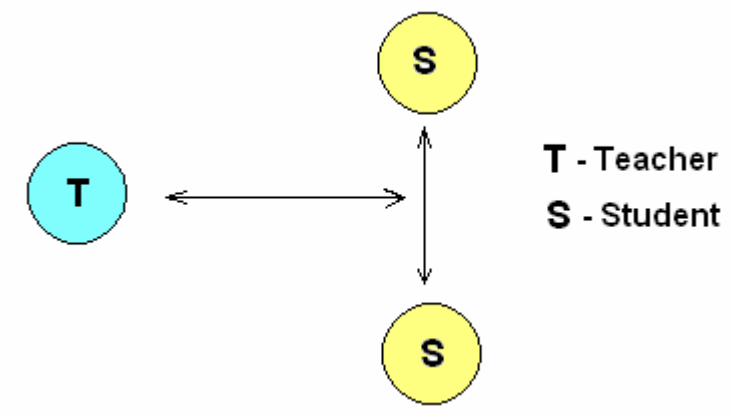

Fig. 5. Scheme of individual education – based on [31]

3.2.4 The Group Education

This form of education is characteristic with its organization. Teacher does not work with students individually but also does not work with the class as a whole. In the group education there are made few groups of students, containing 2-N students per one group. In [25] there is recommended number of students between 3 and 5 per group. Each group has usually given a theme or some task, which must the students solve together. The teacher communicates with each group and checks if all students participate on the task. On this level the teacher communicates with all members of the group. This form is often used for a project development. The group education is classified as a progressive form [31].

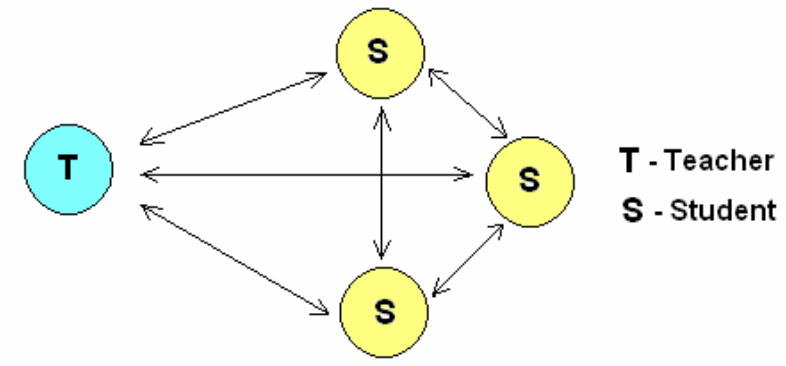

Fig. 6. Scheme of group education

3.2.5 The Team Education

The team education is very similar to the group education, but it is usually not in use, because of its difficulty and demands on the students. During the team work, the students are separated into few groups (teams), which have a task to work on some project and students must participate together. Among the students there is one selected as a team leader, who has a responsibility of the work of the respective team and who communicates with the teacher and synchronizes the team work. This form of education is suitable at the most for the highest classes, where students are able to fulfil the requirements. In the (Fig. 7) there is a scheme of this formation. Teacher (blue) communicates with the team leader (yellow), who organizes and participates with other members (grey) on the teamwork. The teamwork can be defined also another way, that the teams are not made of students, but the meaning is that few teachers build-up a team to systematically educate a greater number of students – as follows in [31].

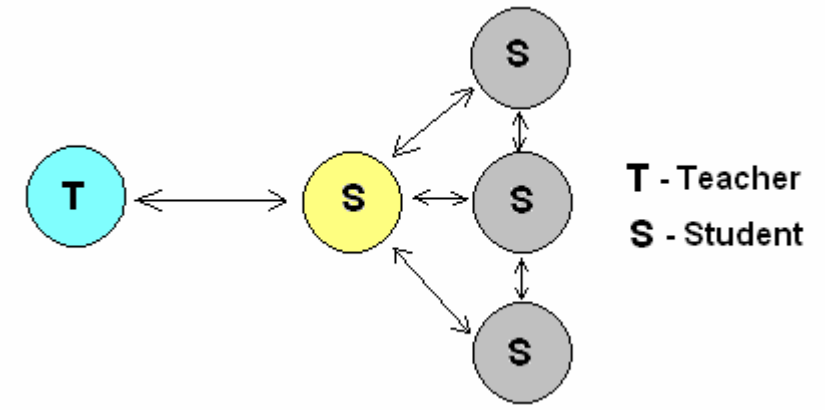

Fig. 7. Scheme of team education

3.2.6 Usefulness for ICT

All of the previously mentioned methods are possible to use in the process of education in case of information technology – subject ICT.

For the **theoretical lesson** it is most common the frontal education (rarely then the lecture), because the taught information is dedicated to all students. It is also almost impossible to use for example the team work organization in the theoretical lesson, because teacher does not have possibility to dedicate himself to several groups of students simultaneously, mainly because of the time donation and also the fact that all students should have the same

level knowledge in final effect. In fact there will always be some differentiation, caused by various interest and potential.

In **practically aimed lesson or students' work**, there are suitable the other organization forms. When working on some task or project, students do not need to be driven frontally, but individually depending on their abilities, skills and level of knowledge. It is also very useful if the students have possibility to work together in groups, or on even higher level in teams. This concept enhances their personal competence and work in group or team carries also many positives for upcoming practice, where the accent is usually put on the co-operability.

3.3 Teaching Methods Generally

At first we should clarify what the method is. This term is well-known for a long time and no matter what time it was, the definition was almost the same. If we take a look in [11], the method is defined as scientific or purposeful procedure, which leads to the set goal. In the oldest source [4] used in this work, with origins in times of totality of this republic, the definition says that each method is a complex of gradual and conscious acts of the human, which lead to reach the concrete result according to the set goal.

And there are other similar definitions of method. One of the most suitable definitions for our purposes can be found in [31] and says that the teaching method is a specific way or technique of arrangement of the teacher's and student's acts, which are enhancing the intelligence profile of the student according to the educational and pedagogical goals.

And very similar definition – from the view of didactics – can be found also in [26], where stays that in didactics we understand the teaching method as the technique of premeditated organization of the acts of the teacher and students, which lead to set goal.

Briefly said, the method is a concrete way based on cooperation of teacher and students, how to reach the set goal.

3.4 Teaching Methods According to J. Maňák and L. Mojžíšek

L. Mojžíšek together with J. Maňák both belong between the most significant authors who dealt with teaching methods. The teaching methods according to J. Maňák [13] are very complex as same as methods developed by L. Mojžíšek [16] and because of that we will

not concern with their complete description, but we will take out only the few methods significant for purpose of this work. The extract of methods has been made. In original the methods are sorted according to several aspects. If the reader of this work would like to study the methods more detailed, he should take a look in respective sources or in [31] and [26] for less complex list of methods based on the original.

Methods as stated in [26] follow:

1. Motivation methods – methods stimulating students' interest for teaching
2. Exposition methods – methods for explanation of the subject matter
3. Fixation methods – methods of repetition and fixation of the subject matter
4. Diagnostic methods – methods of control, evaluation, and classification

These methods should be contained in almost every educated lesson somehow and are very useful in the entire process of education. In this order they can be applied on each lesson in order to fulfil all necessary basic steps for the successful education. We will use these methods as factors present in the education and symbolically dividing the lesson and education process into few parts / phases.

3.4.1 Motivation Methods

Motivation methods are used in two situations. The first is and always should be at the beginning of the lesson [9]. Students should have been given information about usefulness of the upcoming subject matter, for example in the form of practice application, or should be shown that after finishing this lesson/theme they will be able to do something concrete and useful. A. A. Lazarus said [3]: "*Waiting for the motivation before the action is useless. Start the work immediately and then the motivation will come itself.*" But this approach is applicable only with insignificant number of students, because also many adults have problems doing so. Therefore it is necessary to motivate the students before the action. Behind this opinion stay many authors in publication like [26], [31] and [14].

The second situation very suitable for motivation is the part of education process, where students are not very interested in the theme. Particularly in case of theoretical theme/lesson it is necessary to repeat the motivation or motivate continuously. Because of

the theory the students will not see any results and possibly also will not find the subject matter very useful. This is the reason why the theoretical content should be applied on practice as soon as possible, or at least shown the importance for further practice in form of concrete examples. This opinion is also stated in [25].Very good motivation not only for students is naturally also a compliment for well done work or good idea and figuratively also the good mark and last but not least the possibility to choose own theme of work [12].

There are two types of motivation:

- **Internal** – also called *Primary motivation* means that the student is motivated himself, because he alone has stated him/her a goal and wants to reach it. "*I will show myself I am up to make that!*"
- **External** – also called *Secondary motivation* means student is motivated by teacher, parent or other external factor. The motivation also often comes in form of good mark or compliment. "*I will do that if it brings me something.*"

Briefly said, the motivation can be done in many ways and often it does no matter what route to motivate students the teacher uses, but the motivation should be ever present in the process of education and should take place often – not only after all other methods fail. The best approach is to use different kinds of motivation (internal, external) together.

3.4.2 Exposition Methods

Exposition part of the lesson follows directly after the motivation phase. Students should be after the motivation interested into the upcoming theme and therefore the exposition – teaching – should be easier.

Exposition can be driven in few ways. Classical exposition takes place in form of lecture, where the teacher gives students' new information, describes some phenomenon or makes an instruction. This approach is called as *Methods of direct transmission* [9].

This classical approach can be upgraded with demonstrations, practical actions, games or observation of concrete process. In this case the approach is called as *Methods of mediated transmission of knowledge by illustration* [9]. In ICT this form takes place, when the teacher demonstrates something new using for example using the data projector – advantage of this method is in fact that students perceive the information by eye, ear and

tactile, because they usually have possibility to try the action simultaneously on the computer themselves.

Another possible alternative of exposition methods is education using a project, problem-solving task, or forum. The forum can be Socratic or heuristic. The Socratic forum leads to repetition of already absorbed information using the dialogue or discussion, at the other hand the heuristic forum has a search character – attendees are looking for substantiation of their considerations in the world [18]. This approach is called as *Methods of heuristic character*, or also *Problem-solving methods* [9].

The forum can be also used as a fixation method, when repeating the subject matter and the same purpose can fulfil the problem-solving task. Naturally these methods can be used as fixation only after previous exposition.

3.4.3 Fixation Methods

Fixation part should follow the exposition. In practice the fixation can take a place at the end of the lesson, or also can make entire education unit. The fixation is usually in form of repetition of the subject matter, individual work, or practical exercise. Often used term for fixation methods is *Skill and knowledge methods* [9].

The fixation in the subject ICT can be made in case of theoretical theme similarly as in any other subject – in form of dialogue, forum, repetition etc. When fixating the practical subject matter, the repetition is usually made one lesson before an exam and takes place in form of individual work, where students have possibility to try everything of the educated matter themselves and possibly ask the teacher if they encounter any problem.

3.4.4 Diagnostic Methods

Diagnostic methods serve for evaluation, control and classification of the student's level of skills and knowledge. Classical methods for this purpose are verbal or written exams and didactical tests [16].

In ICT there are used mainly written exams and didactical test, but also alternative methods in form of practical exercise. The verbal methods depend on the character of the theme and therefore are in many cases not very suitable. Verbal methods can be used with theoretical themes, but hardly for evaluation of the abilities or practical exercise, where the main goal

is to build up something, when the testifying character has the final creation itself and not only its description.

3.5 Education Unit – the Lesson

The lesson is the basic segment of the education process. In our country one unit lasts for 45 minutes. Each unit corresponds to concrete subject and takes a place regularly in accordance to time table. Dependently on the subject the unit can take place once a week or in most cases several times a week. Time donation of each subject may differ accordingly to the class and school.

In times before reformation of the school system the education unit did not have very clear structure. The structure mostly depended on the teacher and the entire process has been viewed from the post of the teacher. So the goals were written from the side of the teacher in meaning what should teacher do. This is one of the main differences comparing to nowadays system working with FEP (Framework Education Programme). Now the goals are set in way what will student know, what he/she will be able to make, build or demonstrate. But this has been already described in chapter of this work dedicated to FEPs and can be also found in [1], [23] or [17] and other sources.

3.5.1 Lesson Phases

According to [9], the lesson has five basic phases, which should be contained in each lesson. But there is no summarization of the lesson. Another structure is in [16] where the lesson has six phases, including summarization. Depending on these two approaches the author of this work has proposed following lesson phases:

1. **Lesson opening and setting goals** – it the beginning teacher checks the attendance and quickly solves organizational problems. Then the teacher should set the goals of the lesson. After this the students will know, what they can expect and what theme will be on list. Goals should be set in way to motivate students.
2. **Repetition of previous subject matter** – this part serves for repetition of previous themes or parts of themes in order to make a base for further development and make a connection of old knowledge to upcoming new information. In case of subject ICT the repetition is mostly done verbally or using very fast demonstration

of previous creations. Repetition can also serve for evaluation (diagnostic methods), motivation and exposition – this is clear example that the teaching methods are multi-purpose and it is hardly possible to break them into independent parts.

3. **Explanation of new subject matter** – to this part clearly correspond the exposition methods. Students are taught the very new information, or information from previous lesson is upgraded and enhanced. Students are led to generalizations of terms and acceptation of rules and laws, which correspond with the concrete subject matter. Students may be motivated using examples from practice.

   In subject ICT the explanation can be made verbally or using the presentation, when going over theoretical subject matter or in case of practical aim of the subject matter, there is possible that students use their PC and try it in practice.

4. **Repetition and practice of new subject matter** – after the exposition the new subject matter should be fixed and tried practically. If the lesson is theoretical, the teacher should together with students repeat the key information of new subject matter – mostly verbally. In this case the time dedicated for the repetition does not have to be very long. But it depends on the theme and teacher.

5. **Conclusion and summary** – every lesson should contain a part, where students see what they have done. Teacher should repeat stated goals from the very beginning of the lesson/theme and point at the fulfilled ones. He should also mention the goals of upcoming lesson.

6. **Assignment of homework** – this part is not present in every lesson, but it is possible to implement it. Students should have been given a task to find some information – actualities, or solution of a concrete problem, which will be on scene of upcoming lesson. The homework can be also clearly practical, but in this case the teacher should consider if the students have the necessary equipment at home and will be therefore able to fulfil the assignment – especially in ICT. The assignment should be made soon enough before the end of the lesson, because after the bell-ring the students mostly lose their attention. And it is also unsuitable to pass the lesson to the short break.

Each part of the lesson should have its time donation. But the time donation will vary dependently on the teacher, theme, class, lesson conditions and possible problems during the process of education. Although, there should always be made an outline.

Especially for ICT there is proposed time donation in [7] by R. Fojtík and the part *Přednáška VI* in [5] by J. Pelikán. Shown time donations vary but both authors make a segmentation of the lesson into four parts. It is because no of these authors does take into count the phase of homework assignment and have joined few phases together.

3.5.2 Types of Lessons

Lessons are sorted into sever types. The types at the first look correspond with the phase of the lesson – are similar. The phases of lessons shown above are only theoretical and are not in use in every unit. For example if the students work on some project or individual work, which has been planed for several education units, there will be no new information present in the lesson, so the phase of explanation of new subject matter will be missing. The same is valid in case of lesson dedicated to evaluation or other special events. And here we get to the point of this subchapter – types of the lesson.

According to [29], there are following types of lesson used in the process of education, dedicated to:

1. Learning new knowledge
2. Forming and fixation of abilities
3. Fixation of knowledge
4. Testing and evaluation
5. Using the abilities and knowledge in practice

The sequence of respective lessons can be put into rolling “jumping jack” scheme, which is shown in the (Fig. 8). If we imagine the lessons as parts of the body, we will clearly see that in a long term there can not be missed any of them.

