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COMPARISON OF RUSSIAN AND
FINNISH EDUCATIONAL SYSTEMS
AT UNIVERSITY LEVEL

Education in the field of HVAC

Bachelor's thesis


Building Services Engineering
Double Degree Program



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DESCRIPTION

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Author(s) Natalia Vasilyeva		Degree programme and option Building Services Engineering Double Degree Program	
Name of the bachelor's thesis Comparison of Russian and Finnish educational systems at university level. Education in the field of HVAC			
Abstract <p>The subject of the project was comparison of Russian and Finnish educational systems of higher education in the field of HVAC. The system of higher education in Russia is represented by federal, municipal, and private universities and institutions. Higher education in Finland is provided by special institutions, vocational institutions, polytechnics, and universities.</p> <p>The thesis presents literature review of various sources like books, reports, and various Internet sources. These sources helped me to find information about Finnish and Russian educational legislation and about Finnish Polytechnics and Russian technical universities which provide education in the field of HVAC. Some dissimilarities between educational systems of two countries can be seen in the thesis. There are definitions for example in the duration of study and studied topics. Also the contents of Finnish and Russian of the Bachelor's thesis are quite different. Russian thesis includes from 60 to 100 pages of practical calculations and 10 sheets of drawings. And in Finland thesis contains a lot of scientific work and investigations. One of the principal parts of the thesis is making questionnaires for Finnish and Russian teachers and students for getting information about the real present HVAC education.</p> <p>And the last source of information of this thesis was own experience of Russian students who have learned for several years in Russian technical universities and then they have come to study in the Finnish Polytechnic for one year.</p>			
Subject headings, (keywords) Russian education, Finnish education, Finnish general law of education, legislation of education in Russia, Universities of Applied Sciences in Finland, HVAC department, Bologna system, technical Universities in Russia			
Pages 52, appendices 12		Language English	URN
Remarks, notes on appendices			
Tutor Taru Potinkara		Bachelor's thesis assigned by	

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INTRODUCTION

The subject of this Bachelor's thesis is Russian and Finnish systems of higher education at university level in the field of HVAC. Educational system in Russia is represented by the complex of continuity educational programs of various degrees and directivity, national standards and requirements. Educational programs are realized by institutions, which can be federal, municipal, and private. Higher education in Finland is given by special institutions, vocational institutions, polytechnics, and universities, all of which have a continuing education center. Universities are maintained by the State and enjoy extensive autonomy.

The main purpose of my work is to find differences, and disagreements between Finnish and Russian laws and legislations, subjects of studying, student's habits, opportunities, and aspiration to study.

The first chapter of this bachelor's thesis describes the motivation role of attitude of Russian government to higher education. I will use the Main National Law on Higher Education. Also I will use national standards and requirements concerning specialty "Thermal engineering and Thermotechnics" for bachelors and masters.

The second part of my bachelor's thesis will contain differences between the studied subjects. There are definitions in the duration of study and studied topics. Also the contents of Finnish and Russian of the Bachelor's thesis are quite different. Russian thesis includes from 60 to 100 pages of practical calculations and 10 sheets of drawings. And in Finland thesis contains a lot of scientific work and investigations. As there are a lot of technical Universities in Russia and in Finland I will describe the main features of them.

In the third part I want to write something about student's attitude to their education. I am using up questionnaires for Finnish and Russian students.

The final part contains the own experience of my group of Russian students who have been studying in Finland for one year.

1RUSSIAN AND FINNISH SYSTEMS OF HIGHER EDUCATION

1.1. Educational legislation in Russia.

The future of the Russian state, its economic development, and also the well-being of the society depend much on the educational system. Improvement of economy and economic growth are closely connected with education. Science and education together represent one of the most essential guarantees of national and international safety.

In a modern constitutional state education should have thorough regulatory base for several reasons. Firstly, the educational legislation should guarantee everyone's right for education, which is fixed by the Constitution. Secondly, education represents huge branch of the Russian economy. It is a grandiose property complex which requires regulation and financing.

Educational legislation of Russia represents rather difficult and complex system. It regulates the following principal relations:

- Relations between the teacher and the student;
- Relations between educational institutions;
- Relations between controlling agencies and educational institutions;
- Relations developing in the course of individual pedagogical activity. /1/

1.1.1 Federal Law about higher education since the 22nd of August year 1996 №125-Φ3.

Federal Law of Russian Federation "About Higher and Postgraduate Professional Education" was accepted by the State Duma on the 19th of July in 1996. It was also approved by the Federation Council on the 7th of August in 1996. And finally it was signed by the president of Russian Federation Boris Yeltsin on the 22nd of August in 1996. This Federal Law consists of seven chapters, which include certain enactments:

1) General statements (enactments 1-3).

- 2) System of higher and postgraduate professional education (enactments 4-15).
- 3) Entities of educational and scientific activity in the system of higher and postgraduate professional education, their rights and responsibilities (enactments 16-23).
- 4) Control of the system of higher and postgraduate professional education (enactments 24-26).
- 5) Economy of the system of higher and postgraduate professional education (enactments 27-32).
- 6) International and external economic activity of higher educational establishments (enactment 33).
- 7) Final statements (enactment 34).

These seven chapters are divided into enactments which follow one after another. In general statements (includes enactments 1-3) state policy and state guarantees in educational field are described. Higher education in Russia is based on humanistic principles, priority of human values, and freedom of personal development. Education should provide mentoring for the hardworking, reverence for human rights and liberties, love for nature, native country and family /1/.

The second enactment of the Federal Law includes the main principles on which Russian system of higher education is based. Educational process must have continuity. Integration of the Russian system of higher education to the international educational system and protection of traditions and achievements of Russian higher school must be provided at the same time.

The State ensures the priority of higher education by financing not less than 170 students per every 10000 of people living in Russian Federation /2/. It is done by means of the federal educational budget. Students, postgraduates, candidates for doctor's degree, etc. are supported with scholarships, rooms in hostels, free medical aid and others social benefits. Free higher education is organized in a competitive way only for those who want to get it for the first time. Restriction of getting higher education can be established only by the Federal Law for the purpose of protection

morality, health, interests of other people. Also it can be done to provide the defense of the country and the safety of the state.

The third enactment of the Federal Law is about the self-regulation and academic freedoms of the educational institutions. Self-regulation (autonomy) means independence to choose and to place employees, to perform educational, scientific, financial, and economic activity according to legislation and regulations of the higher educational institutions /3/. Teachers are allowed to their own methods of teaching. Students have freedom to gain knowledge according to their inclinations and demands.

The structure of higher and postgraduate education which is introduced in the second chapter of the Federal Law is represented by:

- Federal educational standards of higher professional education, federal requirements to postgraduate professional education, educational programs of higher and postgraduate professional education;
- Higher educational institutions that possess license agreements, scientific organizations and educational institutions of the additional professional education;
- Scientific, designed, productive, clinical, pharmaceutical, and cultural institutions. Organizations and enterprises that make observations and provide functioning and developing of higher educational system;
- Agencies that realize administration in educational field and jurisdictional authorities, organizations, enterprises;
- Public associations (creative unions, professional associations, communities).

Enactment 6 of the Federal Law is very important for the overview of Russian higher educational system. It determines the following levels of higher professional education:

- Higher professional education which awards by the Bachelor's Degree. Normative period of studying for this qualification is 4 years;

- Higher professional education which is vouched by the qualification of “specialist” or “master”. Normative periods of studying for these qualifications respectively are not less than 5 and 2 years relatively. Studying for the Master program is available only after getting the Bachelor Degree;

In the system of higher education one of the most important terms is higher educational institute. Definition of this term is given in the Enactment 8: “Higher educational establishment is an educational institution that is established and operated according to educational laws and regulations of Russian Federation; it possesses the status of a legal body and realizes educational programs of higher professional education under the license agreement”. The main purposes of higher educational establishment are: satisfaction of person’s demand for intellectual , cultural, and moral growth; development of science and art; amplification of attainments among people. Also in Federal Law kinds of different higher educational institutions are defined. They are: Federal University, University, Academy, Institute. Differences between these four types will be analyzed further (in the chapter 3.2).

Enactment 11 of the Federal Law sets the regulation of the enrolment system for the higher educational institutions. Enrolment is done separately for the programs of bachelors, specialists and masters. To enter a higher educational institution for the program of bachelor or specialist a person has to pass well the Universal State exam. To apply for the Master’s program it is necessary to pass the preliminary examination, which is set by the educational institution. There are also some categories of citizens that have benefits (facilities) for studying. For example: orphans, physically challenged people, winners of the national academic competition for pupils, Olympic champions, etc.

Enactments 16-23 of the Federal Law tell about rights and responsibilities of the persons who take part in the educational activity like: students, doctoral students, candidates, employees, research workers. According to the enactment 16 item 2 students have rights to choose courses by themselves, to take part in discussing and solving the problems of the higher educational institutions, to use libraries and various information holdings free of charge, to appeal orders and instructions of the educational institution’s administration, to transfer a paid program to a free program

in case he/she has achieved the required in his/her studies. Also enactment 6 sets the value of the scholarship of the students. For an ordinary student (if he is not an invalid or an orphan) it amounts 1100 rubles (\approx 25 Euros) per month. All the students who need the dwelling place are provided with a room in the state hostel. The rent for this room must not be more than 5% of the scholarship.

The control of the system of higher and postgraduate professional education is realized by Federal Assembly of the Russian Federation, Government of the Russian Federation, and federal authority /1/.

1.1.2 National educational standard of higher education in the area of “Thermal engineering and thermotechnics” for the qualification of Bachelor of Science

This National educational standard gives requirements that are obligatory for educational programs in “Thermal engineering and thermotechnics”. The main users of this standard are professors, students, rectors, state attestation commissions, organizations which provide development of main educational programs, agencies that ensure financing of the higher educational institution, etc.

According to the National educational standard to get the qualification of Bachelor a person has to get 240 credits during 4 years (60 credits per year). The area of professional activity of Bachelors is described in terms of the technical methods and human activity in the application of heat, manipulation of its streams and transformation various types of energy into heat. Principal educational programs for Bachelor should also include courses of general like humanitarian, social, economical, mathematical, and physical.

After becoming a Bachelor of “Thermal engineering and thermotechnics” a person can be involved in the organizations and activities like:

- The Ministry of Industry and Energy of Russian Federation, the Emergency Situations Ministry of RF, the Ministry of Defence of RF, Ministry of Education and Science of the RF, Federal Nuclear Power Agency of RF;
- Scientific research organizations;
- Energy and industrial companies;
- Organizations which are connected to the environmental monitoring and solving ecological problems;

- Thermal power plants, systems of energy supply, systems of high temperature and low temperature technologies;

Also Bachelors can carry out technical tasks involving:

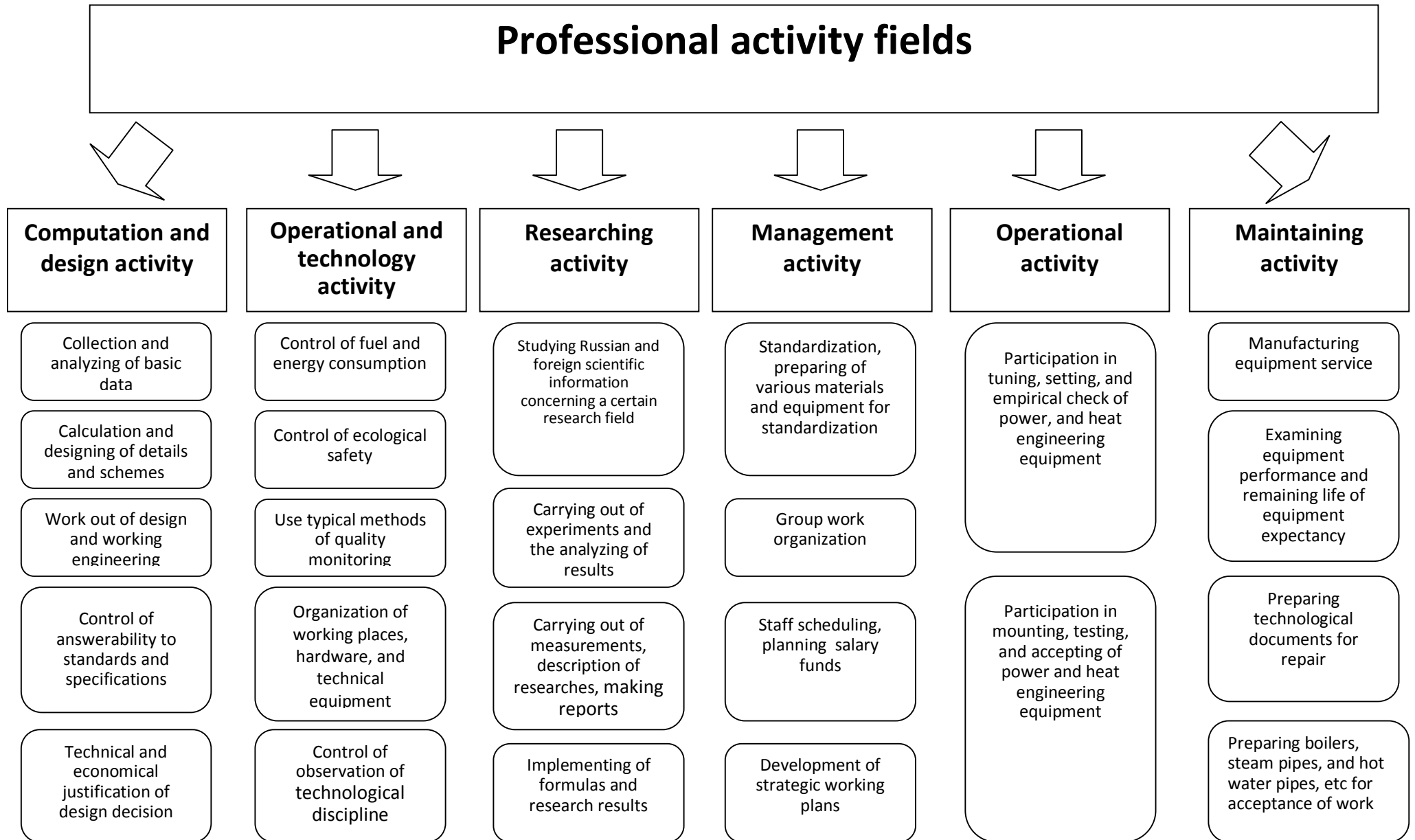
- Steam and hot-water boilers;
- Compressor and chiller units;
- Air conditioning units;
- Heat pumps;
- Heat and electrical gains;
- Normative and technical documentation and systems of standardization;

Of course, there are many more activities which student can choose after graduation, but are represented in the National Standard. It is very useful because before choosing a specialty a person can have an idea about what his future profession will be connected with.

