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Education needs and trends in Environmental Engineering field

With the focus on Eastern Europe region

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Abstract

21st Century highlighted with the biggest challenge humanity has faced – Climate Change. Decrease in the quality of environment, natural disasters and change of usual climate conditions pursued leaders of governments all around the world to take actions against global warming and direct politics towards sustainable development and environmental friendly lifestyle.

There are many aspects needed to be considered for achieving sustainable development goals and one of such aspect is environmental education. Environmental education just starts its way as a separate discipline and requires many developments and improvements of its curricula.

The aim of this research work is to provide reader with the actual information in environmental education sector, current environmental challenges and trends among population with the focus on the countries of Eastern Europe and particularly on Poland and Estonia. This work provides with the information about how the questionnaire research was done, how the quantitative data was analyzed, gives anew information on trends and interests among students in Poland and Estonia towards environmental education.

In this work research showed that the biggest interest of students lays towards knowledge in sustainable development, waste management, environmental health and knowledge of professional computer programs. It is also very important to notice that population preference towards free education is significantly higher.
In the future it is recommended to carry out more research in this sector with better investigation towards current environmental situation in the target sectors.

Keywords

Environmental education, MOOC, sustainable development, Climate change, Global warming, IPCC

CONTENTS

1 INTRODUCTION

The middle of 20th century was a start of rapid industrial development. Mining, machinery, food industry, technological boom and growth of population lead to crucial environmental problems. Together with exhausted natural resources, poisoning of nature, extinguishing of habitats and sever health problems in humans, industrialisation brought the biggest challenge humanity has faced before – climate change (IPCC Report 2018, 53). Scientific society made a series of measurements and studies to understand possible risks and predict future changes in the environment and their impact on the humans.

Governments of countries all around the globe decided to combine efforts and establish relevant restrictions and rules, recommendations and actions for mitigating adverse changes. It was summarized that the way for the future of the planet and humans is aiming of every country for sustainable development (SDG Report 2019).

Providing the knowledge about importance of nature and changing the people's ways of concerns about environmental issues through environmental education is one of the crucial tools towards reaching sustainable development (Herodin & Zuhlsdorff). Therefore it is very important not only to make reforms in environmental legislation system or in industry, but also provide the public with relevant, authentic and trustworthy education on environmental issues and develop critical thinking for the ability to solve current environmental questions.

Nevertheless environmental education plays valuable role in mitigating all existing ecological problems and preventing new ones, still in current educational system of many universities around the world environmental engineering as discipline is relatively new and very often is provided as part of another discipline (The development of Environmental Engineering curriculum 2014, 126).

South-Eastern Finland University of Applied Sciences, Xamk provides students with ability to obtain Bachelor of Engineering in the field of Environmental Engineering. In 2019 Xamk will launch Massive Open Online Courses, MOOC for

students all around the world. MOOC will include courses with the focus on different disciplines one of which will be Environmental Engineering. For this purpose, Xamk would like to know about actual trends and interests among people towards environmental education in Eastern Europe, particularly in Estonia and Poland, to be able to provide potential students with essential information in this sector.

This research work is aiming to provide reader with answers on the following questions:

- Population's interests in Environmental Engineering disciplines in Eastern Europe?
- How much Eastern European society is willing to pay for online education?

2 THEORETICAL BACKGROUND

2.1 Intergovernmental Panel on Climate Change. Report 2018

In 21st century the world and humanity are facing new environmental challenges. Industrialization and technological development increased the ability for usage of natural resources, launched new era of technology and turned the world to the different level of comfort. However, together with improvement and comfortable lifestyle, people are facing irreversible consequences in the nature state. Unethical usage of resources, irresponsible actions of industries towards environment and egoistic behavior of humans lead the progress of technology to degradation of nature. Already now society can notice terrifying changes: droughts and floods, species extinction, migration of animals, new disease and unusual climate conditions such as abnormal temperatures (IPCC 2018, 55.). Human actions lead to abnormal increase of temperature in the last years of 21st century comparing to previous centuries (Figure 1, Figure 2).

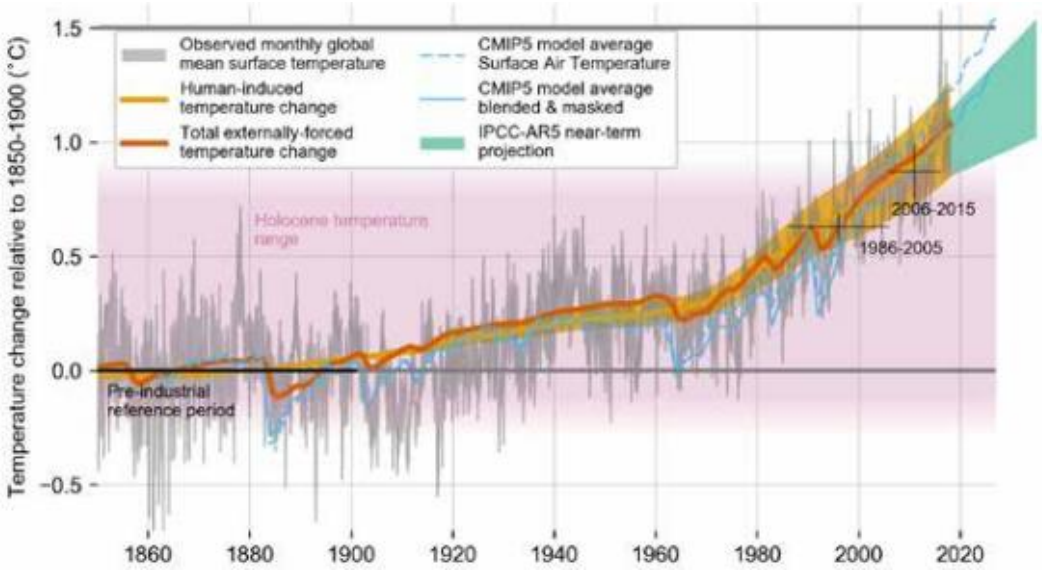

Figure 1 – Change of global surface temperature during decades (from 1860 to 2020) (IPCC Report 2018)

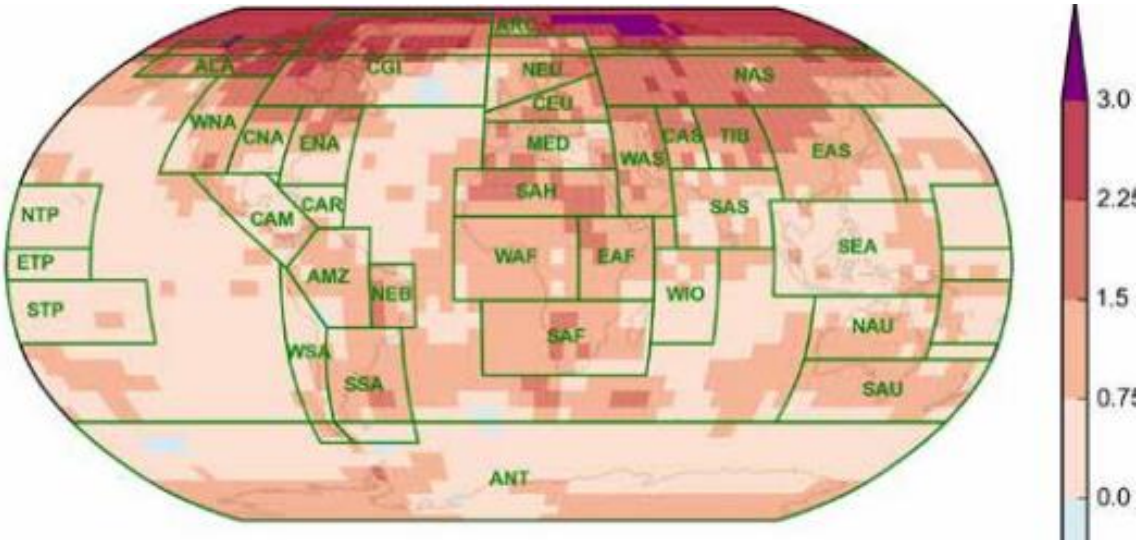

Figure 2 – Increase in temperature in different continents. Pink is equal to 0 °C, purple is equal to 3 °C (IPCC Report 2018)

All of these facts are just beginning of changes, which may not be possible to adopt for humans.

Intergovernmental Panel on Climate Change (IPCC) is an organization which provides people and governments with science-based information on climate change, consequences it can lead to and possible future forecasts with the aim to enhance the fight against fatal for humans changes. Research of this

organization is done by international specialists all around the world, who are volunteering their time and knowledge to contribute to better future of humans and the Earth. The data mentioned in the report is clear and reliable and taken into consideration by authorities at the different level.

In this research work is used the report published by IPCC in the year 2018, which gives information of the climate changes, its future risks and impacts on the planet at the temperature rise at 1.5 degrees. The aim of using this report is to analyze the future forecasts of climate change and possible risks and consequences that it can cause. This can give the reader better understanding of importance of environmental awareness and the need of environmental education for the future of the planet.

2.1.1 Future forecast of nature changes

The assessment of changes in the IPCC report was done based on two main methods: observation and model projection. (IPCC 2018, 183.)
For the observation assessment was used information from previous studies related to the topic. This data is appropriate for assessment of impact of climate changes at the low level temperature with further increase at 0.5°C or 1°C degrees.

Model projection is an essential tool which helps examine and explore the reaction of the environment to climate changes forced by anthropogenic actions. Projections are based on experiments with regional and global climate models and they are used to assess possible risks to humans and nature. Projections are performed for different possible scenarios and provide information on several possible outcomes. Results are listed in sequence that presents evolution of climate along 21st century at different scenarios and during different time periods, for instance 2016-2035, 2046-2065, 2081-2100 etc.

According to IPCC report projections (IPCC Report 2018, Chapter3), main changes that humanity and planet will face in the future is a growth of occurrence of extremely high temperature in all regions around the globe, particularly in

North America, Europe and Australia, central Asia and south Africa regions. (IPCC Report 2018, 189.). Mostly, it will be expressed in higher intensity of temperatures, its longer duration during the seasons and in more often appearance.

Another significant change which has high possibility to appear in the future is a rise of natural disasters such as floods or cyclones, which are prognoses to ruin infrastructure of the cities and lead to deaths of many people. Water surface temperature will tend to increase and it will lead to higher probability of storms. Significantly will decrease water availability and water scarcity will affect biggest part of population. For example projected that around 1.3 billion of people will be affected by water scarcity and about 8% of global population will have severe problems of reaching water resources. Most likely, availability of fresh water in many islands will be extremely low and not enough to cover needs of living organisms. Additionally, changes will impact of energy production from hydropower stations in South European regions, which will have relative impact on humans comfort lifestyle (IPCC Report 2018, 242.).

Quality of drinking water will also decrease. Mainly it will be related to change of water nutrient content, oxygen and chloride concentrations. Additionally, due to floods, quality of ground water will also decrease and may be not adjustable for drinking because of salinization.

IPCC report confirms predictions of many other studies which prognoses extinction of species and lose of specie's range. Over the last several decades plant and animal species moved in nearly 17 km norther and 17 m upper per each decade. It is likely that climate change will cause migration of species, which may lead to modification of food chain and be dangerous for many animal species as well as for humans.

These changes will influence nowadays familiar and comfortable life of humans. However, the upcoming changes may have more serious effect on humans and bring worse changes than expected. Climate change can very negatively affect

the sources of nutrition. Together with decreasing of water quality and water resources, agricultural side will be also prone to changes. It is estimated, that crops yield will decrease up to 60% in some species of crop cultures (IPCC Report 2018, 236.). Livestock will be also affected negatively by changes in natural conditions. The quality and amount of livestock will be influenced by nutritional changes of feed and also by spread of various diseases (IPCC 2018, 237.). In total, estimated decrease of livestock around the world is estimated to be 7-10%. Changes will also influence fisheries and aquaculture in negative direction. This industry is a beneficial source of protein in conditions of growing population. However, changing conditions will negatively impact on it and may exclude this source from the available options.

Climate change will also affect the health of humans. Health issues will be related not only to extreme weather changes, different nutrition content of food and numerous catastrophes, but also to vulnerability to diseases, which will be spread differently in new climate conditions. In general, health issues will affect humans in a way of higher death occurrences, less productivity, injuries and undernutrition (IPCC 2018, 240.).

Urban areas will also get prone by changes in natural conditions. Cities' infrastructure can be directly and indirectly influenced by extreme weather conditions and lead to destroy of whole infrastructure. Climate change will negatively impact on tourism tendency, make places less attractive or adjustable for the travel purposes that they have now. Climate changes will also effect on energy and economic sectors. With higher temperature the thermal efficiency of such energy sources as fossil fuels, nuclear, solar and biomass power will decrease.

It is also prognoses that in the future percentage of poverty will increase with climate changes. Additionally, there is a high possibility of national migration and international conflicts (IPCC 2018, 244.).

All listed factors are the estimated risks, which may appear with upcoming changes in the climate and which have different rates of confidence. However, it already gives enough of understanding of how essential environmental concerns are. It is very important to take actions already now and think about prevention of more negative consequences in the future. Already nowadays governments of many countries around the world are thinking of reaching carbon free goals, inventing taxes of usage of greenhouse gases and promote green lifestyles (SDG Report 2019.).

Therefore, there is a high likelihood that in the nearest future there will be a great need of professionals specialized on environmental protection and related matters, which could develop and implement a right way of lifestyle for individuals, manufactures, nations and governments on how to cope with climate changes and mitigate all possible environmental risks.

2.2 Online education

With the development of computer technologies and internet, life of people became faster and easier. Nowadays, smartphones and computers can be found from almost every individual in middle and high income countries. Internet is playing even more vital role. It has all possible information and includes different types of contents, from entertainment programs to scientific research papers.

One of the most useful implementation of these technologies is online education.
Online education gives possibility of getting education for many people who don't have this opportunity with the traditional model of study due to different reasons: lack of money, lack of time, accessibility problems etc.
Online education is meant to provide students with complete and thorough information on the particular subject by using in direct methods like online discussion chats, video translations, learning diaries and many others, which can be done remotely (Online education: Worldwide status 2018, 233.).

However, beginning of online education started to take its place much more before these actual technologies has appeared. First case was mentioned

already in 1728 year in Boston Gazette article, where it was said about same results of success of learning for those students, who were taught by sent letters as for those, who had been actually present at the lectures. Already at that moment appeared idea to teach students by sending to them letters with information (Online education: Worldwide status 2018, 235.).

After internet became available in people's everyday life, there were many tries for universities in USA to launch online education courses and year 1998 is considered as the beginning of development of online education. However, not every try was successful and it was a main factor of inventing hybrid programs of study, the main idea of which is to combine distance and face-to-face learning and gain advantages of both types (Online education: Worldwide status 2018, 235.).

Nowadays online education gains more and more popularity among new generation of students. It erases borders not only between countries, but also among ages. Online education is available for everyone and does not restrict people by age and status, location and level of income. People can afford online courses and often take them as addition to their main, traditional face-to-face education. However, the tendency of making online education as a main source of knowledge is currently getting more attentions and relative researches worldwide.

Online learning is still at the stage of continues improvements and it needs various moderations and developments (Online education: Worldwide status 2018, 238.).

Online education should not compromise the quality and should be considered at the same level as traditional face to face education (Online education: Worldwide status 2018, 238.).

It is still a big question which form of online education could be most efficient and successful. At the moment it is difficult to avoid face-to-face education and it

should be still combined with online forms of studies (Online education: Worldwide status 2018, 238.).

Online education forms can't fit as a standardized version to every country. It is important to individualized online studies according to location, cultural aspects, and social situation (Online education: Worldwide status 2018, 238.).

2.2.1 Trends in online learning in Europe

The research of Ljubljana International Centre for Chemical Studies (ICCS) (1992) was based on survey and was executed in Universities in Poland, Lithuania, Latvia, Serbia and Belarus. Total number of respondents is 877, 59% of which are students from distance education degree, and 41% are students with traditional face-to-face study experience. The initial aim of this survey was to understand and explore trends and demand level of distance learning and also problems related to it.

Questionnaire included 24 questions, 18 of which were about distance learning and attitude towards it. According to the results, those participants, who have their studies within traditional face-to-face model, were satisfied with their studies on 67.4%, while the students doing their studies through distance learning were satisfied only on 42%. Meanwhile, 32% of respondents from distance learning study type would prefer traditional model of studies. Only 11% of participants from total amount would like to use in their studies individual ways of learning such as online lectures and learning videos. 43% of distance learning students would still prefer real time communication and attendance of university lectures. Also, there is a small amount of people who would be satisfied to get learning materials via Internet (Environmental education in the Central and Eastern European countries 1992.).

In table 1 are shown preferences of methods to prepare for the lectures by students, who are studying in distance learning degree. By comparing results from face-to-face and online methods, online ones have less importance among respondents to prepare for lectures comparing to traditional methods.

Table 1 – Attitude of distant students towards methods to prepare to lectures (Environmental Education in Central and Eastern European countries, 1992)

Preparation methods	Latvia	Serbia	Belarus	Lithuania	Poland
Attend a lecture, to read a text book	30	28	24	25	27
Meet lecturers in person	43	49	39	45	41
Prepare for lecture using Internet	11	13	11	9	10
Watch video materials, records of lectures	5	6	11	9	10
Receive information electronically	11	4	15	12	12

While Table 2 shows preferences of study methods by students, who are doing face-to-face education. Again, students of traditional education model give their preference to traditional methods as well.

Table 2 - Attitude of real time students towards methods to prepare to lectures. (Environmental Education in Central and Eastern European countries, 1992)

Preparation methods	Latvia	Serbia	Belarus	Lithuania	Poland
To read a text book at home/library	55	55	51	51	47
Prepare for lecture using	34	35	31	37	35

Internet					
Watch videos or records of lectures	11	10	18	12	18

Two main conclusions follow these results. First of all, students who are doing distance learning chose this form of education not because of way of study materials they receive, but because of another reason. Second, students still prefer traditional forms of real time education. However, another conclusion which was made is that the students, who are studying in traditional face-to-face program, would be interested to include into their learning program methods of online studies and variety of new technologies.

In Table 3 shows the main reasons why individual can choose distance education to traditional face-to-face one. For the most of respondents it is important factor to combine work with studies. Another reason is to have more freedom in studies and have access to studies at any suitable for them time.

Table 3 – Reasons for people to choose distance learning to real-time learning. (Environmental Education in Central and Eastern European countries, 1992)

	Latvia	Serbia	Belarus	Lithuania	Poland
Possibility to study according to individual plan	11	24	7	18	14
Possibility to study independently using IT devices	7	6	9	7	14
Possibility to combine studies with work	39	20	31	22	22
Absence of everyday attendance	25	19	24	17	23
Study at any time	9	25	14	31	25
Less study fees	9	6	15	5	2

Main reason for choosing distance learning is its flexibility and ability to not being present itself on the lecture, what gives students more freedom and possibilities to do other things at the time of traditional studies. However, the main idea behind distance learning is to learn how to gather and study information independently and be able to continue the study without outsource pressure.