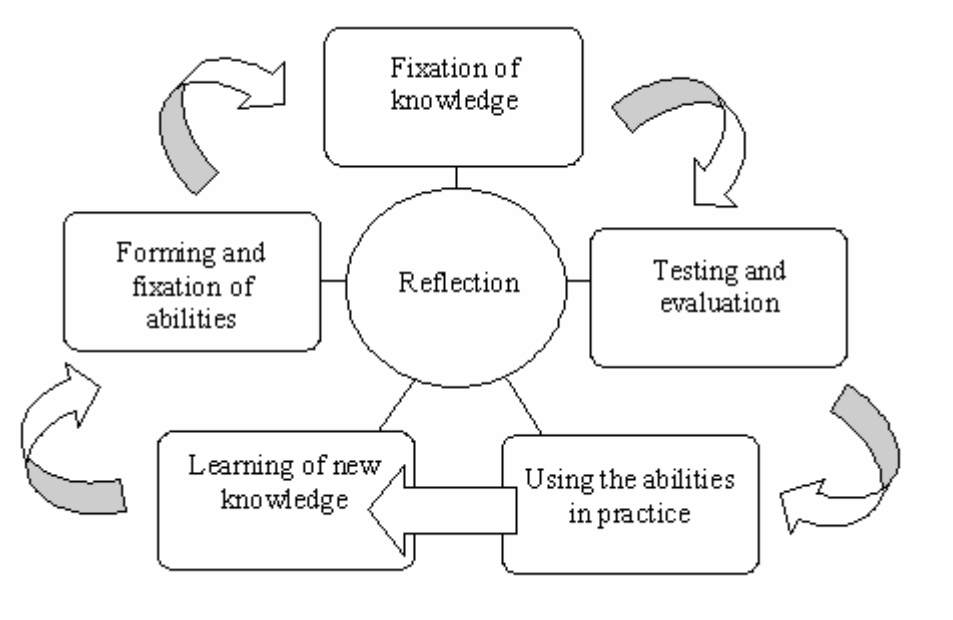

Fig. 8. Scheme of the sequence of lesson types

Learning of new knowledge is put at the basics, because without knowledge we can not get anywhere. We always need some knowledge to perform any action. Based on knowledge, we can gain abilities to do develop or do something – we know how, so if we have the preconditions, we can. However, everything may be forgotten and therefore we need to fix the knowledge or possibly the ability – this is done in lessons dedicated to revision. Figuratively it can be imagined that if we do not revise, we lose the head (information, knowledge). After we have finished the fixation, we have to check if we really remember, what we have learned – so we are testing and evaluating the results. If we have the required knowledge, we can use it in practice. In practice we gain more experience and meet more problems, which we need to solve – and therefore learn new information, which basics are in the previously learned and practiced ones. We are building new, higher level. And students do the same.

3.5.3 Inductive and Deductive Approach

The teacher has always few possibilities, how leads the current lesson. Dependently on the theme character and teacher-preferred methods, the new subject matter can be transferred to students in two ways – inductive and deductive. If we take a look, the same types are present in Logical aspect methods by J. Maňák, at the beginning of this chapter.

- **Inductive approach** – is not widely used in the education process, because it is very dependent on the educated theme. In this approach the lesson starts with some activities, which lead to uncover of some facts and generalizations. Students simply gain a problem to solve and during this process they encounter some situations, which make them learn new facts and make generalizations. New information is subsequently applied in practice and according to gained results there can be made a conclusion about successfulness of the lesson.
- **Deductive approach** – is called also as a *direct form of education* and it is the most often used in the process of education, because the transfer of information is very fast. Question is whether the process is effective also from the wider view and the information is durable enough. At the beginning of the lesson the teacher states some new terms or generalization and then, often together with students' co-operation, explains and demonstrates the subject matter connected with these terms. At the end of the lesson there is naturally time for application of new knowledge and to check the successfulness of the education.

3.5.4 Reflection and Self-reflection

In the centre of the body-scheme shown in (Fig. 8), there is a reflection. The reflection says us, what should we change and what should we more concentrate on. The reflection gives us answers on questions like: "*What could we do better for…? What is the most important information…? What should we change and how?*"

Answers to these questions lead us to enhanced process of education. Dependently on gained information, we can do changes not only in the education process. Now we should then clarify the difference between *reflection* and *self-reflection*.

If we do a *reflection*, we try to find out information connected to concrete process, theme, activity etc., no matter who is in the centre of attention. Usually the reflection is used by teachers to examine, what methods students prefer, what themes are they interested in, when they learn easier and so on. This is made by question-form, action research or other methods [17], [9]. Example of question form will be shown in practical part of this work. Briefly said, the reflection tells, what and how is something made now and mostly we can also get information what and how could be done better.

The self-reflection is almost the same as reflection, but it is made by teacher or student in order to find out the answer on questions like: "*What are I doing well / wrong? Could I do it better? How could I do it better?*"

So the self-reflection is made by person in order to learn the current situation and find out how to make things better than they are. Reflection and self-reflection are very important parts of the education process and should be present in every type of lesson, because there is always something to develop, but not always clear what is it.

But the reflection and self-reflection can be imagined more simply. Teacher gets the reflection also if he gives an exam to students and evaluates it. The results of evaluation give teacher the reflection, how the students understand the problem and what steps should he perform to make the education better. This process is shown in the (Fig. 9), re-built according to [17].

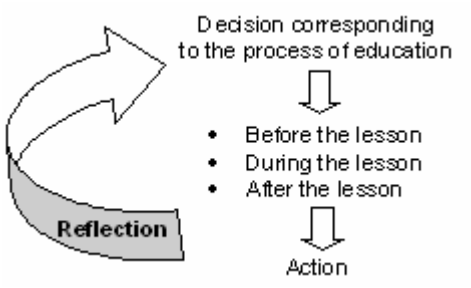

Fig. 9. Cycle of reflection and action – based on [17]

3.6 Didactical tools and equipment

For the successful process of education there are not only necessary good, well-prepared and qualified teachers and motivated, smart students with interest in new themes, but also the tools, which simplifies the process of education.

Didactical tools can be for purpose for this work sorted into two categories – the standard (universal) tools and tool suitable especially for education of the subject ICT.

3.6.1 Standard Didactical Tools and Equipment

Standard tools, or also universal tools, are these, which can be used in the process of education without regard to the concrete subject. These tools have been usually used in past

for education of ICT or similar subjects, when the technologies were not on so high level. Some of the tools are following:

- **Ceramic blackboard** – blackboard is one of the oldest didactical tools. It is used mostly in every subject, from language education, mathematics and technical subjects, to practice and partially also the ICT. In the ICT the blackboard is used rarely, but it is also necessary to demonstrate for example the number systems and conversion between them.
- **Exercise book** – exercise book is often the main source of knowledge in respective subject. Very often there is used only one type of book/workbook in the education of concrete subject, but it is not a rule. Good teacher does not teach only using one source, but gives students complex knowledge base from many sides. In ICT there are also many books to use, but usually the teacher leads the education process according to his knowledge and students do not need to buy expensive books. Nowadays there is also a trend of using the e-books, which are free and widely accessible. The classical books are partially replaced by Internet with unimaginable knowledge base.
- **Model** – models are used mostly in physics, chemistry, biology and other natural sciences. It serves for illustration instead of real objects. Model can be also used in ICT. In this case they are mostly in form of hardware if the hardware is not used itself as a model. On the higher level, corresponding with automation, the model can be used to simulate some of real machines or objects, e.g. the lift, washing machine, traffic lights on crossroads, heating of the house and many others.
- **Overhead projector** – overhead projection is commonly used as a substitution of the data projector. The data projector is dependent on the PC, what makes it in some cases impossible to use. Work with overhead projector is very simple and effective. The teacher has a possibility to prepare watermark materials ahead or can build them directly in the lesson, when explaining new theme to students. Few years ago, when there were no data projectors, or only a few – what has been caused by very high price – the overhead projector was in use in ICT too. Nowadays this equipment is replaced by more modern and interactive data projectors.

3.6.2 Didactical Tools and Equipment Suitable Especially for ICT

In this category are contained the equipment and tools, which are not commonly used in other subject than ICT and similar. The standard tools listed above can also be used in process of education of the subject ICT and few possibilities have been already mentioned by respective tool. For the education of ICT are characteristic the following tools:

- **PC** – personal computer is the necessary tool for effective education of subject ICT, without which the education can not be done. The ideal solution is that the school has few computer laboratories (what almost all nowadays schools fulfil), equipped with modern, multimedia computers with high performance, suitable for the education. And the performance is one of the most limiting factors in education, because the progress goes ahead with mile steps and schools do not have enough resources to upgrade the laboratories according to the new trends. Using a PC accelerates the education and makes it more effective. But it is also necessary that one computer is dedicated to one student. In other case the efficiency decreases.

- **Software** – software is an integral part of the computer. Computer without software applications is same as the body without soul – not useful if we miss the possibility of hardware demonstration. Selection of the software is very difficult task. Students should work with applications, which are used in practice, but in many cases the school does not have enough money to buy such applications. And if the school is able to buy the software, it is also on consideration if the students will be able to gain the software for themselves in legal way. No student will be able to buy expensive graphical editors, whose price is around few thousand crowns – in some cases up to seventy thousands.

  The necessary software is surely the office pack – in form of MS Office or OpenOffice. Usually there is used the first one, because in practice it is used more often. Students have also possibility to buy this software for lower price. There should also be software for work with graphic, web-building applications and some specialized software, which depends on the type of school and the field of study. When selecting the software, the school should consider its usefulness in practice and possibilities for students.

- **Data projector** – data projector is usually used in combination with PC and significantly enhances the process of education with increased efficiency. All students have possibility to try the demonstrated subject matter on their computer while the teacher explains the steps using his PC and the data projector. In the past this device was very expensive and has been present almost exclusively at the academic ground. Since the price goes down, the data projector makes a part of equipment of most of the secondary schools. The greatest expense after the acquisition is the lamp, which needs to be replaced time after time. Using the data projector requires moderately higher technical skills of the teacher.

4 THE SUBJECT MATTER

In the process of education the subject matter is contained on several levels. If we consider the subject matter as syllabus (or curriculum, for the purpose of this work), then the subject matter made of knowledge, skills, abilities and attitudes students will gain during the given term – more complex description has been given in the part of this work dedicated to FEP. On this level the goals are rather general [9], [17].

The curriculum is built for the entire education – according to FEP, and in order to the school education programme (SEP), it is divided into few parts – usually one per year. On this level the goals are more concrete.

From the general goals there are made on the lower level of education process the thematic units, which contain the concrete partial goals.

4.1 Goals of the Education

For better transparency the goals will be listed in structured form.

The goals are:

- **Partial goals** – these goals are connected with the concrete lesson and define, what knowledge, skills and abilities students will gain after they finish the respective lesson. These goals are the most detailed and concrete.
- **Thematic unit** – represents the group of partial goals, which must be fulfilled in order to reach the higher goal. The partial information will be joined together to build a complex of knowledge connected to concrete theme or subject matter. For example, if the thematic unit is called *Working with graphic editor*, then it will possibly be made of partial goals as: *Drawing the basic objects. Working with colours. Modifying a photography* etc.
- **The curriculum** – curriculum is a complex of thematic units. As has been mentioned, it is prepared for the entire length of education and portioned usually into classes. The curriculum defines the complex knowledge, abilities and skills the student will gain after finishing the entire subject. Above these goals stand only the goals of the school which must be at least partially fulfilled by goals of respective subjects.

Very nice and clear illustration of respective goals gives [31], where can be also found the following scheme:

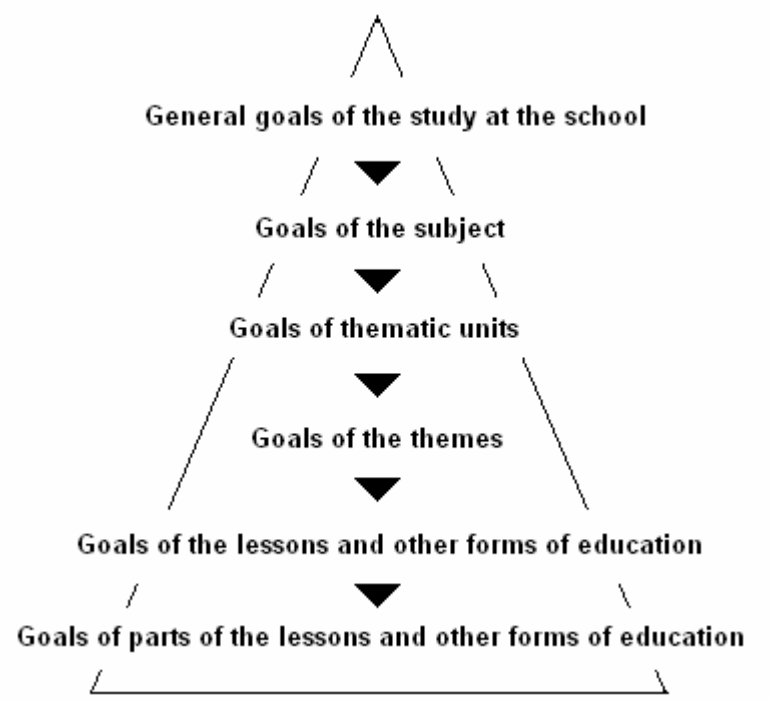

Fig. 10. Pyramid of goals – based on [31]

4.1.1 Principles of Goals Building

When building the goals, it is necessary to consider their usability for the entire process of education at the one hand and for the upcoming students' practice at the other hand. According to [17] the concrete goals of curriculum should be made with consideration to few aspects, which are demonstrated in the (Fig. 11), upgraded from the scheme from same source.

The goals must naturally fulfil some requirements and must be built according to several principles. In [9], there are the requirements the goals must fulfil following:

- **Complexity** – the subject matter should contain all the cognitive, affective and psychomotor areas.
- **Consistency** – means that the goals have to be built adequately to gained knowledge. Lower goals must precede the higher goals and more difficult subject matter should be educated after easier one.

- **Controllability** – in order to gain a backward connection, the goals must be proposed in form that allows checking their state of fulfilment during and after the education.
- **Appropriateness** – the goals should be neither very easy nor very difficult – as stated in [26] and [31] – but must be accessible to the student [25]. The recommended level of difficulty is at the bounds or moderately beyond bounds of possibilities. But it is necessary to have in mind that each student is individuality and therefore can have the bounds elsewhere than other students. On this fact point authors of [4], [9] and also [5] and many other sources.

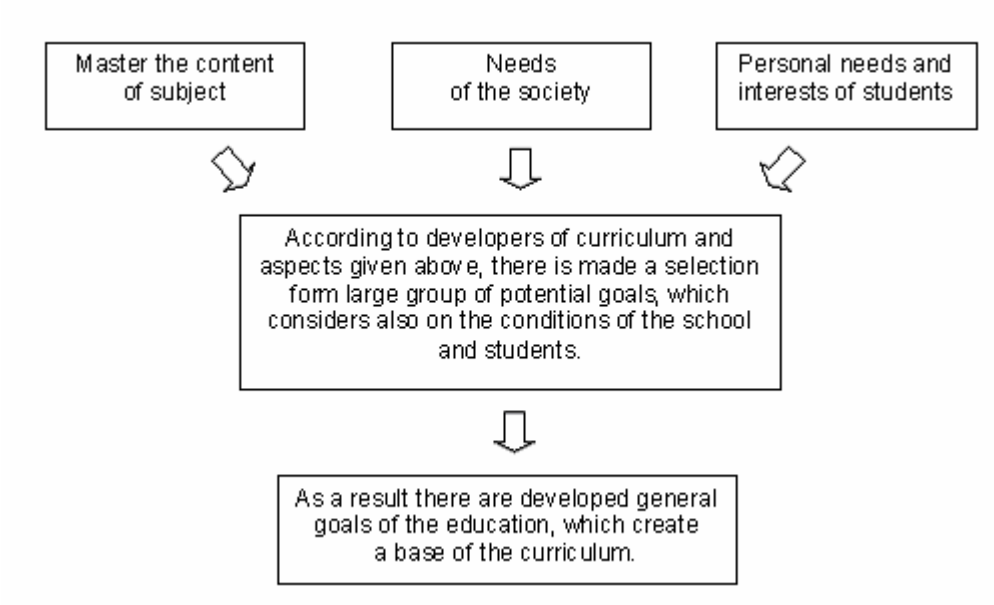

Fig. 11. Principle of building the curriculum – based on [17]

4.1.2 Taxonomy of Goals According to B. Bloom

Taxonomy is a useful thing, which has been developed to help teachers with setting the goals of education, preparation of exercises, activities and methods of evaluation during the process of education [9]. Benjamin Bloom has built a taxonomy, which allows the teachers to set the goals clearly and complexly, together with precise definition of student activities, which lead to the set goals, because the goals are described always by several active verbs.