Fields of the professional bachelor's activity are also set in the National Standard. According to this a student can understand what skills he should possess after graduation from the educational institution. Professor's work can also be estimated by the experience achieved by his students. /4/

In every type of professional activities which are shown above can be detached several professional tasks. It can be seen in Figure1.

Figure1. Professional activity fields of a Bachelor of “Thermal engineering and thermotechnics”.



1.1.3. National educational standard of higher education in the area of “Thermal engineering and thermotechnics” for the qualification of Master of Science.

According to the National standard for becoming a Master of Science in the area of “Thermal engineering and thermotechnics” a person should get 120 credits in two years (60 credits per year). A person can apply for the Master’s degree only after finishing the Bachelor’s program.

Types of professional activities of Master are almost the same as those of Bachelor. But there are some differences. The main difference is that Bachelor gets basic higher education. He gets wide knowledge in his specialty. But the Master is prepared for so-called “scientific” work. He gets deeper knowledge in some particular area. E.g. water supply of industrial plants, reconstruction of utility networks, design and construction of heat and power stations, and others. The other difference is that Master can practice educational activity, which means that he has an opportunity to teach. But in practice Masters do not work as teachers in Russia a extra education is also required for this activity. Also Masters do not usually take up much manual work like operational and maintaining activities.

The educational cycles of Master’s program also differ from the Bachelor’s one. Master’s program consists only of general scientific and professional courses. As a result of basic scientific courses the student has to:

- Know foreign language to be able to get professional technical information from international sources;
- Scientific development, main scientific fields and conception;
- Know management principles and economics of production.

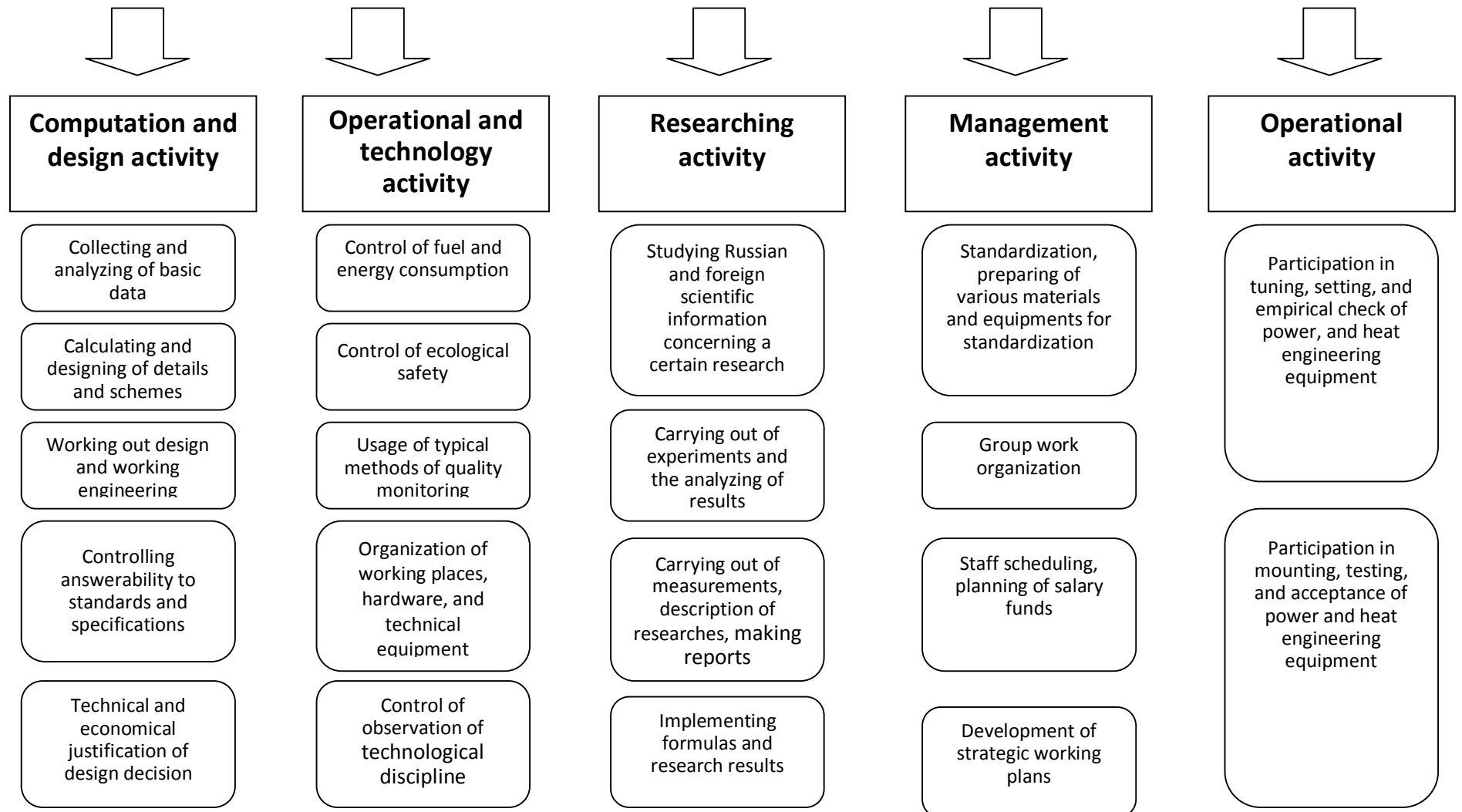
And as a result of professional courses students have to:

- Know about modern and advanced ways of solving HVAC problems;
- Know the basics of the technological design;
- Know the principles of energy saving;
- To make decisions in such areas as thermal engineering, thermotechnics, and heating technology with consideration for energy saving;
- To make plans and programs for improvement of equipment and technologies;
- To put into practice Russian and foreign science achievements;
- To organize activities for professional growth of the staff. /5/

Professional activity aims of Master can be seen from the Figure 2.

Figure2. Professional activity fields of a Master of Science in the area of “Thermal engineering and thermotechnics”.

Professional activity fields of the Master



1.2 Educational legislation in Finland.

Legislation of higher education in Finland consists of laws which are created by the Parliament, by the decrees of the National board, and by the instructions and regulations of the Ministry of Education. Persons who live in Finland possess the right of getting knowledge in the desired area. This right has a legislative base and it is also one of the main human rights.

The aims of higher educational institutions are approved by the National Board of Education once in four years. Though institutes of higher education of Finland are basically financed by the state budget they have broad rights of self management especially concerning training and researching activity. Educational institutions have rights to determine content and methods of studying by themselves. According to the educational development and research plans of the Universities negotiations between various educational institutions and Ministry of Education are held. On the basis of these negotiations contracts for 3 years are made. In these contracts functional and quantitative aims are defined. Assignments for its realization and realization of monitoring of results are also defined in the contracts. The main forms of financing of higher educational institutions are project financing and financing by results of activity. Therefore Ministry of Education sets the demands for the efficiency and productivity of high schools.

1.2.1 Role of the Ministry of education in Finland

“The Ministry of Education is charged with the administration of education, research, culture, youth issues and sports; its remit includes all universities and polytechnics” /6/. The official web site of the Ministry of education of Finland defines its activity as: “The Ministry develops conditions for education, know-how, lifelong learning, creativity and citizens' social participation and well-being. The values underlying this vast sector are civilization, welfare, democracy and creativity. Other important principles in the Ministry's operations are expertise, responsibility, openness and future-orientation”/7/. This means that Ministry of Education executes only administrative, regulative, and controlling roles. It does not affect independence of educational institutions and does not set any limits of the educational process. Implementation of main principles of educational policy and laws approved by the

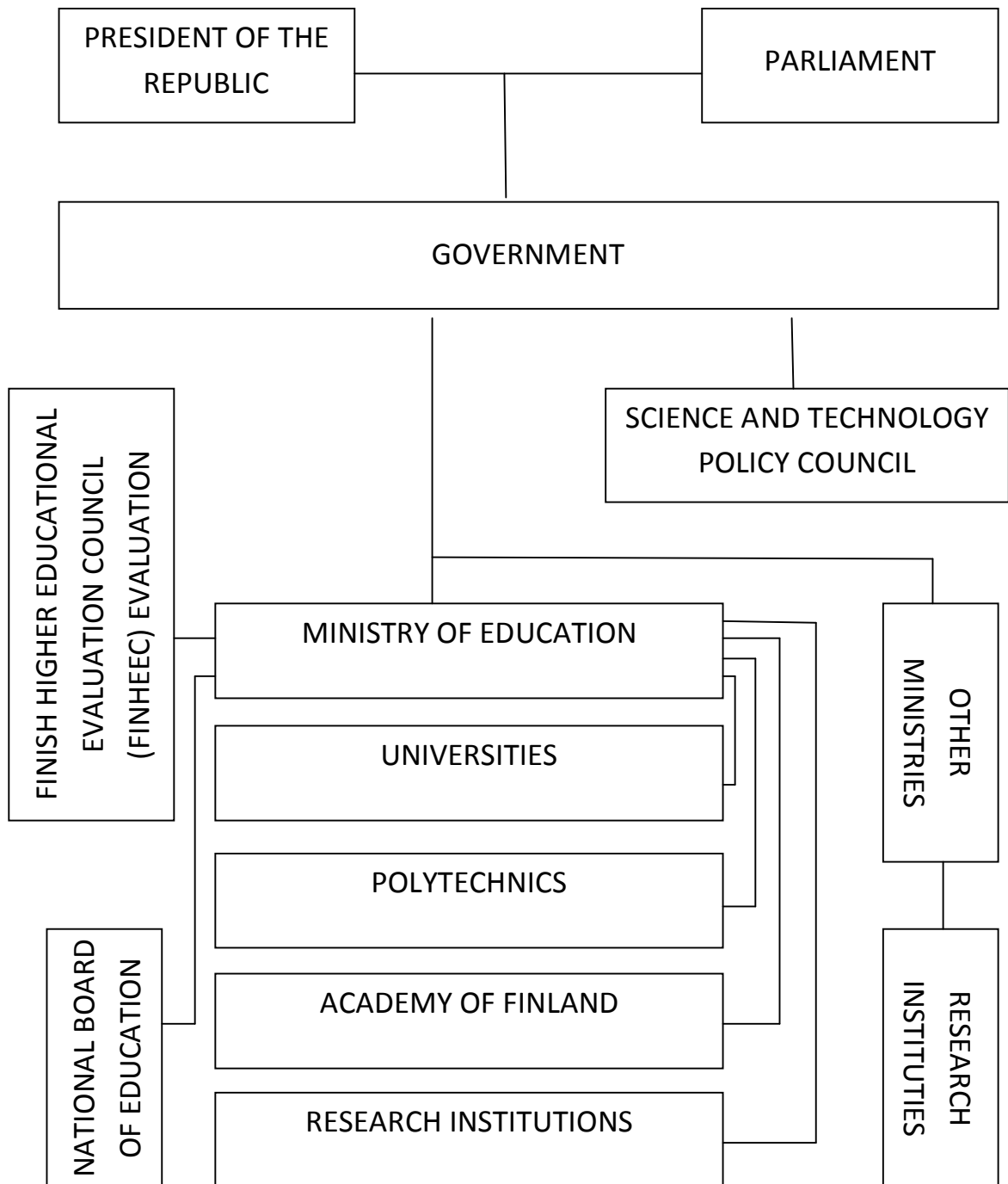
Government is also an important responsibility of the Ministry of Education in Finland.

1.2.2 Administration of higher education.

The Ministry of Education of Finland does not operate as a single authority. It is assisted by the National Board of education when it is necessary to solve the problems concerning upper secondary school, vocational institutions, and adult education. Also Finnish Higher Education Evaluation Council (FINHEEC) cooperates with the Ministry of Education in estimation matters. The Science and Technology Policy Council promotes questions of science and technology. It coordinates science and technology policy, scientific researches, international technical cooperation.

