



Final report, WP4

Baseline study on the state of innovation in the thematic fields of the eSchool4S network

Objectives:

Give a comprehensive up-to-date overview on the current status of innovation in the thematic fields of the eSchool4S network across the region and countries



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LIST OF ABBREVIATIONS:

ICT - Information and communication technology in education

SD - Sustainable Development

ESD - Education for sustainable development

LLL - Lifelong learning

EU – European Union

DESD – Decade of Education for Sustainable Development

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Executive summary

This report presents the baseline study with aim to give a comprehensive up-to-date overview on the status of innovation in the thematic fields of the eSchool4S network. This baseline study will present the status in eSchool4S network Countries (Austria, Bulgaria, Germany, Croatia, Hungary, Romania, Serbia and Slovakia) from Danube Region concerning temporary capacities related to the use of ICT in school and preconditions for implementing Education for Sustainable Development (ESD). The methodology captures those aspects through various ways and by gathering different types of data in order to have a sufficiently comprehensive picture of the ICT status in teaching and ESD in different countries through desk analysis of relevant data, analysis of content of school curriculum, interview with relevant stakeholders and focus group with teachers.

Desk analysis showed that European countries in most cases include general or cross-curricular skills in their steering documents. ICT is seen as one of most important cross-curricular skills, which should empower other cross-curricular skills, such is problem solving, critical thinking, creativity, collaboration and communication. Regarding availability of computers and Internet at the home

level, the majority of partner countries in the project are far below the EU average (Romania, Bulgaria, Serbia - according to national data and Croatia) - below 76% which is EU-28 average.

Recommendations for innovative pedagogical approaches regarding using ICT in teaching, at both primary and secondary level (e.g. in project learning, personalised learning, scientific investigations, online learning) are present in great majority of European countries. The European Commission has also put digital literacy as a learning outcome high on its agenda for the next decade. The countries which have all the listed objectives about ICT competencies in their steering documents for either primary or secondary education are Bulgaria, Germany, Greece, Spain, Latvia, Hungary, Malta, Poland, Slovakia and the United Kingdom (Wales and Scotland). In the meantime, the same listed objectives have entered the national educational goals of Romania and in Serbia.

In most European countries, at least 50 % of students are in schools where one computer is available for every two students but there are large disparities between countries and countries from South-eastern Europe have the smallest number of computers per child (Serbia, Croatia, Romania, and Bulgaria). In Romania, at the age of 15, there are almost 3 students per one computer, in Bulgaria, near 2.6, in Slovakia near 2.5, in Germany, somewhat above 2, in Austria, around 1, in Hungary, around 2.6. In their national report for the purpose of this project, Croatia reports about one IT classroom per school and in Serbia, there are some studies reporting a large number of students per one computer (19 students per one computer). On average, 3.06 students come on one computer in upper secondary education. In Slovenia, this ratio is the best, where 1.37 students come to 1 computer, and, on the other hand, the fewest computers per children are in Greece, where there are 16.6 students per one computer. The assessment of teachers' confidence in social media skills is also uniform among the countries participating in eSchool4S, ranging around the European average.

Regarding ESD, results of various researches show ESD is increasingly perceived as a catalyst for innovation in education and something that loosen boundaries between schools, universities, communities and the private sector and also something that develops new pedagogical methods due to the interdisciplinary character of SD. Results show many positive changes regarding ESD and one of them is that ESD is not important only for SD per se but it has a positive influence on developing new teaching methods and innovative pedagogy but the causal relationship between ESD and new teaching practices should be confirmed in further studies.

Comparative analysis shows that ESD is implemented in all the countries involved in the eSchool4s network and that the implementation models are somewhat different. In the majority of countries ESD is not a separate subject but the elements of ESD are implemented at different levels of education (ISCED 1-3) and different types of schools through the programs of different subjects. ESD has been a Cross-curricular Principle overarching all subject areas and all types of schools in Austria. The analysis of the school curriculum in Bulgaria shows that the SD themes are most dealt with in the education area of Sciences and Ecology. In Croatia, they are not included in one separate subject but are rather distributed among various subjects. In Germany, the national educational standards for certain subjects and subject combinations contain knowledge and competencies in the field of sustainability. In Hungary, since environmental education has no separate school subject, SD topics are realised mainly in other subjects or in extracurricular teaching activities. In Romania, key themes of sustainable development are included/integrated in disciplines/modules from the common core curriculum or optional subjects at all levels of education, including vocational and technical education. In Serbia, SD is not a separate school subject but the elements of SD are integrated in the objectives and tasks of a number of subjects such as Chemistry, Biology, Geography, Physics, Sociology, Civic Education and Foreign Language. In Slovakia, SD is present in several subjects, but mainly in a cross-cutting topic Environmental Education which includes basic concepts from ecology and environment. Environmental education is included in relevant subjects so as to emphasise the environmental character of the subjects or they establish a self-standing subject with environmental

focus or the topic of environmental education is an integral part of a study programme at vocational schools.