Following list of goal levels has been due to its complexity and precision taken as a whole from [9] by S. Kašpárková:

1. **Knowledge –** Student remembers the terms, methods, rules and laws etc. and is able to reproduce them. **Verbs:** *define, fill in, write down, name, describe, assign, reproduce, marshal (arrange), explain, select, term*
2. **Comprehension –** Student understands the meaning of educated content and is able to use it and in his word reproduce the subject matter. **Verbs:** *ask, interpret, clarify, count and measure, translate, transfer, say in own words*
3. **Application –** The education is transferred into situations which are for the student new or unknown. The student is able to use the older knowledge to solve a problem or to understand new information. **Verbs:** *apply, demonstrate, discuss, propose or suggest, solve, prove, arrange or sort*
4. **Analysis –** The student is able to disassemble the information into parts and differ between facts and hypothesis. **Verbs:** *analyze, find principles of order, parse, specify, and make a decision*
5. **Synthesis –** Student is able to assemble the partial information to the whole and make a structure of new matter. **Verbs:** *categorize, classify, combine, modify, summarize and draw a general conclusion*
6. **Evaluative judgment –** Student is able to make a consideration of ideas, documents, methods and solutions, to select the preferred or most suitable possibility and to justify the selection. **Verbs:** *argue, justify, value, oppose, judge, check, give reasons, evaluate and sum up*

4.2 Students' Conception of the Subject Matter

The curriculum, subject matter and themes are all affecting the students' learning. New information usually evokes changes in one of the following areas:

- **Cognitive** – affects students' understanding content of individual ideas, principles and connection between them.
- **Affective** – affects students' attitudes, values, emotions and other aspects connected with the school life

- **Psychomotor** – affects students' efforts to act a concrete way during work with new information and subject matter. Student asks himself, what the new information is good for and what he can do with it. [9]

The same categorization can be found also in [17]. The learning (and also teaching) depends particularly on the preconditions of the student. With preconditions we here mean the information base, knowledge, abilities and skills the student' already has. The second aspect is then the new subject matter. Dependently on previous knowledge, there are few processes that should happen, when the student encounters new information. This is closely connected with the process of memorizing, which has been in the centre of attention of the way called *Constructivism*.

4.3 Process of Memorization

The learning process is closely connected with common principles of the memory. The memory is one of key factors, which affect the learning of new information and gaining new abilities and skills. If we want students to learn something, we must cause that students save the information in their memory. This is very complex process at which beginning must be gained an attention. The attention can be gained by motivation and the motivation can be gained using concrete examples of usefulness of upcoming information for the practice and life. In the process of memorization we distinguished three levels – three types of memory, which depend one on each others.

4.3.1 Types of Memory

Human beings have three types of memory. They are differed particularly by the duration of information present in them and all of them can be at least partially controlled. In the following structure we will see short definition and description of respective types of memory and principles of their work. The three basic types of memory are [17]:

1. **Sensory memory** – accepts the signals from surroundings via smell, sight, hearing and tactile sensors (therefore sensory memory). Duration of information present in this memory is only around 0.7 second and if it does not gain our attention, it is forgotten. If the information is important, what means that it has gained our attention somehow, it is transferred into short-term memory and can be processed

further. Because of that it very important to gain students' attention (motivate them) before we want to teach them anything. In the sensory memory there is one rule that stronger percept beats the weaker. So if we for example attend a seminar and under the window there is man working with pneumatic drill, our attention will be possibly gained by the drill.

2. **Short-term memory** – information, which gains our attention, is transferred into short-term memory. The durability in this case is around 15-30 seconds. However, this memory has limited capacity of average 7 items. After the time period or exceed of the limit, some of the information items are forgotten. If we want to remember something (save into long-term memory), we need to make a repetition. It is also very useful to create the logical complex of knowledge instead of great amount of terms, which we want to teach the students. When building the curriculum, it is very necessary to have this on mind.

3. **Long-term memory** – if we consider that some information item in the short-term memory is important and can be of use, we logically want it to be memorized – transferred into more durable memory. This is made by fixation and revision, but can be made spontaneously if the information is extraordinary. At the other hand, if we do not use the information for a long time, it has lower priority and can be forgotten. The long-term memory is built of complex of information reciprocally connected into network, where it creates logical schemes and structures. If we encounter new information or problem, it is compared with already present "knowledge base" (information is transferred from immerse long-term memory into limited short-term memory or sensory memory) and according to its character it is handled in two possible ways [17], [14]:

    a. **Assimilation** – this means that the new information is adapted to information already present in the memory. If the new information does not correspond entirely, it is connected with most similar scheme. This may result in fake information – the information may refer to anything else.

    b. **Accommodation** – if the information does not match with present schemes or is in contradiction with current knowledge, in case it has been logically clarified, the scheme is due to misconception of old knowledge

re-constructed in order to fit the new, true information. With this process has dealt J. Piaget, the leader of constructivist approach [17], [9], [14].

So it is evident that the process of memorization can be lead in two ways. New information can be adopted into existing scheme or the existing scheme can be re-constructed according the new information. The following (Fig. 12) shows the scheme of memorization based on [17].

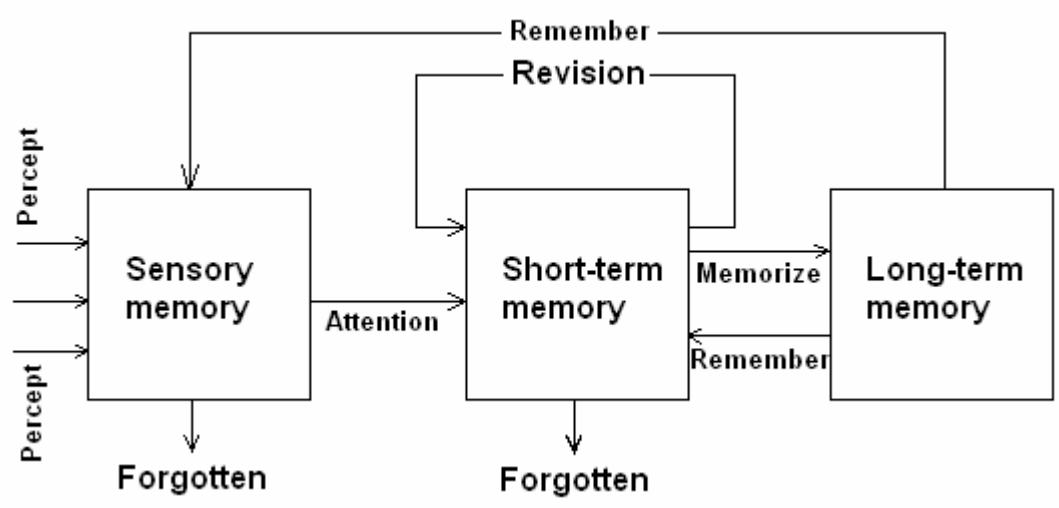

Fig. 12. Process of memorization – based on [17]

4.3.2 Types of Information – Terms, Generalizations, Facts

The information can be sorted into three types. Depending on its complexity and character we differentiate between terms, generalizations and facts. We will now shortly specify each type according to [17]:

1. **Terms** – are kind of categories or classes of subjects or ideas, which have collective the most important attributes. Terms are mostly defined by one or few words – so they have concrete definitions. According to term character we differentiate between concrete and abstract terms:
    a. **Concrete terms** – such term exists in corporeal world and it is possible to describe it by naming its observable attributes. If we encounter some object, we can consider if it depends to some term or not. Concrete term should be in ICT for example hardware. It is mostly defined as part of the computer,

which can be touched – this is a term definition and almost everything fulfilling this precondition can be considered as related to this term. Concrete examples can be keyboard, monitor or graphic adapter.

b. **Abstract terms** – these terms can not be observed, because they do not physically exist in corporeal world, or their physical attributes are not important for their definition. In ICT the abstract term can be for example software, which is characterised as the program equipment of the computer. We know the definition, but we can not touch it.

Specifying the terms creates a base for good curriculum – syllabus. For this purpose there is often used a term-map [17].

2. **Generalizations** – generalization is a statement, which makes a connection between two or more terms, because it represents their relations. Therefore the generalization is usually expressed by one or more sentences. Typical for generalizations is fact that they can not be verified by one observation. Generalizations are would-be universal, but in fact they create many inaccuracies, because they try to universally describe a great number of subjects, which sometimes do not closely correspond one to each other. And this makes multivalent definitions.

3. **Facts** – if do not consider the fake facts, then the facts give the most precise and true description of some objects or events. Characteristic for facts is that they can be checked by observation, experiment or information from credible sources. It is necessary to state facts that are possible to verify, because in other case the fact changes to dogma – pseudo-truth based on unfounded opinions [11].

More detailed comparison of generalizations and facts can be found for example in [17]. With problem of categorization of facts, generalizations and terms, and their implementation into the education process, has dealt J. Bruner, who has developed a sequence, where the teaching begins on generalizations, there from the generalization are extracted concrete terms, which are described and defined and at the end there are facts based on previous knowledge gained from terms and generalizations. He has built a tree-scheme, where generalizations create the trunk, terms are represented by branches and in

the treetop there are facts. More detailed information can be found in [17], originally posted in [2].

This organization of subject matter is necessary to reach the goal, so that the education content was not made only of great amount of separated information, but the structure was made of logical sequence of terms, generalizations and facts. [17]

4.4 Examination

The examination is the last but one part which this work will be engaged to and it also the last but one part of the basic concept of education process. After this part there are only assessment and possibly the reflection. The examination is highly necessary in the education, because it serves for verifying the knowledge and entire successfulness of the process of education – fulfilment of the goals – and as result there is gained a classification and drawn concrete conclusions, which could be good base for further development.

The examination can be lead in two ways as an examination of theoretical knowledge or examination of practical abilities.

4.4.1 Examination of Theoretical Knowledge

This kind of examination is used particularly in humanistic subjects. Especially in case of humanistic subject there is no significant difference between examination of theoretical and knowledge and practical abilities.

The theoretical examination is usually done via oral examination, written exams or tests. Each of these types has its pros and cons.

- **Oral examination** – during the oral examination there is better connection between student and teacher. If there is any opacity in the information, teacher can ask the student to clarify it and also the student can ask teacher what does he exactly mean with the question. Another advantage is that the oral examination serves also for the entire class as a revision. At the other hand, the ratio of examined students and time necessary for the examination is very incommensurate.
- **Written examination** – the written examination is almost the opposite of oral examination. The pros of oral examination – connection between teacher and student and a possibility to clarify the assignment or reply – are in this case not

present. The student must formulate his answers more precisely and univocally and also filter the important and less important information. He also has no ability to co-operate with the teacher or other students. Written examination can be in form of teacher-made test, exam or standardized didactical test [26], [17]. Advantage of this examination is that the teacher is able to examine the entire class during the same time as he would dedicate for oral examination of one student. If the teacher uses the teacher-made test, he should take care that the test is:

- **Reliable** – the results should not significantly differ if the test is applied repeatedly under the same conditions
- **Valid** – measures exactly what is the intention.
- **Sensible** – the test should be complex enough to ensure that also little differences in the amount and quality of knowledge are uncovered.
- **Adequate** – means that the teas should examine only information which has been educated.
- **Useful** – should be based on practical and important factors, which are useful for practice or comprehension of further subject matter. [26], [7]

4.4.2 Examination of Practical Abilities

Examination of practical abilities often follows the examination of theoretical knowledge or serves for examination of theoretical knowledge itself, if the practical action requires previous theoretic base. Practical examination is mostly applied in technical subjects and very important role plays also in subject ICT, where it follows practically aimed thematic whole, e.g. the computer graphic, where students must have some base of theoretical information (which will be probably examined using a test), but should be also able to fulfil concrete assignment – so apply the theory in practice.

As in case of examination of theoretical knowledge also here it is highly necessary that the assignment contains only the educated matter or maximally very similar problems. According to FEP, the examined (and naturally educated) content should suit the purpose of usefulness in further practice [23]. If students see that the subject matter is useful, they will be motivated for following work.

4.5 Assessment and Classification

Assessment and classification is very important part of the process of education, because it gives the student, the teacher and also parents the backward information about successfulness of the education [26]. Without the backward connection, the process would be not useful, because it would have no testifying character. The assessment is a result of examination.

Assessment according to its character can play a role of positive motivation, but can also motivate the students negatively if it is used inadequately. For example the assessment in a form of mark without any verbal comment or faults analysis will not do much useful.

The classification can be categorized according to several aspects like in [26], [31], [17]:

1. **From the viewpoint of functionality**
    a. **Informative** – gives the students, teachers and possibly parents information about status of the reached goals, and serves to check the results of education and if the stated goals have been fulfilled and how.
    b. **Formative** – has an informational character at the one hand and at the other hand also carries the motivation aspect stimulation the development of student's personality.
2. **From the viewpoint of continuality**
    a. **Continuous** – also mentioned as formative [31]. Serves to continuously inform students about their actual results and can help them to uncover their weak and strong points and show which areas they should more concentrate on. For example an assessment of individual work at the end of respective theme or from small tests fulfils this purpose.
    b. **Summarizing** – serves for complex evaluation of students' work. It is also called as concluding assessment. It can be imagined as a summarization of respective continuously gained marks and comments during the term.
3. **From the viewpoint of method**
    a. **Written** – written assessment is most often used for official purposes. At most it is in a form of a mark, not so often in a form of continuous text. It

serves as same for continuous as summarizing purposes. Written assessment is also a school report.

b. **Oral** – makes a connection between teacher and student in the lesson and serves for evaluation of actual state of work or results of education. It is recommended that the oral assessment makes a supplement to written assessment, because the mark has no concrete testifying character and therefore should be supplied by comment. Oral assessment is more personal and therefore can influence the student better.

4. **From the viewpoint of generalization**

   a. **Motivational** – as has been mentioned, the assessment and classification can be a useful tool to motivate students. If the students see that they are successful and the work bring concrete results, they will be motivated. So well selected and used method assessment can be significantly enhance the education.

   b. **Orientation** – assessment and classification serve the teacher as a point for orientation in students' progress and also serve the student to have orientation about their results and gained level of knowledge.

   c. **Official** – the official purpose has also been mentioned. The classification is used for uniform description of student's progress. The official assessment is for example the school report.

4.5.1 Notes to the Oral and Written Assessment

In case of the oral assessment the assessment language must not harm the student. So it is better to say: "*You have done this well, but this part should be done better and therefore needs further development. Try to concentrate more on this…*" Instead of: "*How could you done such stupidity? What are you doing here? Don't you think you would better stay at home watching TV?*"

The advantage of written form of assessment is that it is univocal and durable. Teacher or student can get back to individual assessments, which in case of oral assessment is not possible. If it is in from of the sequence of marks, it draws concrete and transparent

statistical conclusions about development of the education process. But a question is, if the statistics is as much of use in the process of education and in relation to students? No.

The best approach is to combine both verbal and written assessment. The verbal should be used in each lesson to give an instant feedback for student. It should be also present as a complement of the written assessment, which is better for classification of exams and tests, because it uncovers and clarifies the faults and also strong and week points of students.

4.5.2 Pygmalion and Golem Effect

No matter what kind of assessment the teacher uses, he must be objective and unbiased. But this does not mean that he can not have any expectations. The teacher naturally often expects the result of respective assessment – result of student's testing – based on the opinions of his college, parents or echoes from students, and therefore the teacher must care that the expectation does not influence the real classification.

Teacher should haves better meaning about the student than worst. Student may be stressed or have any problems and if teacher shows his negative meaning, the student will hardly do anything well. At the other hand the teacher should not favour the student anywise his previous results were good. Expectations and assessment should be proportionate.

In extreme there are two types of teachers and approaches according to expectation:

- **Golem effect** – is characterized by negative expectations and negative prediction, which can have negative consequences on student's experience and behaviour. It is the opposite of Pygmalion effect. [8] In the other words, no matter how the student tries, the assessment will be probably negative, because it is based on negative expectations.
- **Pygmalion effect** – is characterized by strictly positive expectations, which may be based on opinions of other people. This extreme can be expressed by partiality. "*No matter that the student proves no knowledge today. Colleges say he is very clever, so it is probably an accidental failure. It was almost at 4th grade…well you got 2nd grade this time.*"

Both of the described extremes can lower the student's motivation. More of possible defects are described in [22].

5 SUMMARY OF THEORETICAL PART

The purpose of theoretical part of this work was to build a base of information necessary for the practical part. It contains all necessary information to understand the education system and particularly the changes which have been made by launch of new framework education programme (FEP).

The theoretical part firstly gives reader all necessary information about respective levels of the education system with accent on made changes. This information is ordered in descending order from the highest level in form of national education programme (NEP), over respective framework education programmes (FEP) and school education programme (SEP) to thematic units and concrete lessons – so it covers the entire area of the education process. Thanks to this the reader can simply recognize respective levels of education.

Next the author of this work has also dealt with individual lessons. The content is ordered logically into part dedicated to process of education (organisation forms, methods, lesson character and phases, and necessary equipment) – everything in relation to subject ICT.

The last chapter of the theoretical part deals with the subject matter. It considers the goals and motivation aspect, states several possible forms of examination and following classification with a point at the most often made mistakes and faults such as teachers' fake preconditions etc. There is also described the process of memorization, which is necessary to understand in order to develop the appropriate content and use suitable form of education.

Thanks to the complexity of given information the theoretical part of this work serves not only as a base for upcoming practical part, but can be also used as concrete source of information for teachers, who want to find out only the necessary information connected with changes made by launch of the new FEP, or who want to find some ways how to possibly develop, boost and enhance their teaching methods.

