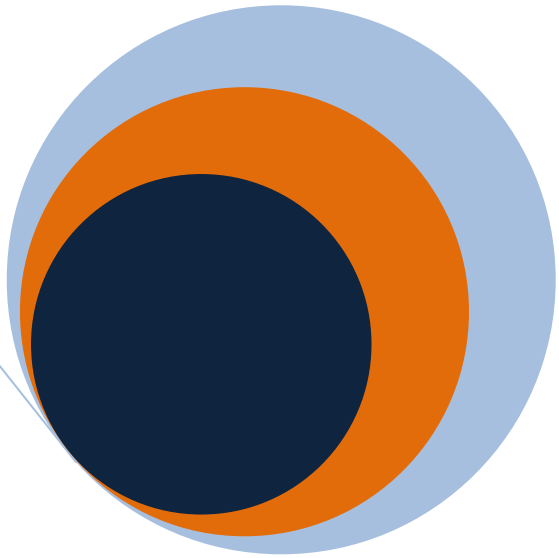
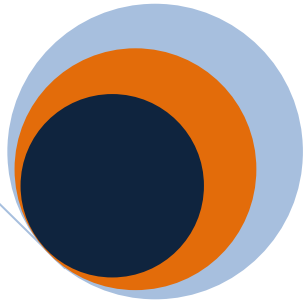


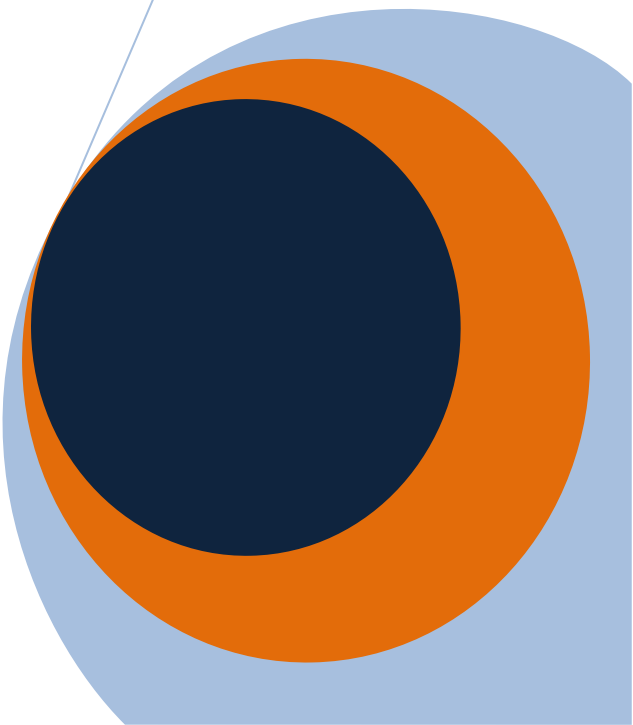


National overview of the education system and the requirements/demands for natural sciences in the curriculum - ESTONIA

