National overview of the education system and the requirements/demands for natural sciences in the curriculum - SLOVAKIA

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Leonardo da Vinci Programme Transfer of Innovation Project
"Computer based Exercise Generation and Evaluation System for Mathematics, Physics and Chemistry Subjects – GENEXIS"

2008

GENERAL DESCRIPTION

To whom vocational educational institutions are subjected (what institutions provides funding for them, what institutions controls them):

Financing of vocational educational institutions in Slovakia is based on Law nr. 597/2003, nr. 523/2004, nr. 564/2004 and nr. 689/2006: Financing of Primary, Secondary and other school centers. Current law specifies three sources of financing for this type of schools:

- state (central),
- self-governmental region,
- local governance.

Institutions financed by Ministry of Education (State funding):

- all types of schools (including church school, special types of school,...),
- specialized educational institutions covered by Regional school office.

Approximately 94% of financial support is given based on number of students attending educational process (by all three sources of financing, key is based on type of school, number of students, number of schools in area,...) and 6% is based on specific results of school (quality marks, teacher assistants, disabilities of students, ...). Direct support is based on normative principle, system of equality of all types of schools.

Since September 2008 there will be large school curricular reform in Slovakia. Currently institutions under the control of Ministry of Education (National Institute for Education - http://www.statpedu.sk, State Vocational Education Institute - http://siov.cmsromboid.sk/,...) are responsible centrally for all curricula. Reform divides responsibility between national given educational plan (1st level) and local school educational plan (2nd level). It will empower autonomy and responsibility of regions and schools. Accordance with national plan will be controlled by State school inspection. Based on decreasing number of students on vocational schools (and all types of schools in general).

New reform divides education in schools, including vocational school into two study programs – national and program of local school. Reform is following this goals:

- not to teach students "everything"
- to understand student as learning subject
- give more responsibility in content to schools
- to change learning content in order to help to develop key competencies
- to provide environment in schools which will allow to be successful

Reform is based on National Educational Program which consists of three primary principles:

- Two-layered model of creation of educational content
- Education is targeting key competencies and outputs of students
- Selection of basic (minimal) learning content

Types of vocational schools in Slovakia [3]**:**

- stredná odborná škola(secondary professional school) – usually age 16 to 19; usually also prepares for higher education,
- stredné odborné učilište (secondary vocational school) – usually age 16 to 19; training center,
- združená stredná škola ('grouped' secondary school) – usually age 16 to 19; rare.

Statistics – schools number (students attending numbers) [3]:

Secondary professional schools + professional schools (stredné odborné školy + odborné školy):

- "public": 191 (74258) state, 35 (3974) private, 6 (1223) church, - (1178) external st. at these schools, 4 (2778) external schools; comprise:
    - in terms of school type: 81 industrial, 98 economic, 20 agricultural, 3 forestry, 1 librarian, 11 pedagogical, 10 conservatories, and 12 girls's professional schools; out of which:
    - in terms of the type of studies:
        - 8-years schools: rare, conservatories only
        - "superstructure" studies (nadstavbové štúdium): rare, 1-3 years, agricultural and pedagogical
        - 4-years school with a maturita: the rule
        - 5-years school with a maturita: rare
        - "higher" studies (vyššie štúdium): 3 years /conservatories 6 years
        - "post-maturita" studies (pomaturitné štúdium): 1-3 years
    - 1-3-years school without a maturita: rare, one pedagogical school only