Science and education are one of the main priorities for the Finland's policy for the future. The majority of the country's population has high education of high quality wellbeing of its citizens also will be at the high level. "Special attention will be paid to developing teaching and learning at all levels of education through teacher education and guidance services /7/". The structure of Finnish educational administration is shown in the Figure3.

Figure3. Central administration of higher education and research. /7/



2 TECHNICAL HIGHER EDUCATIONAL INSTITUTIONS IN FINLAND AND IN RUSSIA

In this chapter the modern conditions of universities and polytechnics are discussed. The purpose of this chapter is to show the educational structures in Russia and in Finland, to find the differences between them. Programs of the principal institutions are also analyzed in this chapter. It is done to detach advantages and disadvantages of the systems of both countries. But quality of education depends not only on teaching. That's why several other things like international integration, accommodation and financial problems are also taken into account.



Population of Russia in 2009 is 141,9 millions of people. The number of higher educational institutions is 1134 (660 state and 474 private educational institutions). The number of students is 7513000 persons /10/. Population of Finland is 5,3 millions of people /11/. There are 46 higher educational institutions (20 universities and 26 polytechnics). The number of students is 306000 /7/. It means that population of Finland is 27 times less than in Russia. Number of universities is 23 times less and number of students is 24 times less. This means that in general the relative factor of the higher educational institutes

is the same.

The first Russian higher educational institution for teaching non-religious subjects is known to be found by Peter the Great on the 27th of January in 1701. Engineering education in Russia has started with the foundation in Moscow the School for Mathematical and Navigational Crafts /8/.

During the period of the industrialization of the country (after the revolution of 1917) engineering education in Russia developed very fast. At the beginning of 1960 some of the best technical universities in the world were established in Russia. The quality of higher engineering education in Russia was highly appreciated all over the world. For example when Russians discovered the outer space first Americans explained it by a better system of education in the Soviet Union.

At the moment conditions and tendencies of higher education in Russia are still satisfactory. Nowadays there are about 350 state higher educational institutions of engineering education in Russian Federation. But because of turn-down of the economical, political, and social factors there are a lot of problems.

For overall discussion of educational systems main socioeconomic factors should be presented.

Finland:

Population: approx. 5.2 million

Capital: Helsinki (population approx. 550000)

Total area: 338000 km², population density 17per km²

Official languages: Finnish (93%), Swedish (6%), and Sami in the Sami areas of Lapland

Religion: Evangelical-Lutheran (86%), Orthodox 1%, other 12%

Principal business sectors (% of GDP): services 60%, industry and construction 35%, agriculture and forestry 5%

Principal trading partners: Germany, Sweden, UK, USA, Russia

Gross domestic product: EUR 122 billion, EUR 20500 per capita

Population in the 25-64 age group: 2, 8 million

Labour force: 2, 6 million

Proportion of population with post comprehensive education: 57%



Russia:

Population: 141, 9 million

Capital: Moscow (population 10508971)

Total area: 17 075 400 km², population density 8, 3 per km²

Official language: Russian

Religion: Orthodox (67%), Islam (6%), other 2%

Principal business sectors: digging, cellulose and paper industry, metallurgy, power generation

Principal trading partners: Germany, Finland, CIS countries

Gross domestic product: USD 2,225 trillion, USD 16239 per capita

Population in the 25-64 age group: 91, 4 million

Labour force: 76, 2million

Proportion of population with post comprehensive education: 37%

Information technology in households: mobile phone 88%, Internet connection 20% /9/

2.1 Finnish Polytechnic's structure.

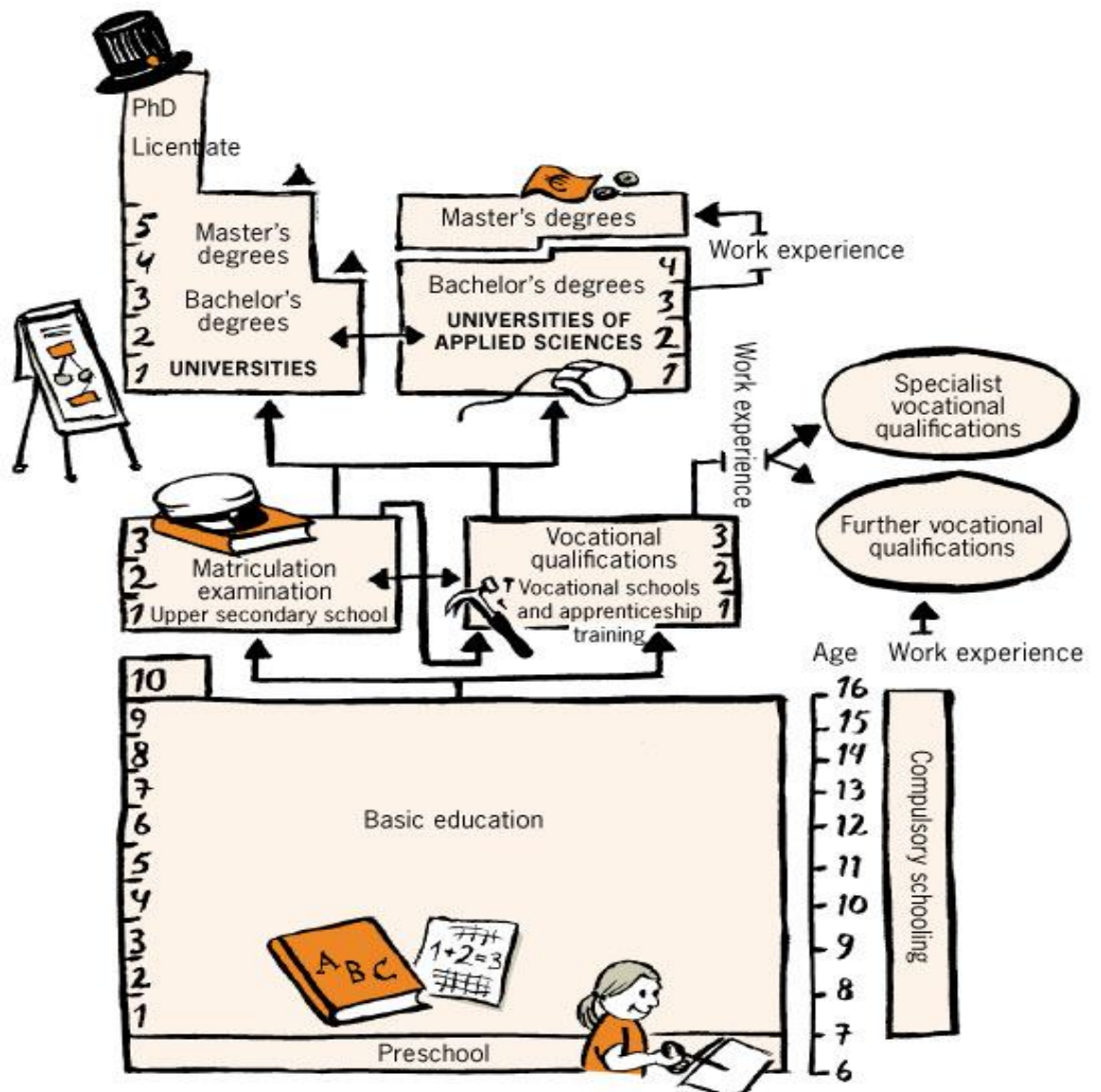
2.1.1 Finnish educational system.

Finnish educational system consists of pre-primary studies, basic and upper basic education, vocational studying, higher education, and adult education. "A Finnish child usually starts schooling at the age of seven. The nine-year basic schooling is free for all pupils. The school year, which has 190 working days, starts in mid-August and ends in the beginning of June. The summer holidays are over 60 days. General upper

secondary education commonly takes three years to complete and gives eligibility for polytechnic and university studies. At the end of the upper secondary school students usually take the national matriculation examination /10/. The stages of Finnish education are represented in the Figure4.

In Finland there is a possibility to get HVAC education in Scientific Universities for example Helsinki University of Technology but in my bachelor's thesis I will concentrate on the polytechnics in which Bachelor and Master programs of Building Services are provided.

Figure 4. Finnish Educational System /11/.



2.1.2 Finland's Universities of Applied Sciences.

One of the most respectable polytechnics in Finland is **Helsinki Metropolia University of Applied Sciences.**

”Practicality, internationality and innovativeness are keywords at Metropolia. In Metropolia you study for work life and after graduation you are in an excellent position in the job market. Metropolia invests in high quality



teaching. Here you can experience the real spirit of doing things” /12/. Metropolia offers 49 degree programs and 8 of them are in English. More than 600 international degree students from more than 50 countries study at Metropolia. There are also more than 300 exchange students from various higher educational institutions from all over the world. Metropolia students have opportunity to study abroad as well. It is possible to cooperate with various working areas and economic life through project works. Location in the capital of Finland offers students variety of practical training and working places.

Metropolia pays attention to research and development activities. It serves the needs of the labour market. “The emphasis is on applied research, on development work that serves the stakeholders and on putting the research results into practice. Business skills and anticipation skills are the focus of all R&D operations. R&D projects support product development of enterprises and at the same time create a link to experts that will be graduating soon” /12/.

School of Civil Engineering and Building Services of Metropolia is represented by the following specialties:

- Construction and Real Estate Management
- Land Surveying Technology
- Civil Engineering
- Construction Management
- Building Services Engineering

It is possible to apply for the Bachelor's degree, adult education, and specialization studies.

Another sufficient educational institution which represent program in Building Service is **Mikkeli University of Applied Science**. It has plenty of fields of studying like: humanities and education, culture, natural sciences, natural resources and the environment, technology, communication and transport, social sciences, business, and administration, etc. It is possible to choose from 20 degree programs, three of them are in English. Over 760 new students begin their studies for a degree every year. Over 200 students come to Mikkeli Polytechnic from more than 30 countries. “The Finnish Ministry of Education has rewarded Mikkeli University of Applied Sciences five times for its international activities” /13/. All in all there are nearly 4500 students. The number of staff is almost 430 persons, 200 of which are full-time lecturers. About 40 of staff possess a doctoral or licentiate degree.



One of the newest and interesting programs of Mikkeli Polytechnic is a Double Degree Program in Building Services Engineering. The language of the studying is English. It takes one year (from January till December) to complete this program. The scope of this Degree Program is 240 credits (ECTS). During the studies the student is provided with a number of abilities which are required for the successful activity of HVAC engineer. After graduating a student gets a degree of Bachelor.

Degree Program in Building Services is open for persons who already obtain a Finnish degree in engineering (the diploma of higher vocational institution in the field of HVAC or the diploma of the polytechnic in any field of technology). It is also available for students who have been studying at least for three years in a higher educational institute. The advantage of this program is the opportunity for getting additional education in particular specialty for respectively short time.

The official web site of Mikkeli University of Applied Science defines the structure of studies in a comprehensible way: “The study time and credits to be completed depend on your previous educational background and work experience. A personal study plan is prepared for each student in the beginning of studies. The professional studies (60 ECTS) are organized during one calendar year. Within this time frame you are also

expected to complete bachelor's thesis (15 ECTS). Practical training (30 ECTS) can be partly completed during the summer term or it can be accepted from earlier work experience" /13/.

One of the largest universities of applied sciences in Finland is **Oulu University of Applied Science**. It started to operate in 1992 and it responds to the employment needs of Northern Finland. There are approximately 8300 students studying in it. Staff of this polytechnic is almost 800



persons /14/. It offers Bachelor's and Master's programs in various fields. The aim of the studies is to provide students with skills required in working life. Students carry out research trainees and Bachelor theses in the partner manufacturers and enterprises of the Oulu University of Applied Sciences. There about 30 degree programs three of which are taught in English. Oulu Polytechnic provides programs in the following fields: culture, natural resources and the environment, natural sciences, social sciences, business and administration, social services, health and sports, technology, communication and transport.



Building Service studying is provided in Oulu Polytechnic. One of the specialties of this program is HVAC engineer. It lasts for 4 years and includes 240 credits (ECTS). Students of this option are oriented in HVAC planning, contracting, building maintenance, etc. Professional studies

consists of subjects like heating and energy technology, indoor climate and ventilation technology, cooling technology, water supply and sewerage technology and building automation. Oulu Polytechnic is equipped with modern special laboratory and various operating heating, ventilation, and water supply units which are used for visual demonstrations. Design practice is also a significant part of studying, three-dimensional design software is used. Graduated students have wide possibilities to

find a job connected with planning, project management, supervision and client duties in building services /14/.

Tampere University of Applied Sciences

is another Finnish polytechnic that provides a wide range of specialties. It offers higher education in such areas as art and media; business; engineering/technology; forestry. All in all there are 16 Bachelor degree programs, 3 of which (Environmental



Engineering, International Business and Media) are totally taught in English. There are also 7 Master's programs, only one of which (Information Technology) is taught in English. Besides studying for students TAMK also provides studying for teachers which are held in Teacher Education Centre.