Prepared by Baltic Innovation Agency

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

2008

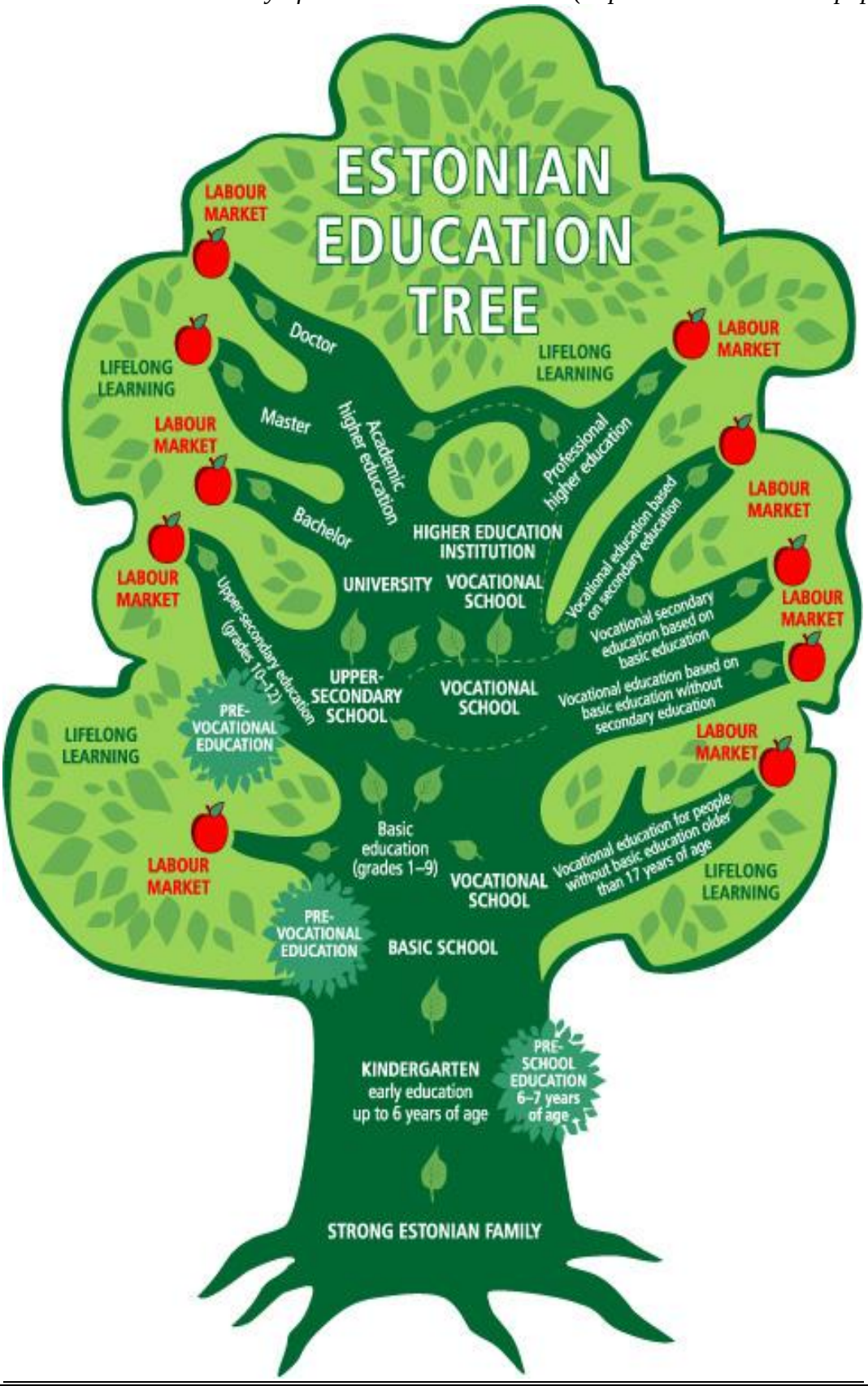


	GENERAL DESCRIPTION
1	**Define what 'vocational' or 'work-related' education means in your cultural context**
	The term "vocational education" includes **vocational, special and professional education in all forms**. • The types of vocational education **within formal education** system are the following: **basic vocational training, secondary vocational education, applied higher education**. • Various training sessions and courses are organized **outside the formal education** system and in all these vocational study-programmes practical training constitutes at least 25% of curricular time and work placement not less than 25%. **<u>Vocational education within formal education</u>** **Basic vocational training:** for persons without basic education and beyond compulsory school attendance age (17 years), vocational education without the requirement for basic education was implemented since the academic year 2006/2007. Along with the acquisition of professional skills it is also possible to continue general education studies for the acquisition of basic education. Vocational education on the basis of basic education is a type of education where, in addition to a profession, only general education subjects related to the profession are taught. Student's level of education (basic education) does not change. The study period is 0.5 to 2.5 years. **Secondary vocational education** is carried out on the basis of basic education in the course of which both the profession and upper secondary education are acquired. The duration of studies is minimum 3 years, which is 120 study weeks. Since the academic year 2006/2007 it is possible for students graduating from vocational educational schools, having acquired secondary vocational education, to continue their general education studies in upper secondary schools for adults or upper secondary schools with a department for evening studies or distance learning to the extent of 35 weeks. This so-called additional year is voluntary and its objective is to enhance the competitiveness of students who have acquired secondary vocational education, so that they could continue their studies in **higher education** and pass the required state examinations. In the named additional year of studies students do not need to pay tuition fees.