II. PRACTICAL PART

6 INTRODUCTION OF SPŠS VSETÍN

SPŠS Vsetín has been the school which served the author for consultations of practical outputs of this work and for are outputs of this work primarily dedicated. Therefore the reader should know at least very basic information about this organization.

6.1 Contact

For interested persons here is the necessary contact information.

Address:	SPŠS Vsetín
	Pod Strání 1776
	755 15 Vsetín
Phone number:	(+420) 571 428 910
E-mail	spss@spssvs.inext.cz
Web:	www.spssvsetin.cz
Headmaster:	Ing. Mgr. Jarmila Gabrielová

Fig. 13. SPŠS Vsetín [28]

6.2 General Information

The school is situated in Vsetín and it is one of the most important schools in this region. It exists and operates for long seventy-five years. Currently – May 2008 – there are 446 students and 36 teachers at the school. Originally the school has been primarily specialized

in industry, but today it offers more high-quality programmes. Applicants can choose from following fields of study on the level of high-school in full-time study programme, but it also offers enhanced services in form of combined education.

SPŠS Vsetín closely cooperates with FT UTB Zlín, which has its department in the top floor of the school building. Thanks to this the graduates have possibility to stay in profession and attend the university in the same building as the high school.

6.2.1 Education Possibilities

The school offers four possibilities of education:

1. **Secondary education** – this is classic four-year study program in three fields of study with graduation. It is dedicated for students with finished basic school and it runs only in full-time study form.
2. **Shortened secondary education** – dedicated for students with another finished high school or for people who want to change or develop their profession. It is finished by graduation only from technical subjects. Applicants can choose between full-time and extramural study.
3. **High-school education** – has been founded in 1999 in cooperation with FT UTB Zlín. Students have possibility to study the bachelor programme at the same school they have attended during secondary education. The education is made primarily in building of SPŠS Vsetín, but students have to partially attend also in Zlín.
4. **University of third age** – this education is dedicated for older people who want to make a re-qualification or study at the university. This education is also made in cooperation with Thomas Bata University.

6.2.2 Standard Secondary Education

To this education belong three basic fields of study, which all last four years and are finished by graduation. The fields of study are following:

- **Mechanical engineering: Computing** – this field of study is primarily aimed on the engineering and technical professions. Graduates will find assert in practice at position like designer, craftsman or technologist. Code: 23-41-M/001

- **Mechanical engineering: Quality management and economics** – this field of study is combination of previous field and the economical character. Technical subjects are not so detailed; the accent is put on causalities and master of basic economic tools. Graduates can find assert on quality management level or on accountant position. Code: 23-41-M/001
- **Technical lyceum** – it is sometimes unofficially called Technical gymnasium. It is because the content of education is partially technical but with very strong part of humanistic subject. Students are primarily prepared for university education, but easily find assert also in practice. The subject matter in not strictly technical, but it is more universal. Code: 78-42-M/001

6.3 Advantages of SPŠS Vsetín

Thanks to very high-quality management and very good staff the school gains several concurrent advantages and enhances the entire process of education.

6.3.1 Cooperation with External Companies

Thanks to the headmaster, the school attempts to keep in touch with people and companies from practice. Dependently on this cooperation there is upgraded the subject matter and students, who are sent during the study into these companies for few weeks, can find possible assert just before they finish the school attendance.

The school also gains necessary equipment and possibly some sponsorship too, in substitution in form of well-prepared and qualified work power.

6.3.2 Technical Equipment

As has been mentioned, the school has very relations with companies from practice and therefore it also gains few machines and equipment for practical education.

Except that the school has about five computer laboratories, which are equipped with approximately fifteen computers each, on which is installed all necessary software for education, for example the CAD/CAM systems, MS Office software and many more. The school is currently planning complex upgrade of all computer hardware. The school is also equipped with several CNC machines, which students learn to programme.

6.3.3 Projects and Competitions

The school participates in several international and national projects. These projects have mostly language character, so they will help students to highly develop their key competencies and teachers to implement necessary cross-curricular subjects.

The school participates in following projects [27]:

- Comenius – Different, yet equal
- E-Twinning
    - Project with Slovenian school Kranj
    - European eMagazine
    - Bridging the schools
- Leonardo da Vinci Programme – international practice

Another advantage of SPŠS Vsetín is that it organises various internal competitions and competitions with another schools, for example in CAD systems, lathering etc. This school is also bearer of Autodesk Academia title.

All of these upper-standard activities help students to develop all their key competencies and the teachers to easily integrate all necessary cross-curricular subjects.

7 ANALYSIS OF ORIGINAL CURRICULUM

For development of new curriculum, which will fulfil the requirements of FEP, there was necessary at first made an analysis of currently used curriculum and consider if the content is suitable or if there should be made some changes. Original structure of the curriculum is shown in Appendix 1 at the end of this work.

7.1 Organisation of Original Curriculum

The original curriculum has been divided into eight parts, where the first served for repetition and the last as time reserve. The content has been proposed well for needs before launch of new FEP, but after that it needs some changes.

Content of respective thematic units is partially suitable, but needs some development in form of definition of key competencies and cross-curricular subjects. Then it will be suitable to re-organize the order of respective thematic units and moderately upgrade their content, because some subject matter required in FEP has not been educated and few of other partial themes could be organized by meaning of author of this work another way.

7.1.1 Thematic Units of Original Curriculum

Extract of thematic units of original curriculum follows. If the reader wants to familiarise with the entire curriculum, he should take a look at Appendix 1 at the end of this work.

1. Repetition – MS Word, MS Excel
2. Technical protocol – MS Word
3. Computer graphics – CorelDraw, Adobe Photoshop
4. Database system – MS Access
5. Presentation – MS PowerPoint
6. Webpage development – MS FrontPage
7. Expansion of IT knowledge
8. Reserve

7.2 Proposed Changes to Original Curriculum

First two changes have been proposed for second and seventh thematic units. Author of this work states opinion that the entire education in second year of study should be made as closed complex of similar themes or themes, which correspond one to each other and it is possible to build one on the previous and make connection between them.

7.2.1 Reorganisation of Thematic Units

Therefore there has been proposed that the theme number two will be educated in first year of study, where is present the block of MS Word and MS Excel. Similar thing has been made with theme number seven, which closely corresponds with programming, which is now present in the third year of study.

Next, the thematic unit of computer graphic makes a break in completing the MS Office package. Therefore this thematic unit has been moved at the fourth position behind MS Access and Webpage development themes.

With these changes it will be possible to enhance the rest of themes that the students will get more complex information and at the same time there will be fulfilled requirements of FEP. And last but not least the entire year will be made as one thematic-related unit.

Proposed upgrade of thematic units is following:

1. Repetition of MS Word and MS Excel
2. Database system MS Access
3. Presentation using MS PowerPoint
4. Computer graphics
5. Webpage development

Because the FEP does not demand exact time donation and also in detail described content of respective thematic units, their will not be explicitly given. The time donation and concrete content of thematic units will be absolutely up to the teacher.

Another reason why author of this work will not state the time donation exactly is fact that there have been made many important changes in entire education process at SPŠS Vsetín and this time is not yet clear how many lessons per week of subject ICT will be educated.

However, the recommended content and materials which can be used in the process of education in respective thematic units have been developed and are shown in following chapters of this work.

7.2.2 Changes in Used Software

During the education there is primarily used the commercial software. This can not be considered as a fault, but we should also remember that students do not have any income and so they will not be able to purchase very expensive software.

One thing is that for example the MS Office package can be bought for relatively low prize, but the same thing can not be said about other software. Another thing is that in practice there is usually used the commercial software, but students for they needs will not be able to use it legally. Therefore author of this work suggests that the commercial software should be in some cases replaced by freeware or free software. The replacement will be made in themes like Webpage development and possibly could be made also in Computer graphics theme. The changes could be made in global scale, because there are full-valued substitutions of commercial software nowadays. But the consideration is absolutely up to the school and teachers.

Possible substitutions for students could be following:

- MS Office - OpenOffice.org
- Adobe Photoshop - GIMP 2
- MS FrontPage - PSPad Editor, Easy Editor 2005, NVU 1.0

7.3 Upgrade of Outputs According to FEP

Very important thing which had to be done was to rebuild the entire curriculum to the form described by FEP. The requirements are closely described in theoretical part of this work and very detailed then in [23].

According to FEP there is no need to complexly specify any thematic units, but there must be defined concrete outputs – in other words knowledge, skills and abilities the student will gain during education. This aspect has not been considered when building curriculums in the past, when the accent has been put on activities of teacher and not the student.

Therefore there has been proposed new curriculum with defined outputs of SEP and concrete results of the education. For definition of outputs (students' knowledge, skills and abilities) there has been used taxonomy of Benjamin Bloom, which has been described in theoretical part of this work. The taxonomy is built on precise specification using verbs, which serve for formulation of respective results.

Proposal of new curriculum with defined outputs of FEP and SEP is shown in Appendix 2 at the end of this work.

The main accent has been put on practical usefulness of the educated subject matter. The subject matter should be at one hand useful in future employment and at the other hand immediately applicable by students in their spare time or during their activities, because by fulfilling these two conditions students will be motivated and education will be easier.

According to this there have been developed complete and complex materials for education, which are based on motivation, ease of use, usefulness in practice, and with consideration to student's individual learning speed. These materials will be described in of the following chapters.

As has been mentioned, the outputs of curriculum should be aimed on students. But the curriculum does not tell anything how to reach the goals. Therefore has author of this work created a questionnaire to find out the attitudes of students in relation to lesson organization, content of subject matter, teacher's approach and so on. Important to say that this questionnaire has served to the author only as an aid tool for building the lessons content and does not have statistical relevance.

8 ORIENTATION RESEARCH

Before building concrete materials for this work there was extremely important to consider how to build them – what the conception should be, what information the materials should contain and how to propose individual thematic units and work with students.

Author of this work has had some preconditions what form the materials should have, but only for feedback there has been made a short research, which goal was to find out, what lessons do students prefer and what is the best way to communicate with students during the process of education and how to simplify students' learning.

The entire questionnaire, which has been used for purpose of feedback, is shown together with its percent results in Appendices 3-6 (Czech and English version) at the end of this work.

8.1 Evaluation of Questionnaire Results

The questionnaire has been given to students of second class of Technical lyceum – the specialization which the practical output of this work is primarily made for. This questionnaire was anonymous, so no one should have fear of possible consequences. After the results analysis there have been driven following conclusions. For better comprehension of structure and sense of the questionnaire the results will be given in form of questions and answers with comment.

8.1.1 Teach Theory or Practice?

In accordance with expectations the students do not like theoretical lesson very much, but it is highly important what approach the teacher will choose and what methods he will use. If the content is taught interestingly or the lesson alone is interesting, most students do not mind when there is all theoretical content in the lesson.

8.1.2 Lead a Lecture or Interaction?

At the other hand it is necessary to have in mind that theoretical lesson do not mean the all-time explanations of subject matter (anyhow it is interesting) without cooperation with students. Almost half of the students do not consider this kind of lesson very interesting

and almost three quarters of students welcome any possibility to participate on the theme solution during the exposition.

8.1.3 Learning for Future or for Today?

Surprisingly only half of students consider as primary the immediate usefulness of taught subject matter. Again almost three quarters of students prefer if the gained knowledge will help them during upcoming practice. Satisfaction of both these groups can be reached by appropriate selection of themes and use of content which will show immediate concrete results and will be useful for further education or practice in the same time.

8.1.4 Work Singular or Plural?

Students rather work in groups than alone. The reason should be at the one hand that they realize the need of team work, but at the other hand there can be students which want to parasite on other members of the group and do less work. The teacher should keep an eye on the work assignment in respective groups and possibly change the group members.

8.1.5 Want to Be Trained Ape or Dolphin?

Most students prefer if they can choose their own theme for individual work, when they have more space for self-realization and creativity. This is very positive result, because we can often encounter that some students rather accept assigned nonsensical themes only because they can be sure that it will be accepted by teacher. Overwhelming majority of students welcome the possibility of theme selection, because such theme is closer to their interests and student are therefore more motivated.

8.1.6 Work as Individualist or Team-player?

Absolutely no of students agree with proposition that they should work all alone. This attitude is especially valuable if we realize that the society puts accent on teamwork than individual approaches. Thanks this students gain an advantage for further assert. Because of this there should be greater number of assignments which allow work in teams or groups. These forms of education lead to result when students learn more – part from teacher and part from classmates – so they get a global view on respective problem.

8.1.7 Do We Want Information or INFORMATION?

Almost three quarters of students consider as very important that they gain in lessons as much information as possible. But this information does not mean theoretical knowledge about many things, but principles how to solve respective problems and where to find necessary information – this opinion state almost 85 % of students.

8.1.8 Teach in a Word or in a Letter?

If we take a look at the process of memorization, the students prefer the verbal way to written form – in almost fifty percents. Approximately one quarter of students see no difference in effect when using one or another form. It is therefore suitable to tell the most percentage (not amount!) of information verbally and the most important then give in shorter written form.

8.1.9 Use Perception or Practical Try-out?

No matter if new information comes in oral or written form, almost all students state the opinion that if they have a possibility to apply new knowledge in practice, they will remember the subject matter more simply. Absolutely no student has disagreed with this proposition. It is therefore necessary to build the lessons in way so students will have a possibility to check the information immediately.

8.1.10 Act Objectively or In a Directive Manner?

Teachers of "the old school" do not have a place by students. Lessons led in directive manner, where there is the content given implicitly without participation of students, are mostly not accepted. Students at the other hand prefer lessons which are led in form of discussion and where they have space to state their opinions and attitudes.

8.1.11 Approach Authoritatively or Magisterially?

The teacher should not have been in any case very reserved. Look down the student classify very negatively. No one of asked students likes authoritative teachers. At the other hand there are few percents of students who do not agree that the teacher and student should be work partners. Therefore it is necessary to find some compromise. It is not possible to get

on the edge where it will not be obvious who is teacher and who is student, anyway the relation of teacher to students should be positive, friendly and helpful.

8.1.12 Fixate by Joke or Glue?

Heavy atmosphere does nothing good – and asked students give evidence. The teacher should remain serious and must not teach false information, but the presentation of information should fit that students are able to absorb it easily. It is useful to join the transfer of information with some story or joke, which can fixate the information and motivate students. But there should be more information than jokes and stories in the lesson!

8.1.13 Use Definition or Picture?

Major part of students does like rather illustrative comparisons during education. Exact and seemingly precise information are hard to remember and many times it gives students nothing useful, because they do not understand it. The best aid tool in any case is practice. When any example is demonstrated on practice or anything concrete, it will also help better and easier comprehension – absolutely all asked students agree with this conception!

8.1.14 What I Know or What I Can?

Character of examination and evaluation of students' knowledge (written and oral character) has not been examined in this questionnaire, because this aspect is very individual and can be strongly influenced by students' precondition and possible dysfunctions. Therefore the question has been formulated if students prefer examination of things they know (theory) or things they can do (practice). From questionnaire results is evident that more than half asked students prefer the examination in practical form. Because it is always necessary to teach some theoretical information, the themes should have practical concept, but should also require at least basic theoretical knowledge about the theme. It is because students on the one hand must be able to make some practical things, but at the same time they must know how and particularly why they do them. So it is suitable to concentrate on practice, but show information in connections and associations so the students can make a judgement based on learned information to unknown.

9 IMPLEMENTATION OF KC AND CCS INTO PROCESS OF EDUCATION

One of the most important key competencies is the Communicational competence. This one competence author of this work considers as very important not only for the education, but the entire life. Students should be able to lead discussions, argument, state their opinions and communicate well and in the right way. And where is better place to learn that than in school during compulsory attendance? Goal of the education is no more only to give students as much information as possible, but to teach them where and how the can find information and how to use it properly. This closely corresponds with another key competence – the Competence to use the tools of ICT and to work with information.

But when student gets some information, he must be able to reproduce them, consider its validity and differ between important and less important information. Particularly the reproduction of information and communication itself requires that students are able to talk in front of people and defend their opinions and point of view.

As is evident, the connecting theme in the education and practice is the communication and informational conversancy. And therefore there have been proposed following several points, which should be present in theoretical and practical lessons and which lead to development of key competencies (KC) and contain cross-curricular subjects (CCS).

Concrete examples of implementation will be shown in following part of this work, which deals with preparation of thematic units.

9.1 Implementation into Theoretical Lessons

Main problem in the process of education is very often bad communication between students and the teacher. Sometimes the teacher wants to give students in well intention as many information as possible. Although this intention is very often unlucky, because when we take a extreme where the teacher wants to give students all information they may use in practice, he should give them all possible information, because there is some probability that they may need them. This approach is impossible, of curse.