In the Table 4 listed main disadvantages of distance learning for participants of the survey. All the disadvantages have high rate, however the most popular one is that respondents don't get enough of motivation and self-control when they study online.

Table 4 – Main reasons why people dislike online form of education (Environmental Education in Central and Eastern European countries, 1992)

	Latvia	Serbia	Belarus	Lithuania	Poland
Lack of face-to-face communication	20	34	22	41	32
Need of motivation during studies	41	29	49	37	49
Lack of practice	39	37	29	22	19

To conclude all the information in the research, it was estimated that still traditional face-to-face education remains its popularity and demand over distance learning. The main reasons for this is traditional form of studies at pre-school and school stages, which makes psychologically difficult for students to adopt to changes and requires efforts for self-discipline.

However, still, prognoses for distance learning are still bright since every year more and more people enrolling to online courses. Therefore, there is a chance that distance learning will be a dominant form of studying in the future (Future trends in environmental education research 2012).

2.3 Environmental education in Eastern Europe

Current environmental situation and expected changes in the future will make demand in professionals, specialized in environmental sciences. Therefore, there will be a high interest towards getting environmental science degree. Currently, many Universities don't provide with separate degree in environmental engineering and usually it appears only as a part of another degree for example civil engineering (The development of Environmental Engineering curriculum 2014.).

Research made by International Center of Chemical Studies (ICCS) (2012) analysis the main problems with the environment and environmental education in countries of Eastern Europe.

Main environmental problems of the study group countries are old technologies, polluted air and water resources, industrialized areas with pollution over long time in high dozes, improper utilizing of waste, and improper treatment of used water resources. However, ministries of environment in studied countries try to focus attention of the public to environmental problems and try to strength environmental education of citizens.

In studied countries operate numerous volunteering green organizations, which provide with courses and studies of environmental education to teachers and also civil citizens. Together with volunteers, there are also many professional organizations providing education in the topics of ecology, toxicology, environmental engineering. Environmental education in countries of Eastern Europe provided along with all levels of education, starting from kindergartens and completing with research institutions.

Situation in general with environmental education is quite favorable, most of the study programs in all countries have spacious environmental content. However, research work has explored one but very serious negative feature of environmental studies in Eastern Europe. Mostly, environmental education is focused on highlighting of environmental problems and providing acknowledge of

the environmental situation in general. However, programs are not focusing on providing students with problem-solving skills. Still, countries are aiming to solve this problem by cooperating with countries, who achieved better results in this sector, for example with countries in Western Europe (Environmental Education in Central and Eastern European countries 1992.).

For better analysis of environmental education in countries of Eastern Europe, the data gathered by ICCS was collected and analyzed from preschool level to research institutions.

At the level of pre-school, environmental education is served in the form of knowledge about importance of care to the environment and to all living organisms.

At the level of primary school, students get information about air, water and soil, protection of plant and animal species, pollution of natural resources and its prevention, effect of polluted environment on human health. At the higher classes studies already cover more complicated knowledge, such as information about ways of water, air and land pollution, pollutants, industrial activities, renewable and non-renewable energy sources. Schools are also organizing field trips.

Secondary school covers almost the same topics as in primary school, but with deeper content and attention to details.

At the level of vocational and technical schools, subject of environmental education is offered as a separate course. However, it is much more rarely that vocational school offers a subject of environmental education as a major of the degree.

At the level of universities, degrees which offer environmental subject as a major is significantly increase.

Nevertheless the situation with environmental education in countries of Eastern Europe at the adjustable level, it is still needs modifications and changes. Most challenge for this is to bring education at the level of preparing specialists with strong problem-solving skills in this area. For solving this challenge, currently universities are looking for collaboration and exchange of experience with universities, where such problem at the minimum level (Environmental Education in Central and Eastern European countries 1992.).

2.3.1 Trends and needs in environment in Estonia

This chapter is based on Estonian Environmental Strategy – research made by Estonian Environmental Ministry (Estonian Environmental Strategy 2007.).

According to Estonian Environmental Strategy, nowadays in Estonia there are several environmental matters which need explicit attention. One of the matter connects to Waste Management. Sustainable technologies are applied to industries, production and landfill management aiming to mitigate waste pollution of nature. Grow also awareness of citizens, which pay their attention to recycling. Generally speaking, nowadays in Estonia topic of waste recycling and sorting is very high and government is applying principals of polluter pays into life (Estonian Environmental Strategy 2007, 7.).

Water resources are very important in Estonia because ground and surface water sources are used for domestic supply and industrial usage (Estonian Environmental Strategy 2007, 7.). However, groundwater supply leads to several problems and salinization of groundwater and industrial usage of surface water sources to pollution of nature ecosystems. Another high risk for water resources in Estonia is Baltic Sea. Due to Baltic Sea pollution, there is a high probability of eutrophication of coastal waters. Therefore, there is a high demand of solving problems related to industrial water treatment and water supply.

There are a lot of discussions and activities towards protection of forest and natural habitats. Due to different reasons, it is prognoses that the amount of forest lands will significantly decrease. For this reason, it is very important in

Estonia to solve the problem of deforestation without compromising economy of the country (Estonian Environmental Strategy 2007, 9.).

There are many issues with soil usage in Estonia. Due to mining, construction works, agricultural activities, infrastructure development soil quality and fertility significantly decrease. It is very important and has very high demand to make soil usage more sustainable and environmental friendly (Estonian Environmental Strategy 2007, 11.).

Very important challenge for Estonia is energy production (Estonian Environmental Strategy 2007, 30). Facilities for industrial manufacture and power plants don't have proper technical equipment, which decreases efficiency of energy production and make it less sustainable.
Additionally, there are not many alternatives for fossil fuels. Resources for biofuel production are limited, but also their price is increasing, which makes production of alternative fuels and energy less possible.

Consumption of energy continues to grow and in the future it prognoses to grow stable every year in 5-7 percent. It means that there will be more demand in energy resources, and if alternative energy sector will not increase its progress in Estonia, its place will fulfill traditional energy sources with harmful effect to environment.

Noise and air pollution become a one of the major problems in Estonia. Level of noise and air pollution increases because of extension of cars and transportation usage. Another significant reason for this problem is that power plants built in areas of dense population, which causes risks for inhabitants of those areas to higher pollution exposure and decrease of health conditions (Estonian Environmental Strategy 2007, 33.).

Another reason of decreasing health conditions of citizens is poor quality of buildings. Due to inadequate HVAC system, prone of the building to radon, usage of artificial materials people are prone to sick building syndrome and the

conditions of their health are decreasing. This tendency is track in both old and new buildings (Estonian Environmental Strategy 2007, 34.).

Public pays a lot of attention to food quality. It is more popular nowadays to buy local and seasonal products, to follow in food production sustainable rules and to improve quality of food in general (Estonian Environmental Strategy 2007, 34.).

Drinking water quality is also increasing and there is a lot of attention to its proper treatment and supply. However, there are more frequent cases of occasion of blue-green algae in surface water resources. Blue-green algae may be toxic and cause health problems to humans (Estonian Environmental Strategy 2007, 35.).

After reviewing these trends and problems with environment in Estonia, it is possible to estimate what would have high interest among Estonian population in environmental education. There are many issues with the environment in area of nature conservation, agriculture, water treatment, energy production and engineering which are waiting to be solved.

2.3.2 Attitude towards environmental education in Poland

This chapter is based on research work of Jagiellonian University (Attitudes to environmental education in Poland 2007.), which made a research in 4 different provinces in Poland to know opinion of students about environmental problems and their interests to them (Figure 3).

Figure 3 – Provinces in Poland, included in the study: Lesser Poland, Silesian, Mazovian, Warmian-Masurian (Attitudes to environmental education in Poland 2007)

According to the research work (Attitudes to environmental education in Poland 2007, 12.), before 1999 year environmental education in Poland was limited by biological classes where students learned about biological features of nature and inhabitants. Additionally, school's curriculum didn't look the same in every school and it brings differences in knowledge among students of different schools and regions. After reform in education the role of environmental education has changed and took bigger aim. The main target of environmental education became to develop in students the feeling of responsibility for the environment (Attitudes to environmental education in Poland 2007, 12.).

Researchers studied the changes in attitudes towards environmental issues of students after changes in curriculum and particularly they payed attention to attitudes of students towards current environmental problems in Poland: protection of biodiversity of species, waste management, pollution of water resources and energy production. Researchers also paid attention to

environmental conditions of provinces, where respondents were from and how it may effect on their attitude. Provinces differ from each other in economic, environmental and industrial development levels (Figure 4).

	Province			
	Warmia-Mazury	Malopolska	Mazovia	Silesia
Area [thousands of hectares]	2420	1514	3558	1229
Population density [persons/ km^2]	61	214	144	393
Urbanisation [percentage of the population living in urban areas]	60	50	65	79
Unemployment rate	29	16	14	24
Percentage of devastated or degraded land	0.2	0.2	0.15	0.48
Percentage of arable land	54	59	67	51
Percentage of built up or urban areas	3.5	5.1	4.5	9.2
Percentage of areas protected by law	54	58	30	22
Dust emissions by plants particularly harmful to the environment [tonnes/year]	2.2	14.4	13.7	32.8
Gaseous emissions (excluding CO2) by plants				
Particularly harmful to the environment [tonnes/year]	13.4	189.9	201.8	571.2
Sulphur dioxide emissions by plants particularly harmful to the environment [tonnes/year]	6.3	58.4	136.9	145.6
Percentage of substandard surface waters	49	57	80	70
Waste rendered harmless to be landfilled (excluding municipal waste) [thousands of tonnes/year]	17.4	1162.2	1593.4	4048.4
Landfilled municipal waste [kg/person]	320	199	284	319
Percentage of municipalities collecting hazardous waste	5.2	7.8	9.5	25.9
Percentage of municipalities segregating waste	9.5	41.1	22.2	34.9
Legend (the scale values are given for comparison only and do not represent absolute values)	low	medium	high	

Figure 4 - Development of provinces in different aspects (Attitudes to environmental education in Poland 2007)

According to results, the best knowledge towards environmental education was expressed in Malopolska and Silesian regions, where Malopolska is the cleanest province and Silesian is the dirtiest one (Attitudes to environmental education in Poland 2007, 16.). Researchers explain these phenomena as that in cleanest region there are many national parks and therefore it is important to provide students with valuable information towards environmental protection. Same reason have the dirtiest provinces as well, because of higher pollution concentration and continuous featuring of it in society. It means that environmental awareness in Poland is not equal and is higher in regions with better environmental or industrial development. People there have better

understanding of issues towards environment and may have higher interest in environmental education after school.

Another important observation is that the main source of knowledge about environmental awareness comes from television but not from schools (Figure 5).

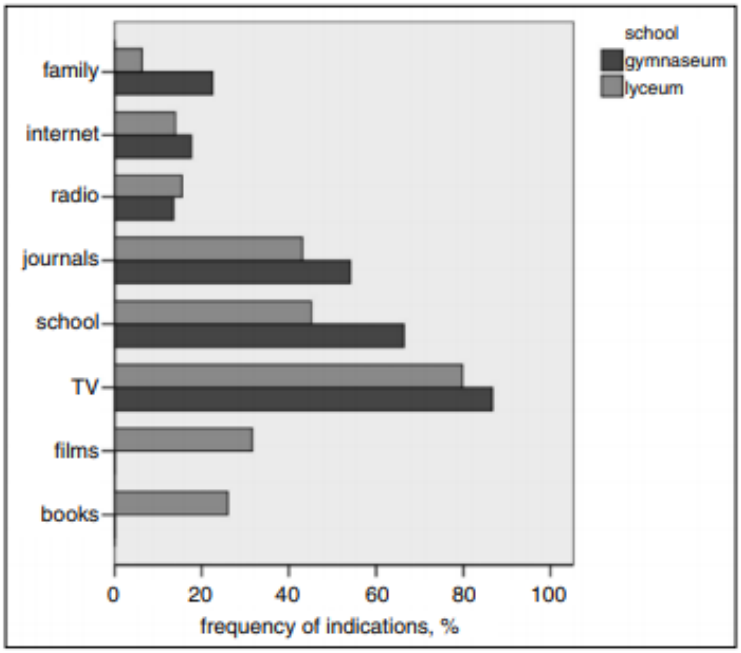

Figure 5 - Sources of environmental awareness of respondents from gymnasium and lyceum (Attitudes to environmental education in Poland 2007)

Also, research involved study of attitudes of students towards different parts of environmental protection, such as recycling and reusing, sustainable usage of raw materials, active interest in nature and environment in general.

Results showed, that all activities were relatively low (most of the responses were approximately at 50 % level); however results from greener regions were higher (Attitudes to environmental education in Poland 2007, 17.).

To consider all the results which were obtained, can be made following conclusions that in general situation with environmental education in Poland is at medium level, they know about modern trends and actions towards environmental protection. However it is important that students understand the main reason of these actions and find direct connections of their actions and real impact on nature.

It is however not satisfying to know that education in schools is not the main source of knowledge of environmental issues. Therefore, it is important to involve into studies more modern techniques of education such as videos and motivation of students towards more individual education on environmental issues, for example video programs, online courses etc.

In general, attitude towards environmental issues has quite positive correlation and demand of getting environmental education has high possibilities to rise in the nearest future. The poorness of environmental education in Poland may cause therefore a demand of getting this education from foreign countries (Attitudes to environmental education in Poland 2007, 17.).

3 MATERIALS AND METHODS

This research work was planned to be done in several stages to ensure the best possible quality and accuracy of results:

- Identify interview method
- Identify study questions
- Identify study group
- Identify methods to reach respondents

After preparing all research pre-requests, actual research was done between 14th of May 2019 - 30th of June 2019. The timing was decided based on summer holiday schedule of respondents.

The aim of this section is to provide reader with clear information on the all steps of the research so it can be repeated by another person if there will be a need in the future for similar research work.

3.1 Research method

Thesis questions of this research are based on discovering opinion and attitude of people towards environmental engineering education. Therefore for gathering, measuring and analyzing data were used methods of quantitative research.

5-scale Likert´s questions were used for data rating, where for every question statement it included 5 scale options of answer where 1 is “strongly disagree”; 2 is “disagree”; 3 is “neutral”; 4 is “agree”; 5 is “strongly agree”.

Another important part of interviewing is the tool for collecting results. Google forms were used for holding and analyzing respondents’ answers.

After interview method and tool was decided, Google form was designed and created. The form was created without request of entering email or sign-in of participant.

Later, when interview questions of research were identified, they were added to Google form.

Full version of survey can be found from Appendix 1.

3.1.1 Research Group and interview questions

For this research was chosen to ask opinion of high school and university students in Estonia and Poland.
Survey questions were designed based on Xamk’s Environmental Engineering curriculum of the group T8715SN and included following disciplines:

- Environmental chemistry
- Microbiology
- Environmental health
- Waste management
- Energy production
- Water treatment
- Air pollution
- Environmental legislation
- Environmental health and quality
- Environmental economy and sustainable development
- Environmental applications of GIS

Structure of questions had simple content for better understanding of high schools students, for example:

- Is it important to take care for nature in your country? (Environmental health course)
- Do you aware of plastic pollution in the world? (Waste management course)
- Would you be interested to study renewable energy sources? (Energy production course)

In total, per each study course were created several questions.

Additionally, were created questions which ask basic information about respondents, their opinion on obtaining degree in natural sciences and their general attitude to environmental matters, opinion about online education and study methods used in online education (video lectures, study diaries). Several questions were multiple choice questions. In total, questionnaire form included 41 questions, 40 of which were compulsory to fill.

Full list of questions for this research work can be found from Appendix 1.

After considering all parameters and making a list of questions, they were added to the Google form.

3.2 Data collection

To collect data was researched all international schools and universities in Poland and Estonia, where the education is in English and major focus of studies is on natural sciences. In total were chosen 13 schools and 21 universities in both Estonia and Poland. The full list of schools can be found from Appendix 3.
The full list of 21 Universities taken part in the research can be found from Appendix 4.

Next step was to send a link of Google form to all chosen educational institutions. Google form was sent not directly to each student, but to contact representatives of each school and university with explanation of the aim of this research work and with the kind request to spread this link among students attending particular school or university. Participants could follow the link and fill the form and results were automatically gathered in Google form.

The sending of results was made from 14.05.2019 and 26.05.2019 and waiting for replies till 30.06.2019 – the last possible date before official summer holidays in all schools and universities participated in this research. Due to the reason that survey link was sent to contact representatives and not personally to each potential respondent, the sending wave was done only once and total amount of form which were sent personally is unknown. By 30th of June amount of responses has reached 48 replies. After 30th of June 2019 the survey form was closed and research proceeded directly to analyses of results.

3.3 Data analysis

Data analysis was done by using Google form and Excel tools.

Firstly, results of each question were processed and analyzed one by one by Google form. In Google form analysis for every question were created automatically. This method has been used for analyzing general opinion of all respondents.

After that, mean value (M) was measured for two sub-categories of the research - respondents from Poland and Estonia. This was done to see the difference between opinion of Polish and Estonian population.
Results were transformed to Excel, where they were separated by the country and analyzed by each question. For each question was created a table, where was calculated a mean value M for both sub-categories according to the formula:

$$M = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{S} \qquad (1)$$

Where

- M - mean value of response per category,
- S - total amount of respondents per country,
- x_1 - total value of responses per score 1,
- x_2 - total value of responses per score 2,
- x_3 - total value of responses per score 3,

- x_4 - total value of responses per score 4,
- x_5 - total value of responses per score 5.

Per each score (from 1 to 5) was calculated total value of responses x:

$$x_1 = n \times 1 \quad (2)$$

$$x_2 = n \times 2 \quad (3)$$

$$x_3 = n \times 3 \quad (4)$$

$$x_4 = n \times 4 \quad (5)$$

$$x_5 = n \times 5 \quad (6)$$

Where

- n - Number of answers per score

After that, calculated M values of two countries per each question was compared to each other and was assessed according to Likert scale scoring, where 1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly.

All calculation tables and mean values per questions can be found from Appendix 5.

After all calculations general and sub-categorical results were processed and analyzed.

4 RESULTS

This part presents the most valuable results for this research work. The full list of results to all survey questions can be found from Appendix 5.

4.1 What students want to study

Questions related to Environmental health course gave the highest scores among respondents and were rated as Agree and Strongly agree generally and individually in both Poland and Estonia (Figure 6).