After secondary education is acquired, students have **three possible options** for further studies.
A. In vocational educational system:
* vocational educational institution –vocational education (0.5-2.5 years) or professional higher education (3-4.5 years) is acquired;
*institution of professional higher education, colleges of universities – professional higher education (3-4.5 years) is acquired;
B. In academic education:
*university – academic education is acquired (Bachelor's degree (3-4 years) > Master's degree (1-2 years) > Doctor's degree (3-4 years)).

In the academic year 2006/2007, **the total number of vocational education students in formal education system amounted to 29,000.**
Sources:

- *Innove "Financing: investment in human recourses Estonia" (http://www.innove.ee/ee/files/Financing.pdf)*
- *Estonian ENIC/NARIC, 2006. Factsheet "Vocational Education and Training Estonia."*
- *Estonian Ministry of Education and Research. „Vocational Education" (http://www.hm.ee/index.php?148658)*

	Estonian Education Tree *Source: Estonian Ministry of Education and Research (http://www.hm.ee/index.php?148625)* 
2	**Explain the institutional/political framework within which work-related education takes place – who delivers it, who funds it, who controls it etc**

Delivering Vocational Education

In 2007, there were **48 vocational educational institutions in Estonia**, 34 of which are **state** vocational educational institutions, 3 **municipal** vocational educational institutions and 11 **private** vocational educational institutions.

In recent years many vocational education institutions have merged into **regional vocational education centres** that enable to unite resources as well as competence in a certain area to ensure the quality of vocational education.

Supervision

Depending on the field of study, state vocational education institutions are subject to the supervision of the **Ministry of Education and Research, the Ministry on Internal Affairs, the Ministry of Defence or the Ministry of Social Affairs**.

The **Ministry of Education and Research** (*Eesti Vabariigi Haridus- ja Teadusministeerium*) is responsible for the whole domain of education, including initial vocational education, and is the main co-ordinating body for management of the education system. Alongside the Ministry of Education and Research, the **county** is the other main state supervisory body that shall exercise state supervision over the schooling and education in schools. These state supervisory agencies, in turn, have the right to involve experts in the exercise of state supervision.

In the general quality management of the education system, the Council of Rectors of State Applied Higher Education Institutions and Higher Education Quality Assessment Council (*Kõrghariduse Hindamise Nõukogu)* are important actors. Their role is to assess and decide wheter an institution of higher learning and its curricula meet the requirements laid out in relevant legislative and regulatory documents.

Funding

The organization of the financing of **state and municipal vocational schools** is regulated by the Vocational Education Institutions Act. Vocational education institutions are financed from:
- state budget and the budgets of local governments;
- revenue from foundations;
- fee-charging services related to the main activities of schools;
- other sources.

For municipal schools the state budget covers the costs of teachers' salaries, administrative staff and educational expenses. The school maintenance costs must be covered by the local government budget.

Private vocational schools are financed from the state budget similarly to public vocational schools, but the cost of a student place is financed from the state budget only to the extent of the cost of the salaries of teachers and study aids. Other costs are covered by the owner of the school.

The EU Structural Funds have also been widely used for support of establishing and reorganising vocational educational institutions.