9.1.1 Information about Information

In accordance to above, it is highly necessary to choose from a great amount of information only the most important, which students should remember. About the rest information should students primarily know where to find it and how can they consider the validity of respective source. At few universities there are allowed different materials during exams, because it is in some cases not very important to remember great amount of information, but to know where to find it. So the purpose of exams is not to find out how much information is the student able to remember, but how is he able to work with it – find it, consider its validity, reliability and importance, and consequently use it. Same approach should take a place during the education. Students should have very necessary information, but primary they should know where to find more if they need.

This approach is also supported by fact, that every single human gives some information different priority than another human. Therefore it is almost impossible to select the most important and universal information. This approach will cover almost all key competencies.

9.1.2 Examples from Practice

Information which has no context and is not connected to practice or something real is not very useful, because students do not have opportunity to use it effectively. To make students remember the information easily it is necessary to ensure such connection. Therefore there will be given examples from practice or the real world, which can help students understand the currently solved problem, anytime it is possible. This approach will also boost the motivation and interest of students, because they will see that the information is useful.

9.1.3 Reports According to Educated Theme

Students will regularly get assignments of reports from concrete branch according to currently educated theme. From this branch they will have an opportunity to select any object or sub-theme which fits their interests. For example in chapter dedicated to computer graphics students will have possibility to select any device, programme or technique which they will shortly describe etc.

9.1.4 Actualities and News in Almost Every Lesson

As an integral part of the education students will have periodical actualities and news. In almost every lesson one or more students will have any actuality from the IT branch. It does no matter to what the information is connected, but it must not be older than one week or month (the time period will depend on the teacher consideration). Such actualities students will present before their classmates. This approach will fulfil several important factors the education should have – knowledgeableness, actuality, development of communicational competence, competence to use tools of ICT and work with information and many others.

Actualities and news should not be probably present in examination lessons, where students will write tests or other exercises, because in this case they will not be possibly concentrated on the theme of actuality but the upcoming test.

Actualities will play very important role in the education, but because there are approximately twelve students per group, they will not be classified individually, because fifteen and more marks per student per term are too much. There are two possibilities how to solve this problem. One is to make the final mark always of three partial marks (news); the other is to lower the frequency from one actuality per lesson to one actuality per week.

9.1.5 Communication, Communication, Communication

Communication is the key factor of entire process of education. If the communication does not function properly, the education can not function itself or it is at least impossible to gain feedback and check the results.

Precondition that students will have nothing to say to new theme is absolutely fault. In most cases there are at least few students, who have encounter with the theme and have anything to say. Teacher is neither guarantor of truth nor the well of information and therefore he should let students to tell their opinions and enriched classmates and teacher himself with their experience. If the student knows that he knows more than others and can be somehow helpful, he will be more motivated as same as the others, because no one wants to be the last one.

By questions get to students it will be possible to upgrade the lesson scheme according to the level of students' knowledge and so the students should learn more. It is useless to

repeat round and round what students do already know. At the other hand it is necessary to repeat banal and trivial information if students do not know them or have remember them incorrectly.

Communication with students also serves to hold their attention. If students are not asked during the exposition, they usually lost their interest up to 10 minutes. Therefore it is very useful to ask students questions which correspond to current theme – here is very important to formulate questions properly. Developed competencies are evident from the content.

9.2 Implementation into Practical Lessons

Practically aimed lessons will be proposed that they simplify the education and boost students' motivation. This will take effect also in assessment, because more motivated students mostly reach better results. The learning process can be also enhanced by group work or teamwork, where students have possibility to gather new information from their colleges.

9.2.1 Project and Problem Oriented Education

The practical part of education is composed in way that it contains as most problem or project oriented themes as possible. For example in thematic part dedicated to computer graphics students will have to develop a document based on photography. The document will be in form of greeting card, photomontage, collage etc. In block of web page development, students will have to create their own web page according to arbitrary theme – but there will be several aspects to be evaluated (e.g. validity of the source code, contained information, graphics).

All the themes are based on practice and lead to concrete and clear result, which students should make use of. Because of the usefulness the students will be more motivated and there is a precondition that they will do their work better. There will be guaranteed implementation of key competencies at the same time.

All assignments of individual work then contain an introduction to the problem, which is always based on concrete situation which students can encounter during their practice or everyday life. Therefore students will clearly see that things they will develop do not serve only to gain a mark, but will be useful in future and have their logical reason.

9.2.2 Possibility to Select Own Theme

Also from the made research is evident that students prefer the opportunity to select their own theme during individual practical activities. Therefore there are always few examples of themes, but students will have possibility to select arbitrary of these themes or to bring out their own theme, which is not contained in "standard" edition. By this there will be made a differentiation between respective students and students will have better relation to the work, because it will be close to their hobbies and interests. Students which will not want to think out their own theme should work on one of the proposed themes from the assignment. This approach is suitable in any class and year of education.

9.2.3 Work in Group or Team

The research has confirmed the precondition that students are glad if they have possibility to work together – in teams or in groups. It is not only during work on evaluated assignment, but also during practice of new information.

During this cooperation students also develop their professional and social competence, communicational competence and other. This approach will serve students as a training for upcoming assert on the labour market, because the co-operability is very valued in the practice. This approach will be very useful especially in the second and third year of education, where students develop their own webpage and deal with programming.

However, during the teamwork or work in groups it is highly necessary that the teacher checks that all members cooperate together and are not only parasitizing on others.

10 DESCRIPTION OF DEVELOPED MATERIALS

According to author's consideration and result of the questionnaire above, there have been developed materials for all thematic units, which cover the theoretic presentations, assignments of practical work for students and assignments of individual work.

Respective materials are composed to fulfil requirements of FEP, their content is optimized so that the learning will develop key competencies of students and also cover the cross-curricular subjects, which should be contained too. Lessons are categorized into four types, which differ in the organisation of the lesson.

10.1 Materials for Theoretical Lessons

This type of lessons will be present at the beginning of each thematic unit. In these lesson students will gain necessary theoretical information, which they will need during further work in practical lessons and to understand the problem. Furthermore they will get information about other sources of information, which can be useful.

10.1.1 Presentations

Materials developed for this type of lessons are in form of PowerPoint presentations. These presentations contain information base and describe the problem connected with respective thematic unit. The presentations will serve as powerful aid tool during expositions.

In few cases there are also materials which will serve to boost interest of students. Such materials can be find for example in thematic unit of Computer Graphics, where there are two motivation videos, what could students do if they master the subject matter.

According to character of developed materials and the lesson type there is proposed use of following organisation form and methods:

- Organisation form: Frontal education with possible individual consultations
- Methods: Motivation, exposition
- Tools: PC and data projector

10.2 Materials for Combined Lessons

After theoretical lessons which will be aimed on basic information related to respective thematic unit there will take place not only the practical lessons, but at first something like an alternative made of combination of theory and practice. In these lessons students will repeat previous information, fixate it and gain new information and apply it in practice at the same time. For these lessons it is typical that students work together with teacher and learn how to use software – teacher shows students a step and students try it themselves.

10.2.1 Video Tutorials

Video tutorials are the most important and also most difficult part of this work. Their importance in process of education is really enormous. Because the tutorials make one of the key parts of this work, their structure and system will be described in separated chapter.

There are two possibilities when to use the tutorials. The first and less recommended is to use the tutorials as a substitution of the teacher – so directly in the lesson. In this case the teacher has no influence on students, does not have good control of their activity and students are not motivated, because they do not get any feedback.

The second and much recommended is to use these tutorials as powerful aid tool after teacher's exposition – cooperation with students, which has been described at the beginning of this chapter. During the lesson the teacher should show students how to do necessary operations and students will then work and practice it alone. If they encounter any problem, they can ask the teacher or see the tutorial.

Tutorials can be used also as another point of view. Teacher shows students his favourite way how to do something and because it is very probable that the tutorial has another conception, students will gain two possible solutions of solved problem.

The greatest advantage of tutorials is that they support individual learning speed of all students. This aspect is ensured by fact that tutorials are:

1. Clear
2. Illustrative
3. Repeatable
4. Made as project

5. Categorized by themes
6. Divided into chapters

What more, students will always get some original material which has been upgraded in the tutorial, so they can do exactly the same operations as shown in the tutorial and they can also get the same result, which gives a guaranty that they worked correctly.

Although there is a possibility to use these tutorials as a substitution of teacher, it is much recommended to use it only as a supplement!

According to character of developed materials and the lesson type there is proposed use of following organisation form and methods:

- Organisation form: Frontal education with possible individual consultations
- Methods: Motivation, exposition, fixation (are present implicitly)
- Tools: PC and data projector

10.3 Materials for Practical Lessons

The third types of lessons are the practical lessons. These lessons are characteristic with application of theoretical information into practice, or individual or group development of concrete product. Concretely these lessons are suitable for alternative organisation of education. These lessons will usually serve for development of concrete project and work on assignment. Results of this work will be sequentially evaluated and assessed.

10.3.1 Assignments of Projects

Every thematic unit contains in its second half practical activities of students. The activities are based on previous theoretical and combined units, where students learned how to use respective software, its tools and how to develop concrete results. Practical lessons will serve for evaluation if students understand the problem and are able to work effectively. Outputs of these lesson can be evaluated or have only informational character, but developed assignments are appointed for evaluation and assessment.

Also in this case there has been rebuild the traditional concept of stated task which students have to fulfil. To ensure motivation of students and explain them why they should make concretely the thing that has been assigned, every assignment contains at its very beginning description of problem situation from real life. Because students will see at the very beginning that their work has a reason and will lead to practical and useful output, they will be more motivated and make better work.

Because there is still a need to specify the assignment more concretely and closely than only with description of problem situation, after the problem situation there is present classical assignment, where students clearly see what they should do.

To ensure students motivation and freedom when selecting the theme (accordingly to principles stated in chapter 9.2) there are always several sample possibilities what students can work on, but each student still has a chance to bring his/her own theme, which corresponds with thematic unit and character of the assignment.

According to character of developed materials and the lesson type there is proposed use of following organisation form and methods:

- Organisation form: Individual, Group or Team education
- Methods: Motivation, fixation, evaluation – diagnostic
- Tools: PC

10.4 Materials for Evaluation Lessons

Evaluation lessons will be present as the last one type. They will serve for assessment of practical lessons outputs. Students and also the teacher will gain feedback how they have mastered the subject matter. It is very hard to develop universal assessment, because every single teacher has little different requirements. Therefore there is no recommended classification of project and this part of education will be absolutely up to respective teachers.

10.4.1 Orientation Test

Outputs of respective thematic units are primarily aimed on development of some concrete project, not on reproducing theoretical information, because ability to apply is more important than only reproducing something. Therefore there is only one sample test in thematic unit of Computer Graphics, which is aimed on theory. The theoretical information is not usually tested explicitly, because it has to be contained in result of the application.

According to character of developed materials and the lesson type there is proposed use of following organisation form and methods:

- Organisation form: Individual, Group or Team education
- Methods: Evaluation – diagnostic, fixation
- Tools: PC

11 EXAMPLE OF CONCRETE IMPLEMENTATION OF CCS + KC

Although there is according to requirements of new FEP no need to explicitly describe respective thematic units but only the goals of education, author of this work will make brief description of content and goals of respective thematic units. At the one hand there will be described the content of each unit and at the other the accent here will be put on more detailed description of included KC and CCS.

11.1 Repetition of MS Word and MS Excel

This unit serves for repetition of subject matter from the first year of study, where there are present complex thematic units dedicated to this software. Therefore students will not learn any new information about the software or its tools, but they will make a revision of knowledge they gained in previous year.

The education in these units is based on individual work of each student. Students have prepared assignments, which they will work on. In order to ensure that the work is meaningful and students are motivated, there are selected clearly practical themes.

11.1.1 MS Word – Documents for Practice

There is prepared an assignment of five documents students will develop during lessons. Time donation is absolutely up the teacher, but according to documents character it should be three lessons for all themes. The themes are following:

- Appeal for admission to a college
- Application for employment
- Letter of resignation
- Curriculum Vitae
- Envelope

From character of assignments it is evident that they develop significant number of key competencies and also contain almost all cross-curricular subjects. Concretely the contained CCS and CK are following:

- **Cross-curricular subjects**
    - Citizen in democratic society – students will be familiarised with their rights they have in case when they are not successful during entrance exams, they are not satisfied in their employment or if they want to apply for job.
    - Human and the world of labour – this CCS is closely connected with the previous. Students will learn how to write all necessary documents which they should made of use in practice, no matter if they will want to study at the university or work in employment.
    - Information and communication technology – all the documents shown above will be created using PC and relevant software. Therefore students will train the practical work with ICT and at the same time they will learn new formal rules connected with respective official documents.
- **Key competencies**
    - Learning competence – students will gain new information and thanks to character of the assignment they will also develop this competence by self-learning during the work and search for necessary information. They will simply learn how to learn this way.
    - Problem-solving competence – this competence is ensured explicitly by the character of the assignment, because each of developed assignments contains concrete problem situation from real life, which students have to solve.
    - Communication competence – because students will create official documents which serve for communication, also this competence will be developed. The communication competence will be also developed during the work in form of communication with teacher.

- Professional and social competence – during these lessons students will gain knowledge about how to create formal documents and what way to use in communication with other people.
- Competence to Labour-assert and Business Activities – this competence is absolutely evident from the character of assignment and above mentioned competencies.
- Competence to Use the Tools of ICT and to Work with Information – is contained explicitly.

11.1.2 Repetition of MS Excel – Problem Solutions

In this thematic unit students will be put into situations, where they encounter some concrete problem from the real life. There are again few prepared few assignments which will cover approximately three lesson. Themes of the assignments are following:

- Calculation of net earnings
- Graphs of goniometric functions
- Register of HDD prices

Because the character of assignments is very similar to MS Word, there will developed almost the same key competencies and also contained similar cross-curricular subjects. Therefore there will be closely described only the different ones. The key competencies and cross-curricular subjects developed by this thematic unit are following.

- **Cross-curricular subjects**
  - Citizen in democratic society – similar as above
  - Human and the world of labour – similar as above
  - Information and communication technology – similar as above
  - Human and the environment – in chapter where students will have to find about ten different hard discs, they will encounter a fact, that several types of these devices have some “green logo”, e.g. the Greenpower type of Western Digital hard discs. These devices are saving the environment, because consume less power and are partially made of ecologic resources.

Students will at least gain a knowledge about possibility to replace classical devices with these ones, which can save the environment and also customers money.

- **Key competencies**
  - Learning competence – similar as above
  - Problem-solving competence – similar as above
  - Communication competence – similar as above
  - Professional and social competence – similar as above
  - Competence to Labour-assert and Business Activities – this competence is absolutely evident from the character of assignments. Students will learn how to calculate their net earnings according to actual laws and how to check if they get exactly the sum they should get.
  - Mathematical competence – the Excel editor is extremely suitable for developing of this competence. During lessons students will use mathematical functions for different calculations and also create various graphs of goniometric functions and to register important attributes of studied data.
  - Competence to Use the Tools of ICT and to Work with Information – is contained explicitly.

12 BRIEF DESCRIPTION OF REMAINING THEMATIC UNITS

Because the key competencies and cross-curricular subjects are clearly evident from previous chapter, in this chapter there will be described only the content of respective thematic units with accent on concrete outputs. The outputs will serve also for description of the goals, because main goals of respective thematic units are to develop concrete, practical and useful output. Concrete outputs of respective thematic units are shown in Appendix 2.

12.1 Database system MS Access

This thematic unit will serve students to understand the problems and importance of database systems. During the education process students will gain necessary knowledge and abilities to create their own database using MS Access.

12.1.1 Theoretical Lessons

At the beginning they will be informed about usefulness of saving and organizing data and they will understand the term database and all necessary information around it. This will be content of theoretical units, which will be aided by prepared presentations.

12.1.2 Combined Lessons

In these lessons will be new theoretical information slowly applied in practice. Students will get familiar with MS Access software and during several lessons they will learn how to use its function and how to develop full-valued database with all its necessary components like tables, relations, queries, forms etc. These lessons will be led by teacher who will demonstrate the actions which students will repeat.

To ensure all students will understand the problem and will not miss any important information due to fast exposition or another issue, there are prepared complex video tutorials, which can fully substitute the teacher.

12.1.3 Practical Lessons

These lessons will be dedicated to individual students work, or possibly on group or team work. This will depend on the teacher, which organisation form he will choose. During

these lessons students will have to develop fully functional database according to the given assignment. Students will have possibility choose from several themes or to think up their own. The assignment is again made of problem situation, which will closer the task to students and show them, that the assignment has its sense and is applicable in practice.