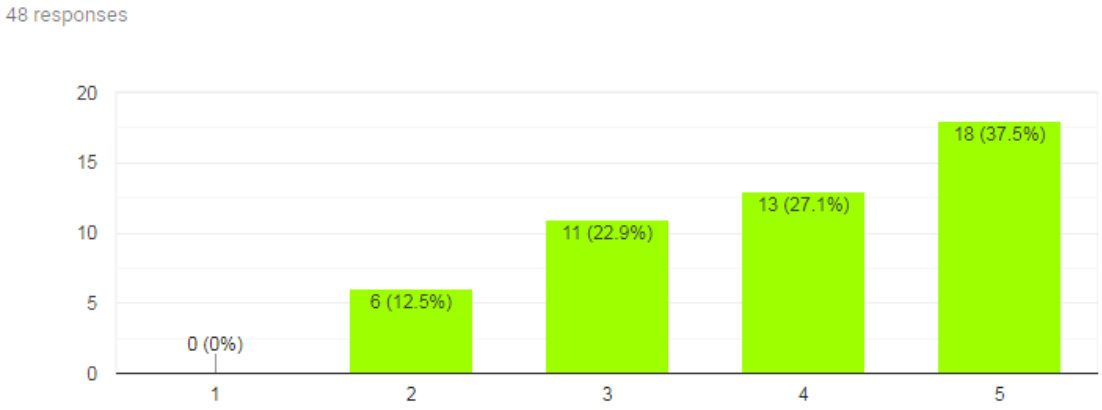

Figure 6 – Interest of respondents towards Environmental Health course, where 1 – the lowest interest, 5 – the highest interest, 48 – number of respondents

In both countries there is a high interest of studying renewable energy production (Figure 7).

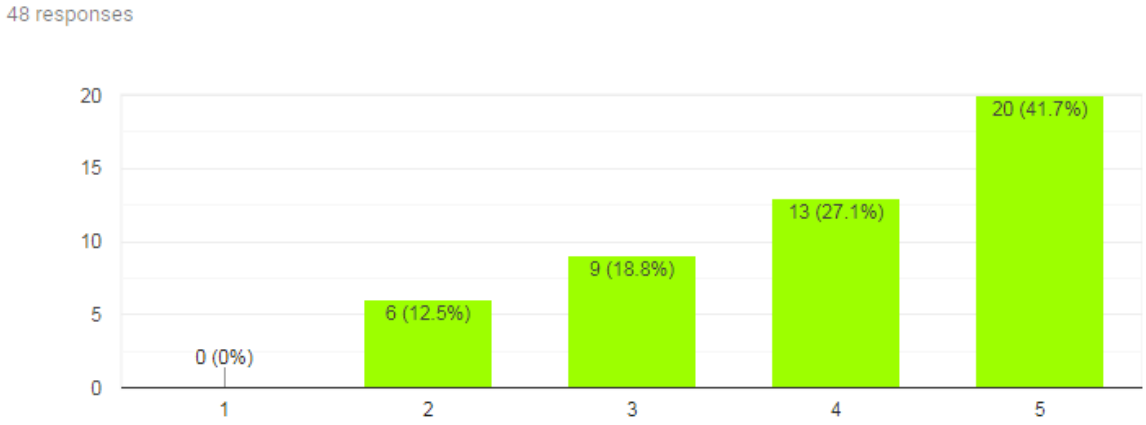

Figure 7 – Interest of respondents towards studying about renewable energy, where 1 – not interested, 5 – very interested, 48 – number of respondents

Respondents from both countries agree that legislation in nature protection is important in their countries (Figure 8). However for respondents from Poland it is important to study legislation as a part of their major degree while respondents from Estonia are neutral to it (Appendix 5/2).

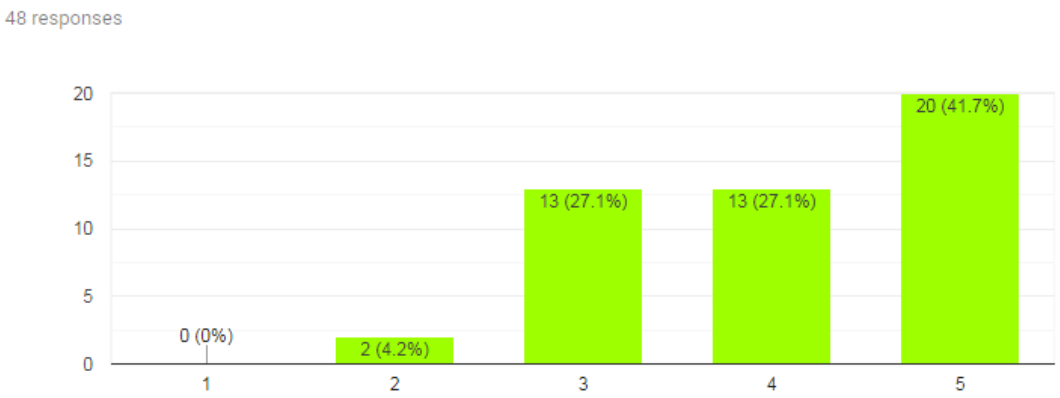

Figure 8 – Importance for respondents of legislation studies, where 1 – not at all important, 5 – very important, 48 – number of respondents

Both categories of respondents value safe conditions at work (Figure 9). Respondents from Poland would be interested to study about how to protect them at work place and learn about safe working practice while in Estonia people have more neutral attitude towards it.

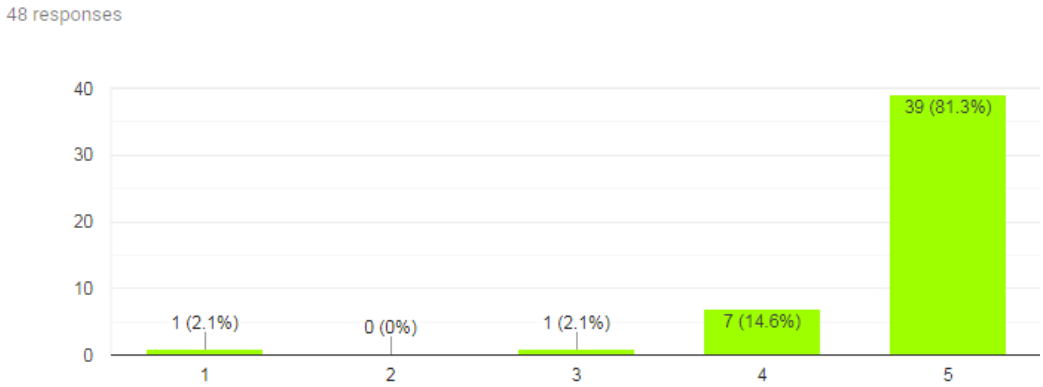

Figure 9 – Importance of work conditions for respondents, where 1 – not at all important, 5 – very important, 48 – number of respondents

Respondents of both countries also agreed about concern of sustainable development in their countries and that government and companies should take responsibilities for actions related to environment (Figure 10).

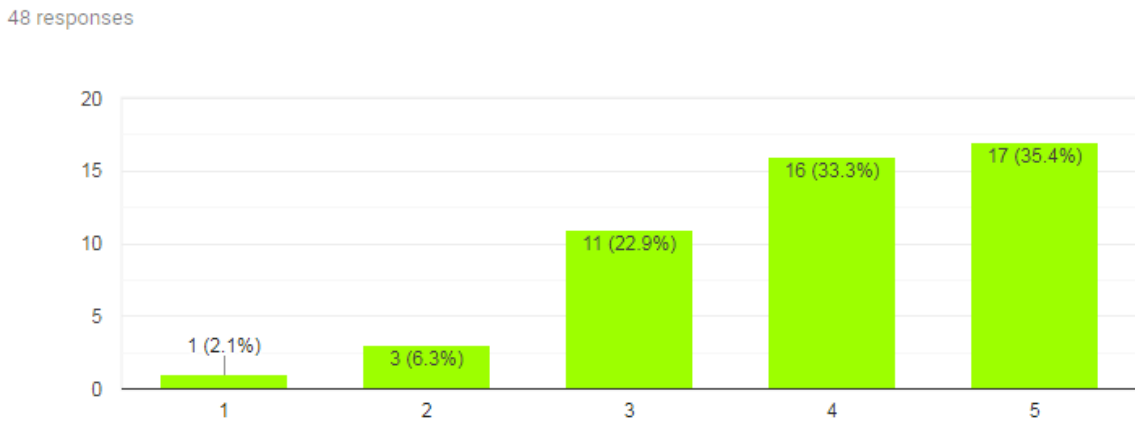

Figure 10 - Importance of sustainable development in respondents countries, where 1 – not at all important, 5 – very important, 48 – number of respondents

Having professional computer skills is highly appreciated for respondents in both countries (Figure 11) and both categories think that it is needed to know professional programs in natural sciences field.

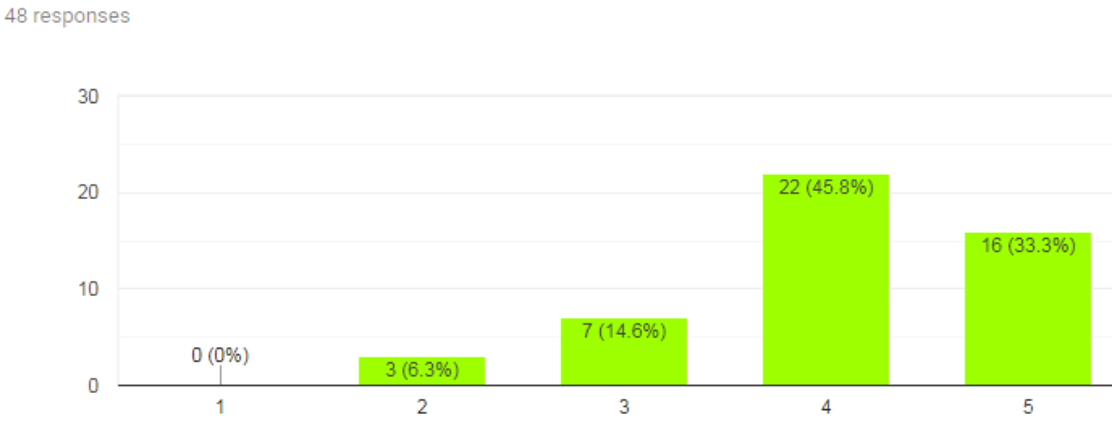

Figure 11 – Interest of respondents toward studying professional computer programs, where 1 – not at all interesting, 5 – very interesting, 48 – number of respondents

4.2 Opinion on study fee

For the majority of respondents it is common to think that education should be free of charge (Figure 15) and both categories have negative attitude towards paying money for online courses (Figure 16).

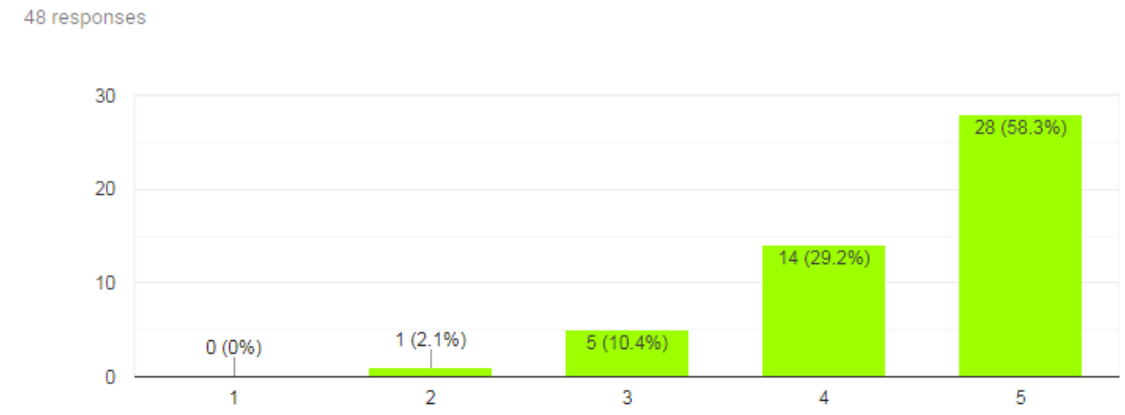

Figure 15 – Opinion of respondents for having free education, where 1 – not important, 5 – very important, 48 – number of respondents

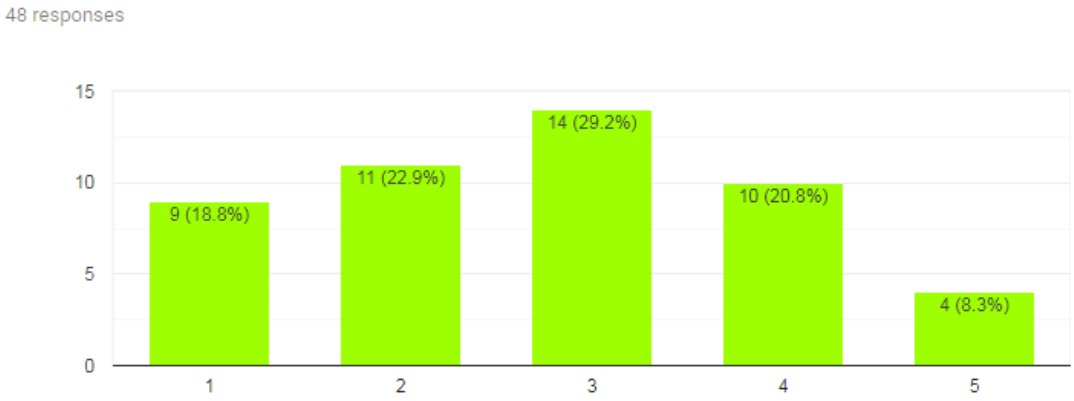

Figure 16 – Interest of respondents in paying for online courses, where 1 – not at all interested, 5 – very interested, 48 – number of respondents

Price range among respondents is very diverse and varies from 0 to 1000 euros. However, for most respondents maximum course price would be between 0 and 100 euros (Figure 17).

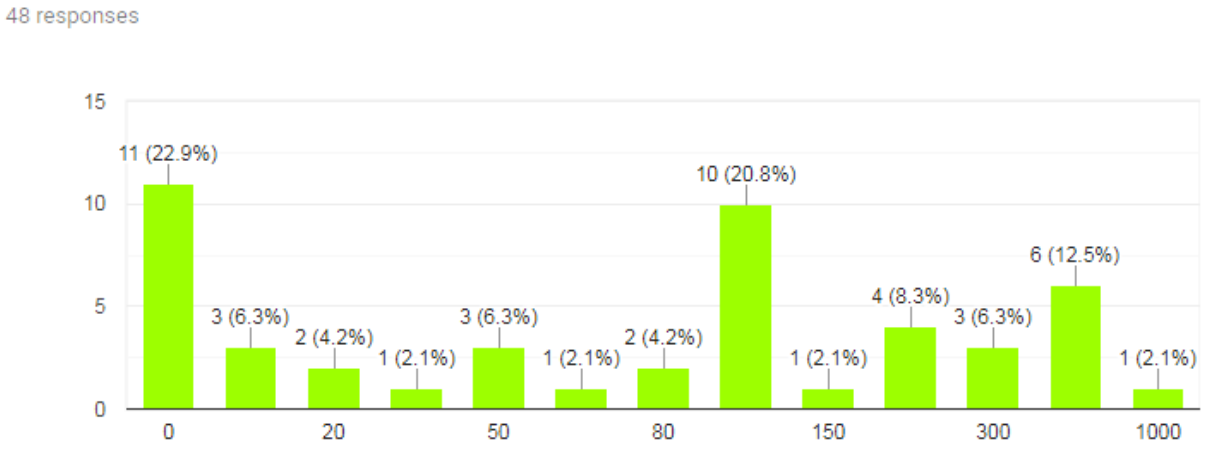

Figure 17 – Price which respondents can pay from 0 to 1000 euros, 48 – number of respondents

4.3 Interest in online education

Most of participants have good interest to online education as a source of professional education (Figure 18).

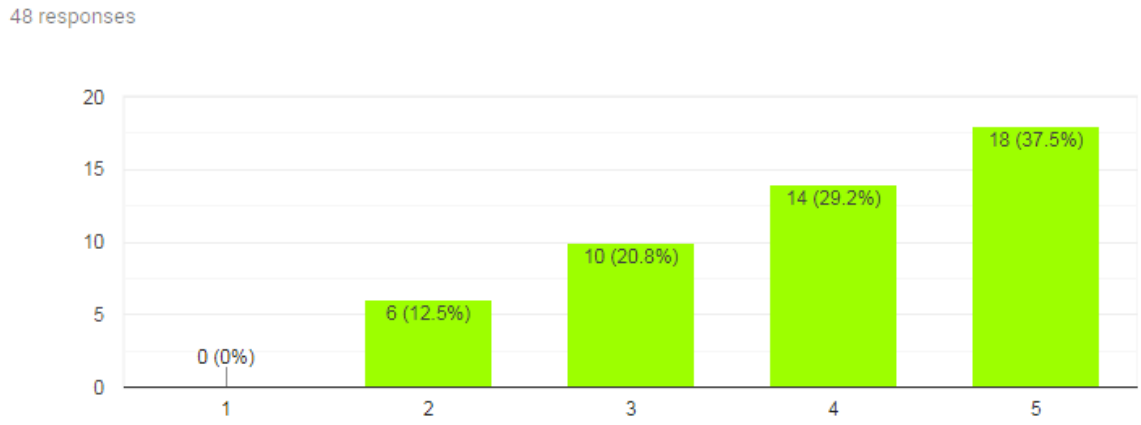

Figure 18 – Interest of respondents in gaining professional education via online sources, where 1 – not at all interested, 5 – very interested, 48 – number of respondents

Higher interest in taking online courses for professional competence respondents see from abroad universities (Figure 19).

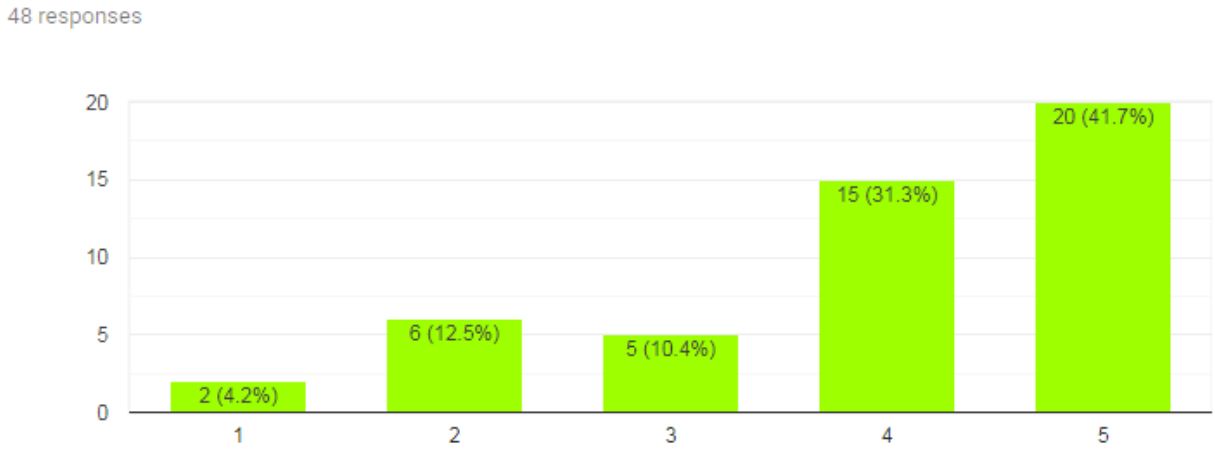

Figure 19 – Interest of respondents in taking online courses from abroad universities, where 1 – not at all interested, 5 – very interested, 48 – number of respondents

5 DISCUSSIONS OF RESULTS

The interest in Environmental Engineering degree among population in Estonia and Poland intents to obtain knowledge in environmental health, renewable energy, sustainability, legislation, occupational safety and professional computer programs.
Educational fee is not desirable and the price per study course is willing to be as low as possible.