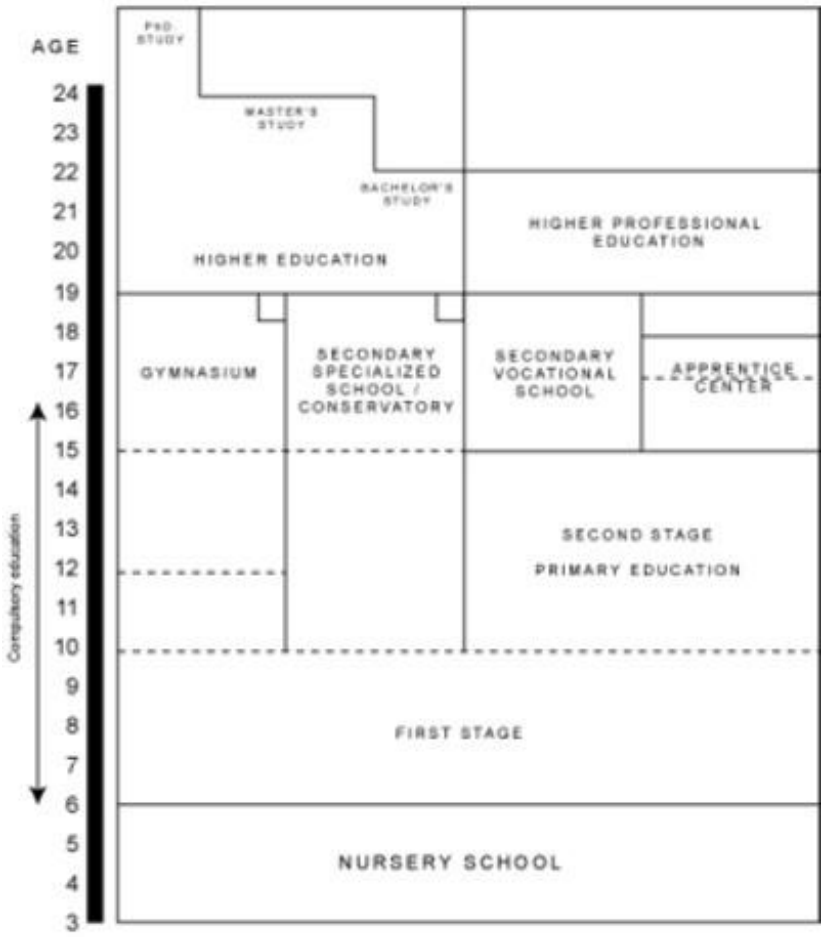
- professional schools of the Ministry of Health: 22 (6637) state, 8 (1441) church, - (2693) external st. at these schools
- professional schools of other ministries: 3 (1014) state, 1 (715) external school
"Grouped" secondary schools (združené stredné školy): 105 (62772) state, 3 (1310) private, 1 (656) church, - (1248) external st. at these schools; comprise:
- "superstructure" studies: 2 years
- 4-years school with a maturita
- 5-years school with a maturita
- "higher" studies: 3 years
- "post-maturita" studies: 1-3 years
- 1-3-years school without a maturita
- specially adapted curricula: 1-3 years
- gradual preparation (stupňovitá príprava): 1-3 years

Secondary vocational schools + vocational schools (stredné odborné učilištia + učilištia):202 (63886), 26 (8433), 5 (1206), - (3848) external st. at these schools; comprise:

- "superstructure" studies (nadstavbové štúdium): 2 years
- 4-years school with a maturita
- 5-years school with a maturita
- 2-3-years school without a maturita
- specially adapted curricula: 1-3 years
- gradual preparation: 1-3 years

STRUCTURE OF THE EDUCATION SYSTEM

SLOVAKIA



Source:

[1] Ministry of Education – Slovakia, <http://www.minedu.sk/index.php?rootId=41> [cit. 2008-06-25], only in SK lang.

[2] Ministry of Education – Slovakia, <http://www.minedu.sk/index.php? lang=sk&rootId=312> [cit. 2008-06-25], only in SK lang.

[3] Wikipedia contributors, "Education in Slovakia," Wikipedia, The Free Encyclopedia, <http://en.wikipedia.org/wiki/Education_in_Slovakia> [cit. 2008-06-25]

[4] Tvorba školského vzdelávacieho programu, National Institute for Education, [cit. 2008-06-22], <http://www.statpedu.sk/buxus/docs//kurikularna_transformacia/tvorbasvp.pdf >, SK language

What are the main topics in the educational programme for vocational schools in mathematics, chemistry and physics and what are the major methods of teaching (theoretical or practical exercises, laboratory works):

PHYSICS [5]**:**
Curricula for vocational school are based on allocation of 3 hours per week for whole study period. School is free to decrease or increase number of hours, but primary topics given by national curricula plan has to be presented. Content is divided into three parts:

- fundamentals – 81 hours in total
- extended lessons using modules – 93 hours in total (extra for schools with more than 3 hours of physics per week)
- laboratory works (theoretical and practical) – 18 hours in total

In standard way of teaching physics (no extended lessons) students will attend 99 hours of physics in vocational schools.