12.1.4 Evaluation Lessons

To develop student's communicational and other competencies, students will in these lesson demonstrate what they have built and they will also have to defend the way they have used to reach the goal. They will show the structure of database, tell their classmates what theme they have chosen and why and shortly described functions of their database. For this purpose there will be usually used PC and data projector, using which students will have a short presentation.

12.1.5 Contained KC and CCS

- **Key competencies:** Learning, Problem-solving, Communication, Professional and social, Mathematical, Competence to use tools of ICT and work with information
- **Cross-curricular subjects:** Human and the world of labour, Information and communication technology

12.2 Presentation Using MS PowerPoint

It this thematic unit the students will learn the most important rules of development of presentations and presentation itself. In the second half of this thematic unit students will create their own presentation using MS PowerPoint.

12.2.1 Theoretical Lessons

For these lessons there are prepared two presentations which will help students to accommodate the most important theoretical information they will need in practical lessons. This information includes basic typographical rules, principles of well-formed presentation and will learn how the lead the presentation correctly. They will be also warned about most often mistakes and fault, which they should beware.

12.2.2 Combined Lessons

In combined lessons students will learn how to use the necessary software tools. They will be guided by teacher and this way they will learn few ways how to create a full-valued presentation. For these lessons are again prepared the video tutorials, which cover all the necessary parts of this theme. Therefore students have assurance, that if they miss something during the exposition, they have a possibility to easily find all the necessary information.

12.2.3 Practical Lessons

These lessons are also led in problem-solving way. There are prepared several possible assignments students can choose from or they still have possibility to think up their own. At the very beginning of the assignment there is again stated some real problem situation, which has to be solved. Students will work alone or in groups and create a presentation about selected theme.

12.2.4 Evaluation Lessons

At the end of this thematic unit students will have a short presentation in front of the class. They will again tell their classmates what theme they have selected and what they will be talking about and subsequently they will present their work they have made during practical lessons. The accent will be put on several aspects. The first will be the prepared materials, second the content of the presentation and the last then the presentation (speech, postures) itself. Each student will suggest his/hers own classification and all other present people including the teacher will state their opinions. The students can possibly choose a mark by a vote. The final mark then will be made as combination of assessment made by student, class and teacher.

12.2.5 Contained KC and CCS

- **Key competencies:** Learning, Problem-solving, Communication, Professional and social, Competence to use tools of ICT and work with information
- **Cross-curricular subjects:** Human and the world of labour, Information and communication technology, Citizen in democratic society

12.3 Computer Graphics

In this thematic unit students will learn the necessary theory about colour models, graphical formats and application for work with the graphical content. During this unit students will also gain skills necessary to create and modify digital graphics. Students will work with CorelDraw and Adobe Photoshop software.

12.3.1 Theoretical Lessons

For theoretical units, where students should gain the theoretical base, there are made three different presentations, which have a relation to computer graphics. In the first part students will learn about basic and most often used graphical models, secondly about graphical formats and last but not least about compression and its importance. Presentations are supplemented by photo examples of pictures with various settings, so students will not get only theoretical information, but also see its concrete examples from practice.

12.3.2 Combined Lessons

For these lessons there are prepared video tutorials, which will guide students through the development of concrete project. Students will get the same source material as is used in the tutorial, so they can reach the same output as is shown on the video. At first the students will be familiarized with CorelDraw and Adobe Photoshop software and subsequently they will learn how to use its tools and functions. During the work students will create their own sample collage and photo modification.

The possibility here is similar as in case of any other combined lessons and so the teachers leads the exposition his way while students repeat his actions – in this case the tutorial will serve as good supplement – or the tutorials could be used as a substitution of teacher, but the second possibility is not recommended.

12.3.3 Practical Lessons

During practical lesson students will create graphical project dependently on their choice. There is again stated the problem situation which needs to be solve and which will serve also for motivation and the there are given several possible themes students can work on.

During these lessons students will develop their own graphical document dependent on the assignment. One of the assignments is for example the business card.

12.3.4 Evaluation Lessons

In this thematic unit there will be no student's presentation, but the results of their work will be classified by teacher himself. Students will be informed about their results verbally and also by suggested mark and they will have a chance to explain why they have chosen respective theme and why they have used respective work methods and so they can also influent the final mark.

12.3.5 Contained KC and CCS

- **Key competencies:** Learning, Problem-solving, Communication, Professional and social, Mathematical, Competence to use tools of ICT and work with information
- **Cross-curricular subjects:** Human and the world of labour, Information and communication technology

12.4 Webpage Development

This is the final part of proposed curriculum, where students can make use of all materials and practical outputs they have developed in previous thematic units. During this unit students will gain necessary theoretical information they will need during development of their own webpage and subsequently develop it.

12.4.1 Theoretical Lessons

In these lessons student will learn rules and principles of online communication and presentation. They will be also familiarized with HTML language syntax and basic Internet services. All necessary information is again contained in prepared presentations. Strong accent is put on theme of source code validity students should keep and there is also explained why is the validity so important.

12.4.2 Combined Lessons

There are made more video tutorials, which describe the process of manual webpage development from the very basics to the final product using PSPad editor. Students will see and learn how to build the web page using tags and how to format the source code.

In these lessons students will learn how to create a web page using tags and in the second half they will be familiarized with one of WYSIWYG editors. Choice of the software is absolutely up to the teacher. Author of this work recommends Notepad and PSPad for manual creation of the webpage, and for click-and-drop creation the NVU 1.0 or Easy Editor 2005 which are all very easy to use. And what is very important – all this software is published as Freeware, or is an implemented part of OS.

12.4.3 Practical Lessons

After the combined lesson where students should learn all necessary information and gain needed abilities and skills, they will have to develop their own webpage. The work on this project can be individual but students can also work in groups or teams. There are again prepared several themes in the assignment students will work on. The inseparable part of the assignment is of course the problem situation.

Students will choose one of the themes or think up their own and individually or in groups/teams they will build a webpage according the theme. For the work they can choose any text-based or WYSIWYG editors. During the development process there can be used outputs of previous thematic units – students can for example put on the web their curriculum or photos etc.

12.4.4 Evaluation Lessons

In these lessons students will present their work to their classmates. The process will be the same as in every other presentation-based evaluation lesson. The assessment will be suggested by the presenter, class vote and teacher and the final mark will be made as a result of these three numbers. Evaluated will be the content, graphical realization and also the validity of source code.

12.4.5 Contained KC and CCS

- **Key competencies:** Learning, Problem-solving, Communication, Professional and social, Competence to use tools of ICT and work with information, Competence to labour-assert and business activities
- **Cross-curricular subjects:** Human and the world of labour, Information and communication technology, Citizen in democratic society

13 TUTORIALS

Because the tutorials developed for purpose of this work are its significant and very important part, they should be closely described. The following chapter will be dedicated for description of software, which has been used for the development process of tutorials and subsequently there will be described the system and structure of developed tutorials.

13.1 Wink 2.0

Wink 2.0 is very powerful yet easy-to-use software developed by Debugmode Company. This software is dedicated for building complex tutorials of whichever software and it is absolutely free of charge, published under freeware licence policy.

13.1.1 Building the Tutorial

At first the user has to open new project, set the area to capture and make few basic settings. Then it is possible to start the work. Most important part of this software is a built-in application, which serves to capture screenshots.

The screen can be captured in three different modes:

- By click or key press – approximately 3 screenshots per action
- By press of Pause key – one screenshot per press
- By any action like move with cursor – various sequence of screenshots

These screenshots are saved into project in form of picture sequence. Author must subsequently pass through all the pictures and add various elements for navigation or explanation of the content of the screen, and define timing – similarly as in MS PowerPoint. To supply the tutorial with these elements there are few sets of predefined shapes. Example of screenshot supplied by various elements is shown in (Fig. 14).

Only for imagination, one tutorial consists of 500-1200 frames which must be processed by the author, sorted, timed and supplied by description and navigation elements. So it is evident, that time spent by developing tutorials for this work has been really enormous.

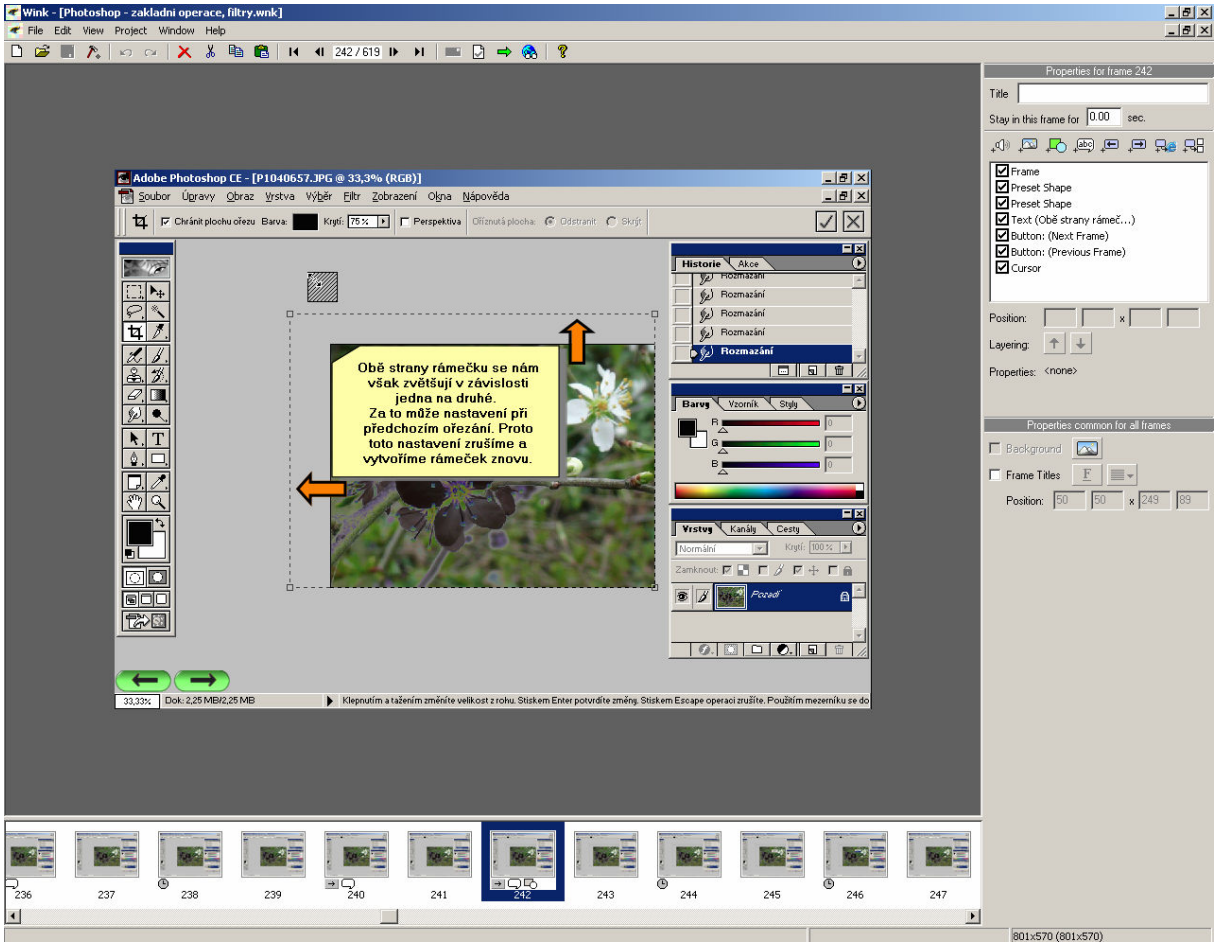

Fig. 14. Development of tutorial in Wink 2.0

Complete project must be subsequently exported into one of supported formats, among which belong EXE, SWF, HTML and PDF formats [32]. For purpose of this work there has been used the EXE format. It is mainly because of the compatibility insurance, because tutorials in this format contain integrated Wink Player and therefore it is possible to run the tutorials on any computer. For the web it is possible to export the tutorial into SWF and HTML files, where the SWF file will be integrated into the webpage.

13.1.2 Encountered Complications

There are few complications the author of tutorials can encounter and which have been present during the development process of tutorials for this work. Some of them are not critical, but other can seriously influent the development process and of course the final product.

There were three problems author of this work encountered during the development:

- **Damaged screenshots** – this complication appears if the tutorial contains great number of screenshots with great amount of graphical content. For example when working on tutorial for Adobe Photoshop, the file size of project has been above 300 MB. This should do no matter, but when the project was saved and loaded again, some of the screenshots had been damaged and had to be erased. Luckily, the screenshots were not in important part of the tutorial, so the error could be bypassed, but if it has been in another part, it will make serious complication. Important to say that Photoshop tutorial was the only where complications of this kind appear.
- **Improper format** – Wink 2.0 is English software and has no localization to Czech language, so user can not expect it will recognize the grammar. But the language is not the main problem. The heart of the matter is in fact that the text in description boxes is considered as one-line sequence of chars. Text boxes are resizable and if the text overflows the area, the box will automatically change its size and the text needs to be upgraded. Therefore it is sometimes necessary to break lines manually and check if there are no prepositions or improper chars at the end of the lines.
- **Improper window size** – this is not a serious problem, but it can bring user of the tutorial little complications. When the project is exported into HTML file, the tutorial will always run in window of proper size, because the size is explicitly defined in the source code. But when exporting the project into EXE file and this file is executed, the tutorial appears in small window which has to be resized. The resize can not be made proportionally, so the user has to try for a while until the content (especially text) is easy to read. But this is only little tax for absolute compatibility. The original size of window is optimized for resolution 800 x 600 px.

13.2 Structure of Tutorials

To make the learning using tutorials and also orientation in respective tutorials easier, there has been developed the uniform scheme, which is present in every created tutorial. The principle lies in unification of used navigation and description elements, so when the

student or any other user passes through one tutorial, he will not absolutely have any problem working with another tutorial. Following subchapters will briefly described the most important elements present in all tutorials.

13.2.1 Introduction Screen

At the introduction screen of every tutorial there a welcome box, in which students can find information about tutorial number (there are always few tutorials per thematic unit) and they are familiarized with goals of respective tutorial.

When the students does not want to pass through the entire tutorial, because he wants only to check some information or from another reason, he has possibility to choose from predefined chapter in the right box by clicking on respective arrow next to the chapter title. This is clearly evident from the (Fig. 15) below.

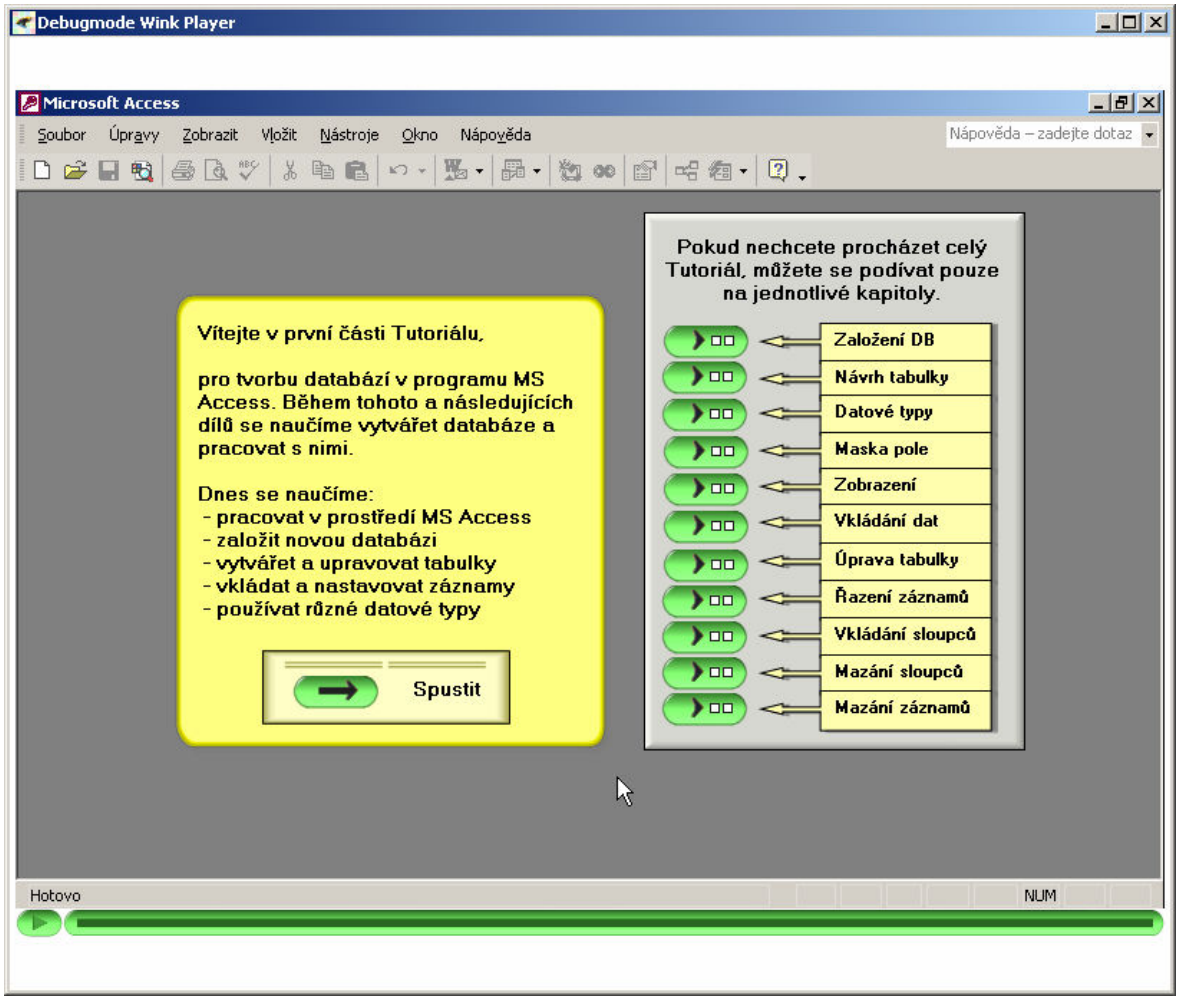

Fig. 15. Sample welcome screen of the tutorial

13.2.2 Navigation Elements

As has been mentioned, in all tutorials there have been used the same elements for navigation and description of their content. These elements altogether are shown in (Fig. 16) and described below.