The study demonstrates that significant interest of respondents from Poland and Estonia objects proportionally to knowledge about environmental health. However, these findings are controversial with environmental state in both countries. While Estonia makes positive progress in development its environmental state in different sectors (Estonia country briefing 2015), meanwhile Poland is still has to deal with many environmental problems (Poland country briefing 2015). Nevertheless, these results correspond to hypothesis that the highest interest to environment is maintained in the most polluted and cleanest regions (Attitudes to environmental education in Poland).

Significant interest of respondents of both participated counties lays towards renewable energy studies. These findings may be explained by the accepted strategies in Poland and Estonia on energy production. The National Renewable Energy Action Plan developed in Poland aims for increased usage of renewable energy sources in overall energy production (Renewable energy in Poland 2019, 3). Accordingly, Estonian Environmental Strategy 2030 (2007) highlights attention on improvement and development alternative energy sources. These actions and changes in government of countries may explain interest of respondents within finding presented in this research.

In line with proportionally high interest of respondents, results concerning legislation assume unexpected for this research work. During earlier research on environmental issues in Estonia and Poland, legislation matters in environmental sector have not been arisen. However, results showed very high parameters of interest in studying environmental legislation. This interest may be explained

regarding sever problems with nature protection in Poland such as illegal logging of trees in Natura 2000 cite, protection of coal industry by Polish government and appointment of Poland by European Commission to the European Court of Justice because of brakeage of EU environmental law (Sustainable governance indicators 2018, 14). However, more research in this sector has not found any matters with legislation in Estonia. Thus, it is suggested to make research on legislative sector in Estonia before considering the data from results for further implications.

Unexpected results have been found in the question about work and safety conditions. In both respondents' groups the interest towards safety working practice has suddenly high level. Researches made in this sector corresponds that in both Poland (Occupational safety and health in Poland 2001, 194) and Estonia (The legal problems of occupational and health safety in Estonia 2016, 171.) occupational quality increases and develops with every year. However, this sector still remains incompleteness of competence (The legal problems of occupational and health safety in Estonia 2016, 171.) and thus may impact on attitude of population towards self-knowledge of safe working practices.

Findings on studying sustainability among respondents from Poland and Estonia correspond to results made from research on implementation of sustainability strategies in both countries. Thus, active implementation and successful achievement of Sustainable development goals in Poland (Implementation of the 2030 Agenda SDG in Poland 2019, 13) and Estonia (Review on the implementation on 2030 Agenda in Estonia) may arise interest to sustainability among population and lead to enthusiasm of getting profound knowledge in this sector.

Contrary to the hypothesis that distance learning has less preference among students than traditional model of studies (Environmental education in the Central and Eastern European countries 1992), findings of this research expresses higher interest of respondents in online education than expected. This finding supports another result that shows that respondents consider skills in professional

computer programs as one of the most valuable. Such differences may be effected by rapid development of technological development in last 20 years (Rapid development of information technology no date) and therefore the previous findings can be considered as an old source of information and need to be updated with another research on this sector.

There were no research made on education payments in Poland and Estonia before beginning of this research work and therefore knowledge on willingness of people to pay for education are estimated only by results obtained in this research work. Findings declare that respondents have negative attitude towards payment for education. The average amount respondents are willing to pay is under 100 euros. This can be explained that the monthly income in Estonia (Statistics Estonia 2018) and in Poland (Average salary in Poland 2018) are low and less than average income in Western and Northern European countries.

However, the reliability of the data expressed in this research work is affected by several factors which are important to be taken into consideration before using them for further implementations.

The amount of gained responses per both answers is significantly lower than expected and thus cannot express the opinion of population at the age between 18 – 25 years old in Poland and in Estonia. The study institutions in this research work were chosen by the principle of advanced usage of English language in students' studies with the focus on natural science discipline. Therefore, possibility that the language of survey (English) or the theme of survey (Environmental Sciences) may distract respondents' attraction should be excluded or at least should not be considered as the main factor of adverse results. This may be explained by that survey link was sent to school and university's representatives and not directly to respondents.

Request to spread the survey was asked only once and this may also affect amount of responses.

Additional important factor is the timing of conducting research. The survey was asked to be completed at the time of school and university examinations and this may not attract attention of students to survey.

Important to note that because survey has not been sent directly to respondents, it is impossible to calculate amount of contacts with survey form to amount of actual answers and thus estimate percentage of interest to survey's topic among students in Estonia and Poland. Therefore, data cannot be considered reliable due to impossibility of its correlation with population number.

Additionally, there is a possibility that research questions may be perceived incorrectly by respondents. Estimation of respondents' interests are made based on importance of environmental matters in respondents countries, however such statement cannot claim the direct correlation between importance of issue and interest of respondent.

Nevertheless, methods used for data collection and analysis in this research work are appropriate for quantitative type of research carried in this work. Data produced by Likert scale surveying are described in statistics as ordinal data (Research methods in competitive intelligence 2009). There are many arguments between which methods to use for analyzing data from Likert's scale, however methods used in this research work applied to the amount of produces data may be consider as valid and thus be used for further implementations (Best way to analyze Likert item data 2016).

Nevertheless on low reliability of the data, results obtained in this research work comply with previous findings and confirm the information which has been already discovered. Environmental issues and problems in research countries which has been studied before research and results of this work supports the presented in different sources information and therefor may be considered as trustworthy and real. Besides, they discover new areas where attention has not been paid yet and thus may be a reason for further research on this sector.

For the future research on this topic it is recommended to make more theoretical research in the planned study area, consider timing of conducting research, specificity of population group, work in closer cooperation with educational institutions and use broader statistical methods.

6 CONCLUSIONS

This research work confirms the general interest of student population in Poland and Estonia towards environmental education and distance learning. Awareness of environmental concerns and active implementation of environmental friendly practices align together with increased awareness of population to environmental problems. It results to increase interest of population in advance knowledge on energy production, safe working practices, sustainability and narrow computer skills. Rapid development of information technologies make changes in population's stereotypes and habits in educational models and drive people towards new study techniques.

The importance of availability of education is still a valuable matter among people and has direct correlation with income level of population.

Thus, this research work provides with important insight on the topic of concern and invokes to broad this topic with further research in this area.

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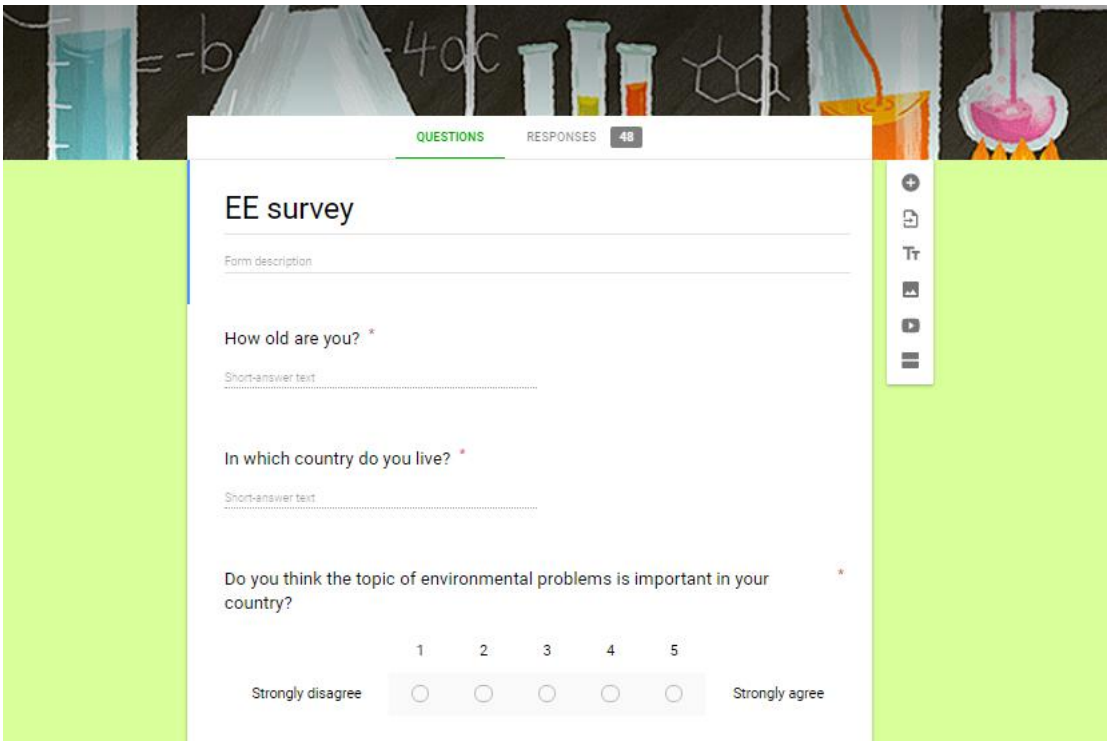
APPENDICES

Appendix 1

Survey google form



Appendix 2/1

Survey questions

1. How old are you?
2. In which country do you live?
3. Do you think the topic of environmental problems is important in your country?
4. Do you think, in the future specialists who solve environmental problems will be more popular in job market in your country?
5. Would you like to get professional degree (Bachelor/Master) in the area of natural/environmental sciences?
6. Are you interested in chemistry sciences?
7. Are you interested in biological sciences?
8. Do you think environment has a direct impact on human health?
9. Is it important to take care for nature in your country?
10. Would you be interested to study about influence of environmental factors on human health?
11. Do you aware of plastic pollution in the world?
12. Is it important to recycle waste in your country?
13. Is it popular to use alternative energy sources (sun/wind energy) in your country?
14. Would you be interested to study about alternative energy?
15. Do you think quality of drinking water is high in your country?
16. The topic of clean water is important in your country?
17. Do you think air quality is high in your country?
18. The topic of clean air is important in your country?
19. Do you think it is important to have legislation in nature protection in your country?
20. Do you think it is important to study about legislation of any professional field as a part of professional degree?
21. Do you think it is important to work in safe and comfortable working conditions?
22. Do you think working conditions are good in your country?
23. Do you think topic of human rights is important in your country?
24. Would you be interested to study about how to protect yourself at work place?
25. Do you think quality of nature has direct impact on the economy of the country?
26. Would you be interested to study economy, if it will be connected to natural sciences?
27. Do you think, in future the quality of the environment in your country will be better?
28. Do you think topic of sustainability is important in your country?
29. Do you think in your country companies and government should take more responsibilities for nature protection?
30. If you would study professional degree in natural sciences, do you think it is important to have knowledge of professional computer programs?
31. Do you think professional education should be free of charge?
32. Would you consider online courses (study from home via computer) as possible method to gain professional degree?

Appendix 2/2

33. Would you be interested to take online courses for your professional degree from abroad universities?
34. If you would like to take online course, do you think you could pay money for it?
35. What would be the maximum price (in euros) you could pay for online course?
36. Do you think video lectures is good way to study online?
37. Do you think online course should include individual reading tasks?
38. Do you think online course should include individual writing tasks?
39. What is, in your opinion, a suitable time for one online session?
40. How long in your opinion online course should be?
41. Optional section. If you want, here you can leave your comments and opinion on the mentioned above topics, your desire from future education and some advices for development of this survey.

Appendix 3

List of schools in Estonia and Poland to where survey was sent

1. Tallin 21st School
2. Tallin English Collage
3. International School of Tallin
4. International School of Estonia
5. Vöru gimnasium
6. Tallin European school
7. Tartu International school
8. Kolegium Europejskie
9. The British school Warsaw
10. Meridian international schools
11. Akademeia high school
12. International school of Krakow
13. International school of Poznan

Appendix 4

List of Universities in Estonia and Poland to where survey was sent

1. Tallinn University
2. Tallinn University of Technology
3. University of Tartu
4. Estonian University of Life Sciences
5. Institute of agricultural and environmental sciences
6. Tallinn University of Applied Sciences
7. University of Białystok
8. University of Gdańsk
9. Jagiellonian University
10. Maria Curie-Skłodowska University
11. University of Łódź
12. University of Warmia and Mazury
13. University of Silesia
14. Nicolaus Copernicus University
15. University of Warsaw
16. University of Wrocław
17. AGH University of Science and Technology in Kraków
18. Lublin University of Technology
19. Technical University of Łódź
20. Opole University of Technology
21. West Pomeranian University of Technology

Appendix 5/1

Calculations of individual answers by country for every question

Question 1(3)			Estonia(28)	Poland(20)
	SD	1	0	0
	D	2	1	1
	N	3	2	2
	A	4	12	8
	SA	5	13	9
MeanValue			4,321428571	4,25

Question2(4)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	3	1
	N	3	7	6
	A	4	13	2
	SA	5	5	11
MeanValue			3,714285714	4,15

Question3(5)		Criteria	Estonia	Poland
	SD	1	5	1
	D	2	4	2
	N	3	5	5
	A	4	4	6
	SA	5	10	6
MeanValue			3,357142857	3,7

Question4(6)		Criteria	Estonia	Poland
	SD	1	5	4
	D	2	1	6
	N	3	8	2
	A	4	5	4
	SA	5	9	4
MeanValue			3,428571429	2,071428571

Question5(7)		Criteria	Estonia	Poland
	SD	1	4	1
	D	2	2	8
	N	3	7	3
	A	4	6	4
	SA	5	9	4
MeanValue			3,5	3,1

Question6(8)		Criteria	Estonia	Poland
	SD	1	0	1
	D	2	0	0
	N	3	1	1
	A	4	8	2
	SA	5	19	16
MeanValue			4,642857143	4,6

Question7(9)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	0	1
	N	3	0	1
	A	4	6	5
	SA	5	22	13
MeanValue			4,785714286	4,5

Question8(10)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	4	2
	N	3	8	3
	A	4	10	3
	SA	5	6	12
MeanValue			5,1	4,25

Question9(11)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	1	0
	N	3	3	0
	A	4	11	4
	SA	5	13	16
MeanValue			4,285714286	4,8

Question10(12)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	0	2
	N	3	5	4
	A	4	8	3
	SA	5	15	11
MeanValue			4,357142857	4,15

Question11(13)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	4	1
	N	3	11	4
	A	4	7	5
	SA	5	6	10
MeanValue			3,535714286	4,2

Question12(14)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	4	2
	N	3	7	2
	A	4	9	4
	SA	5	8	12
MeanValue			3,75	4,3

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Question13(15)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	2	6
	N	3	1	5
	A	4	7	6
	SA	5	18	3
MeanValue			4,464285714	3,3

Question14(16)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	6	0
	N	3	6	4
	A	4	11	8
	SA	5	5	8
MeanValue			3,535714286	4,2

Question15(17)		Criteria	Estonia	Poland
	SD	1	0	1
	D	2	0	5
	N	3	2	5
	A	4	13	6
	SA	5	13	3
MeanValue			4,392857143	3,25

Question16(18)		Criteria	Estonia	Poland
	SD	1	1	1
	D	2	2	1
	N	3	4	4
	A	4	10	5
	SA	5	11	9
MeanValue			4	4

Question17(19)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	1	0
	N	3	4	0
	A	4	8	8
	SA	5	15	12
MeanValue			4,321428571	4,6

Question18(20)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	1	1
	N	3	11	2
	A	4	10	3
	SA	5	6	14
MeanValue			3,75	4,5

Question19(21)		Criteria	Estonia	Poland
	SD	1	1	0
	D	2	0	0
	N	3	0	1
	A	4	7	0
	SA	5	20	19
MeanValue			4,607142857	4,9

Question20(22)		Criteria	Estonia	Poland
	SD	1	0	1
	D	2	1	7
	N	3	3	2
	A	4	12	7
	SA	5	12	3
MeanValue			4,25	3,2

Question21(23)		Criteria	Estonia	Poland
	SD	1	0	2
	D	2	0	1
	N	3	4	4
	A	4	15	7
	SA	5	9	6
MeanValue			4,178571429	3,7

Question22(24)		Criteria	Estonia	Poland
	SD	1	1	1
	D	2	2	3
	N	3	8	1
	A	4	12	4
	SA	5	5	11
MeanValue			3,642857143	4,05

Question23(25)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	6	2
	N	3	9	3
	A	4	9	5
	SA	5	4	10
MeanValue			3,392857143	4,15

Question24(26)		Criteria	Estonia	Poland
	SD	1	4	2
	D	2	9	3
	N	3	7	1
	A	4	6	7
	SA	5	2	7
MeanValue			2,75	3,7

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Question25(27)		Criteria	Estonia	Poland
	SD	1	0	1
	D	2	3	2
	N	3	8	7
	A	4	12	2
	SA	5	5	8
MeanValue			3,678571429	3,7

Question26(28)		Criteria	Estonia	Poland
	SD	1	1	0
	D	2	2	1
	N	3	8	3
	A	4	6	10
	SA	5	11	6
MeanValue			3,857142857	4,05

Question27(29)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	0	0
	N	3	4	2
	A	4	9	3
	SA	5	15	15
MeanValue			4,392857143	4,65

	Criteria	Estonia	Poland
SD	1	0	1
D	2	3	2
N	3	8	7
A	4	12	2
SA	5	5	8
		3,678571429	3,7

Question26(28)		Criteria	Estonia	Poland
	SD	1	1	0
	D	2	2	1
	N	3	8	3
	A	4	6	10
	SA	5	11	6
MeanValue			3,857142857	4,05

Question27(29)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	0	0
	N	3	4	2
	A	4	9	3
	SA	5	15	15
MeanValue			4,392857143	4,65

	Criteria	Estonia	Poland
SD	1	0	0
D	2	2	1
N	3	4	3
A	4	14	8
SA	5	8	8
		4	4,15

Question29(31)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	1	0
	N	3	3	2
	A	4	5	9
	SA	5	19	9
MeanValue			4,5	4,35

Question30(32)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	5	1
	N	3	6	4
	A	4	8	6
	SA	5	9	9
MeanValue			3,75	4,15

	Criteria	Estonia	Poland
SD	1	0	2
D	2	5	1
N	3	5	0
A	4	8	7
SA	5	10	10
		3,821428571	4,15

Question32(34)		Criteria	Estonia	Poland
	SD	1	6	3
	D	2	5	6
	N	3	9	5
	A	4	7	3
	SA	5	1	3
MeanValue			2,714285714	2,85

Question34(36)		Criteria	Estonia	Poland
	SD	1	0	0
	D	2	4	1
	N	3	6	4
	A	4	9	4
	SA	5	9	11
MeanValue			3,821428571	4,25