	Sources: • *Estonian Ministry of Education and Research. „Vocational Education" (http://www.hm.ee/index.php?148658) and „Funding"* (http://www.hm.ee/index.php?148629) • *Archimedes Foundation. „Factsheet: Vocational Education and Training. Estonia"* (www.archimedes.ee/enic/File/Fact_sheet_16_Vocational_education.pdf) • *The Estonia Page "Education in Estonia"* (*http://www.esis.ee/ist2000/einst/culture/education.htm#Funding%20of%20the%20educational%20system*) • *Innove. "Financing: investment in human recourses Estonia" (http://www.innove.ee/ee/files/Financing.pdf)* • *International Association of Universities from Estonian ENIC/NARIC (http://www.unesco.org/iau/onlinedatabases/index.html)*
3	**What are the main topics in the educational programme for vocational education providers in mathematics, chemistry and physics and what methodologies are used (theoretical or practical exercises, laboratory work):**
	General mathematics, chemistry and physics are taught in most of the secondary vocational educational institutions. In professional training, those subjects are taught in **specialized ways** - e.g. *physics of construction, chemistry of construction, specialized mathematics, introduction to higher mathematics* etc. The Ministry of Education and Research shall prepare the national curricula for vocations or professions in co-operation with social partners of the vocational education system on the basis of the vocational education standard and professional standards. The national curricula shall be established by a regulation of the Minister of Education and Research. (*24.11.2005 entered into force 01.01.2006 - RT I 2005, 65, 498*) Some examples of some national curricula that include (specialized) mathematics, physics and/or chemistry: National curriculum for Construction (http://www.riigiteataja.ee/ert/act.jsp?id=12940025); National curriculum for land-surveying (http://www.riigiteataja.ee/ert/act.jsp?id=12940018); National curriculum for Chemistry and Process technology (http://www.riigiteataja.ee/ert/act.jsp?id=12921224); National curriculum for car experts (http://www.riigiteataja.ee/ert/act.jsp?id=12862900). The number of specialized mathematics, physics and chemistry lessons varies across professions and it is difficult to bring out any specific average or norm. *Source: The National Examinations and Qualifications Centre. "Üldharidusained kutseõppeasutustes"* (http://www.ekk.edu.ee/valdkonnad/kutseharidus/kutseoppeasutuse-uldharidusainete-ainekavad)

4	**Total number of lessons in each subject per all period of subject learning at this speciality at vocational schools; the total number of lessons in each subject in relation to number of lessons overall (all subjects):**
	In regular schools (hours per week): • 10. grade: chemistry 2, physics 2, mathematics 3. • 11. grade: chemistry 1, physics 2, mathematics 3. • 12. grade: chemistry 0, physics 1, mathematics 3. *Minimum workload on secondary level 32 hours per week.* **In vocational educational institutions** (in study weeks): • mathematics 4 (1/10 of total volume*) • chemistry 2 (1/20 of total volume) • physics 3 (3/40 of total volume) *Overall volume of general subjects in secondary level is 40 study weeks. 1 study week = 40 study hours. *Source:* *The National Examinations and Qualifications Centre "General subjects in vocational education institutions" (based on the National Curriculum of Basic and Secondary Education)* (http://www.ekk.edu.ee/valdkonnad/kutseharidus/kutseoppeasutuse-uldharidusainete-ainekavad)
5	**Teaching load – number of lessons per week,** methodology preparation **work and extracurricular activities:**
	Full-time teacher should work at least 35 hours per week – this includes teaching in classes (in average 22 hours per week), preparing for classes and tests controlling. **NB**: many schools use study process based on study periods. This means that workload for teacher varies across periods. The timing of periods also varies across schools. *Sources:* • *Ministry of Education and Research (http://www.hm.ee/index.php?popup=download&id=4062)* • *Interviews with teachers & other representatives of educational system*
6	**Describe the qualifications requirement for teachers; opportunities for improving subject knowledge and CPD (continuing professional development) provided** In Estonia, there are **two types** of teachers in vocational schools: general education teachers and vocational teachers, respectively. The previous division between theoretical and practical vocational teachers was abolished in 1995. Starting 1 September 2003, **all vocational teachers must have higher education, a pedagogical background and professional work experience.** This requirement may be fulfilled through either (i) a pedagogical higher education and two years of professional experience in the field taught or (ii) a higher education in the field taught and two years of professional experience as well as a course of 160 hours of vocational-pedagogy which must be started at the latest during the first year of employment as a teacher.