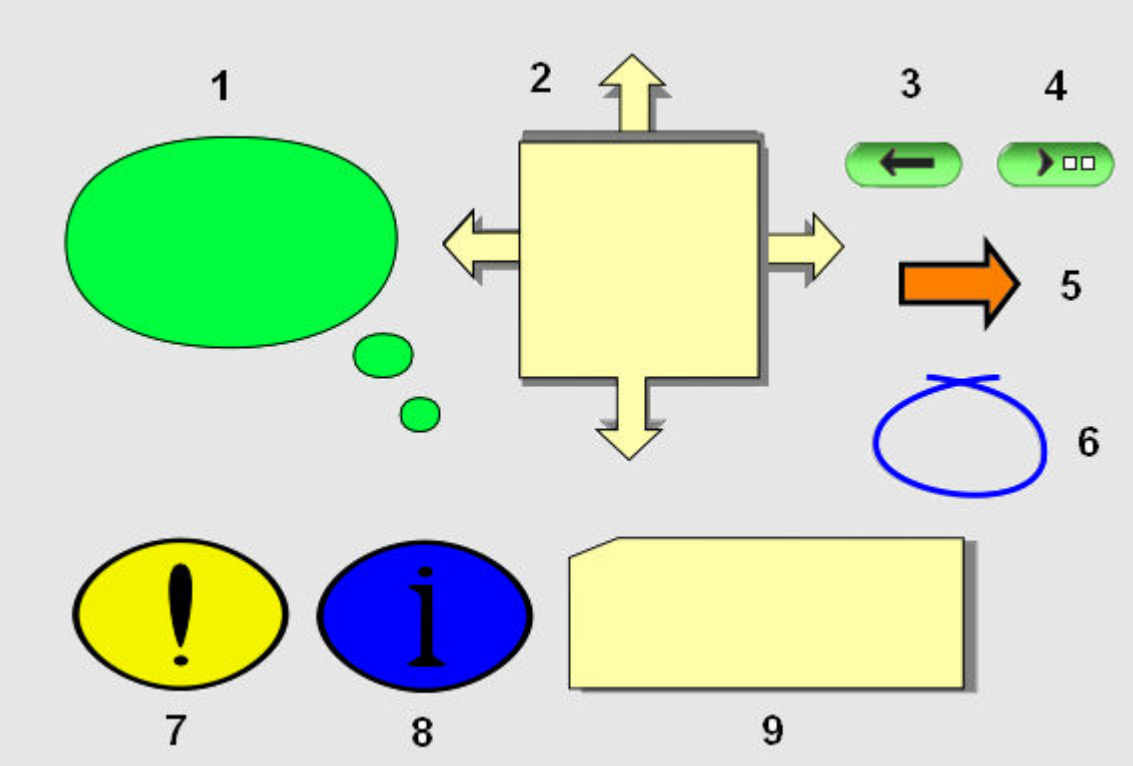

Fig. 16. Navigation and description elements of tutorials

Purpose of individual elements is following:

- **Nr. 1** – green bubble with text inside serves to state partial goal or predict the activity or action that will be made in following part of the tutorial. This element also serves as a separation between single subchapters of the tutorial.
- **Nr. 2** – boxes with pointing arrows are used in case where there is a need to mark and describe something (usually some item of a menu or part of a window). In the figure above they are joined altogether, but in tutorial there is used every single alone.
- **Nr. 3** – black arrows with green background are basic navigation elements. When there is present the arrow pointing to the right, clicking on it will take user to next

frame. The opposite arrow pointing to the left will then take user to previous frame with right arrow.

- **Nr. 4** – small arrow with two white boxes is another navigation element and serves for direct jump from the introduction frame to another chapter. The same arrow is also present in the last frame of each tutorial and gets user at the very beginning.
- **Nr. 5** – orange arrow is a pointing element, which is used to notice something. It is sometimes used together with crossed blue ellipse (element nr. 6).
- **Nr. 6** – crossed blue ellipse or classic ellipse is used to mark concrete part of the frame – usually icon or part of the picture.
- **Nr. 7** – question mark with white or other background is used to notice the most important information students or users should remember. It is used together with yellow description text box (element nr. 9).
- **Nr. 8** – letter "i" with blue background fulfils similar purpose as element nr. 7, but it is used to mark notices with informational character – for example description of program function or any other information connected with respective action. It is used together with yellow description text box (element nr. 9).
- **Nr. 9** – yellow box with text is the most often used element in tutorials. It serves for description of actions, menus and any other elements on the screen.

13.2.3 Conclusion Screen

The conclusion screen contains only few elements – as is evident in (Fig. 17). There is one grey description text box which contains some concluding information. This information includes repetition of fulfilled goal which were stated at the beginning of the tutorial and outlines the theme of upcoming tutorial. Next there is also assignment of the activity students will do after they finish the tutorial – it is mostly practice of newly learned abilities and skills.

The last part of the screen is a bidding of successful work and the navigation arrow leading to the very beginning of the tutorial.

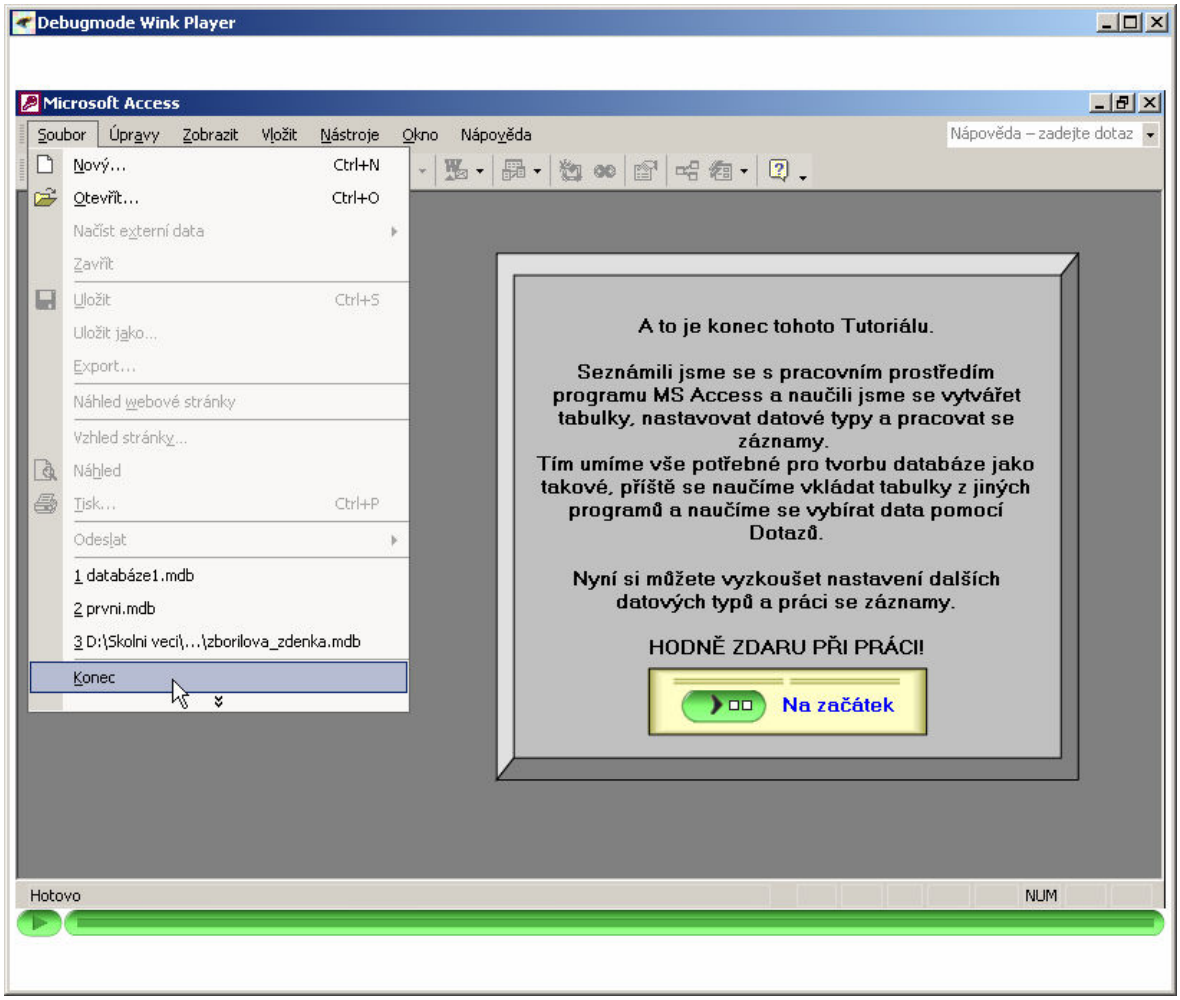

Fig. 17. Sample conclusion screen of the tutorial

13.3 Developed tutorials

There were developed video tutorials for following thematic units:

- Database system MS Access – 5 pieces
- Presentation using MS PowerPoint – 5 pieces
- Computer graphics – 2 pieces
- Webpage development – 7 pieces

CONCLUSION

The purpose of this diploma thesis was to propose the functional curriculum for education of subject IKT/ICT in second year of study in Technical lyceum field of study at SPŠS Vsetín, which would include all the changes prescribed to these documents due to launch of new framework education programmes (FEP). According to the proposal there should have been developed complete materials necessary for education of subject IKT/ICT in respective year of study.

The theoretical part of this work is organized hierarchically, so the reader can completely understand the solved problem and its structure. At first the reader is shortly familiarized with education system in Czech Republic, beginning at level of national education programme (NEP), over respective framework education programmes (FEP) and ending at the level of school education programmes (SEP). In next chapter there are shown the most important information from framework education programme for Technical lyceum, where the greatest accent is put on competencies and cross-curricular subjects. All the information is put into connection with education of subject IKT/ICT.

In remaining two chapters of theoretical part the author deals with problems of education process and conception of subject matter. In these parts there are described most often used and most suitable forms of education and teaching methods for education of subject IKT/ICT. Last but not least there are also described the goals of education, process of memorization – which is very important to understand in order to be able to develop suitable materials for education – ways of examination and also importance of assessment.

As is evident, the theoretical part covers all basic information about entire education system beginning at the level of national education programme and ending at the level of thematic unit and respective lesson. Therefore the theoretical part gives not only full-valued base for the practical part of this work, but can also serve as source of information for readers interested in these problems.

In practical part the reader is shortly familiarized with SPŠS Vsetín, under which patronage this work has been developed. Subsequently there is made an analysis of original curriculum and according to requirements of FEP there is proposed new curriculum together with defined outputs of SEP. Original curriculum is shown in Appendix 1 and the newly developed curriculum can reader see in Appendix 2.

After proposal of the curriculum there was a necessity to develop lesson system together with complete materials for education, which would fulfil the requirements of education, but will also fit students as most as possible. Author of this work had certain presumptions, but it was suitable to check these presumptions in practice. Because of that there has been given an orientation questionnaire to students which should find what methods and education forms students prefer. The questionnaire is shown in Czech and English version in Appendix 3 and Appendix 4 respectively. From result of this research there have been driven out some conclusions, which are in form of thesis introduced in following chapter. Results of the questionnaire are shown again in Czech and English versions in Appendix 5 and Appendix 6.

Remaining chapters of the work describe the way how there were integrated the key competencies and cross-curricular subjects into the process of education and what materials have been chosen for respective type of the lesson. There is also made a brief description of all thematic units with consideration of the lesson character. Finally there is shown the development process of materials and developed materials themselves.

Concrete results of this diploma thesis are then in form of new functional curriculum for subject IKT/ICT and complete materials for education of respective thematic units of the curriculum. During the work on this diploma thesis the content of prepared materials has been enhanced. In addition to originally prescribed presentations, assignments and test there were developed complex and easy-to-use video tutorials, which allow students to learn their individual speed and to completely understand the solved problem.

There have been developed following materials for education:

- 9 pieces of explanatory presentations
- 19 pieces of complex and clear video tutorials
- 10 pieces of assignments containing real-life problem situations
- 19 pieces of sample outputs
- 1 piece of examination test

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LIST OF ABBREVIATIONS

CCS	Cross-curricular Subjects
ECDL	European Computer Driving Licence
EXE	Executable file
FEP	Framework Education Programme
HDD	Hard Disc
HTML	HyperText Markup Language
ICT	Information and Communication Technology
IT	Information Technology
KC	Key Competencies
MS	Microsoft
NEP	National Education Programme
OS	Operating System
PC	Personal Computer
PDF	Portable Document Format
px	Pixel
SEP	School Education Programme
SWF	Shockwave Flash File
WWW	World Wide Web
WYSIWYG	What You See Is What You Get (HTML Editors)

LIST OF FIGURES

LIST OF APPENDICES

APPENDIX I: ORIGINAL CURRICULUM

Střední průmyslová škola strojnická Vsetín

Obor: 78-42-M/001 Technické lyceum

Tématický plán předmětu : **Informační a komunikační technologie**

Schváleno MŠMT ČR dne 7.7.1999, č.j. 24 959/99 s platností od 1.9.1999 počínaje 1.ročníkem.