Thematic overview:
1, Physical quantity and units – approx. 3 hours
2, Mechanics – approx. 28 hours
3, Molecular physics and thermodynamics – approx. 14 hours
4, Electricity and magnetism – approx. 21 hours
5, Optics – approx. 8 hours
6, Fundamentals of physics of microcosms – approx. 7 hours
In total: 81 hours.

CHEMISTRY [6]**:**
Curricula for vocational school are based on allocation of 2 hours per week for whole study period. School is free to decrease or increase number of hours, but primary topics given by national curricula plan has to be presented. Content is divided into three parts:

- Essentials – min. 40 hours
- Selected (advanced) classes – max. 20 hours
- Laboratory works – min. 6 hours

In standard way of teaching physics (incl. selected content/classes) students will attend 66 hours of physics in vocational schools. Schools are free to combine advanced content based on number of hours per week. Advanced content is focusing on practical applying of theoretical knowledge into real life.

Thematic overview (Essentials):
1, Introduction to study of chemistry – approx. 1 hour
2, Atoms and chemical elements – approx. 5 hours
3, Periodic law and periodic table – approx. 2 hours
4, Chemical bonds, molecules, chemical compounds – approx. 5 hours
5, Names and formulas of inorganic compounds – approx. 7 hours
6, Mixtures and solutions – approx. 7 hours
7, Chemical reactions I. – approx. 6 hours
8, Chemical reactions II. – approx. 8 hours
In total: 40 hours

Thematic overview (Advanced classes):

1, Inorganic chemistry – nonmetals – approx. 10 hours
2, Inorganic chemistry – metals – approx. 10 hours
3, Essentials of organic chemistry – approx. 8 hours
4, Hydrocarbons a its sources – approx. 8 hours
5, Hydrocarbon derivatives – approx. 10 hours
6, Macromolecules – approx. 8 hours
7, Heterocyclic compounds – approx. 2 hours
8, Natural resources – approx. 10 hours
9, Biochemist essentials – approx. 6 hours
10, Chemistry in real life and chemical industry – approx. 8 hours
In total: 20 hours

MATHEMATICS [7]**:**
Curricula for vocational school are based on allocation of 8 or 12 hours per week for whole study period. But is real – schools are decreasing this number to 4 hours per week. National curricula plan is covered by topics but not so in deep. On vocational schools main goal is to build positive attitude to this subject. But this text will follow recommended study plan build by National Institute for Education. Plan is based and accommodated to this two variants:

- Variant A – 12 hours per week
- Variant B – 8 hours per week

Thematic overview		**Approx. amount of hours**	
		variant A	**variant B**
1.	Introduction to study of Mathematics	20	20
2.	Functions, equations and inequations 1	40	24
3.	Trigonometric functions a planimetry 1	42	42
4.	Functions, equations and inequations 1	48	40
5.	Analytic geometry	44	24
6.	Stereometry	35	24
7.	Combinatorics	24	10
8.	Statistics a probability	24	24
9.	Written exams	30	30
10.	Additional lessons of math	80	20
	In total	387	258

Planned number of weeks is 33 in one school year, in fourth year its 30. In every year 8 hours are planned for written exams and analysis of this exams.

In all three subjects – Mathematics, Physics and Chemistry – schools are free to increase or decrease amount of hours per week. Import point is to cover all topic presented in thematic overviews. School program is controlled by National Institute of Education, School inspection and commented by local authorities. Since new curricula reform will be reality there will by higher freedom given to local schools. But it's hard to tell more before reform will be implemented in real everyday practice.

[5] Učebné osnovy – Fyzika, National Institute for Education, [cit. 2008-06-22], <http://www.statpedu.sk/buxus/docs//Pedagogicke_dokumenty/stredne_skoly/osnovy/UO_F_SOS_a_SOU4.pdf >, SK language

[6] Učebné osnovy – Chémia, National Institute for Education, [cit. 2008-06-23], <http://www.statpedu.sk/buxus/docs//Pedagogicke_dokumenty/stredne_skoly/osnovy/UO_4roc_SOU_SOS_chemia.pdf >, SK language

[7] Učebné osnovy – Matematika, National Institute for Education, [cit. 2008-06-24], <http://www.statpedu.sk/Pedagogicke_dokumenty/SOS/Osnovy/Matematika_SOS.doc>, SK language

Total number of lessons in each subject per whole period of education at vocational schools; the total number of lessons in each subject in relation to number of all lessons (all subjects together):

Mathematics: 4 hours per week
Physics: 3 hours per week
Chemistry: 2 hours per week

Maximum number of hours for all topics is set to 33 per week [8]. Ratio to other subjects is for Mathematics 12%, Physics 9% and Chemistry 6%.