	In 1999 it was made compulsory for all vocational teachers to do a traineeship in industry at least for a two-month period every three years in order to ensure that teachers are acquainted with the latest developments in their sector. Furthermore, vocational teachers must participate in 160 hours of training every five years. *Source: European Training Foundation. "Teachers and Trainers in Vocational Education and Training in the Future Member States"* (www.see-educoop.net/**education**_in/pdf/voca-future-members-oth-enl-t05.pdf)
7	**Explain the exam framework (internal and external), monitoring and-, laboratory based assessment activities among vocational education providers?**
	In chemistry, physics and mathematics there are no exams for testing general knowledge in vocational schools. Specialized exams are organized, mostly in the form of traditional written exams. Web-based exams are sometimes used, but these are carried out in a regular classroom setting (all students are physically in the same room) in order to maintain control over the process. Usually laboratory based assessment activities are not used (except in some chemistry-based curricula). In **general schools**, examination period is usually at the end of the school year. In 9th and 12th grade, most of the students take exams in Mathematics. In 12th grade, pupils have to pass 5 final exams – at least 3 have to be national exams and the other 2 can be both school-organized or national exams. It is compulsory to take a written exam in Estonian language but all other subjects can be chosen by the student. *Sources:* • *The National Examinations and Qualifications Centre. "State Examinations"(http://www.ekk.edu.ee/oppurile/riigieksamid)* • *Interviews with teachers & other representatives of educational system*
8	**How long does it take a teacher to prepare an exam, mark it or to supervise and evaluate laboratory based assessement?**
	To provide a somewhat subjective assessment, preparation of one exam and marking it takes about four times the time of the exam itself. *Source: Interviews with teachers & other representatives of educational system*
9	**Could GenExis be used to improve systems/resource use and learning outcomes?** In principle, yes. The main questions are a) content (e.g, to be used in specialized professional training, the subjects/ exercises in GenExis have to be specialized as well), b) functionality and user friendliness (including such aspects as easy access over the Internet, interoperability with other systems (e.g web-based exercise repositories), c) price.

	NB: there are already some very good – <u>web-based and free to use</u>! – programs/platforms available. See for example WIRIS (http://www.wiris.ee/) - a program developed by a mathematical software company Maths for More in Spain (http://www.mathsformore.com/). **Because of that, many teachers are sceptical about using GenExis in future.** *Source: Interviews with teachers & other representatives of educational system*
10	**What systems of monitoring/testing/examination do vocational education providers use?**
	Vocational education providers in Estonia use mainly traditional monitoring, testing and examination systems. ICT-based tests are used e.g. in entrance examination (because of large numbers of examinees and the need to get results fast). E.g. APSTest (http://www.ce.ut.ee/apstest), IVA web-based work environment and other similar solutions are used. *Source: Interviews with teachers & other representatives of educational system*

	ICT IN VOCATIONAL EDUCATION SCHOOLS
11	**Significance of government/relevant ministries in introducing and promoting sue of new technologies within work vocational education providers:**
	Ministry of Education and Research holds the main responsibility in developing the IT infrastructure of vocational education system. A special agency**, Estonian Information Technology Foundation** (EITSA) has been very actively involved in promoting new technologies. **Estonian e-Learning Development Centre**, a structural unit of EITSA, administers two consortia planning and developing e-learning in Estonian higher and vocational education: • **Estonian e-University** - www.e-uni.ee (founded in 2003) • **Estonian e-Vocational School** - www.e-vet.ee (founded in 2005) The **Tiger Leap programme**, administered by the Tiger Leap Foundation (www. Tiigrihype.ee) is a national specific programme launched by the Estonian Government with an aim to increase Estonian school education quality utilizing modern information and communication technology. The programme is funded from the national budget via Ministry of Education. By today the Tiger Leap programme 1997–2000 and Tiger Leap Plus development plan 2001–2005 are put into practice. The objective of Tiger Leap programme (1997–2000) was to modernize ICT infrastructure of educational establishments, but the next programme Tiger Leap Plus already highlighted ICT competency assurance for all students and teachers. Both programmes supported innovative e-learning initiatives of schools, universities and other institutions. Focus of the Learning Tiger development plan 2006-2009 is mainly on e-learning and various e-learning related content services development. Main objective of this development plan is to increase curriculum quality and effectiveness utilizing ICT and introducing e-learning as a part of daily curriculum. According to statistics gathered by Tiger Leap Foundation (TLF), 75% Estonian teachers have participated in TLF´s ICT training “Computer in school” (volume: 40 hours). *Sources:* • *Estonian Information Technology Foundation, www.eitsa.ee* • *Tiger Leap Foundation, www.tiigrihype.ee*
12	**Which organization is responsible for application of technologies in vocational education providers:**
	Please see the previous answer. **NB: irrespective of the activites of the above mentioned agencies, each school still holds the main responsibility in upgrading its infrastructure and developing the relevant knowldege base!**