The main purpose of Building Services Engineering program is to teach students to understand technical services, systems, and applications. In the program such points as heating, air, water, energy, lighting, data transfer, and security are represented. A lot of attention is also paid to financial and management skills of the students.

Program of Building Services includes studies in the field of HVAC. During these studies students get general knowledge connected with heating and ventilation systems of buildings, water and sewer technology, heat insulation, energy consumption and the indoor air factors. The content of the HVAC engineering studies can be found at the official web site of TAMK/16/. It consists of the following items: HVAC systems and equipment, generation of heat, distribution and release systems, ventilation, air conditioning and air handling systems and their equipment, cooling systems, water and sewer systems, manufacturing warm service water, increasing pressure and pressurized water tanks, separators and sewer water pumping stations, symbols and documents, energy efficiency regulations of buildings /15/.

Satakunta University of Applied Sciences (SAMK) operates on the west coast of Finland and it is the leading university in this region. The main features of SAMK are providing the skills needed in the working life, making applied researches, focusing on international cooperation, promoting cooperation between different educational



institutions. SAMK consists of 10 campuses and 3 faculties. There are over 500 staff members and 6500 students in it. Every year nearly 900-1000 students graduate from the university. SAMK provides 25 degree programs 4 of which are in English.

There is a Construction Engineering program for the degree of Bachelor in SAMK. This program gives an opportunity to concentrate either on building construction or heating and ventilation engineering. Broad knowledge can be obtained in both programs. Students get to know planning, implementation and maintenance of constructions and their heating and ventilation systems.

The principal courses of the Construction Engineering program are production planning, overall management of construction and repair projects, building design, technology of flow and thermal conduction systems for water, heating and ventilation. According to the official web site of Satakunnan Polytechnic: “A Bachelor’s Degree in Construction Engineering guarantees that the graduated person has true expertise and wide knowledge of the qualities of construction materials and equipment, the functions of constructions, effects of environmental factors and working methods” /16/.

2.2 Structure of Russian technical Universities.

Nowadays Russian education is continuous system which consists of several stages. Educational system consists of preliminary studying, high school education, vocational education, education at university level, postgraduate study and extended education.

Basic education begins at the age of seven and lasts for nine years. Graduates of this level have an opportunity of choosing further education. They may either continue their education at senior high school to receive secondary general education or they may enter initial vocational school or secondary vocational college. Initial vocational schools offer one and a half to two years of low professional education. Secondary vocational college provides joint professional and secondary general education and

skilled workers' training which lasts from three to four years. Secondary general education lasts for two years and ends when students are 17-18 years old. Graduation from secondary general school gives an opportunity to enter a higher educational institute.

Higher education is provided by public and private higher educational institutions. There are three levels of higher education:

- Basic higher education lasts for four years and awards by the Bachelor's degree;
- Higher education that lasts for five or six years (depending on the specialization of the higher educational institution) and awards by the Specialist's degree;
- Higher education that lasts for two years and awards by the Master's degree. But it is possible to proceed with this level of education only after getting the Bachelor's degree.

It is difficult to understand this structure because the difference between Master and Specialist degrees can not be clearly matched. The reason for it is so called "Bologna process" that has taken place in the Italian city Bologna in 1999. During this process 29 ministers of European countries made a decision to bring together educational systems of various European countries. Russia has been involved in this process since 2003. But the reform is not completed yet. That's why some Universities have already applied for the Bologna system and provide Bachelor's and Master's degree; other universities still have Soviet system of education and provide Specialist's degree. But during the meetings of G8 Minister of Russian education Andrey Fursenko has told that by 2010 all Universities in Russia will change to European educational standards /17/. The stages of Russian educational system are shown in the Figure5.

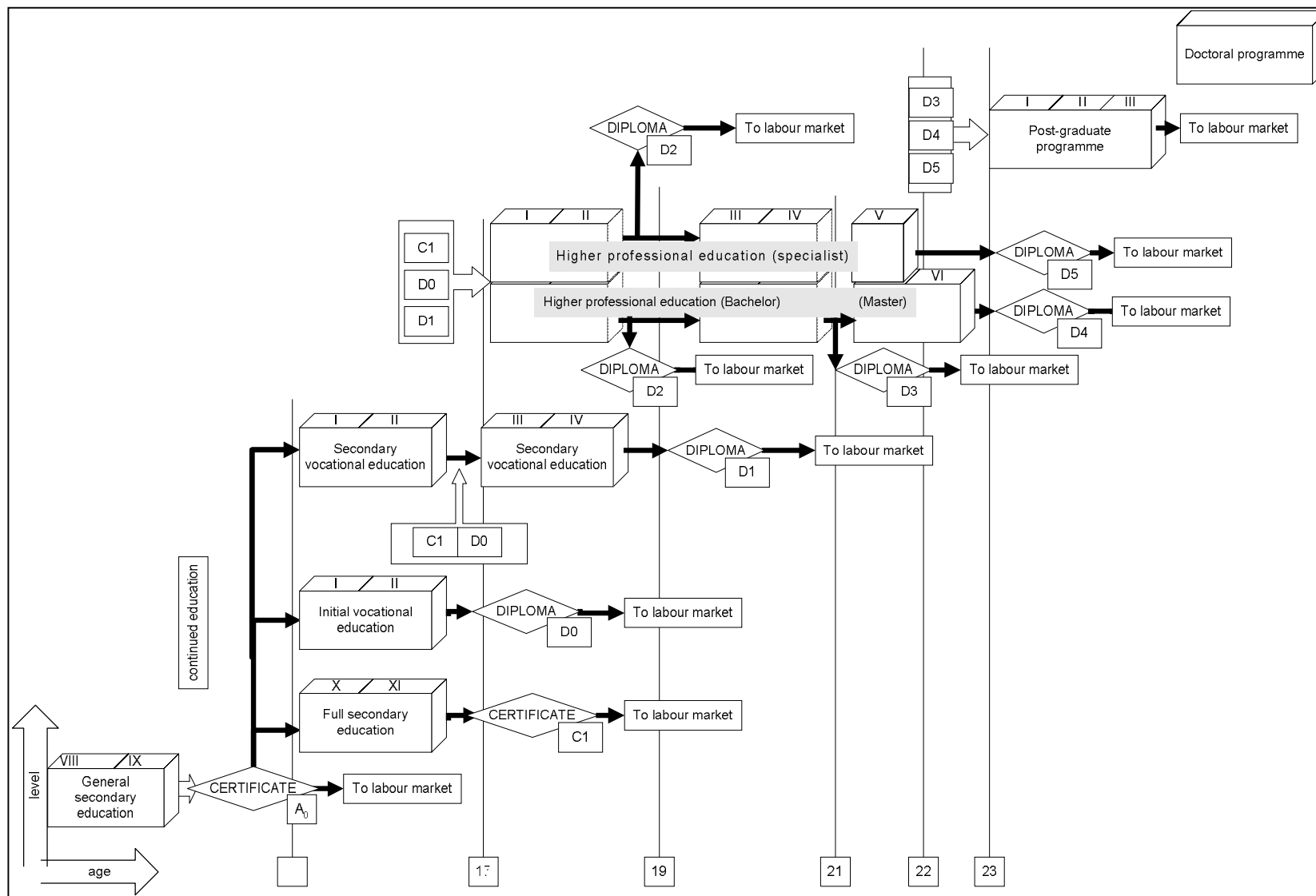


Figure5. Russian System of Education /18/.

Entry to the Russian's Universities is realized in a competitive way. Special entry exams are held every year. The academic year lasts from the 1st of September to middle June everywhere, summer vacations are quite long: from the 1st of July until the 31st of August.

2.2.1 Russian's technical Universities

In this part the principal technical Universities which provide education in the field of HVAC are described.

The Moscow State University of Civil Engineering is one of the leading engineering higher educational institutions in Russia.

It was founded in 1921 and nowadays it is one of the largest world's centers of building science and education. For the whole time of its existence it has prepared over 100000 of construction engineers. At present time there are 960



teaching staff of which 123 are professors (doctors of science) and 514 are candidates of science (Ph.D.). The amount student is nearly 17871. Among them 10 676 students are studying full time, 1727 are studying part time and 3909 persons are correspondence graduate students. There are also 1559 external students in the University. The Moscow State University of Civil Engineering provides 19 programs for specialist and 2 programs for Bachelor's and Master's degree.

The faculty of HVAC was established in 1928. Since that time nearly 7000 students have graduated from this faculty. The main feature of the specialty of HVAC engineer is its diversity. In general this specialty is constructional. But at the same time experts in manufacturing of HVAC equipment can work in mechanical engineering. Graduates can also work in the field of power engineering and allocation and using of heating energy. During the last years significant attention is paid to the environmental protection which makes this specialty ecologically oriented. There are four specializations on the faculty of HVAC, they are:

1. Heating, ventilation, and air conditioning;

2. Heat and gas supply and heat producing units;
3. Air pollution control;
4. Energy management.

The first specialization is connected to designing, producing, mounting, and operation of heating, ventilation, and air conditioning systems in buildings. Graduates of this specialty work in design offices, construction firms and associations. Second specialization prepares experts in designing, installation and operation of municipal and industrial thermal stations, thermal networks, thermal stations and inlets in buildings, gas networks, installations and the equipment for gas use. Specialists in air pollution control are prepared for designing and maintaining of air treatment plants which purify air from energy and technological emissions. Energy management is a new specialization which trains engineers for administration of energy establishments of various facilities, of constructional facilities as well /19/.

Saint-Petersburg State University of Architecture and Civil Engineering (SPSUACE) was founded in 1832 by the decree of the Emperor Nickolay I. Today this University keeps the traditions of Higher School of Civil Engineers: in 2001 it was admitted the best architecture and construction University of Russia. Saint-Petersburg State University of Architecture and Civil Engineering consists of seven faculties:

- The Faculty of Architecture;
- The Faculty of Civil Engineering;
- The Faculty of Environmental Engineering;
- The Automobile and Road building Faculty;
- Economics and Management Faculty;
- Urban Construction and Public utilities Faculty
- Correspondence Faculty.



There are 26 programs for Bachelor's and Specialist's Degree, SPSUACE also provides 17 programs of postgraduate studying and 25 programs of extra professional studying. Nowadays there are about 9000 of students studying in the University and about 300 of them have come from 54 different countries. The amount of teaching

staff is about 600 persons and almost 65 % of them possess various academic degrees. There are four corresponding members of the Russian Academy of Sciences and seven counselors of Russian Academy of Architectural and Constructional Sciences. SPSUACE publishes research and development magazine which is called “Civil Engineering Newsletter”, it also publishes a newspaper “Constructional Staff”, and it also produces a newspaper for students which is called “Block”.

The Faculty of Environmental Engineering offers several specialties connected with the fields of HVAC. One of them is defined as “Thermal Engineering”. Graduates of this specialty have an opportunity of working in regional and state agencies that are specialized in heat power control. They can also work at various enterprises as power engineers, at research institutions, and at designing organizations. Another specialty is “Heating and Gas Supply and Ventilation”. According to this specialization students are prepared for working in organizations whose activity is connected to design, installation, operation and repair of heat and gas supply systems of cities, civil and industrial objects, etc. The principal subjects of this specialty are:

- Principles of designing desirable indoor climate;
- Heating;
- Ventilation;
- Air conditioning and cooling;
- Pumps, fans, compressors;
- Air pollution control;
- Technology and organization of construction and mounting processes;
- Mechanics and automation of operation of HVAC systems;
- Construction management;
- Energy efficiency in HVAC systems;
- Setting and maintaining of HVAC systems;
- HVAC design;
- History of HVAC systems;
- Methods of air pollution researching;
- Air flow mechanics;
- Heating and ventilation of agricultural buildings /20/.

Two Architecture and Construction Universities that were mentioned above are the principal universities of the country. Nowadays they are leaders in constructional education. Programs of education and basic principles of studying are almost the same in Constructional Universities all over the country. But of course there are other universities in which specialties in the field of HVAC are represented, they are:

- **Astrakhan Construction Engineering Institution.** It was founded in 1992 to prepare engineers of various specializations, also HVAC engineers.
- **Volgograd State University of Architecture and Civil Engineering.** It was founded in 1930 because of the industrialization of the city. Ecological institution was created only in 1997 and the specialization of HVAC engineer is available for the students of Heat and Power Production Faculty.
- **Voronezh State University of Architecture and Civil Engineering.** It was founded in 1930. Nowadays it prepares architects, engineers, and other specialists. There 25 educational programs in the university. The amount of teaching staff is nearly 500 persons.
- **Ivanovo State Academy of Architecture and Civil Engineering.** It was founded in 1981 because of the lack of building and construction engineers in Ivanovo Region. Nowadays it consists of 7 faculties, and one of them provides specialization of HVAC engineer. There about 5000 students in the Academy and teaching staff is about 200 persons.
- **Kazan State University of Architecture and Engineering.** Nowadays 6799 students are studying in this University, teaching staff is 540 persons. The department of HVAC education was founded in 1967.

There are also HVAC departments in such educational institutions as:

- Krasnoyarsk State Academy of Architecture and Civil Engineering;
- Nizhny Novgorod State University of Architecture and Civil Engineering;
- Novosibirsk State University of Architecture and Civil Engineering;
- Penza State University of Architecture and Civil Engineering;
- Rostov State University of Civil Engineering;
- Samara State Academy of Architecture and Civil Engineering;
- Tomsk State University of Architecture and Civil Engineering;
- Tyumen State Academy of Architecture and Civil Engineering.