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35(37)	Criteria	Estonia	Poland
SD	1	0	0
D	2	1	0
N	3	6	3
A	4	12	7
SA	5	9	10
		4,035714286	4,35

Question36(38)		Criteria	Estonia	Poland
	SD	1	1	0
	D	2	4	1
	N	3	5	3
	A	4	11	5
	SA	5	7	11
MeanValue			3,678571429	4,3

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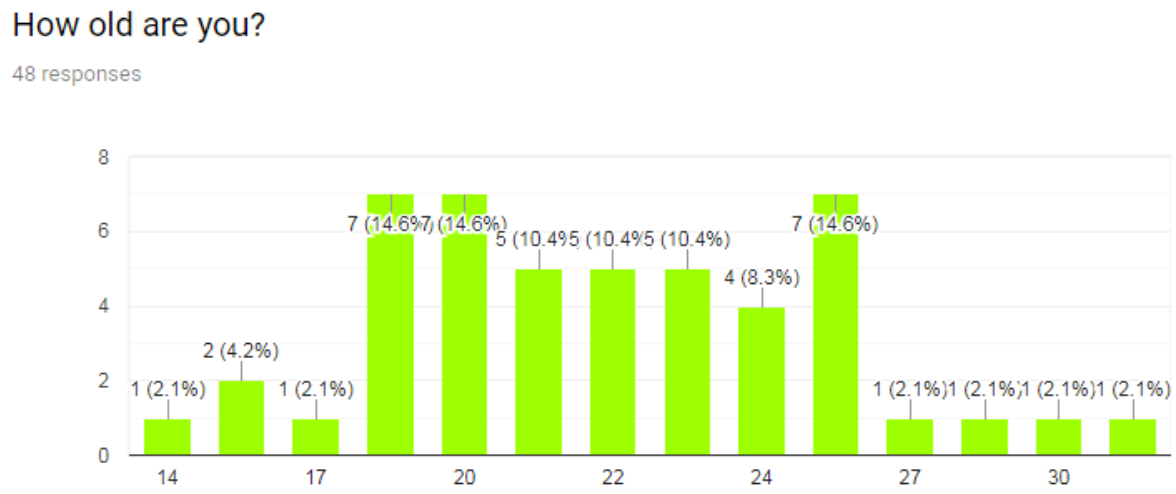
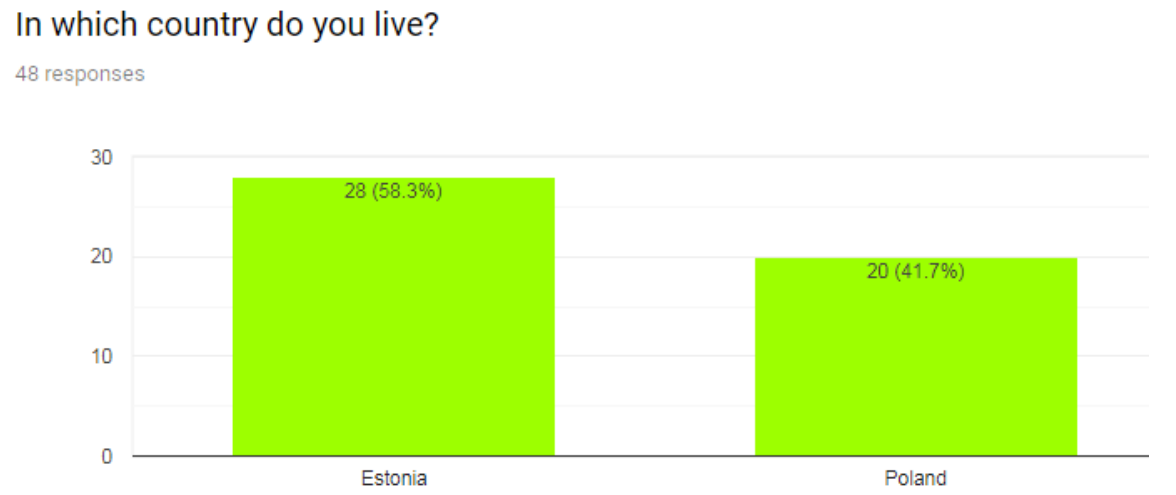
Results of all questions

Question 1



Question 2

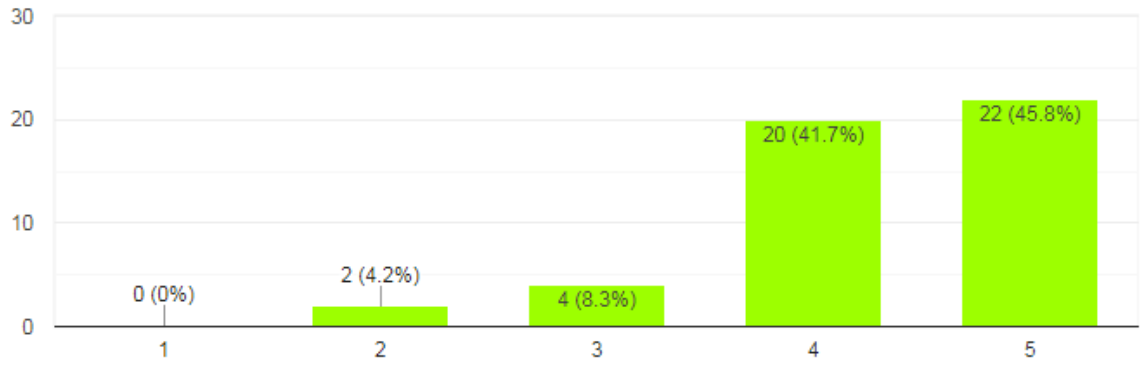


Appendix 6/1

Question 3

Do you think the topic of environmental problems is important in your country?

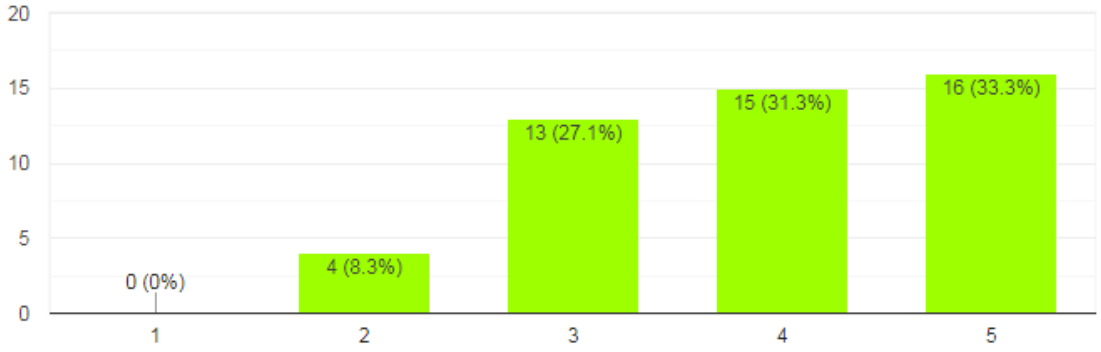
48 responses



Question 4

Do you think, in the future specialists who solve environmental problems will be more popular in job market in your country?

48 responses



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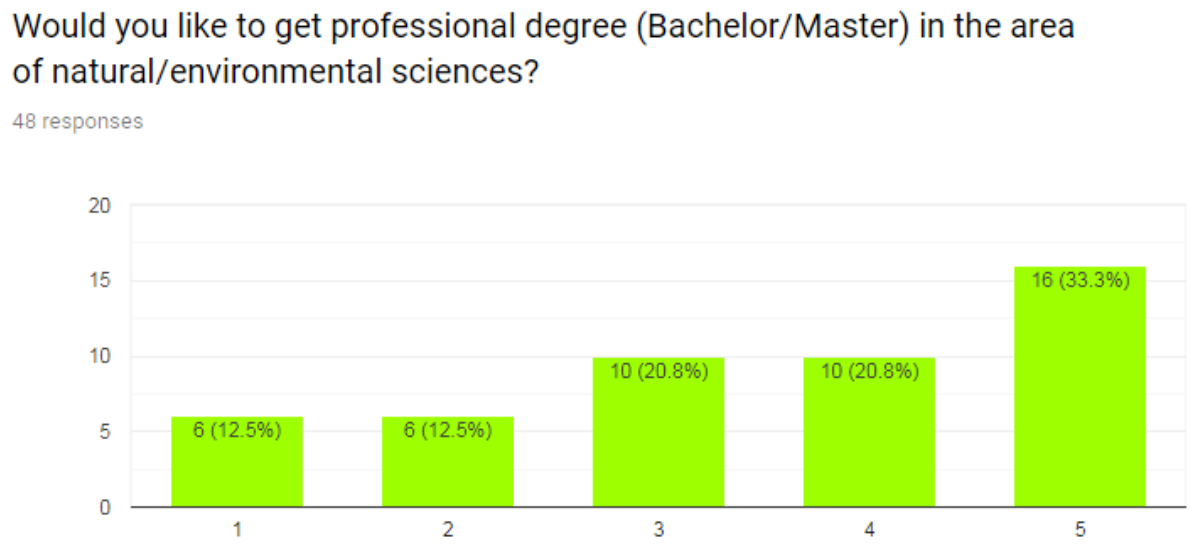
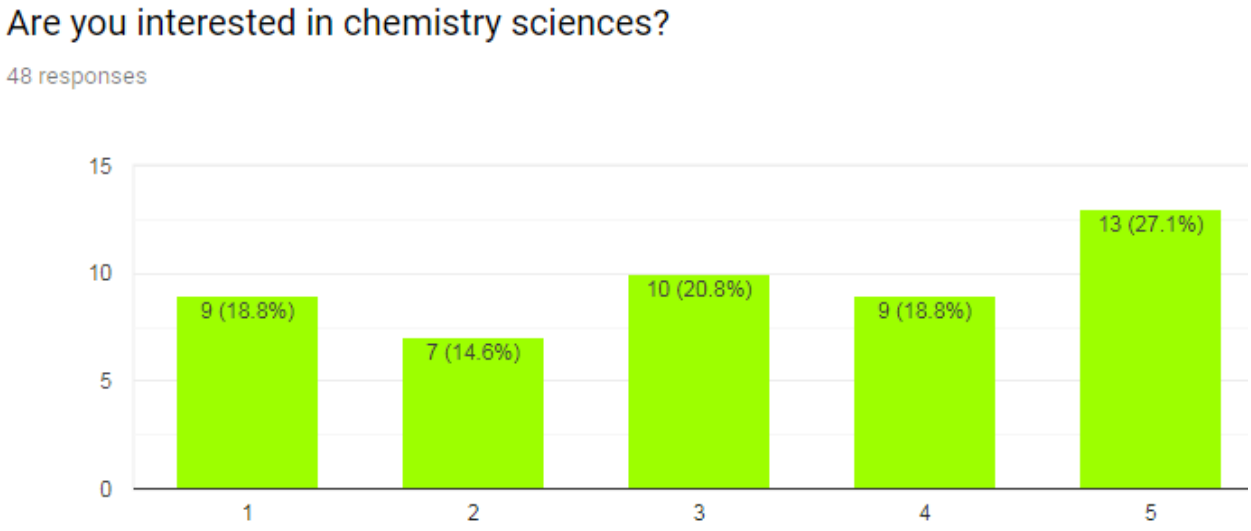
Question 5



Question 6



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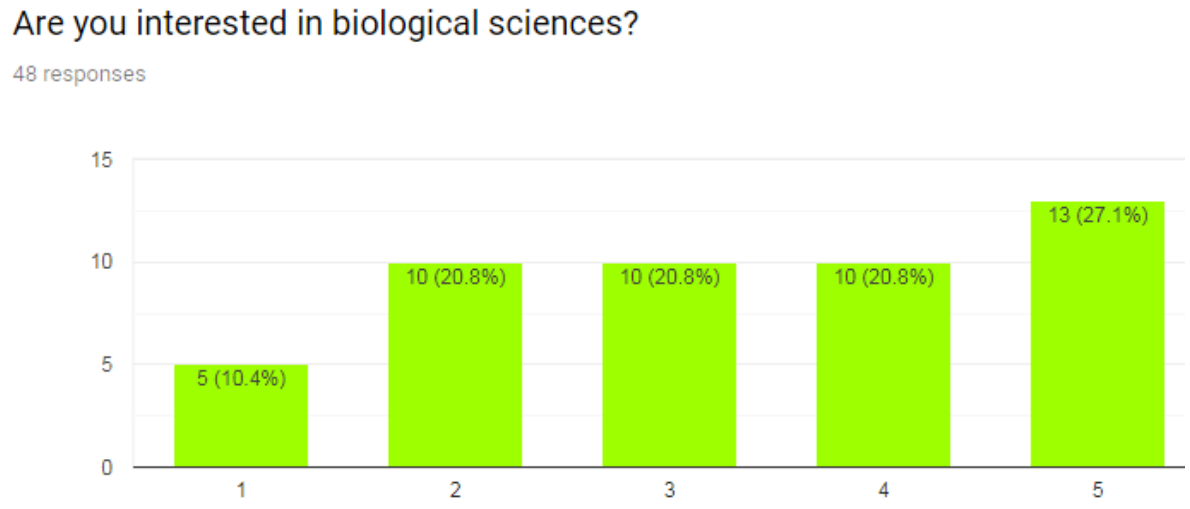
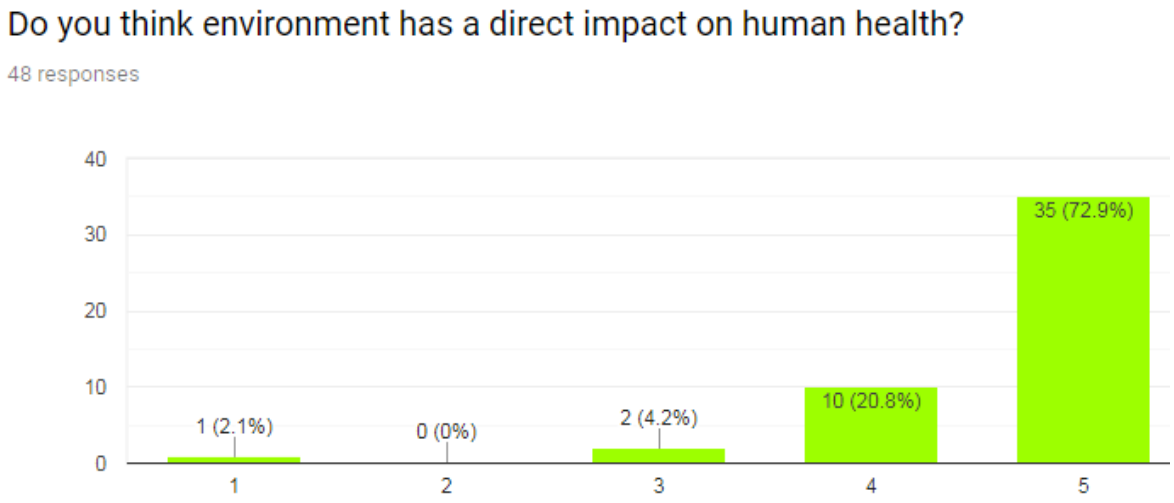
Question 7



Question 8



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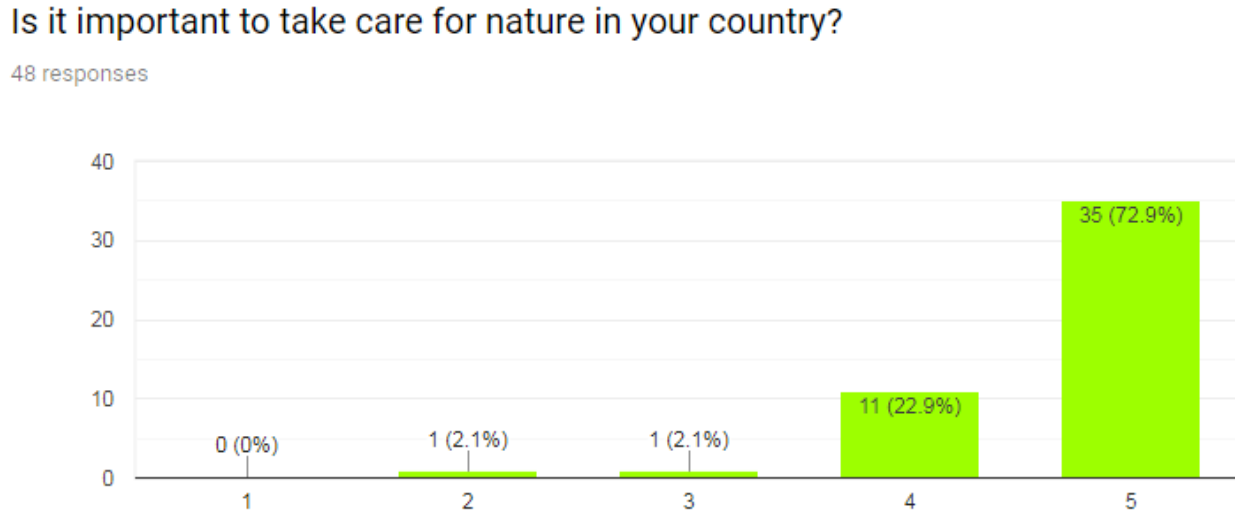
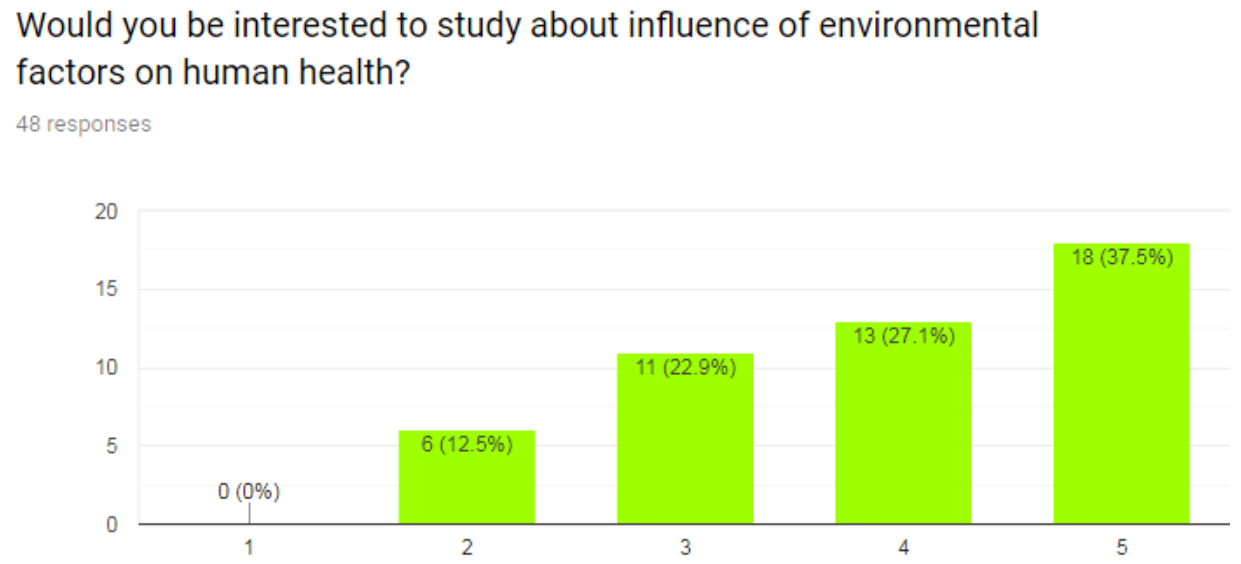
Question 9