13	**Are there any programmes or projects aimed at introduction and application of ICT, computer facilities and training of teachers and pupils?**
	The **Tiger Leap Programme** (please see above) is the most important instrument. As a result of that programme, every school in Estonia is today equipped with computers and connected to the internet. Some recent Tiger Leap programme initiatives focused on teacher training involve projects like DigiTiger, Project Kit, TechnoTiger and AnimaTiger. DigiTiger is targeted to subject teachers who have already mastered basic knowledge of information technology and are willing to utilize this knowledge actively in curriculum (http://www.tiigrihype.ee/?op=body&id=49). AnimaTiger project comprises trainings to the teachers of the Estonian schools of general education, introducing the essence of animation and its modern application possibilities (http://www.tiigrihype.ee/?op=body&id=48). Project Kit is meant for teachers who are willing to make their classes more attractive using project-based learning methods and information technology tools (http://www.tiigrihype.ee/?op=body&id=47). TechnoTiger is targeted to computer-, arts- and handicrafts teachers to teach how design and technology can be connected (http://www.tiigrihype.ee/?op=body&id=50). **Estonian e-Vocational School** is a platform developed by EITSA, which allows vocational educational schools to develop and carry out e-courses, work projects and preparatory studies for teachers. Participation in the e-Vet is voluntary; however, the consortium today covers 87% of the total number of students in vocational educational system of Estonia. In 2007, the share of e-courses in the Estonian e-Vocational School consortium amounted up to 2% of total volume of courses in the vocational schools. In the framework of the project **e-KEY** (e-VÕTI), funded by the European Social Fund, in total 23 different mathematics and physics e-courses have been developed by today. *Sources:* • *Estonian e-Learning Development Centre, www.e-ope.ee* • *Estonian e-Vocational School, www.e-vet.ee* • *Tiger Leap Foundation, www.tiigrihype.ee*

	SITUATION within vocational education providers
14	**Is ICT used in learning process; if so in what ways:**
	E-learning is mostly used as a **support to lectures**, which entails use of some ICT equipment and making materials available on the web. Teachers use various ICT devices in lessons (e.g. computers, smart-boards, data-projectors etc). According to a study conducted by TNS Emor Estonia in 2006, **60%** of all teachers in Estonia had used a computer in their **teaching activities in 2006** (EU average is 74%; in Latvia 35%, in Finland and Denmark respectively 85% and 95%). According to the same study, **73%** students claim they have used ICT in some subject, different from computer lessons Some of the most commonly used platforms and programs in vocational education institutions in Estonia: • IVA, www.htk.tlu.ee/iva • Moodle, www.moodle.org • WIRIS, http://www.wiris.ee/ • APSTest (http://www.ce.ut.ee/apstest • Estonian e-Vocational School, www.e-vet.ee **Vocational educational schools mainly use programs available free of charge** (freeware). *Sources:* • *TNS Emor & Empirica. "Benchmarking Access and Use of ICT in European Schools 2006" (http://ec.europa.eu/information_society/newsroom/cf/itemlongdetail.cfm?item_id=2888)* • *Interviews with teachers & other representatives of educational system*
15	**How many computers do vocational education providers have (x per 100 people):**
	According to EHIS (Estonian Education Infosystem) there were 20,1 pupils per one computer in 2005/06. In 2006/07 there were 16,8 pupils per one computer. (http://www.ekk.edu.ee/ehis/)
16	**Are there separate computer rooms in each vocational education providers; are they easily accessible?**
	Yes, usually school have separate computer classrooms. The accessibility to computers in the schools is however limited by the student/computer ratio – see question nr 15. If there are as many as 4-5 pupils per one computer, the practical use of computers in teaching activities is limited. *Source: Interviews with teachers & other representatives of educational system*
17	**Are there separate classrooms for mathematics, physics and chemistry:**
	All bigger schools with better opportunities have separate classrooms for mathematics, physics and chemistry. Unfortunateley, detailed statistical data is not available on that issue.
18	**What sort of Material and technical equipment is provided in physics, chemistry and mathematics classrooms (are essential technical and practical aids provided; is there a separate laboratory and lab assistant):**