Teacher attitudes towards ICT differ in all countries between highly motivated and low motivated teachers. High motivated teachers see ICT primarily as a tool that serves for increasing students' achievement. Low motivated teachers, on the other hand, take e-learning as a must because their colleagues have agreed upon the use of e-learning for certain parts of their lessons. These findings suggest caution in selection of teachers for eSchool4S. There might be the case, according to the teachers reports that even motivated teachers in some cases lack ICT competencies. Regarding teacher attitudes towards ESD, there are more positive views about importance of SD in curriculum, but teachers generally think that there are more difficulties in connecting SD to the real life problems as well as to interconnect different themes of SD across different subjects.

The general conclusion is that teachers have a more positive opinion on EDS than on e-learning but the majority of teachers are interested to participate in the eSchool4S project.

Based on the existing data and analysis, the following conclusion and recommendations should be made. Strategies for implementation of ICT and SD in education exists in each country for eSchool4S network and digital competence is recognised as one of the key competencies but in some cases national policy documents are not correlated (like in Romania) or/and there are no action plans and practical guidelines on how to introduce ICT and SD in teaching. Free training for teachers on the use of ICT should be provided both in pre-service and in-service teacher education. Rural schools should be better equipped with computers and a high-speed internet should be provided (especially in Romania and Serbia, and some islands in Croatia). The eSchool4S network should rely on the existing results and positive experience in ESD at the European and international level. There is a recommendation that the specific part of the program should contain SD topics of particular importance for each member of the eSchool4S network. If we want teachers to successfully teach the content relating to sustainable development, it is necessary that they themselves are committed to this system of values, which should be taken into account in the selection of teachers who will participate in the eSchool4S project. The need for creating basic ICT training for using web classroom should be taken into consideration in order to ensure participation of motivated teachers without ICT competence. It is necessary that schools form interdisciplinary eSchool4S teams of teachers. In addition to science teachers (disciplines where SD is already represented in the subject curricula), team members should also be teachers of social science disciplines. The eSchool4S web-classroom needs to increasingly take into account the social aspects of SD issues, as well as to largely incorporate SD issues in social science subjects, due to the practical importance, motivation of teacher and students and better connection of SD to the real life problems.

1. Introduction

This report presents the baseline study with aim to give a comprehensive up-to-date overview on the status of innovation in the thematic fields of the eSchool4S network. Project needs this baseline study in order to accomplish strategic project objective of creating innovative methods and tools for the design and implementation of interactive web-based classrooms.

In addition, it needs it in order to create virtual project partnerships involving teachers and students from different countries in the Danube Region through establishment of the website www.eSchool4S.eu. This web portal will be the main internet portal for the joint development and exchange of innovative teaching concepts, contents and methods bringing Europe to the schools in the Danube Region and involving the youth in the Sustainable Development of their home region.

This baseline study will present the status in eSchool4S network Countries (Austria, Bulgaria, Germany, Croatia, Hungary, Romania, Serbia and Slovakia) concerning temporary capacities related to the use of ICT in school and preconditions for implementing Education for Sustainable Development (ESD). The Institute of Psychology (Belgrade, Serbia) with the support of the project partners has created the baseline study methodology in order to assess baseline conditions before implementing the project activities through the eSchool4S network implementation.