Question 10



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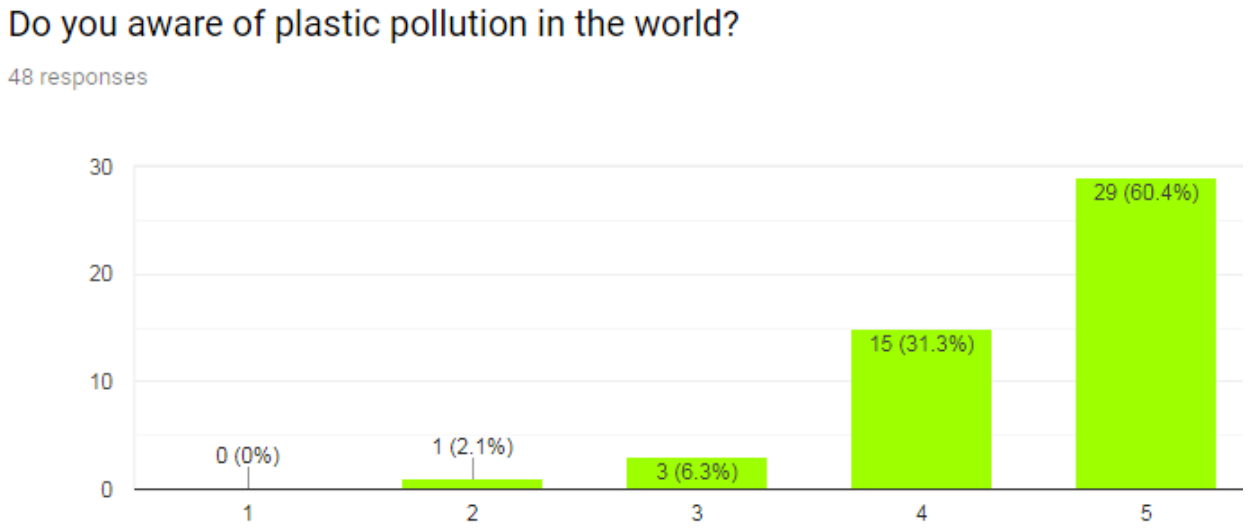
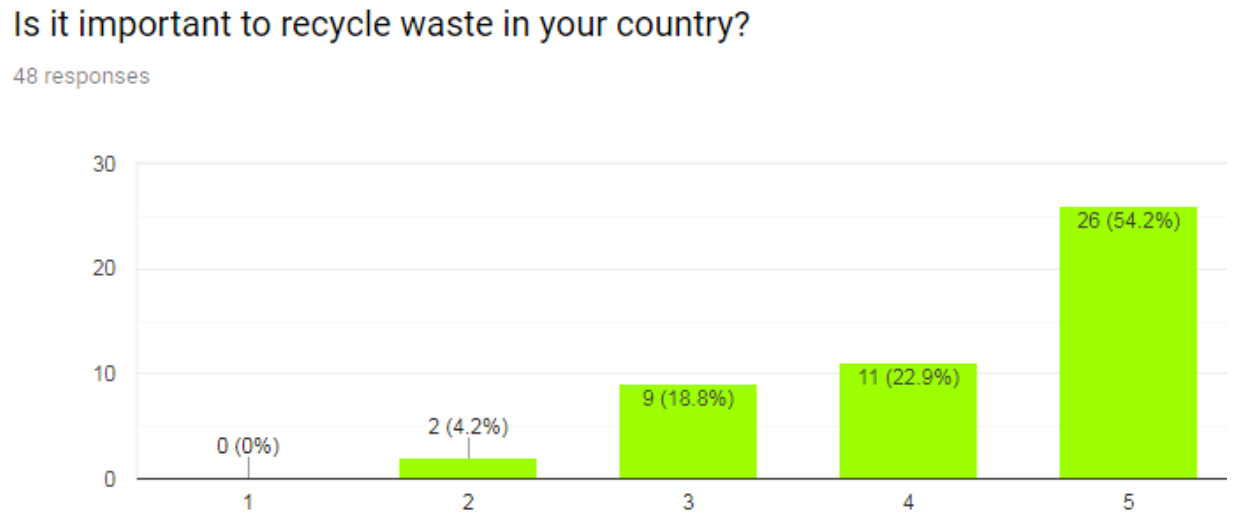
Question 11



Question 12



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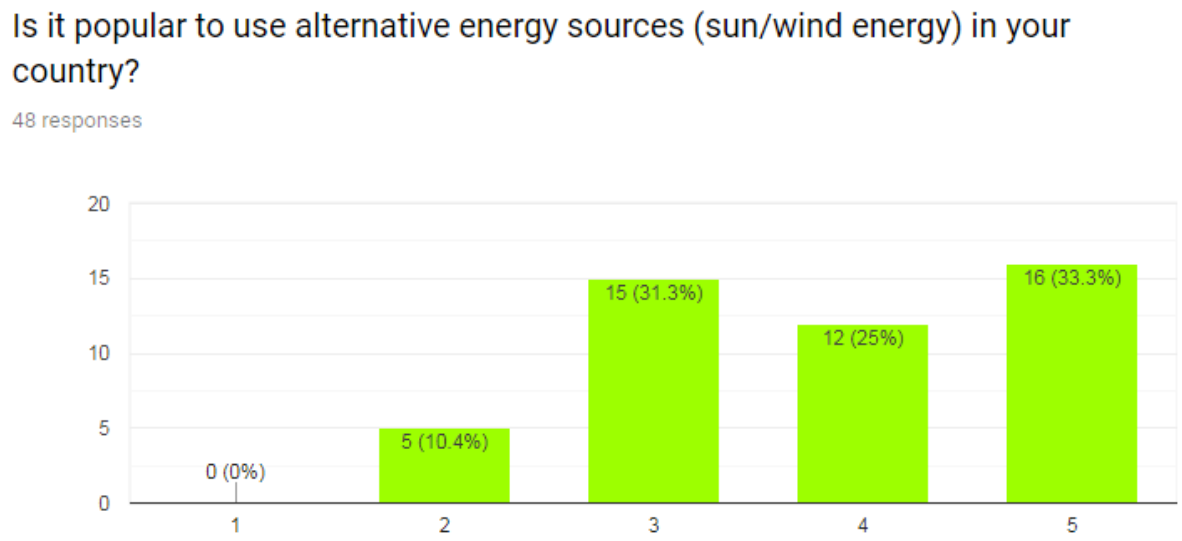
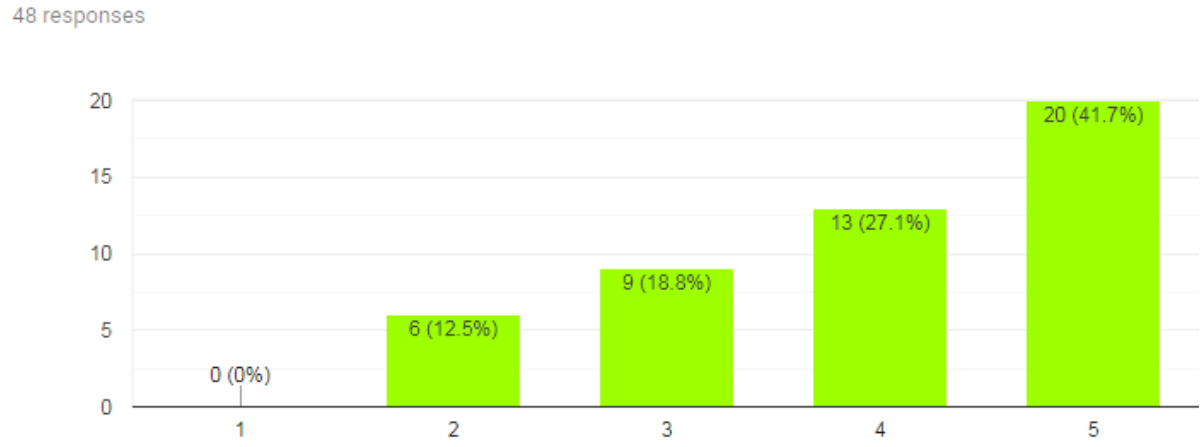
Question 13



Question 14



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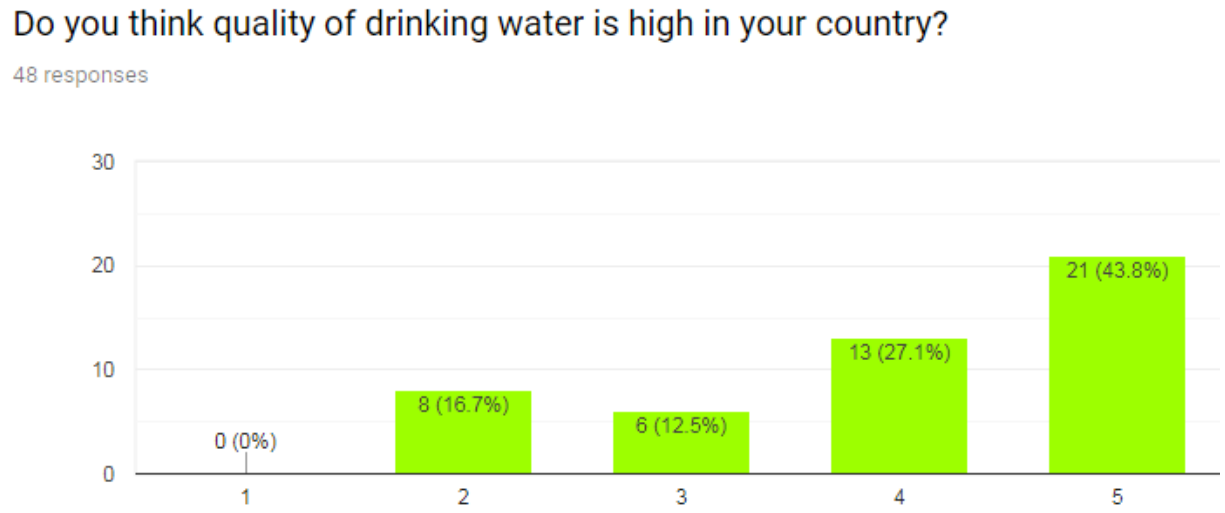
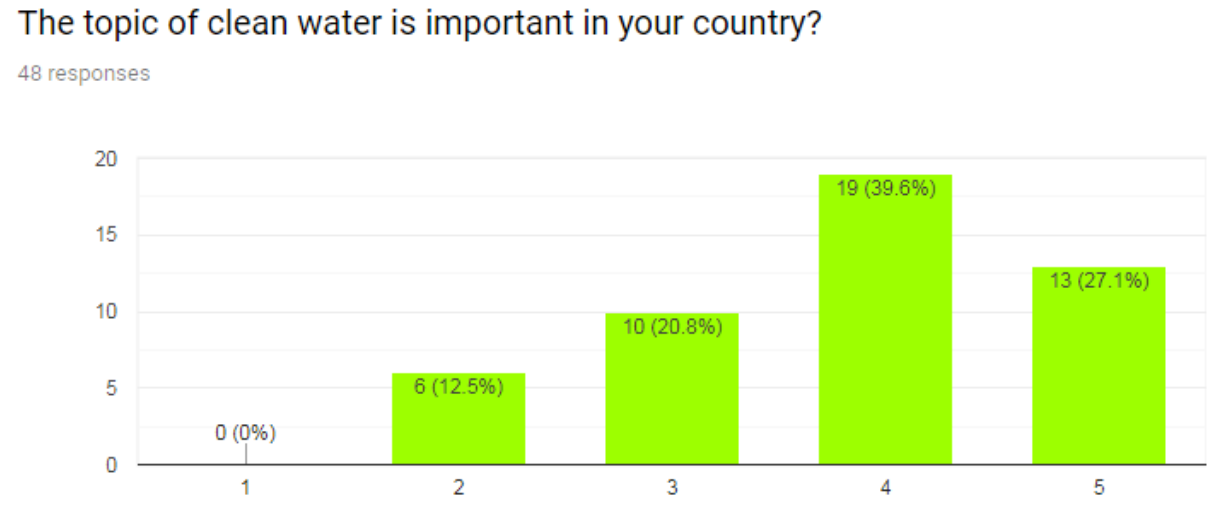
Question 15



Question 16



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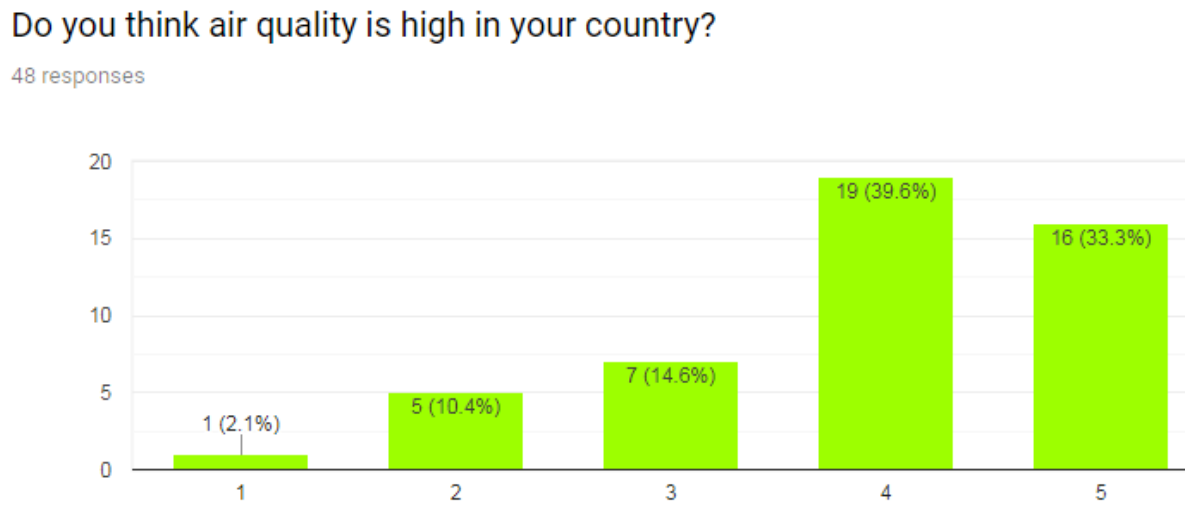
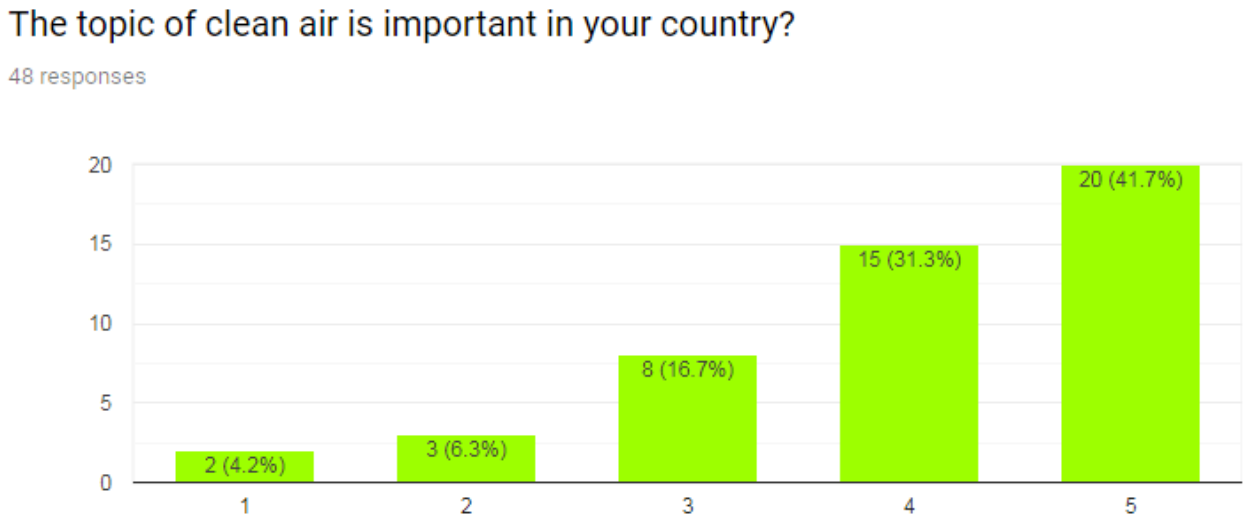
Question 17