	Larger and better-equipped schools usually have o**ne computer and data projector** per (maths/physics/chemistry) classroom. **Smart-boards** are also effectively used for teaching mathematics, physics and chemistry. Generally there are no separate laboratories and lab assistants. *Source: Interviews with teachers & other representatives of educational system*
19	**What type of teaching aids and materials are used in the teaching of mathematics, physics and chemistry:**
	Generally, very traditional teaching aids and materials are used - published textbooks, workbooks + self-developed exercise collections etc. The e-learning component is increasing but the proportion compared to traditional means still remains relatively low. *Source: Interviews with teachers & other representatives of educational system*
20	**Is there any information about further education or graduates' work careers (how do they use acquired knowledge):**
	It is very difficult to answer that question – i.e. to assess how the specific knowledge acquired in school is put into practice at work. Unfortunately, no reliable aggregate statistics is available about further education or graduates' work careers. However, based on information gathered by single schools and examining the vocational educational schools web-pages, the unemployment rate of the graduates remains under Estonian average. However, according to conversations with various representatives of vocational education institutions, there definitely is enough room for improving the pupils´/students´ maths, chemistry and physics skills.

	THE OPINIONS *Main source for answers in this block: Interviews with teachers & other representatives of educational system*
21	**The teachers' view – where do they get materials for work, do they use any personal materials, how often do they use ICT and is it convenient for them, what is the general situation regarding preparation and application of exercises:**
	As pointed out above, to a large extent very traditional teaching aids and materials are used - published textbooks, workbooks, some self-developed exercise collections etc. However, there is great willingness to use more IT in teaching/study process – both from the teachers´and especially from the pupils´side. **As a relatively new initiative, a web-based repository of commonly shared exercises and web-based materials is being developed by a** (please see the web-page of Estonian community of Maths teachers, http://mott.edu.ee/component/option,com_remository/Itemid,28/). The leaders of modern ICT based teaching and study process consider it very important that all new programs that are to be used in teaching, would be able to communicate with such central repositories – **interoperability with other systems is seen as a critical factor in adopting new programs like GenExis.** Despite some progress in modernizing the study process, it has to be noted, that the difficulties with technical resources (not enough computers in schools) as well with human resources still remain. Most of the teachers older than 50-years (in 2007/08 approximately 46% of all teachers in vocational education schools (data by Ministry of Research and Education, http://www.hm.ee/index.php?popup=download&id=7524) would need further training in using the modern ICT tools.
22	**The Employers' view – what do they expect and what is the real knowledge of the graduates of work related learning providers; is the knowledge sufficient and are they capable to use it in practice:**
	Unfortunately there are no studies available that would provide a sufficient answer to that question. It is commonly believed that the Estonian labour market needs more professionals that have gone through vocational training and also that the preparation of many of the current graduates does not measure up to labour markets needs. The most important aspect from the employers´ perspective is that the employee performs well in the specific conditions of the specific organization – as such, specific skills, that are often acquired not in school but at the workplace, are more important to the employers. However, this does not lessen the importance of schools – sufficient basic and general knowledge is absolutely vital in order to be able to deal with the specific challenges of the future work-place. This means that **the general knowledge-level of graduates of the vocational education institutions and their studying skills have to be significantly improved in order to meet the needs of the modern companies.**
23	**The pupils's view – how often is ICT used in the teaching process, is it successful, does it facilitate the learning of particular themes; do they get the necessary information and are the materials understandable:**

	According to the interviews, in bigger schools the estimated **proportions** between traditional and ICT-based teaching is about **80/20 per cent.** From students´ side there is great willingness to involve in untraditional study process. According to teachers, students of vocational schools welcome new innovative solutions and more interactive tasks which would make learning process more interesting and lively.
24	**Please define the general opinion of teachers, employers, pupils - in what area of the teaching learning process is the use of ICT most effective:**
	The **most important issue** is the ICT-tools **compatibility with the needs of the national education system and the curricula. CONTENT is the absolutely vital issue.** To point out some concrete subjects or fields, GenExis is seen useful in tasks involving functions, geometrical exercises and all schematic exercises, where a large number of tasks can be generated fast and easy The main value of GenExis is seen in the students´ possibility to practice independently; the program is not considered to be very suitable of helpful in classroom teaching.