2.3 Degree structure in Finland and in Russia.

As it was show above educational structures in Russia and in Finland have some differences. Especially in the field of HVAC, as all Finnish polytechnic provide programs which meet the requirements of the Bologna system. It means that they provide programs for Bachelor's and Master's degree. So, for getting higher professional education students have to write two thesis works: for the Bachelor's and Master's Degree. But in Russia in the majority of technical higher educational institution that provide education in the field of HVAC the Soviet systems is still the dominant one. It means that Russian students for getting full professional education need to write one thesis which is needed for the Specialist's Degree.

Bachelor degree for Finnish students is a long lasting process. The student needs to acquire basic knowledge. During the years of studying student also has to gain skills of writing research works. The subject of the thesis relates firmly to the field of studying (HVAC technology in our case). As a rule Bachelor thesis is done for companies, communities or public sector organizations. It can be either an individual work or a part of a considerable project. Students are interested in writing a research work for some constructional or designing company as they can get some financial encouragement for his/her Bachelor thesis. Also it is a very interesting process to do some real research for a real company. Students discover new information, for example about new technologies and implementations. They meet with new people who have professional practical experience, attend seminars, read scientific magazines and articles in the Internet.

Specialist's thesis in Russian technical Universities is done almost in the same way as in Finland. After four and a half years of studying student has to choose a subject for the thesis. He has one month time period for completing his practical training at any company which is connected with the field of HVAC. During this month he has to collect all the required information and materials for his/her thesis. But as a rule this time is not enough. So, usually this scheme is followed only by the students who have been working during their studies for at least half a year. In fact this means that students have to start working at their projects in advanced time. But as it is not easy to find a job for the student who does not have any work experience and can not work for the whole day because of studying. That's why there is also another scheme of

writing the thesis. It is possible so that the supervisor gives the topic and the material to the student. Usually it is some standard designing project. For example it can be designing of ventilation system for some industrial building or residential building. But in both cases the role of supervisor is very significant. It is he who refers the student to the right destination. Supervisor follows student's work carefully to correct the mistakes. Student's thesis is estimated by the special commission. When the thesis is completed certain date is scheduled for so called thesis defense. Student has to present his work that usually consists of 10 drawings and 80-100 sheets of theoretical part to the commission. Commission consists of about ten people who have a wide experience in HVAC technology. They also have to possess a certain academic title. After this experts have listened about student's executed work they have to ask some questions. According to the presentation and student's answers every expert gives his own grade. Then these grades are summarized and the mean value is the student's grade.

3 PROFESSORS AND STUDENTS VIEW OF EDUCATION

Professors and students are the main participants of the educational process. Their abilities of hardworking, explaining and listening affect much on the educational productivity. For providing efficient studying it is quite necessary to create favorable conditions for students and professors. It should be done both by the Government of the country and by the educational institution. Government should put an emphasis on educational policy. Students should be provided with satisfactory financial assistance, available information and literature access, demonstrative materials, laboratories, etc. Professors should be evaluated to working by various material rewards. For organizing and maintaining high performance higher education it is very important to be familiar with students and professors position concerning educational process. Feedback can inform about problems and incompletes.

As in my thesis it is necessary to define HVAC education in Russia and in Finland it is quite necessary to obtain information from the proximate persons who are connected with this field of study.

3.1 Description of the methods.

To get the information about Russian student's and professor's attitude to the educational system questionnaire method was used. Questionnaire is a research instrument which consists of a number of questions to gather information from respondents. Usually it contains a number of questions that has to be answered in a set format. There are two types of questions. They are open-ended and closed-ended questions. For answering an open-ended question the respondent has to produce his own answer. And for the closed-ended question the respondent has to choose an answer from a given alternative answers.

For the research in my bachelor's thesis I have decided to use closed-ended questions combined with open-ended questions. It was done because of the time restriction of students and teachers. Closed-ended questions take less time to answer but at the same time there is an opportunity for the respondent to give an explicate answer if he/she wants. In such a way I would have a chance to get as much information as possible. I have also tried to make the questionnaires logical: to put questions in a logical order.

It was decided to deliver the questionnaires to Finnish and Russian professors and students. Finnish professors were chosen of those who give lectures in Mikkeli University of Applied Science. Professors whose professional activity is related to the field of HVAC were asked to answer 20 questions about educational system, about their teaching methods and activity, and about estimation of HVAC education in general. The respondent students were also chosen from those studying in the Mikkeli Polytechnics. It was done because of simplicity of delivering and giving back the questionnaires, as I at that moment I was also a student of this Polytechnic. Questioning of Russian students was not difficult at all as it was decided to ask the students who participate in the double Degree Program of Mikkeli University of Applied Science. Nearly half of the students are getting education in Saint-Petersburg State Polytechnic University and half of them are the students of Saint-Petersburg State University of Architecture and Civil engineering. Difficulties took place only when asking Russian teachers. It was decided to choose the professors from Saint-Petersburg State University of Architecture and Civil Engineering as this year I have graduated from it and I have got a diploma of Water Treatment and Water Disposal Engineer. Of course I am acquainted with the majority of staff of the Faculty of

Environmental Engineering which provides education for HVAC engineers. That's why it was possible for me to contact the teachers and to ask them to answer 20 questions.

3.2 Attitude of Russian professors and students.

As in my Bachelor thesis it is important to write about particular qualities, problems, advantages, and disadvantages of HVAC education I think that it is useful to take into account professors and students who are completely involved in educational process in this field. It was the reason for asking five professors of Saint-Petersburg State University of Architecture and Civil Engineering who work at such chairs as:

- Heating, ventilation and air-conditioning;
- Heat-gas-supply and air protection;
- Water disposal.

Besides its teaching activity all these chairs are involved in research and development activity, are engaged in designing activity, make projects expertise, counsels technical decisions.

As for students two graduated students and two last year students of Saint-Petersburg State University of Architecture and Civil Engineering of water supply and water treatment specialization have been responded. Three last year student of the same University of HVAC specialization have been asked. I have also had an opportunity to ask 12 five year students of Saint-Petersburg State Polytechnic University who get education at the Faculty of Industrial and Civil Engineering. The number of delivered and given back questionnaires is shown in the Figure6.

Figure6. Percentage of delivered and given back papers.

	Delivered questionnaires	Answered questionnaires
Russian teachers	10 (100%)	5 (50%)
Russian students	19 (100%)	18 (95%)

3.2.1 Results

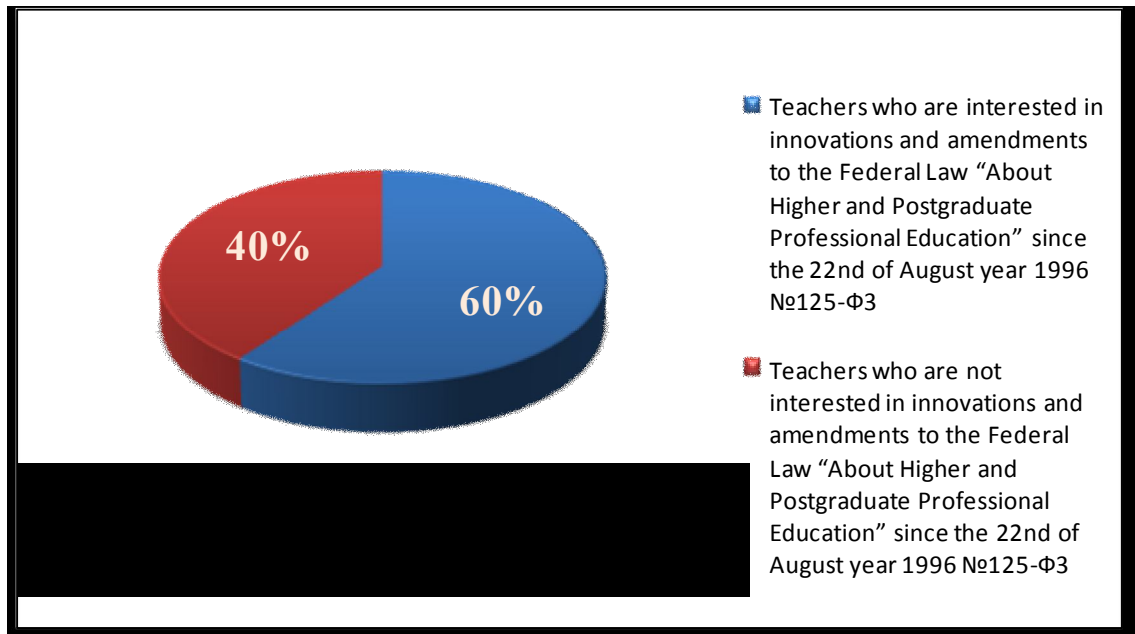


Figure7. Ratio of teachers who are interested and who are not interested in innovations to the Federal Law.

60 % of teachers care about innovations of the Federal Law "About Higher and Postgraduate Professional Education" because they consider that it is important for their professional activity. 100% of responded students have never heard about this Law.

All of the responded teachers find that their professional ideas and initiatives are not encouraged financially by the Government. Students' position is the following:

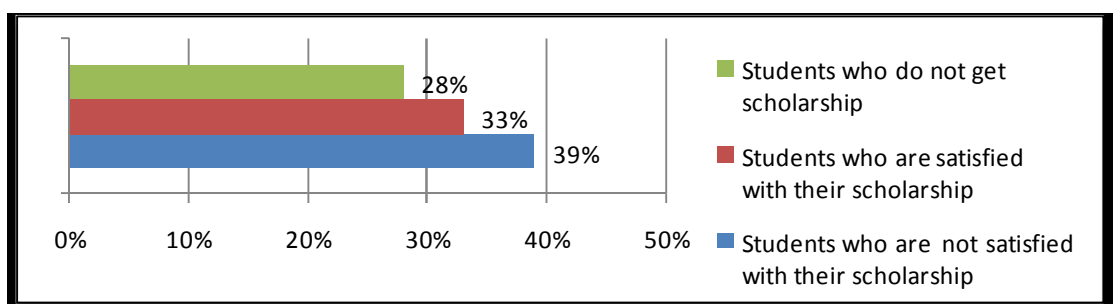


Figure8. Attitude of Russian students to their scholarship.

On the average students who are not satisfied with their scholarship concern that it should be multiplied 5 times.

All of the teachers are not satisfied with the transition of Russia to the Bologna system. The main reason is that it will deactivate traditional system of Russian

technical education that was developed for many years and provided enough technical specialist of high quality for the country. Students do not have so equal opinions.

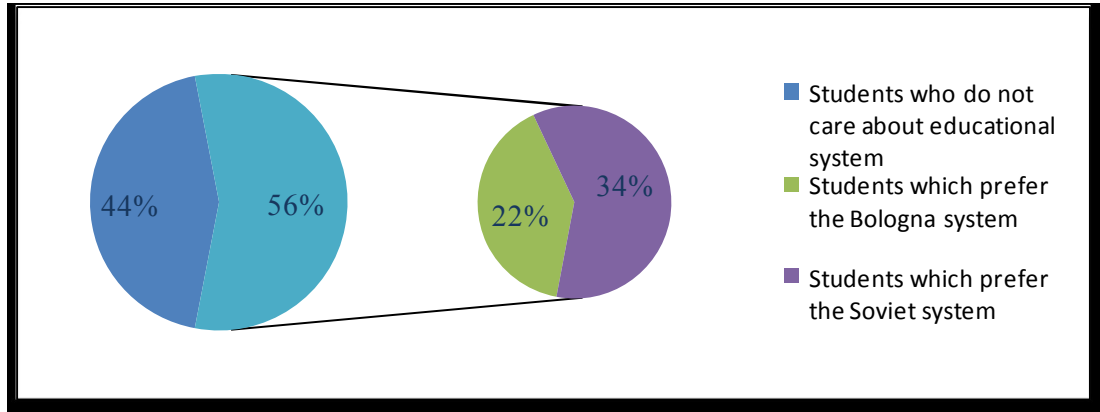


Figure9. Attitude of Russian students to the educational system.

Neutral position is explained by the reason the quality of education is not estimated by the name of the degree. Students who prefer to study according the Soviet system rationalize their position by the fact that the qualification of Bachelor is not enough for getting a good job. The majority of the employers looks for Specialists and Masters that are the same in Russia. But for getting the Master Degree it is necessary to study one extra year and students think that it is just a waste of time. One more reason is that quality of the Soviet system has been approved during the long time period. The main explanation of choosing the Bologna system is that it is a worldwide system and students would like to have the same degree as students of the other countries have. The possibility of getting the higher education in two different Universities has also been mentioned.

Professors consider that the qualification of the Bachelor is not enough for the further work in the field of HVAC. There was an opinion that it is enough only for the work connected with the maintaining of the HVAC systems. The principal purpose is that student to not get enough specialization knowledge and the lack of this knowledge has to be compensated by the employer. 78 % of Russian students said that knowledge which they get in their Universities is not enough for their future work. Almost everyone has given their reasons for it. Students complained about the lack of practical training and suggested to arrange more practical training approximated to real situations and projects. Many students told that there is too much theoretical background during their studies and they do not receive enough highly specialized

knowledge. Most of the studying materials in the Universities are outdated. Students have also mentioned that the financing of the Universities is not enough.