Question 18



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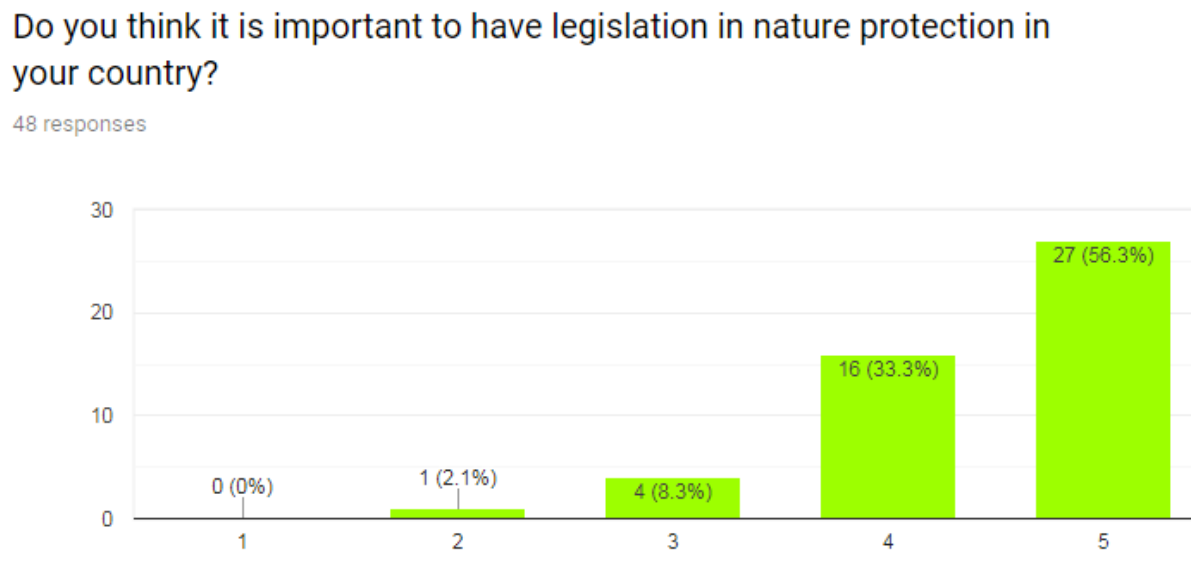
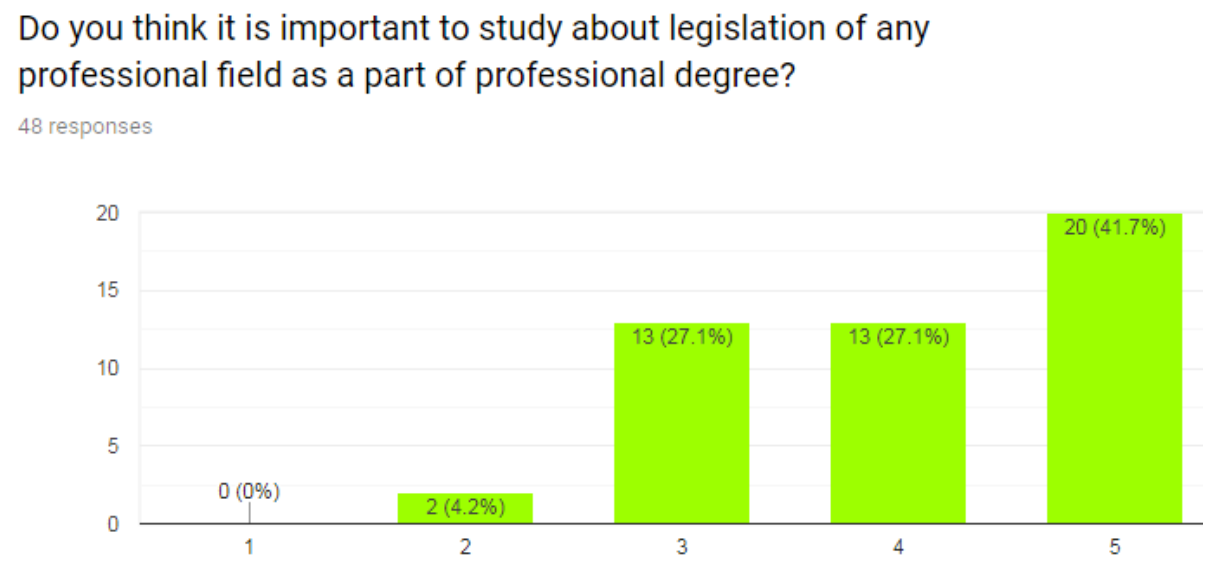
Question 19

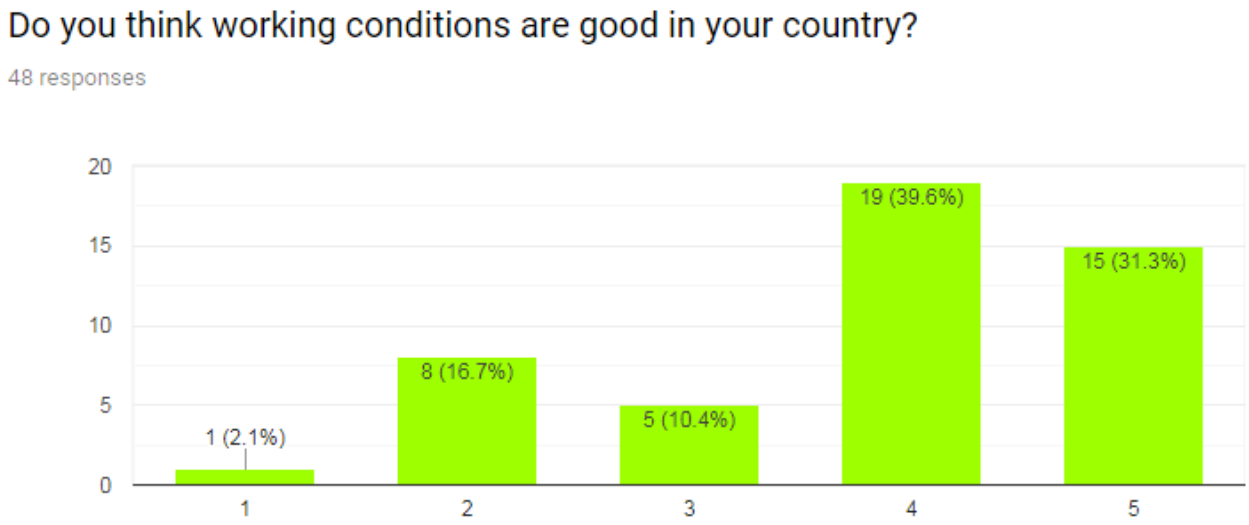


Question 20



Question 21

Question 22



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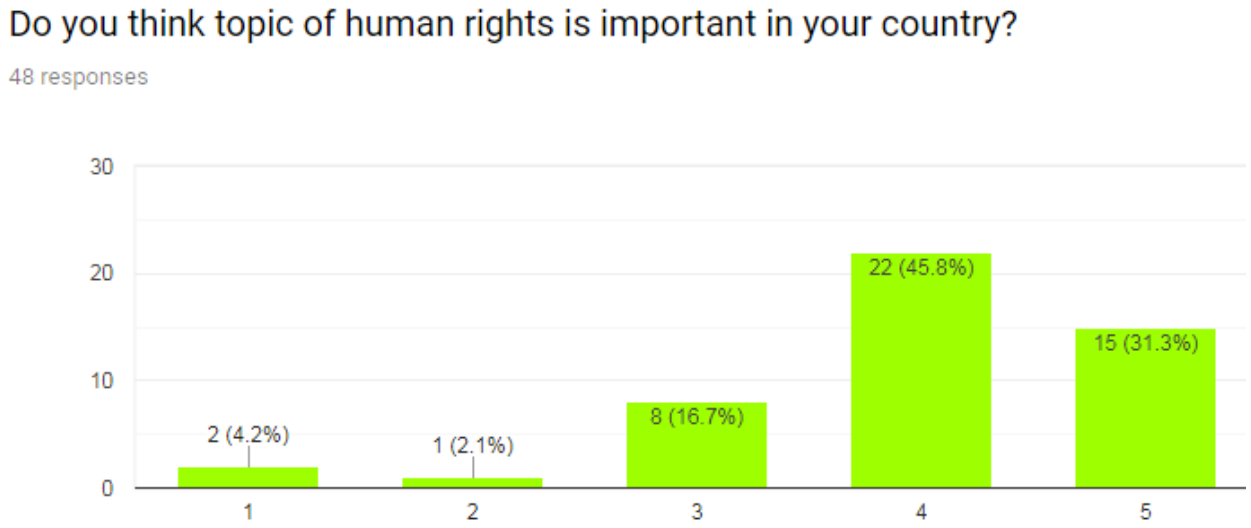
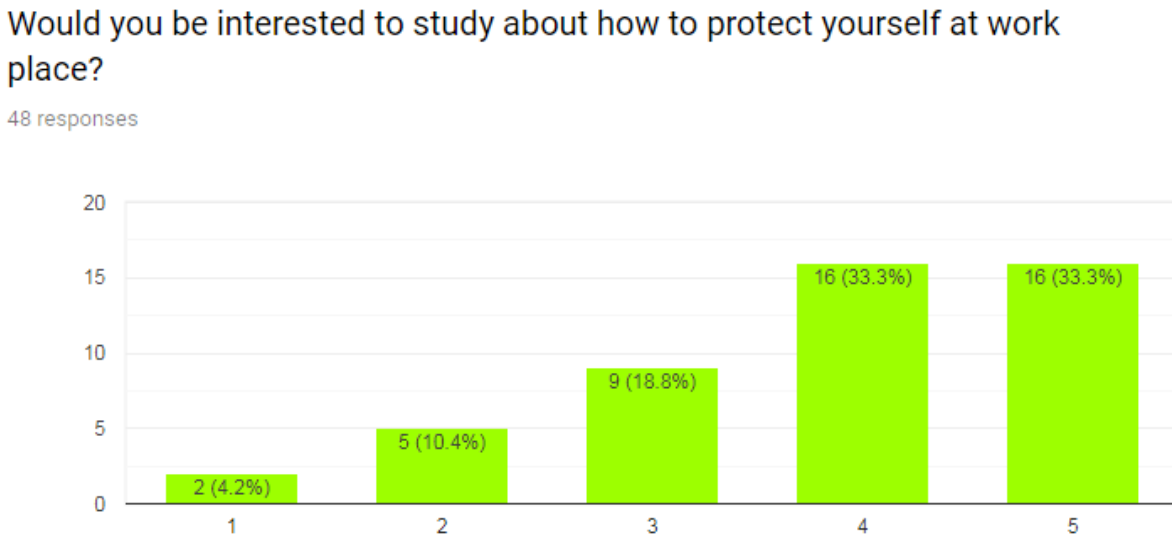
Question 23



Question 24



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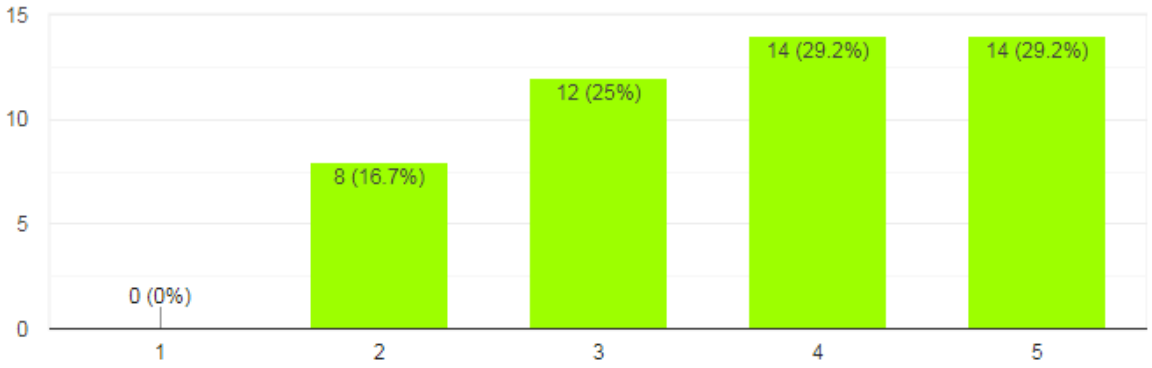
Question 25

Do you think quality of nature has direct impact on the economy of the country?

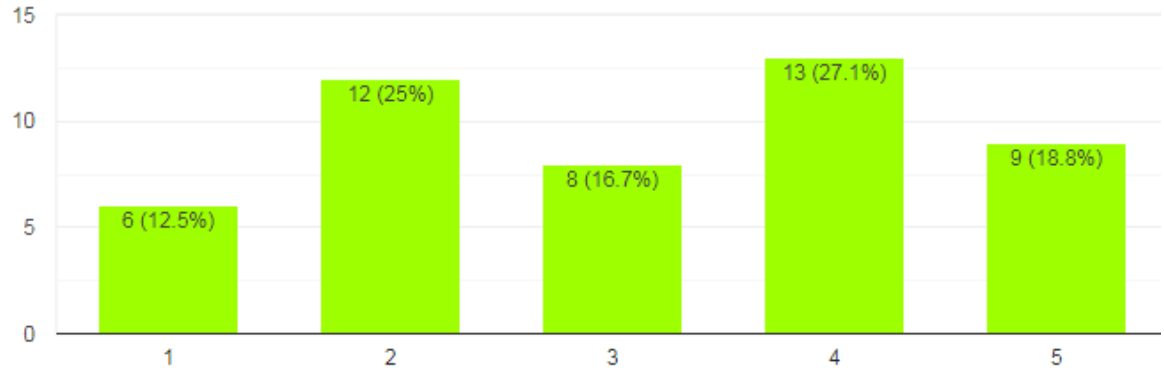
48 responses



Question 26

Would you be interested to study economy, if it will be connected to natural sciences?

48 responses



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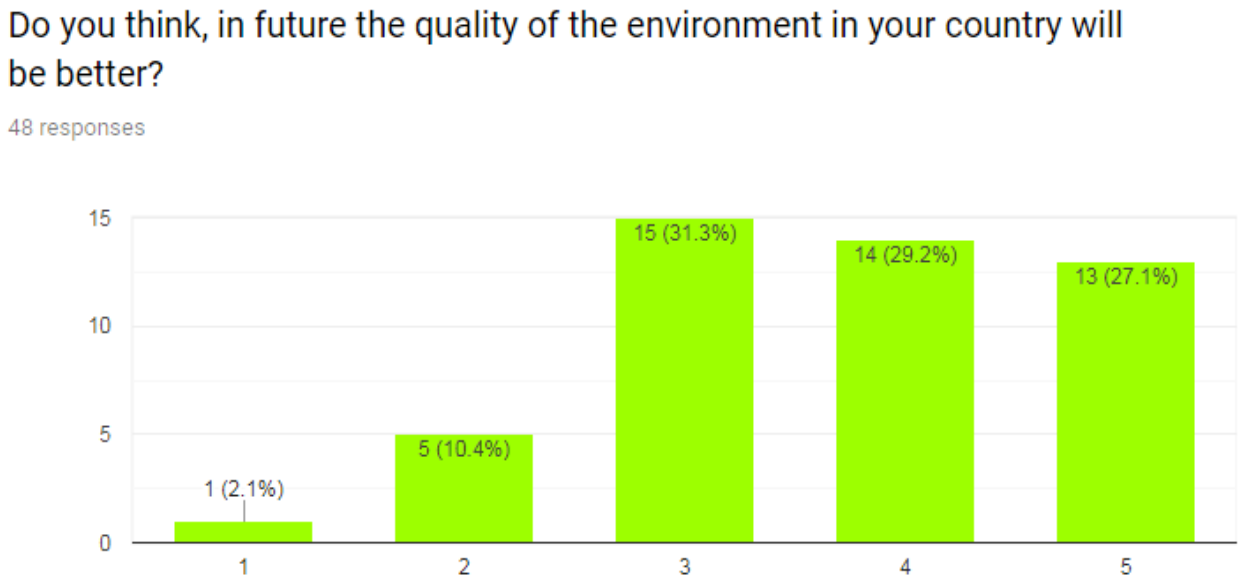
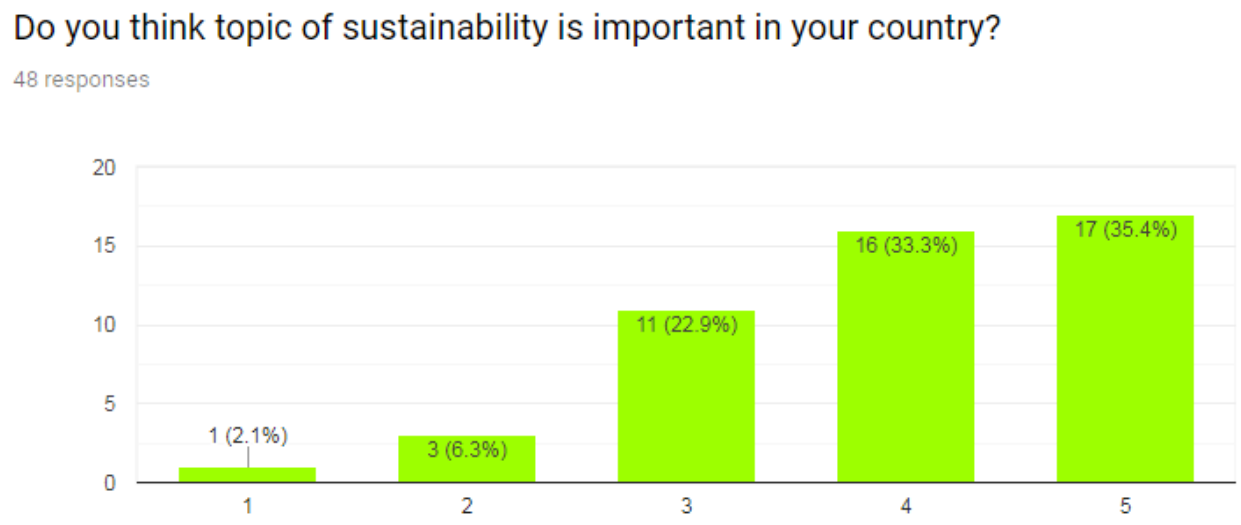
Question 27



Question 28

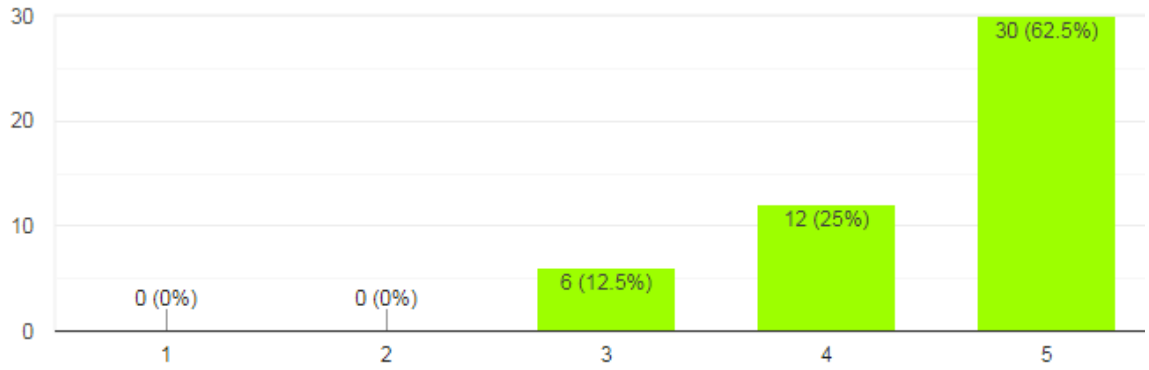


Appendix 6/8

Question 29

Do you think in your country companies and government should take more responsibilities for nature protection?

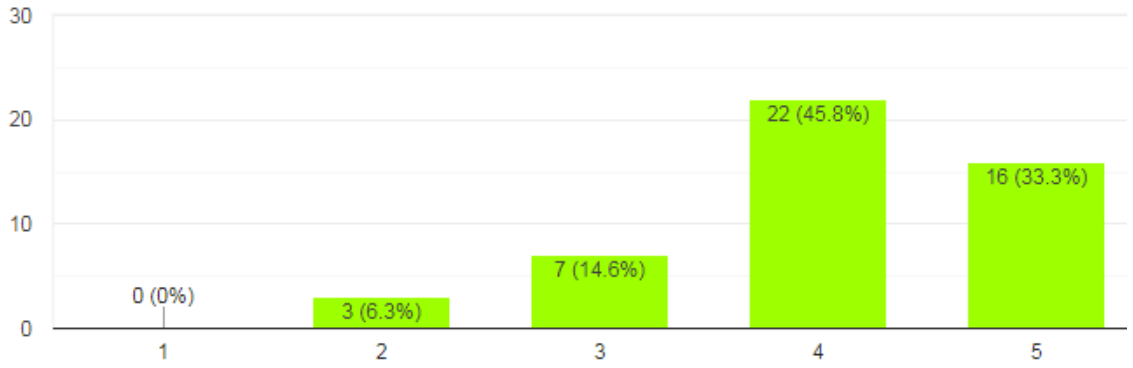
48 responses



Question 30

If you would study professional degree in natural sciences, do you think it is important to have knowledge of professional computer programs?