[8] Portál o reforme vzdelávania, Konzervatívny inštitút M. R. Štefánika, [cit. 2008-06-25], <http://www.noveskolstvo.sk/>, SK language

Amount of work for teachers – number of lessons per week, methodical work and extracurricular activities:

Number of lessons per week: 23
School hour length: 45 minutes
Time spent by teaching per year: 652 hours
Days spent by teaching per year: 189 [9]

Methodical work/Extracurricular activities: N/A

[9] Podmienky práce a platy učiteľov, Pedagogické rozhľady 2/2004, [cit. 2008-06-25], <http://www.rozhlady.pedagog.sk/cisla/p2-2004.pdf>, SK language

Teachers' basic education required for work at schools, further education offered, improvement of professional skills:

Teachers are asked to have university degree in selected topics. For technical topics teachers without education in pedagogy asked to attend pedagogical minimum. Further education is offered to teachers using State Vocational Education Institute (hundreds of courses). New reform will provide grade system also for teachers – more courses they will attend = higher salary.

ICT IN VOCATIONAL EDUCATION SCHOOLS

Significance of appropriate ministries in introduction and application of various technologies at vocational education schools:

Only one ministry is responsible for implementation of technologies into vocational schools – Ministry of Education of the Slovak Republic.

Which organization is responsible for application of technologies in vocational education schools:

Ministry of Education of the Slovak Republic – using its institutions:
1, National institute for education – curricular guidance
2, State Vocational Education Institute – support for teachers, improvement of teachers skills and further education
3, Institute of Information and Prognoses of Education – Infovek is part of this institute, HW and SW support for schools

Are there any programmes or projects aimed at introduction and application of ICT, computer facilities and training of teachers and pupils?

Infovek (InfoAge) - The aim of the project is to prepare the young generation in Slovakia for life in the information society of 21st century in order to prove competent in the knowledge economy, to create the preconditions for our young generation to be competitive on the forming global labour market, especially in comparison with the young people of the same age from the European Union.

The project concept stands on the following four pillars:

1. To equip every elementary and secondary schools (state, church or private) in Slovakia with a multimedia classroom with high quality Internet access
2. Development of a modern education curricula for general and specialised subjects at all types of schools
3. Training of tens of thousands of teachers in integrating modern information and communication technologies and their application into education
4. Building information society – providing Infovek classrooms to the local community for the development of the digital literacy of the inhabitants of all regions in Slovakia in the time they are not used by the school for the purpose of life long learning and education.

The Infovek project successfully started the process of information technology development not only in the sector of the elementary and secondary schools in Slovakia, it also plays an important role in the change of the entire society to an information society. The interest of both experts and wide public in the project both at home and abroad speaks loud about the necessity of the project. Slovakia as one of the thirty most developed countries of the world and also as the OECD member must not stay behind in the area of development of modern information and communication technologies and building of information and knowledge economy. Therefore it has to invest in this particular area of education of our young generation.

INFOVEK website: www.infovek.sk
SANET website: www.sanet.sk
eSlovakia website: http://www.telecom.sk/En/Default.aspx?CatID=31

SITUATION AT VOCATIONAL EDUCATION SCHOOLS

Are ICT used in learning process; in what ways:

Yes. In vocational schools there is mandatory topic Informatics – number of hours per week varies based on type of school. At minimum it's two hours per week for one year. In specialized types of school its more hours per week and for whole 4 (3) years.

Problem is with limited access to ICT resources in other subjects than Informatics. Only 22% of other subjects uses ICT as tool for teaching. And 30% of teacher confirmed they do not uses ICT at all in teaching.

Source: http://www.euractiv.sk/vzdelavanie0/clanok/skoly-a-internet-slovensko-na-chvoste-eu

Number of computers in vocational education schools (x per 100 people):

On vocational schools in Slovakia number of computers per 100 students is 9,2 and 7,4 with internet access.