Half of the professors consider that level of school education is enough for entering higher educational institution and half of them consider that it is not enough at all. The main reason is that that ordinary school gives general education in all subjects but higher educational institution requires deep knowledge in certain subjects. The ration of students' opinions is the following: 69% think that school education gives enough knowledge to enter and to study in the higher educational institution, and 31% motivated that it is not so. The disadvantages of school education that were mentioned are:

- Simplicity of the program of school education;
- The scope of all subject is similar, so the ordinary school can rarely prepare its' pupils for all kinds of higher educational institution;

- Very often there is not enough teachers in the schools;
- Poor qualification of some teachers;
- School education does not improve logical thinking.

All the professors consider that studies in Russian universities are given in too large groups and it is quite necessary to split the number of HVAC students into smaller groups. At the same time 80% of teachers consider that their timetable is too busy and they have to work overtime. Nevertheless 40% of teachers consider that there are not enough hours for their subject and they are ready to work more.

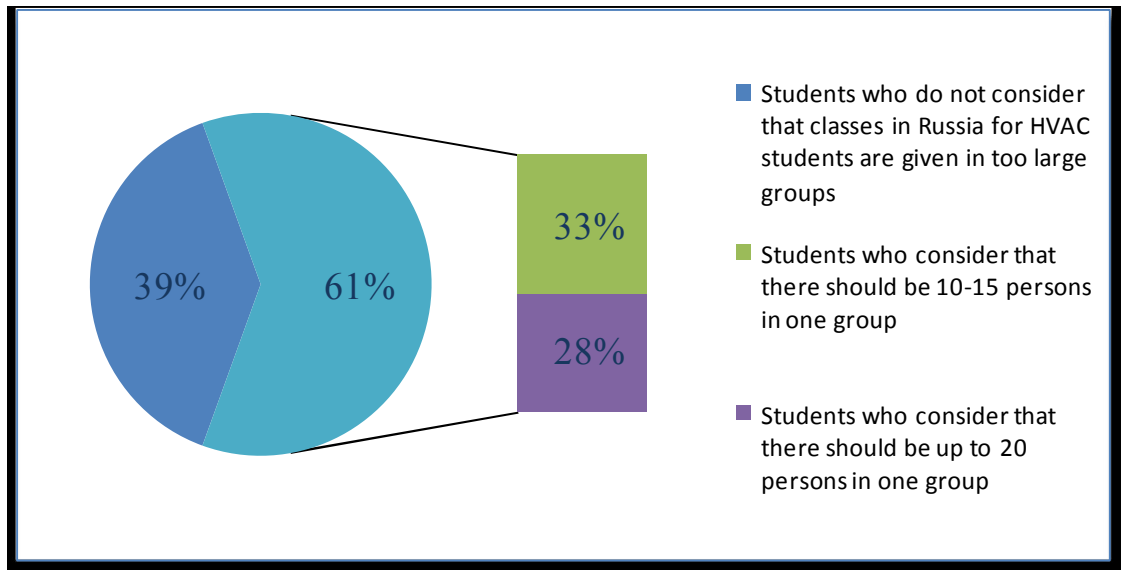


Figure10. Attitude of Russian students to the number of students in one group.

39 % of students consider that there are a lot of “unnecessary” courses which are obligated for studying. Among them were mentioned such subjects as: philosophy, psychology and pedagogy, history of Russia, history of water supply engineering, PE, theory of mechanical oscillations, hydrology, soil engineering, construction materials engineering, environmental impact assessment. 83 % of responded students would like to have an opportunity to choose subjects on their own. All students prefer practical studies as they are more interesting, clearer, and more useful in the future working life.

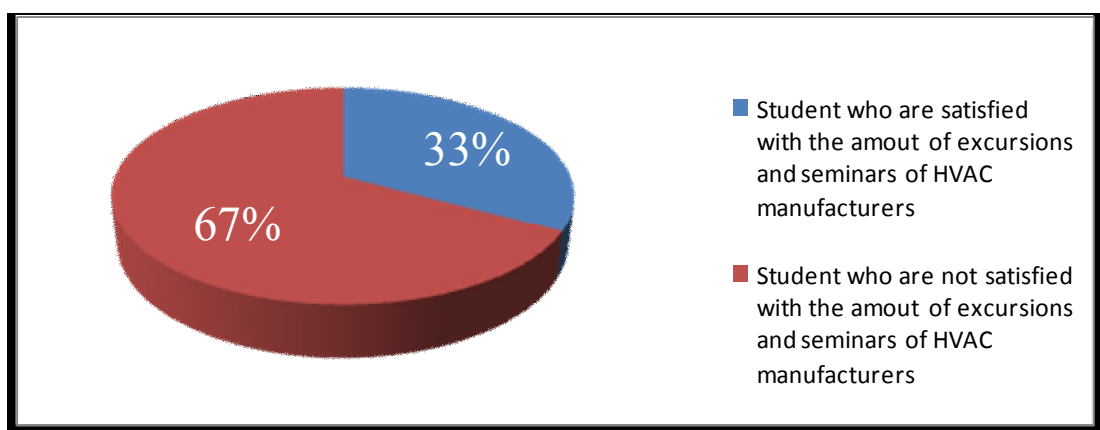


Figure 11. Attitude of Russian students to the amount of excursions.

All the teachers try to combine theoretical and practical studying during their lectures, as practical training is impossible without theoretical basis. All the teachers consider that excursions and seminars of HVAC manufacture are useful for students, but the amount of them during the studies is not enough. Also 80% of responded teachers

posses a considerable working experience and make an examples of their working life during their lectures.

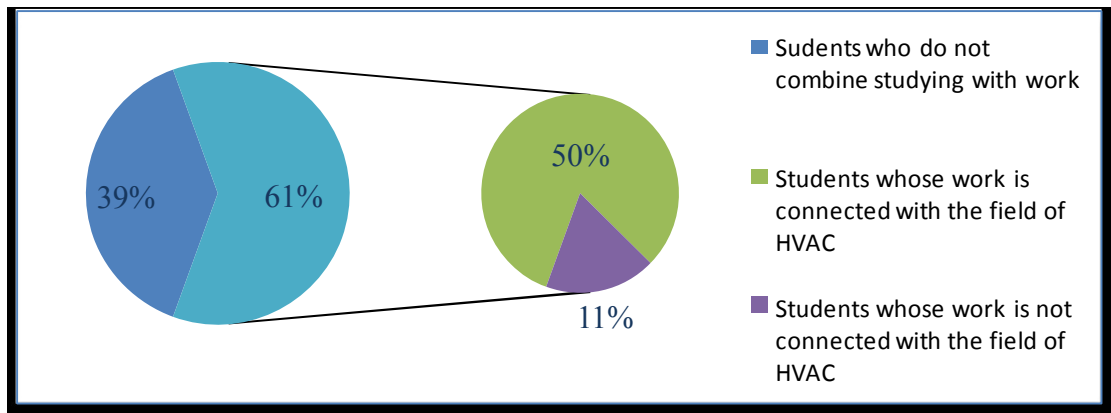


Figure12. Percentage of working and not working students.

60% of responded teachers are interested in new methods of education that are practiced in foreign countries. 80% of responded teachers try to discuss new HVAC technologies during their lectures. As an example they mention trenchless pipe laying technology, floor heating, coil heating. Also all teachers are trying to arouse students' interest to renewable energy resources and pay much attention to energy efficiency problems during their lectures. Almost all teachers are in general satisfied with the content of HVAC program of Saint-Petersburg State University of Architecture and Civil Engineering. Those who are not satisfied suggest working out of more practicable projects.

All the respondent students consider that specialty of HVAC engineer offers good future prospects. The main reasons which have been pointed out are: constant need of new buildings and renovation of old buildings because of the urban expansion, more and more people want to live in comfortable conditions, high wages, opportunity of freelance working. Only 22% of students would like to become teachers in the field of HVAC. Subjects which they would like to teach are: project management, heating systems, air conditioning, and energy saving technologies. It is difficult to study for 25% of respondent students nevertheless all of them pass the majority of exams from the first time.

56% of responded Russian students read additional technical literature which is connected with the field of HVAC. They get extra information from prospects of various HVAC companies, Internet, libraries, HVAC magazines. 72% of respondents

are interested in innovations of HVAC production and technology. Such matters as air distribution, chilled beam, heat pump, underground construction, water purification methods are of the greatest interest. 83% of respondents are interested in energy saving problem. The main reasons for such considerable interest are:

- Bad ecological situation;
- This problem is of current interest for Russia;
- It helps to save your own money and money for the whole country;
- Natural resources are limited;
- Energy efficiency is a part of the Bachelor thesis of some students.

Half of the students are planning to continue their professional education and 89% are satisfied with the chosen specialty of HVAC engineer. Practically all students have told about professions that they would like to choose in the future. Among them are:

- Contractor;
- Designer of building services systems, designer of water treatment and waste water systems;
- Project manager;
- Specialist of commissioning of HVAC systems;
- Research work;
- Estimating calculations.

3.3 Attitude of Finnish professors and students.

As it was told above it was decided to question the professors of the Mikkeli University of Applied Sciences. I managed to get the answers for the questionnaires from eight teachers. They are tutoring the following subjects:

- Heating systems;
- Cooling technology;
- Design and dimensioning of HVAC systems;
- Power production and district heating;
- Heating and cooling demands in buildings;
- Project Management Skills;
- Air conditioning systems;
- Indoor climate;
- Principles of HVAC design;
- Water and sewage services in buildings.

As for students it was manageable to ask the second year student of Mikkeli University of Applied Sciences who are studying the program of HVAC engineering. It was possible to question the students of two different groups. The total value of respondent students is thirty four.

Figure13. Percentage of delivered and given back papers.

	Delivered questionnaires	Answered questionnaires
Finnish teachers	10 (100%)	8 (80%)
Finnish students	34 (100%)	34 (100%)

3.3.1 Results

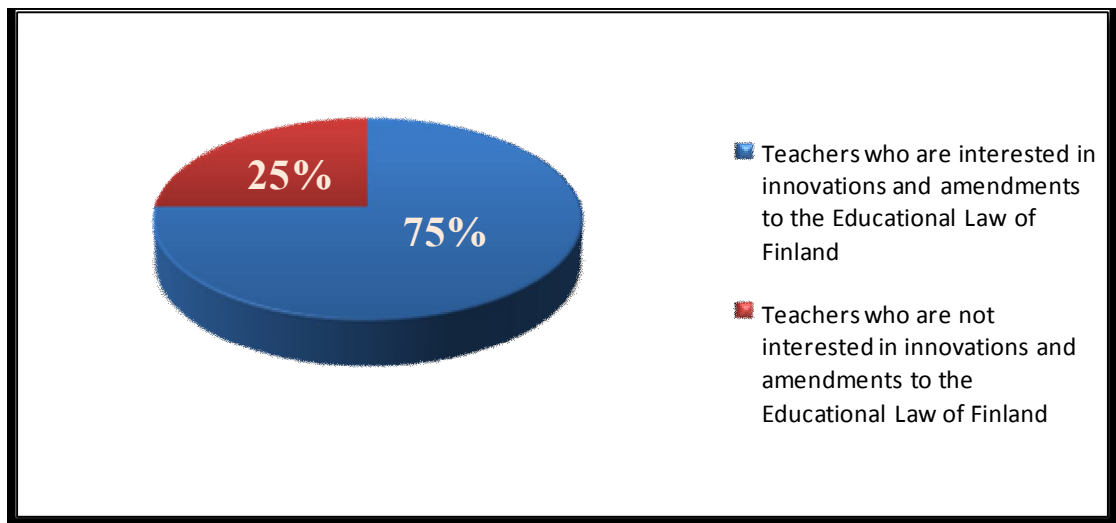


Figure14. Ratio of teachers who are interested and who are not interested in innovations to the Educational Law of Finland.

75 % of teachers care about innovations of Educational Law of Finland because of their own interest, but half of them also do it as it is necessary for their professional activity. 100% of responded students have never the official web site of the Ministry of Education of Finland.

75% of the responded teachers find that their professional ideas and initiatives are not encouraged financially by the Government. Students' position is the following:

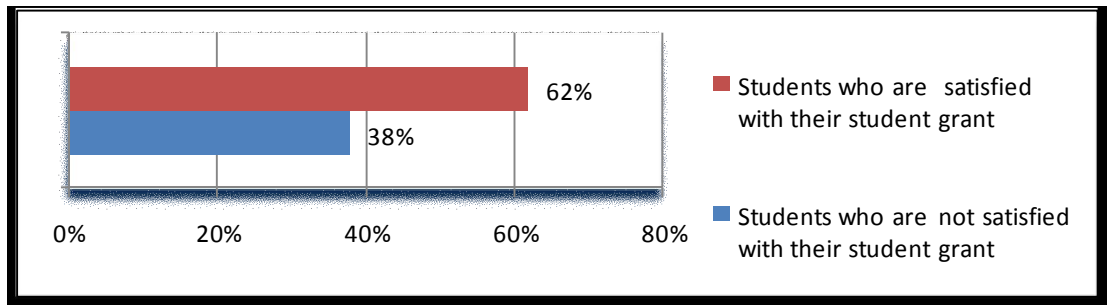


Figure15. Attitude of Finnish students to their study grant.