48 responses



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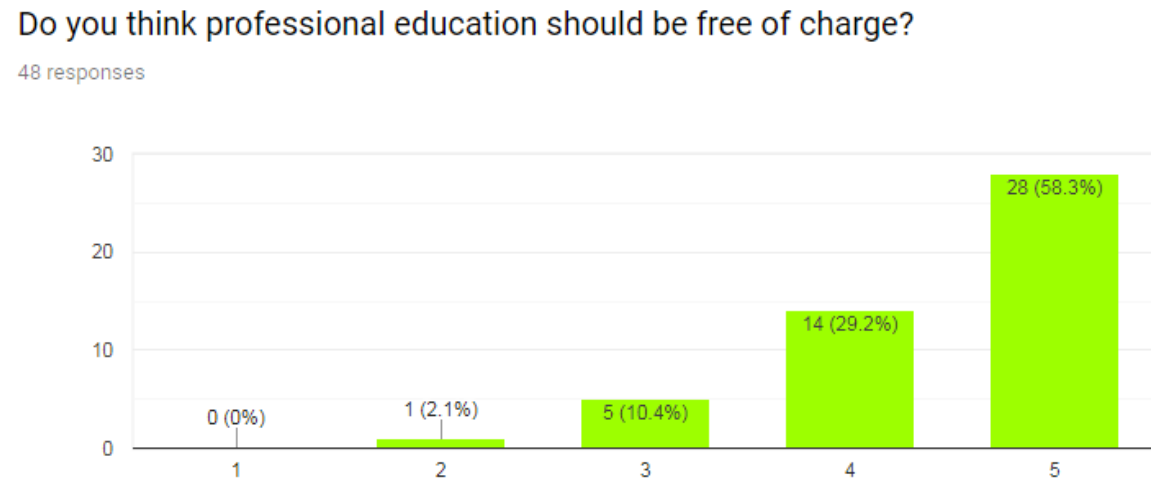
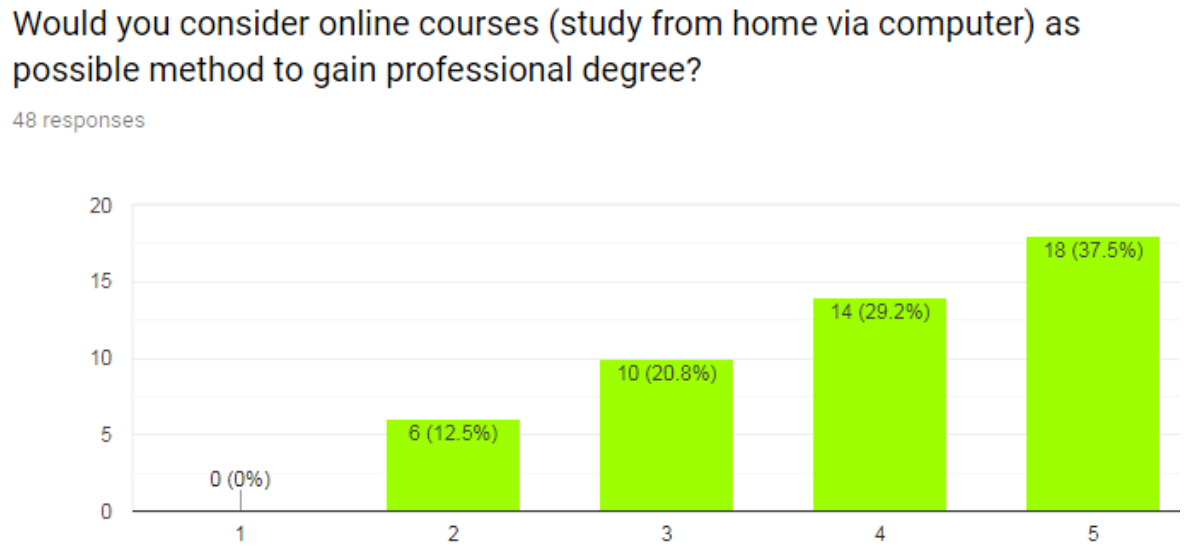
Question 31



Question 32



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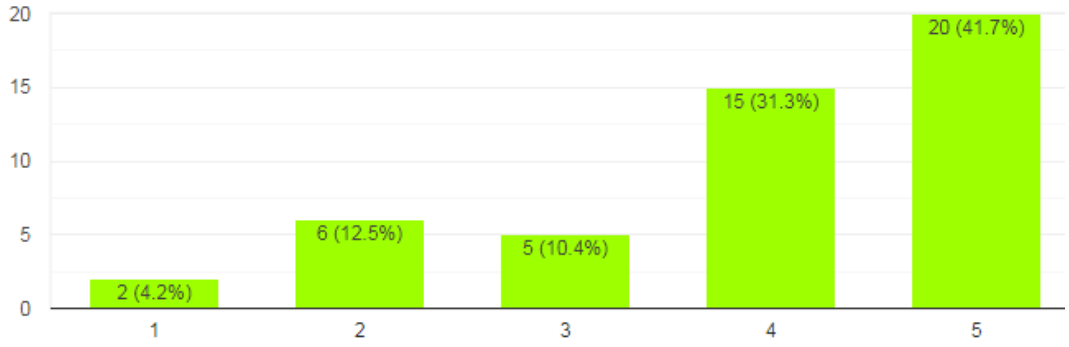
Question 33

Would you be interested to take online courses for your professional degree from abroad universities?

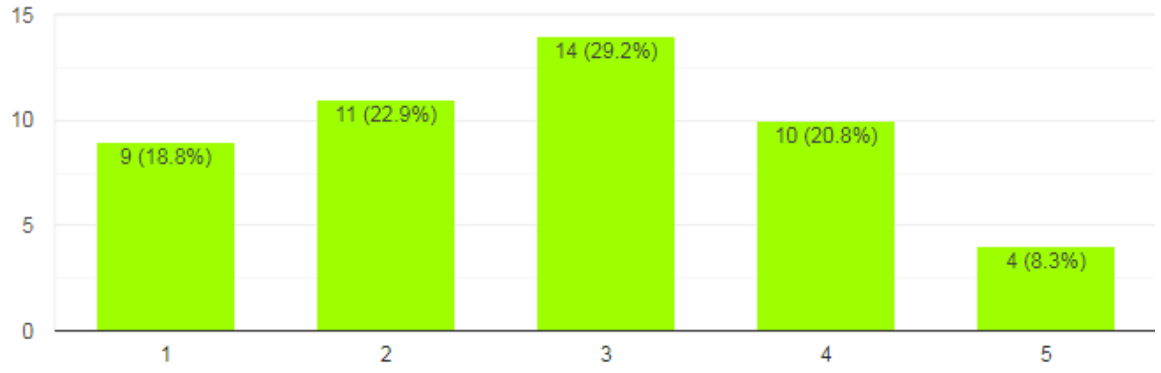
48 responses



Question 34

If you would like to take online course, do you think you could pay money for it?

48 responses



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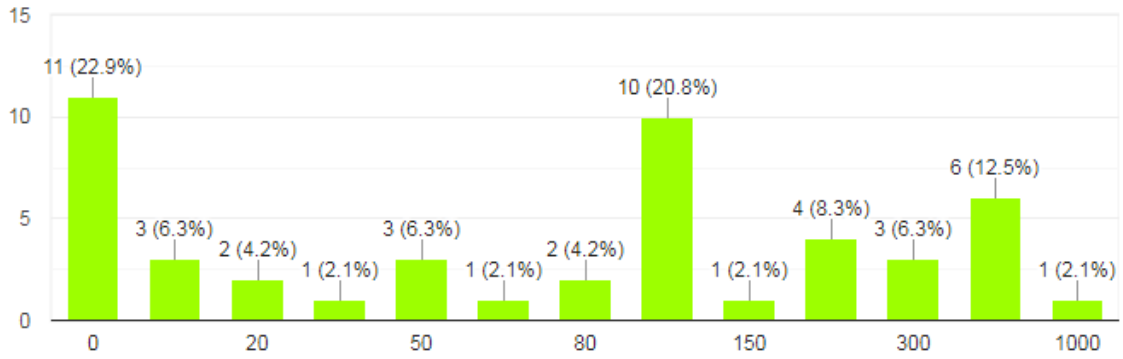
Question 35

What would be the maximum price (in euros) you could pay for online course?

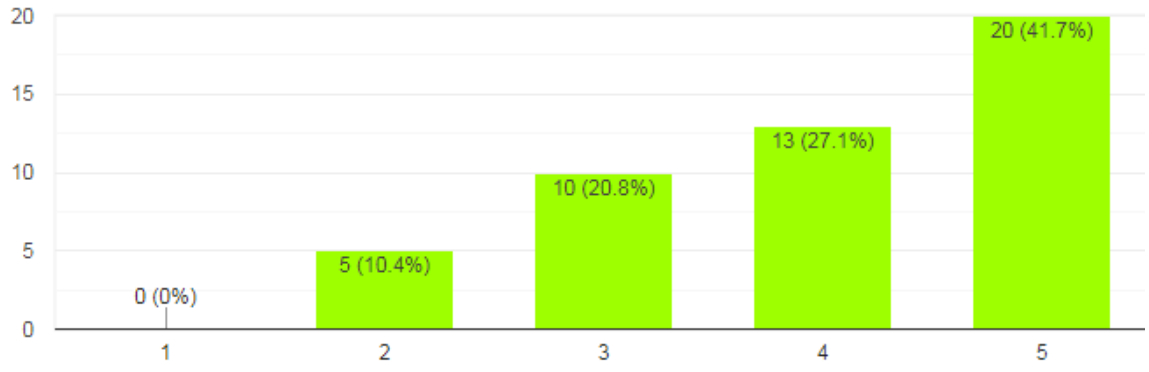
48 responses



Question 36

Do you think video lectures is good way to study online?

48 responses



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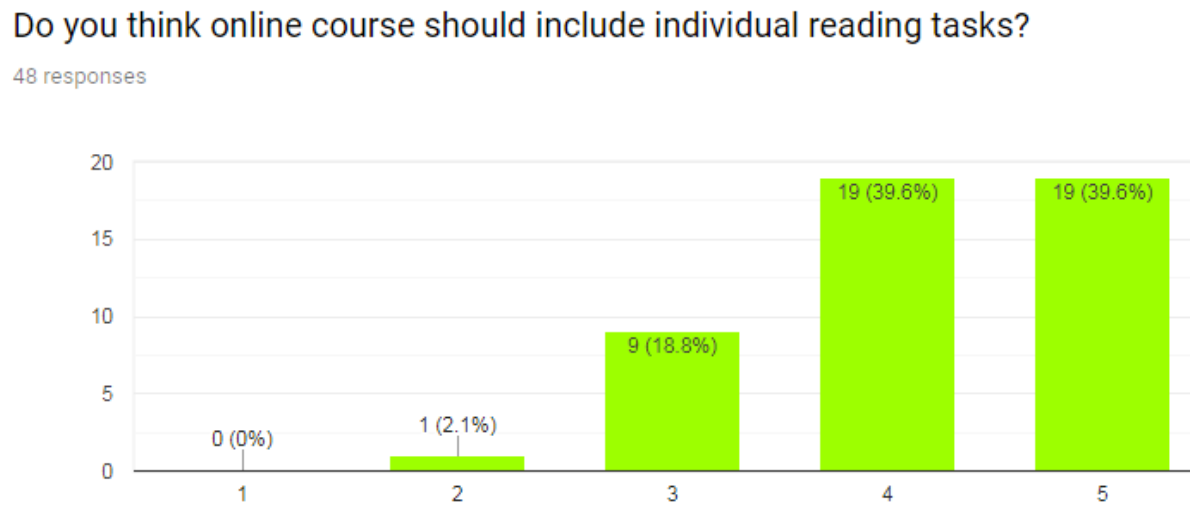
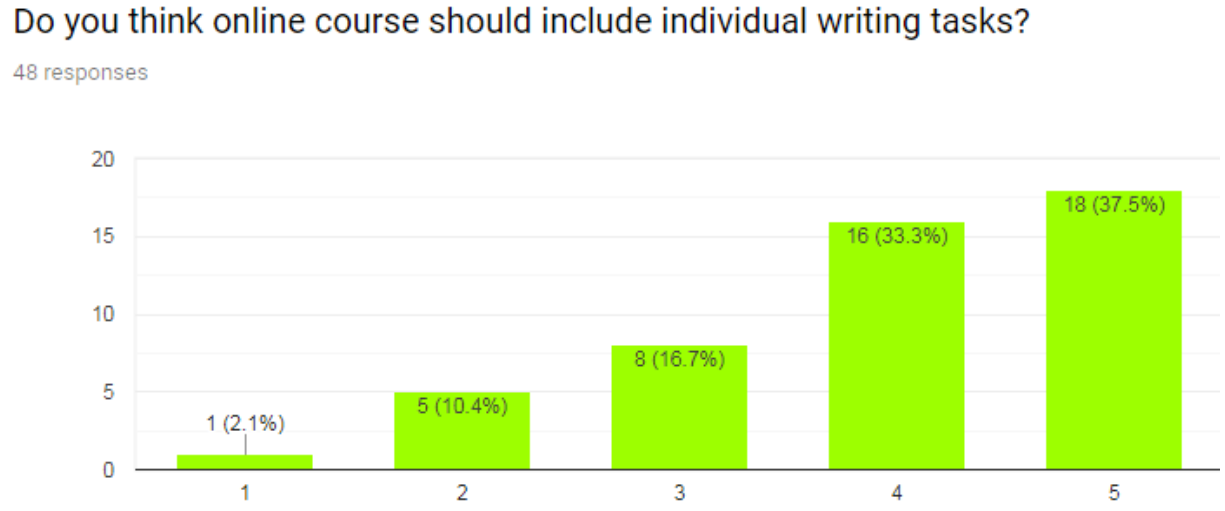
Question 37



Question 38



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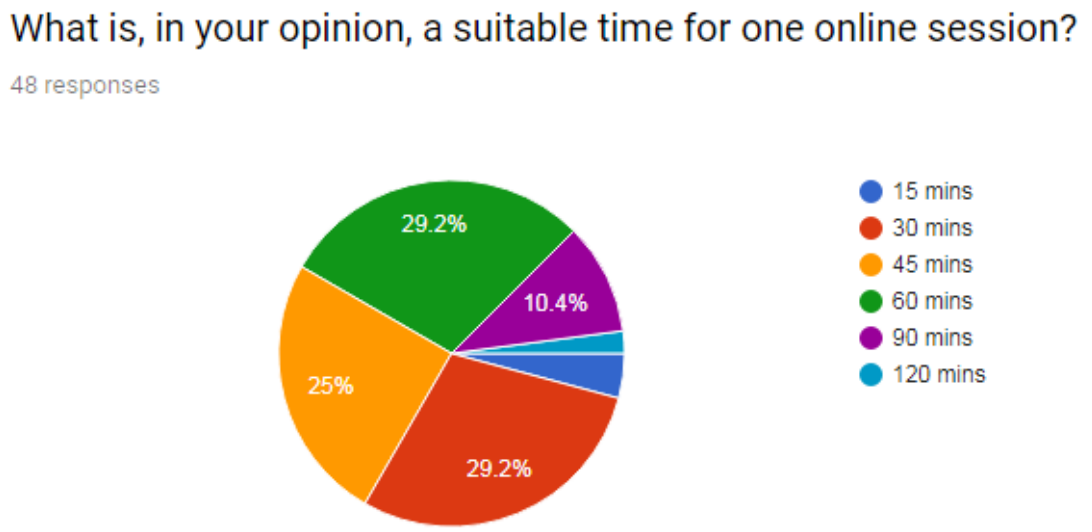
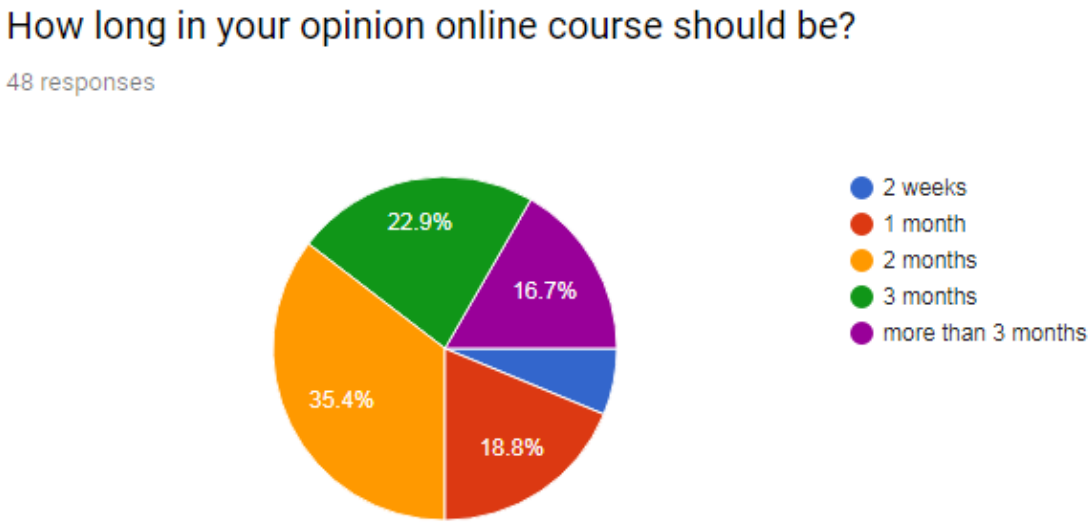
Question 39



Question 40



Appendix 6/11

Question 41

Optional section. If you want, here you can leave your comments and opinion on the mentioned above topics, your desire from future education and some advices for development of this survey.

8 responses

is important in your country?" applies to everyone, not just my country...
"What would be the maximum price (in euros) you could pay for online course? "
Oh this HIGHLY depends on the course....

Allasort of computer skills are highly important now, but will become even more important in the near future. Allows people to also develop their analytical mindset.

Need to improve the Legal Awareness

Most of the foreign students applied to get a visa and enjoy EU. also finding job in western countries to have a better life. Quality of education is not very high in EU in comparison to Iran. Only the strong economy and good income is the reason of study in EU. Environment is very Important for all people but a few people in this field can find a good job. In my country these job vacancies will be filled according to personal connections not the resume of a person.

For the course prices I think there should be discounts for poor students

The topic of my future education concerns me a lot. Hopefully, more higher education will become free or cheaper in the future, and online courses could be the way for it to happen.

Well I myself am a Taoist practitioner, and whilst I'm learning this philosophy, I already know that nature is very important to us because it reminds us of how things are naturally meant to be. Nature is inside of all of us and will always help us, but if we take that away we get back the planet's ultimate downfall. I also think that you have