Source: http://www.euractiv.sk/vzdelavanie0/clanok/skoly-a-internet-slovensko-na-chvoste-eu

Are there separate computer rooms in each vocational education school, are they easily accessible?

Yes. Schools have separate rooms – but in most cases access is limited to Informatics lessons and after school activities – guided by teacher.

Is there a separate classrooms for subjects of mathematics, physics and chemistry:

Yes, vocational schools have separate rooms for mathematics, physics and chemistry.

Material and technical equipment of the classrooms of physics, chemistry and mathematics (are there necessary technical and practical aids, is there a separate laboratory and assistant):

Laboratories are equipped with technical equipment necessary for experiments given by curricula. No special assistants are used, teaching is guided by teachers. Exceptions are on specialized types of vocational schools – on chemistry, physics, mathematics – as curriculum requirements and difficulty raises. Its hard to specify all equipment in this document.

What type of teaching aids and materials are used in teaching of mathematics, physics and chemistry:

For mathematics there are many books available with game based activities, educational software is also available from Infovek project (http://www.infovek.sk). In chemistry there are labs available for elementary experiments and also software MIXChemie. For physics there are lot of books and software are available. Students mainly uses books for their studies and experiments are part of classes in schools. Extra teaching materials are rare in these three topics.

Is there any information about further education or work carrier of graduates (how do they use the gained knowledge):

Statistics (2007) shows that in year 2005/2006 finished 56 859 graduates. 25 024 graduates continued to university – its equal to 44%. In average 5,4% to 11,4% become unemployed. For example graduates from vocational schools with maturita 10,4% is unemployed and gratuates without maturita its 10,1%. In compare to professional schools number is equal to 8,3%.

Source: http://www.uips.sk/sub/uips.sk/images/JH/Uplatnenie_A07.xls

THE OPINIONS

The general opinion of teachers – where do they get the materials for work, do they use any personal materials, how often they use ICT and is it convenient for them, what is the general situationin preparation and application of exercises:

There are three main sources for teacher to get materials for work:
1, Regional school offices (curriculum guidelines, qualified support on phone, discussions)
2, Trainings - State Vocational Education Institute (hundreds of courses). New reform will provide grade system also for teachers – more courses they will attend = higher salary.
3, Internet sources. On national level it is special educational software for simulations, calculating, interactive lessons, encyclopedias – by Infovek (InfoAge) project (http://www.infovek.sk).

Teacher are free to use any personal material if it not harmful or danger for students and has educational potential. Utilisation of ICT depends on teacher – younger generation of teachers prefers ICT and interactive type of education. Also number of practical exercises depends on teacher and his/her enthusiasm in teaching.

The general opinion of employers – what do they expect and what is the real knowledge of graduates of vocational education schools; is the knowledge sufficient and are they capable to use them in practice:

Providing of education behaves as marketplace in Slovakia. As number of your pupils is due to demographic changes (decreasing number of birthrate) decreasing - schools with low number of pupils are in risk of closure. So schools are trying to be the best in region in order to be attractive for students – as number of students increases – amount of money increases also. There is per student financing mechanism in Slovakia. It is hard to measure quality of practical knowledge gained during study – but one of parameters is number of unemployed pupils after finishing the school – statistics are mentioned above. More number are available here: http://www.uips.sk/sub/uips.sk/images/JH/Uplatnenie_A07.xls [only in Slovak language]

The general opinion of pupils – how often ICT are used in teaching process, is it successful, does it ease the digestion of the particular themes; do they get all needed information and are the materials understandable:

There are no surveys of this type available. But in general pupils are interested in new forms of education and prefers non-traditional access. Based on random questions asked for this survey students are not satisfied with frequency of utilisation of ICT in schools. Specifically it is valid for mathematics, physics and chemistry.

Please define the general opinion of teachers, employers, pupils - in what area of teaching process use of ICT give more effectiveness:
In general teachers welcome advantages of ICT but its difficult to implement it fully into real teaching process. Classrooms for chemistry, physics and mathematics are not equipped with computers for every pupil (only one for teacher at maximum). ICT would be great for using of various simulation tools – in order to improve imagination and to memorizing. Pupils prefers implementation of ICT to all topics. Modern technologies brings their attention. Employers are well aware of need for new technologies but they are limited by finances. Common problem is also with some teachers (mostly older) – their computer illiteracy reflects into lack of interest to this new forms of education.