On the average students who are not satisfied with their student grant concern that it should be multiplied 2 times.

86% of the responded teachers consider that Bologna system is a good educational system, 14% are not satisfied with it. But for all of the

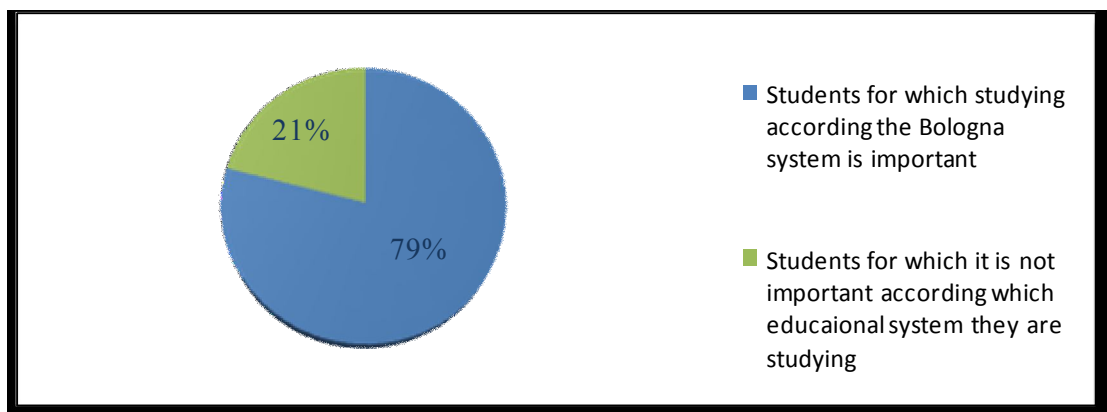


Figure16. Attitude of Finnish students to the Bologna system.

All of the professors consider that the qualification of the Bachelor is enough for the further work in the field of HVAC. The main reason is that it is a good start for the future career. Student gets an overview of the field of HVAC and in the future he can start to specialize in a certain area. Some teachers also consider that tasks and projects during the process of education are closed to practice. 76% of Finnish students think that knowledge which they get in the University of Applied Sciences are enough for their future work. 23% have an opposite position as they say that there are different requirement at different working places and it is impossible to learn everything at school.

88% of professors consider that level of school education is enough for entering higher educational institution. As for students 100% of them think that school

education gives enough knowledge to enter and to study in the higher educational institution.

25% of Finnish teachers consider that studies in Finnish universities are given in too large groups and it is quite necessary to split the number of HVAC students into smaller groups. And all of the teachers consider that their timetable is too busy and they have to work overtime. Only 25% of teachers consider that there are not enough hours for their subject and only 14% of them are ready to work more.

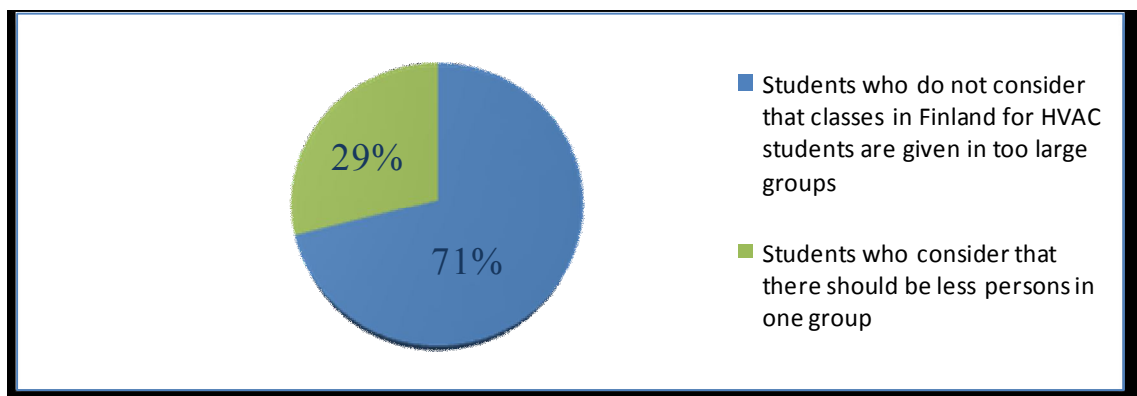


Figure17. Attitude of Finnish students to the number of students in one group.

94% of students like an opportunity to choose the subjects on their own but 12% think that it is difficult to choose it by themselves.

89 % of students prefer practical studies as it is nice to see what kind of work will be in the future. For many students practical training are easier to understand and they consider it to be more important. Some students said that they prefer to work by hand and they are planning to do the installation work in the future. 19% of students prefer theoretical studies as they want to have good theoretical knowledge before setting about the practical activity. Some students also said that they have been working before studying and at the moment they just need theoretical knowledge.

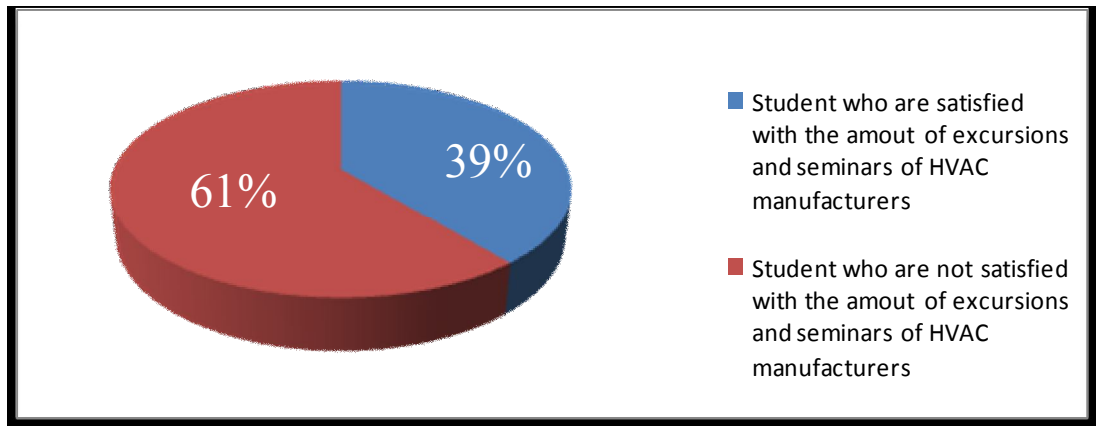


Figure 18. Attitude of Finnish students to the amount of excursions.

63% of the responded teachers give more importance to theoretical training as practical training is difficult to organize. They also say that theory is the basis for practice and it is quite necessary to impact theoretical studying before practice. 37% of teachers give more importance to practical training as it is easier to learn in practice. All the teachers consider that excursions and seminars of HVAC manufacture are useful for students, but 62% of teachers think that the amount of them during the studies is not enough. Also 88% of responded teachers possess a considerable working experience and make an examples of their working life during their lectures.

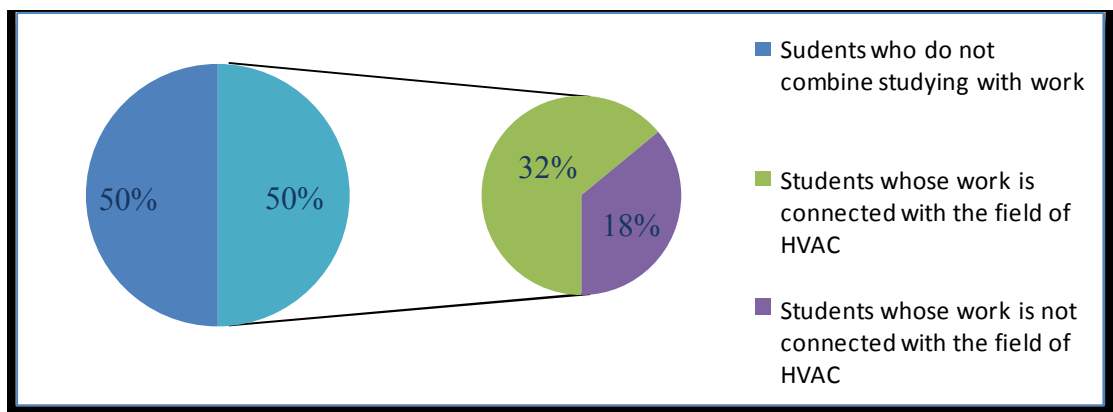


Figure19. Percentage of working and not working students.

71% of responded teachers are interested in new methods of education that are practiced in foreign countries. 88% of responded teachers try to discuss new HVAC technologies during their lectures. As an example they have mentioned cooling systems without refrigerant and compressor (environmental friendly), chilled beam, heat pump, heat recovery, heat demand control ventilation, low energy construction, water supply measurements, software programs for designing systems, energy

production, new energy models. 75% of teachers are trying to arouse students' interest to renewable energy resources and pay much attention to energy efficiency problems during their lectures. The rest 25 % do not do this because their field of teaching does not connected with energy saving. Almost all teachers are in general satisfied with the content of HVAC program of Mikkeli University of Applied Sciences. Those who are not satisfied suggest to increase the amount of subjects which are closely connected to the professional field of HVAC engineers and to reduce the amount of subjects as professional growth, communication skills, internalization, etc. Almost all of the respondent students consider that specialty of HVAC engineer offers good future prospects. The main reasons which have been pointed out are: good working life prospects, good market, houses are built and renovated all the time, which means that there are a lot of work for HVAC engineers. Only 21% of students would like to become teachers in the field of HVAC. Subjects which they would like to teach are: installation of air conditioning systems, planning heating and tap water systems, air handling units. It is difficult to study for 32% of respondent students nevertheless only 5% of them do not pass the majority of exams from the first time. The reason for it is that they are lazy students.

19% of responded Finnish students read additional technical literature which is connected with the field of HVAC. They get extra information from Internet and HVAC magazines. 79% of respondents are interested in innovations of HVAC production and technology. Such matters as energy saving and, cooling systems, and automation are of the greatest interest. 73% of respondents are interested in energy saving problem. The main reasons for such considerable interest are:

- Saving daily costs as an owner of the apartment in the future;
- To create "greener world";
- To prevent global warming;
- Good market;
- Energy efficiency is important for studies.

26% of the responded students are planning to continue their professional education and 97% are satisfied with the chosen specialty of HVAC engineer. Not so many students have told about professions that they would like to choose in the future. Among them are:

- House manager;
- Selling of HVAC equipment;

- Supervisor;
- Installation of HVAC systems;
- Planning and designing;
- Construction.

3.4 Discussion and comparison of the results.

As we see teachers in Russia and in Finland has almost the same position for the legislation of educational systems in their countries: more than half of them are interested in it. And students in both countries have equal position: educational legislation is not interesting for them at all. It may be so because it is more important for teachers to know about their rights and responsibilities, as they are in charged with the students' education. A considerable part of Finnish teachers think that they are not encouraged financially by the State for their working initiation, though they have several times higher salaries than Russian teachers which are not satisfied either. The similar situation is with students' position: 38% of Finnish students are not satisfied with their study grant, though its value is desirable for Russian students.

The attitude of Finnish and Russian teachers to the Bologna system is quite opposite. The majority of Finnish teachers appreciate this system and all of the teachers are not satisfied with it. This happens because Finland has been practicing the Bologna system for more than 10 years and the teachers got used to it while Russian teachers do not want to change program of education that has been practiced for almost 100 years. And there is also a considerable amount of students who prefer studying according the Soviet system.

As for the Bachelor Degree positions of Russian and Finnish teachers are also quite different. Russian teachers think that students have to earn deep knowledge in their professional studies before starting the working life while Finnish teachers consider that basic knowledge are quite enough. This also explains teachers' attitude to the Bologna system. But despite the position of Russian teachers the majority of Russian students said that knowledge which they get in their Universities is not enough and there is too much theoretical background. And the majority of Finnish students are satisfied with their level of education.

All of the Russian teachers have had a common opinion that it is quite necessary to combine practical and theoretical studies when the Finnish teachers have split into two groups: for practical and theoretical studies.

The majority of Russian teachers and students consider that classes in their universities are given in too large groups. But the majority of Finnish teachers and students are satisfied with the amount of students in one group. To my mind Russian teachers and students are dissatisfied as there are lectures in Russian universities which are held for three-four groups at the same time and in the same auditorium. And also there are a lot of groups where there are up to 30 persons.

Two times as many Russian students would like to continue their education and to get the Master Degree. I think that it is so because of the future professions chosen by the Russian students. As the majority of them want to do intellectual work that requires high professional specialization. And the majority of Finnish students would like to work in installation of the systems which is better to learn in practice.

4 OWN EXPERIENCE OF THE GROUP OF RUSSIAN STUDENTS WHO HAVE BEEN STUDYING HVAC IN FINLAND.

A group of Russian students who have been studying in St. Petersburg University of Architecture and Civil Engineering for 5 years have also been studying for one year in the Mikkeli University of Applied Science to get the Double Degree. During these years they have mentioned some difference between educations in these two universities. In Russian university students get deep knowledge in various subjects. Some of these subjects may not be useful in the future working life but they give a considerable theoretical basis to the person and learn students to think open mindedly. After graduating from St. Petersburg of Architecture and Civil Engineering student can easily proceed with research activity. To my mind Finnish Polytechnics do not give such deep knowledge in such a variety of subjects but they give the basic knowledge and after graduating from the University student can decide whether to continue education connected with the similar field of studying or to choose another one.