Ročník: druhý Škol. rok: 2007/2008 Počet vyuč.hodin týdně: 3

Počet listů: 2

Poř. čís.	Tématický celek	Poč. hod.	Hodin kumul	Poznámky
1.	Opakování			
	Microsoft Word	3	3	
	Microsoft Excel	3	6	
2.	Microsoft Word – rozšiřování znalostí.			
	Vytváření formuláře technické zprávy.	2	8	
	Kreslení náčrtů strojních součástí.	2	10	
	Vkládání a úpravy textových polí, použití.	2	12	
	Výkresy z AutoCADu ve zprávách, úpravy.	1	13	
	Opakování, test.	1	14	
3.	Počítačová grafika.			
	Základní typografická pravidla.	1	15	
	Základní pojmy, vytváření barev (RGB, CMYK), rastrová a vektorová grafika, digitální fotografie.	2	17	
	Corel Draw – vektorová grafika - ovládání	1	18	
	Tvorba grafiky, možnosti úpravy.	2	20	
	Načítání grafických objektů, editace.	1	21	I. pololetí
	Psaní, úpravy textu, uložení textu na křivku, test.	2	23	
	Prostorové zobrazení, tisk.	2	25	
	Návrh grafického objektu (vizitka, plakát).	2	27	
	Vytvoření pdf souboru, samostatná práce, test.	2	28	
	Photoshop – rastrová grafika – ovládání, možnosti	1	29	
	Editace grafiky (ořezání, rozlišení, jas a kontrast…)	2	31	
	Vytváření koláží	2	33	
	Filtry a retušování	2	35	
	Samostatný projekt dle zadání, test	2	37	
4.	Databázový systém Microsoft Access.			
	Pojem relační databáze, použití databází.	1	38	
	Založení DB, tabulka, struktura .	2	40	
	Vkládání tabulek WORD, EXCEL.	2	42	
	Vkládání a úpravy dat, řazení dat.	2	44	
	Dotazy – výběr dat z tabulky, třídění.	2	46	
	Tvorba formuláře, možnosti tisku.	2	48	
	Opakování, test.	1	49	
	Samostatná práce.	3	52	

5.	Prezentace - Microsoft PowerPoint. Základní pojmy, snímek, práce se snímky. Tvorba textů, kreslení, aut. tvary, seskupování, rotace. Vkládání objektů – obrázek, graf, videoklip. Vkládání objektů – tabulka, organizační diagram. Animace, úprava prezentace, časování, předvádění. Samostatná práce – tvorba prezentace na zadané téma. Předvádění prezentace, hodnocení.	 2 2 1 1 1 3 2	 54 56 57 58 59 62 64	
6.	Programování WWW stránek, editor Front Page. Základy jazyka HTML. Struktura dokumentu , formátování textu. Hypertextové odkazy, obrázky a grafika. Seznamy a tabulky. Rámce, barvy a pozadí. Opakování, test. Front Page – ovládání a použití. Hypertextové odkazy, obrázky a grafika. Seznamy a tabulky. Rámce, barvy a pozadí. Samostatná práce – vytvoření WWW stránek na zadané téma. Hodnocení prezentací	 1 2 2 2 2 1 2 2 2 2 6 2	 65 67 69 71 73 74 76 78 80 82 88 90	II. pololetí
7.	Prohloubení znalosti výpočetní techniky. Číselné soustavy. Zobrazení dat v počítači. Kódování (ASCII tabulka).	 4 2 2	 94 96 98	
8.	Opakování, rezerva.	6	104	

Schváleno dne : 30.8.2007

APPENDIX II: PROPOSAL OF NEW CURRICULUM

Výstup RVP	Výstup ŠVP	Učivo	Souvislosti
Žák Vytváří, upravuje a uchovává strukturované textové dokumenty	***Žák*** • chápe důležitost správné formální úpravy oficiálních dokumentů a samostatně takové dokumenty vytváří • při tvorbě dokumentů vyhledává potřebné informace a prověřuje a posuzuje jejich kvalitu a věrohodnost	Opakování MS Word	Občanská nauka Český jazyk
Ovládá běžné práce s tabulkovým procesorem	• využívá tabulkový procesor pro usnadnění a zefektivnění každodenních činností, zejména při výpočtech a ilustraci jejich výsledků • při tvorbě dokumentů vyhledává, analyzuje a hodnotí potřebné informace a dokáže rozhodnout, zda jsou kvalitní a věrohodné	Opakování MS Excel	Matematika Ekonomika
Ovládá základní práce v databázovém procesoru	• samostatně provádí rozbor velkého množství informací, je schopen vybrat jejich podstatné části • samostatně kategorizuje dílčí informace a zdůvodňuje jejich rozdělení • při vyhledávání informací posuzuje a prověřuje jejich kvalitu a věrohodnost	Tvorba databáze v MS Access	
Vytváří jednoduché multimediální dokumenty v některém vhodném formátu	• samostatně vytváří prezentace odpovídající danému tématu • je schopen navrhnout vhodnou strukturu textu a barevných schémat	Tvorba prezentace v MS PowerPoint	Český jazyk
		Tvorba WWW stránek	Český jazyk Anglický jazyk Matematika

	pro dokumenty praxe • dokáže správně uspořádat prostor i čas pro práci • rozpozná vhodnost volby formálního či běžného jazyka • vlastními slovy ve stanoveném čase popisuje zadaný problém a reprodukuje informace s ním spojené, přičemž aplikuje prostředky multimediální techniky • navrhuje a vytváří dokumenty v souladu s uznávanými standardy a normami • provádí rozbor informačních zdrojů, samostatně vyhledává a posuzuje informace		
Zná základní typy grafických formátů, volí odpovídající programové vybavení pro práci s nimi a na základní úrovni grafiku tvoří a upravuje	• vlastními slovy specifikuje základní typografická pravidla • popisuje rozdíly mezi základními barevnými modely a grafickými formáty • je schopen pojmenovat charakteristické rysy vektorové a rastrové grafiky • uvědomuje si potřebu komprese dat a dokáže objasnit její princip • aplikuje teoretické znalosti při tvorbě grafických dokumentů a prokazuje schopnost práce s grafickými editory • kombinuje techniky práce s grafickými editory a samostatně modifikuje digitální fotografie	Počítačová grafika Adobe Photoshop, CorelDraw	Matematika Český jazyk Anglický jazyk

APPENDIX III: ORIENTATION RESEARCH – CZECH

DOTAZNÍK POSTOJŮ STUDENTŮ

Přečtěte si, prosím, následující tvrzení a označte, do jaké míry s nimi souhlasíte.

☺ - Souhlasím ☹ - Nemohu se rozhodnout ☹ - Nesouhlasím

Č.	Tvrzení nebo výrok	☺	☹	☹
1	Teoretické hodiny mě většinou nebaví			
2	Když jsou hodiny zajímavé, nevadí mi, že je v nich samá teorie			
3	Jsem raději, když v hodinách mluví převážně vyučující			
4	Rád(a) se během hodin aktivně zapojuji k tématu			
5	Je pro mě důležité, abych mohl(a) učivo ihned využít			
6	Naučená látka mi teď nic přinést nemusí, hlavně že mi v budoucnu usnadní práci			
7	Nejraději pracuji samostatně, ostatní by mi jen mluvili do práce			
8	Rád(a) pracuji ve skupině, protože „víc hlav, víc ví“			
9	Při samostatné práci mi na tématu nezáleží, mám raději jasné zadání			
10	Možnost výběru vlastního tématu mi usnadňuje samostatnou práci			
11	Při práci bychom neměli mít možnost spolupracovat, hezky každý sám za sebe			
12	Je dobře, když můžeme při práci na zadání spolupracovat, více se tím naučím			
13	Z hodin bych si měl(a) odnést co nejvíce nových informací			
14	Lepší je vědět, kde co najdu, než si spoustu informací přesně pamatovat			
15	Více si zapamatuji z toho, co si přečtu, než z toho, co slyším			
16	Pro zapamatování je nejlepší si všechno rovnou vyzkoušet			
17	Mám raději přesně vedenou hodinu, která probíhá přesně podle plánu			
18	Vyhovují mi hodiny, kde mám prostor pro vlastní tvorbu a vyjádření názoru			
19	Vyučující by měl být přísný a držet si odstup od studentů			
20	Vyučující by měl se studenty jednat jako s pracovními partnery			
21	Vyučující by měl být vážný, vtipy a příhody jen brání ve vzdělání			
22	Když je hodina proložena nějakou historkou nebo vtipem, odnesu si z ní více			
23	Raději mám jasné a přesné definice než obrazná přirovnání			
24	Dobré přirovnání nebo příklad z praxe mi pomůžou látku lépe pochopit			
25	Jsem raději, když se zkouší to, co vím (teorie), než to, co dovedu (praxe)			
26	Ve vyučování mi chybí / změnil(a) bych:			

APPENDIX IV: ORIENTATION RESEARCH – ENGLISH

STUDENTS ATTITUDES QUESTIONNAIRE

Please, read the following propositions and mark what opinion you state.

☺ - I agree ☹ - I can not decide ☹ - I disagree

No.	Contention or proposition	☺	☹	☹
1	I don't usually enjoy the theoretical lessons.			
2	If the lesson is interesting, does no matter that they contain nothing but theory.			
3	In lessons I prefer whet the teacher speaks the most time.			
4	I am glad when I have an opportunity to participate on the lesson.			
5	Immediate usefulness of subject matter is very important for me.			
6	The learned subject matter doesn't have to bring me something right now – important is that it will help me during further work.			
7	Individual work is what I like the most; the others should only bother me.			
8	I like to work in team, because "more heads = more knowledge"			
9	I prefer exact assignment to individual selection of theme during the work.			
10	Possibility using my own theme makes the work easier for me.			
11	During the work we should not cooperate – everyone all alone.			
12	It is good when we can cooperate during the work, because I will learn more.			
13	I should leave the lesson with as much new information as possible.			
14	It is better to know where to find the information than remember it exactly.			
15	I remember more when I read it than I hear something.			
16	To remember something it is better for me to try it in practice immediately.			
17	I prefer strictly led lesson, which goes exactly in accordance with the plan.			
18	Lessons where it is place to say my opinion or to make own creations fit me more.			
19	Teacher should be strict and keep distance from students.			
20	Teacher should act the students as work partners.			
21	Teacher should be sober, jokes and stories only hamper the education.			
22	When there is some story or joke during the lesson, I will remember more.			
23	I prefer exact definitions to figurative comparison.			
24	Good comparison or examples from practice help me to understand the matter.			
25	I prefer if the teacher examines what I know (theory) than what I can (practice)			
26	In the education I miss / would like to change:			

APPENDIX V: ORIENTATION RESEARCH – RESULTS ENG

☺ - I agree ☹ - I can not decide ☹ - I disagree

(in percents)

No.	Contention or proposition	☺	☹	☹
1	I don't usually enjoy the theoretical lessons.	69,2	15,4	15,4
2	If the lesson is interesting, does no matter that they contain nothing but theory.	92,3	0,0	7,7
3	In lessons I prefer whet the teacher speaks the most time.	30,8	23,1	46,2
4	I am glad when I have an opportunity to participate on the lesson.	69,2	15,4	15,4
5	Immediate usefulness of subject matter is very important for me.	53,8	7,7	38,5
6	The learned subject matter doesn't have to bring me something right now – important is that it will help me during further work.	69,2	7,7	23,1
7	Individual work is what I like the most; the others should only bother me.	15,4	15,4	69,2
8	I like to work in team, because "more heads = more knowledge"	84,6	7,7	7,7
9	I prefer exact assignment to individual selection of theme during the work.	23,1	15,4	61,5
10	Possibility using my own theme makes the work easier for me.	92,3	0,0	7,7
11	During the work we should not cooperate – everyone all alone.	0,0	15,4	84,6
12	It is good when we can cooperate during the work, because I will learn more.	92,3	7,7	0,0
13	I should leave the lesson with as much new information as possible.	69,2	7,7	23,1
14	It is better to know where to find the information than remember it exactly.	84,6	7,7	7,7
15	I remember more when I read it than I hear something.	15,4	30,8	53,8
16	To remember something it is better for me to try it in practice immediately.	84,6	15,4	0,0
17	I prefer strictly led lesson, which goes exactly in accordance with the plan.	15,4	15,4	69,2
18	Lessons where it is place to say my opinion or to make own creations fit me more.	84,6	7,7	7,7
19	Teacher should be strict and keep distance from students.	0,0	23,1	76,9
20	Teacher should act the students as work partners.	69,2	15,4	15,4
21	Teacher should be sober, jokes and stories only hamper the education.	15,4	7,7	76,9
22	When there is some story or joke during the lesson, I will remember more.	84,6	15,4	0,0
23	I prefer exact definitions to figurative comparison.	15,4	15,4	69,2
24	Good comparison or examples from practice help me to understand the matter.	100,0	0,0	0,0
25	I prefer if the teacher examines what I know (theory) than what I can (practice)	15,4	23,1	61,5
26	In the education I miss / would like to change: *more practice, more tolerance, teachers should know what they teach*			

APPENDIX VI: ORIENTATION RESEARCH – RESULTS CZE

☺ - Souhlasím ☹ - Nemohu se rozhodnout ☹ - Nesouhlasím

(v procentech)

Č.	Tvrzení nebo výrok	☺	☹	☹
1	Teoretické hodiny mě většinou nebaví	69,2	15,4	15,4
2	Když jsou hodiny zajímavé, nevadí mi, že je v nich samá teorie	92,3	0,0	7,7
3	Jsem raději, když v hodinách mluví převážně vyučující	30,8	23,1	46,2
4	Rád(a) se během hodin aktivně zapojuji k tématu	69,2	15,4	15,4
5	Je pro mě důležité, abych mohl(a) učivo ihned využít	53,8	7,7	38,5
6	Naučená látka mi teď nic přinést nemusí, hlavně že mi v budoucnu usnadní práci	69,2	7,7	23,1
7	Nejraději pracuji samostatně, ostatní by mi jen mluvili do práce	15,4	15,4	69,2
8	Rád(a) pracuji ve skupině, protože „víc hlav, víc ví“	84,6	7,7	7,7
9	Při samostatné práci mi na tématu nezáleží, mám raději jasné zadání	23,1	15,4	61,5
10	Možnost výběru vlastního tématu mi usnadňuje samostatnou práci	92,3	0,0	7,7
11	Při práci bychom neměli mít možnost spolupracovat, hezky každý sám za sebe	0,0	15,4	84,6
12	Je dobře, když můžeme při práci na zadání spolupracovat, více se tím naučím	92,3	7,7	0,0
13	Z hodin bych si měl(a) odnést co nejvíce nových informací	69,2	7,7	23,1
14	Lepší je vědět, kde co najdu, než si spoustu informací přesně pamatovat	84,6	7,7	7,7
15	Více si zapamatuji z toho, co si přečtu, než z toho, co slyším	15,4	30,8	53,8
16	Pro zapamatování je nejlepší si všechno rovnou vyzkoušet	84,6	15,4	0,0
17	Mám raději přesně vedenou hodinu, která probíhá přesně podle plánu	15,4	15,4	69,2
18	Vyhovují mi hodiny, kde mám prostor pro vlastní tvorbu a vyjádření názoru	84,6	7,7	7,7
19	Vyučující by měl být přísný a držet si odstup od studentů	0,0	23,1	76,9
20	Vyučující by měl se studenty jednat jako s pracovními partnery	69,2	15,4	15,4
21	Vyučující by měl být vážný, vtipy a příhody jen brání ve vzdělání	15,4	7,7	76,9
22	Když je hodina proložena nějakou historkou nebo vtipem, odnesu si z ní více	84,6	15,4	0,0
23	Raději mám jasné a přesné definice než obrazná přirovnání	15,4	15,4	69,2
24	Dobré přirovnání nebo příklad z praxe mi pomůžou látku lépe pochopit	100,0	0,0	0,0
25	Jsem raději, když se zkouší to, co vím (teorie), než to, co dovedu (praxe)	15,4	23,1	61,5
26	Ve vyučování mi chybí / změnil(a) bych: *Více praktických činností, více tolerance, učitel by měl vědět o čem mluví*			

APPENDIX VII: USED SOFTWARE

Software	*Used for*
Adobe Photoshop 6.0	Thematic unit 4, tutorials
CorelDraw 10	Thematic unit 4
Easy Editor 2005	Thematic unit 5
Foxit Reader 2.0	Viewing the pdf format
Internet Explorer 7.0	Thematic unit 5
IrfanView 4.10	Screenshots – Figures 14, 15, 17
Mozilla Firefox 2.0.0.14	Thematic unit 5
MS Access XP	Thematic unit 2, tutorials
MS Excel XP	Thematic unit 1
MS PowerPoint XP	Thematic unit 3, tutorials
MS Word XP	Output materials, text of this work
NVU 1.0	Thematic unit 5
Paintbrush 5.1	Figures 2-13, 16
PrimoPDF 2.0	Conversion of doc to pdf format
PSPad 4.5.3	Thematic unit 5, tutorials
Wink 2.0	Tutorials development

APPENDIX VIII: DEVELOPED MATERIALS

MS WORD

Assignment: Documents for practice (The life goes on after the high school)

Developed sample materials: Curriculum Vitae; Appeal for admission to a college; Application for employment; Letter of resignation; Envelope

MS EXCEL

Assignments: Calculation of net earnings (Boss the liar); Graphs of goniometric functions (Mathematical-physical institution); Register of HDD prices (Competitor analysis)

Developed sample materials: Calculation of net earnings; Graphs of goniometric functions; Register of HDD prices

MS ACCESS

Presentation: Databases

Tutorials: Foundation of the database, data, tables; Import of data; Queries; Relations; Forms and compositions

Assignment: Development of the database (Stolen equipment)

Developed sample material: First database

MS POWERPOINT

Presentations: Principles of presentation development; Principles of presenting

Tutorials: Foundation, image, background and basic modifications; Text modification and automatic shapes; Pictures, video, tables, graphs; Organization diagram; Small print, transitions, animations and presentation

Assignment: Development of the presentation (Upcoming conference)

Developed sample materials: Manually developed presentation; Presentation using template

COMPUTER GRAPHICS

Presentations: Graphics models; Colour formats; Compression

Tutorials: Basic operations and filters; Layers, retouch and collage

Assignments: Development of greeting card (Almost missed anniversary); Proposal and development of business card (Beginning of business); 18 pieces of photos

Test: Orientation test from computer graphics

Developed sample materials: Retouch; Collage; Picture; Photo

WEBPAGE DEVELOPMENT

Presentations: HTML Language; Basic Internet services; Frames

Tutorials: Structure and text; Images and background; Tables; Lists; Links and bookmarks; Frames; Validator

Assignment: Development of own webpage (Information society)

Developed sample materials: Simple webpage; Webpage using frames; HTML crib, Templates – Frames