The great advantage of Finnish Polytechnics is their technical equipment. For example in Mikkeli University of Applied Science there is a computer and free Internet access in every classroom. Also every classroom is provided with screen projection unit which helps in demonstrating of material a lot. There are also well equipped laboratories where the main heating, cooling, etc. processes can be visualized. Also libraries provide good service and up-to-date literature. In the majority of Russian technical Universities the situation is not so satisfactory. Students can not easily get the Internet access in the University, laboratories are not modern at all, and there is not much new books in the libraries. Meal in some student canteens is not good at all, and sometimes students do not even have time to eat during the day time. The majority of student hostels do not provide comfortable and even satisfactory conditions for living.

The principal difference between Finnish and Russian educational systems is that Finnish system is rather steady. Finland has been involved in Bologna system for more than 10 years and the levels and degrees of higher education are well defined nowadays. Russian educational system is just starting to introduce Bologna system to the system of higher technical education and it causes a lot of contradictions between students, teachers, and state interest. On one hand it is good opportunity for student to get the same Degree as students get in Europe, but on the other hand for the majority of students it would be difficult to get the Master Degree as it is planned to make it on a paying basis.

To my mind there are a lot of good things in Finnish Polytechnics which the Russian Ministry of education should put into practice, and there are a lot of interesting subjects and educational methods in Russia which Finnish polytechnics should take into account. And the main idea is that integration between Russian and Finnish technical Universities should develop in more intensive way.

CONCLUSION

In conclusion I would like to discuss the main points of my thesis. In the first chapter it was shown that both countries Finland and Russia try to provide higher education for as much people as possible as it is well known that the future of any state depends on the educational level of the rising generation. The main legislation educational

Laws and standards of both countries were introduced. As it could be seen from the first chapter the educational legislation of Finland is difficult to understand for Russian people and the situation with Russian legislation for Finnish people is the same.

The principal aim of the second chapter was to tell about Russian and Finnish educational systems and to show the examples of Finnish and Russian educational institutes. It was done using the examples of Finnish Polytechnics and Russian Technical Universities which provide programs for Building Services engineers in the field of HVAC.

The main purpose of the third chapter was creating the questionnaires for the teachers and students of both countries and to analyze the results. These questionnaires have matched some principal features like:

- Dissatisfaction with State financial encouragement and Study grants;
- Opposite positions about the Bologna system;
- Opposite positions about the Degree structure;
- Varieties of student plans for their future working life;
- Differences in students' plans for the further education.

And the fourth chapter is some kind of the finalizing thoughts which finally describe the main talking point of my thesis which tells that sharing experience between two countries in the field of HVAC education is quite necessary and for sure it will provide good results at an early date.

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Appendix 1(1). Questionnaire for Russian teachers.

1) Do you follow innovations and amendments to the Federal Law “About Higher and Postgraduate Professional Education” since the 22nd of August year 1996 №125-Φ3? Yes/No?

If yes, do you do this because of your own interest or you have to do this for your professional activity?

2) Are your professional ideas and initiatives encouraged financially by the state (Government of RF)? Yes/No?

If yes, are you satisfied with this encourages? Yes/No?

3) Do you consider that transition of Russia to the Bologna system of education will bring good results? Yes/No?

Can you explain why?

4) Do you consider that the qualification of Bachelor is enough for the work in the field of HVAC? Yes/No?

Can you explain why?

5) Do you consider that level of school education is high enough for the entrance to a higher educational institution and for getting further education in it? Yes/No?

If no, can you ask why or can you write what should be changed to improve school education?

6) Do you think that classes in Russia for HVAC students are given in too large groups (especially lectures)? Yes/No?

7) Do you think that it is quite necessary to divide the number of HVAC-students to smaller groups? Yes/No?

8) Do you think that one exam per one semester (once in four months) is enough to evaluate students' knowledge well? Yes/No? If no, than how many exams would be enough on your opinion?

Appendix 1(2). Questionnaire for Russian teachers.

9) Do you think that there are enough classes in the whole HVAC program for your subject?
Yes/No?

If no, would you be ready to work more? Yes/No?

10) Do you think that your own timetable is too busy and you have to work overtime? Yes/No?

11) Do you give more importance to practical training or to theoretical training on your lessons?

Can you explain why?

12) Do you have a considerable working experience in the field of HVAC (not teaching experience)? Yes/No?

If no, would you like to have it to improve your teaching activity?

13) Do you often take examples of your previous working life during your studies? Yes/No?

14) Do you think that excursions to HVAC-manufacturers, seminars of HVAC-producers, etc are useful for students? Yes/No?

15) Do you think that there are enough excursions to HVAC-manufacturers, seminars of HVAC-producers, etc in the HVAC-program in your University? Yes/No?

16) Are you interested in new methods of education that are practiced in foreign countries? Yes/No?

If yes, can you give an example of any method?

17) Do you try to discuss new HVAC-technologies, modern HVAC-equipment, etc during your lectures? Yes/No?

If yes, can you give an example of the modern technology which is the most interesting for you?

18) Do you try to arouse students' interest to renewable energy resources during your lectures?
Yes/No?

Appendix 1(3). Questionnaire for Russian teachers.

19) Do you touch upon the subject of energy efficiency (saving of energy) during your lectures?
Yes/No?

20) Are you in general satisfied with the content of HVAC program in the University where you are working? Yes/No?

If no, can you write what should be improved in your opinion?

Appendix 2(1). Questionnaire for Russian students.

1) Have you ever read the Federal Law “About Higher and Postgraduate Professional Education” since the 22nd of August year 1996 №125-Φ3 for getting acquainted with your educational rights? Yes/No?

If yes, did you read it because of your own interest or something/someone forced you to do it?

2) Are you satisfied with your scholarship? Yes/No? If no, how many times it should be multiplied in your opinion?

3) Is educational system important for you? I mean is it important for you to study either according to Bologna system (Bachelor’s and Master’s degree) or Soviet system (Specialist’s degree)? Yes/No?

If it is important then what system do you prefer? Can you explain why?

4) Do you think that knowledge that you have got in your University is enough for your future work and the employer will not have to arrange some educational seminars for you? Yes/No?

If no, than what should be improved in your opinion?

5) Do you consider that level of school education is high enough to enter a higher educational institution and for getting further education in it? Yes/No?

If no, than what should be improved in your opinion?

6) Do you think that classes in Russia for HVAC students are given in too large groups (especially lectures)? Yes/No?

If yes, how many students would you like to have in one group?

7) Do you think that there are a lot of “unnecessary” subjects in your schedule? Yes/No?

If yes, can you name any?

Appendix 2(2). Questionnaire for Russian students.

8) Would you like to have an opportunity of choosing the subjects on your own? Yes/No?

9) What studies do you like best: theoretical or practical?

Can you explain why?

10) Do you combine your studies with work? Yes/No?

If yes, is your work related with HVAC? Yes/No?

11) Are there enough excursions to HVAC-manufacturers, seminars of HVAC-manufactures, etc during your studies? Yes/No?

12) Do you think that the specialty of HVAC-engineer offers good future prospects? Yes/No?

Can you give any example?

13) Would you like to become a professor/teacher in the field of HVAC? Yes/No?

If yes, what subject would you like to teach?

14) Is it difficult to study for you? Yes/No?

Do you pass the majority of exams the first time? Yes/No?

If no, do you have any reasons why?

15) Do you read additional (extra) technical/professional literature on HVAC? Yes/No?

If yes, where do you find this literature (library, Internet, etc)?

16) Are you interested in the innovations of HVAC production and technology? Yes/No?

If yes, can you give any example?

Appendix 2(3). Questionnaire for Russian students.

17) Are you interested in energy efficiency problem (energy saving)? Yes/No?

If yes, can you explain why?

18) Are you planning to continue your studies in the field of HVAC? Getting a qualification of Master for example? Yes/No?

19) Are you satisfied that you have chosen a profession of HVAC engineer in general? Yes/No?

20) Please write what kind of work exactly would you like to do after graduating from the University.

Appendix 3(1). Questionnaire for Finnish teachers.

1) Do you follow innovations and amendments to the Educational Law of Finland? Yes/No?

If yes, do you do this because of your own interest or you have to do this for your professional activity?

2) Are your professional ideas and initiatives encouraged financially by the state (Government of RF)? Yes/No?

If yes, are you satisfied with this encourages? Yes/No?

3) Do you consider that Bologna system is a good educational system? Yes/No?

Can you explain why?

4) Do you consider that the qualification of Bachelor is enough for the work in the field of HVAC? Yes/No?

Can you explain why?

5) Do you consider that level of school education is high enough for the entrance to a higher educational institution and for getting further education in it? Yes/No?

If no, can you ask why or can you write what should be changed to improve school education?

6) Do you think that classes in Finland for HVAC students are given in too large groups? Yes/No?

7) Do you think that it is quite necessary to divide the number of HVAC-students to smaller groups? Yes/No?

8) Do you think that writing exams is good enough to evaluate students' knowledge?

Appendix 3(2). Questionnaire for Finnish teachers.

9) Do you think that there are enough classes in the whole HVAC program for your subject?
Yes/No?

If no, would you be ready to work more? Yes/No?

10) Do you think that your own timetable is too busy and you have to work overtime? Yes/No?

11) Do you give more importance to practical training or to theoretical training on your lessons?

Can you explain why?

12) Do you have a considerable working experience in the field of HVAC (not teaching experience)? Yes/No?

If no, would you like to have it to improve your teaching activity?

13) Do you often take examples of your previous working life during your studies? Yes/No?

14) Do you think that excursions to HVAC-manufacturers, seminars of HVAC-producers, etc are useful for students? Yes/No?

15) Do you think that there are enough excursions to HVAC-manufacturers, seminars of HVAC-producers, etc in the HVAC-program in your University? Yes/No?

16) Are you interested in new methods of education that are practiced in foreign countries? Yes/No?

If yes, can you give an example of any method?

17) Do you try to discuss new HVAC-technologies, modern HVAC-equipment, etc during your lectures? Yes/No?

If yes, can you give an example of the modern technology which is the most interesting for you?

18) Do you try to arouse students' interest to renewable energy resources during your lectures?
Yes/No?

Appendix 3(3). Questionnaire for Finnish teachers.

19) Do you touch upon the subject of energy efficiency (saving of energy) during your lectures?
Yes/No?

20) Are you in general satisfied with the content of HVAC program in the University where you are working? Yes/No?

If no, can you write what should be improved in your opinion?

Appendix 4(1). Questionnaire for Finnish students.

1) Have you ever visited the www.minedu.fi/OPM/ for getting acquainted with your educational rights? Yes/No?

If yes, did you read it because of your own interest or something/someone forced you to do it?

2) Are you satisfied with your study grant? Yes/No?

3) Is educational system important for you? I mean is it important for you to study either according to Bologna system (Bachelor's and Master's degree) or Soviet system (Specialist's degree)? Yes/No?

If it is important then what system do you prefer? Can you explain why?

4) Do you think that knowledge that you have got in your University is enough for your future work and the employer will not have to arrange some educational seminars for you? Yes/No?

If no, than what should be improved in your opinion?

5) Do you consider that level of school education is high enough to enter a higher educational institution and for getting further education in it? Yes/No?

If no, than what should be improved in your opinion?

6) Do you think that classes in Finland for HVAC students are given in too large groups (especially lectures)? Yes/No?

If yes, how many students would you like to have in one group?

7) Do you think that there are a lot of "unnecessary" subjects in your schedule? Yes/No?

If yes, can you name any?

Appendix 4(2). Questionnaire for Finnish students.

8) Do you like to have an opportunity of choosing the subjects on your own? Yes/No?

9) What studies do you like best: theoretical or practical?

Can you explain why?

10) Do you combine your studies with work? Yes/No?

If yes, is your work related with HVAC? Yes/No?

11) Are there enough excursions to HVAC-manufacturers, seminars of HVAC-manufactures, etc during your studies? Yes/No?

12) Do you think that the specialty of HVAC-engineer offers good future prospects? Yes/No?

Can you give any example?

13) Would you like to become a professor/teacher in the field of HVAC? Yes/No?

If yes, what subject would you like to teach?

14) Is it difficult to study for you? Yes/No?

Do you pass the majority of exams the first time? Yes/No?

If no, do you have any reasons why?

15) Do you read additional (extra) technical/professional literature on HVAC? Yes/No?

If yes, where do you find this literature (library, Internet, etc)?

16) Are you interested in the innovations of HVAC production and technology? Yes/No?

If yes, can you give any example?

Appendix 4(3). Questionnaire for Finnish students.

17) Are you interested in energy efficiency problem (energy saving)? Yes/No?

If yes, can you explain why?

18) Are you planning to continue your studies in the field of HVAC? Getting a qualification of Master for example? Yes/No?

19) Are you satisfied that you have chosen a profession of HVAC engineer in general? Yes/No?

20) Please write what kind of work exactly would you like to do after graduating from the University.