The concrete aims of the eSchool4S network are:

- Initiation and sustainable development of a regional network of stakeholders, decision makers of national education systems, school managers, teachers and students from countries in the Danube Region.
- Creation of an operational platform for the regional cooperation and the exchange of information, opinion, know-how and experience between projects and programmes as well as between teachers and teacher training institutes from all countries in the Danube Region.
- Raising awareness of decision makers as well as of teachers for the needs of ESD in an interdisciplinary setting in the context of European integration and regional cooperation.
- Compilation of a baseline study report (and annual updates) on the status of innovation in the thematic fields addressed by the eSchool4S network.
- Development and demonstration of innovative methods and tools for the design and implementation of interactive web-based classrooms and virtual project partnerships involving teachers and students from different countries in the Danube Region.
- Establishment of the website www.eSchool4S.eu as the main internet portal for the joint development and exchange of innovative teaching concepts, contents and methods bringing Europe to the schools in the Danube Region and involving the youth in the SD of their home region.
- Demonstration of the application of the jointly developed e-teaching concepts and materials in the eSchool4S web-based classrooms.
- Efficient promotion of the eSchool4S network and consequent dissemination of outputs from the network.
- Development of ICT competences and practical experiences

This baseline study report helps continuous monitoring and evaluation of the development of the eSchool4S network and its activities through identification of baseline capacities and country conditions.

Strategic objectives of eSchool4S network are coherent to the objectives of the Life Long Learning European Programme. This means that capacities of participants should be strengthened and enhanced. This will demand commitment of teachers and students to promote the objectives of SD of the Danube Region within the on-going European integration. Teachers will expose themselves to extensive and innovative approaches of web-based learning environments and advanced e-teaching materials for use in an intercultural context. They will also benefit in terms of technical and methodical skills acquisition.

Students will be motivated and trained to join a web-based learning environment and to work with interactive e-teaching materials. They will directly benefit from the interaction and intense exchange with partners from other countries. Exposure to a variety of contents and views will prompt them to form their own opinion and address these issues in their own voice. They will develop a firmer grasp of national and regional specificities, and gain intercultural skills, which will equip them for working and adult life in the EU labour market.

In order to assess how the project has helped these processes, it is important to estimate prior countries' condition regarding all relevant issues in the baseline study.

2. Aim of the baseline study and research methodology

Aim of development of the methodology was to grasp different aspects of current country baseline conditions important for the project purposes. The methodology captures those aspects through various ways and by gathering different types of data in order to have a sufficiently comprehensive picture of status of ICT and ESD in different countries. Consequently, there are analyses of current strategic documents regarding ICT and SD, which contain analysis of current technical capacities for e-learning at the national and school level, national data analysis, content analysis of school curriculums and focus groups with teachers and relevant stakeholders (see Annex 1).

The key partner in the methodology development was the Institute of Psychology from Belgrade, Serbia, but all partners contributed by their suggestions and comments, so the methodology was developed in a participative manner, with the help of all partners.

Desk analysis. Desk analysis uses the existing national statistical data to get overview of available offers concerning e-learning and e-teaching courses for teachers and students in partner countries and in Europe, to get overview of available offers concerning e-learning and e-teaching courses for teachers and students and to capture status of initial teacher training in the respect of development of ITC competence.

Analysis of available statistical data and existing reports (Eurydice, Eurostat) regarding ICT equipment in schools and homes will help assess the school capacities for participating in web-based classroom. Rooms for improvements are important also in analysis of ways of funding (state versus private resources) for school equipping for implementation of ICT in teaching.

Analysis of national documents and national strategies (if they exist) for ICT use and ICT implementation in teaching and learning is important in order to see the development path in using technology in school that will be possible to rely on in future at the state level. Analysis of national strategic documents about SD aims to show current awareness about SD in different countries.

Analysis of content. Analysis of content of school curriculum helped to see available teaching programs regarding issues of SD and how they are represented in national curricula.

Analysis of the structure of different areas of Sustainable development (Economics, Culture, Ecology, Politics, Chemistry and Biology), underlining the main themes in every area will help mapping the interconnection in curriculum and will make a room for better comprehension of SD at the interdisciplinary level. See Annex 2 for an example of the content analysis of Biology curriculum in Serbia.

Interview with relevant stakeholders. Interviews with relevant stakeholders will help identify gaps between proscribed ICT use in school and actual use (based on the existing national data). In addition, they will help underline priorities of relevant subject matters of SD in public dialogue and assess preparedness of schools and teachers to include these priority issues in their teaching. Opinions of stakeholders will help in formulating recommendations and possible paths for improving ESD and ICT use in teaching.

Focus group with teachers. Focus group with teachers aims to explore teachers' perception regarding needs and potentials for ESD in secondary schools, as well as to explore existing experience in participation in international education networks and their motivation, willingness and ability to participate in the eSchool4S network and to contribute to the eSchool4S web-based classrooms. Two groups of teachers were interviewed, those very motivated for innovations and those who were not, according to the assessment of the principal and other experts.

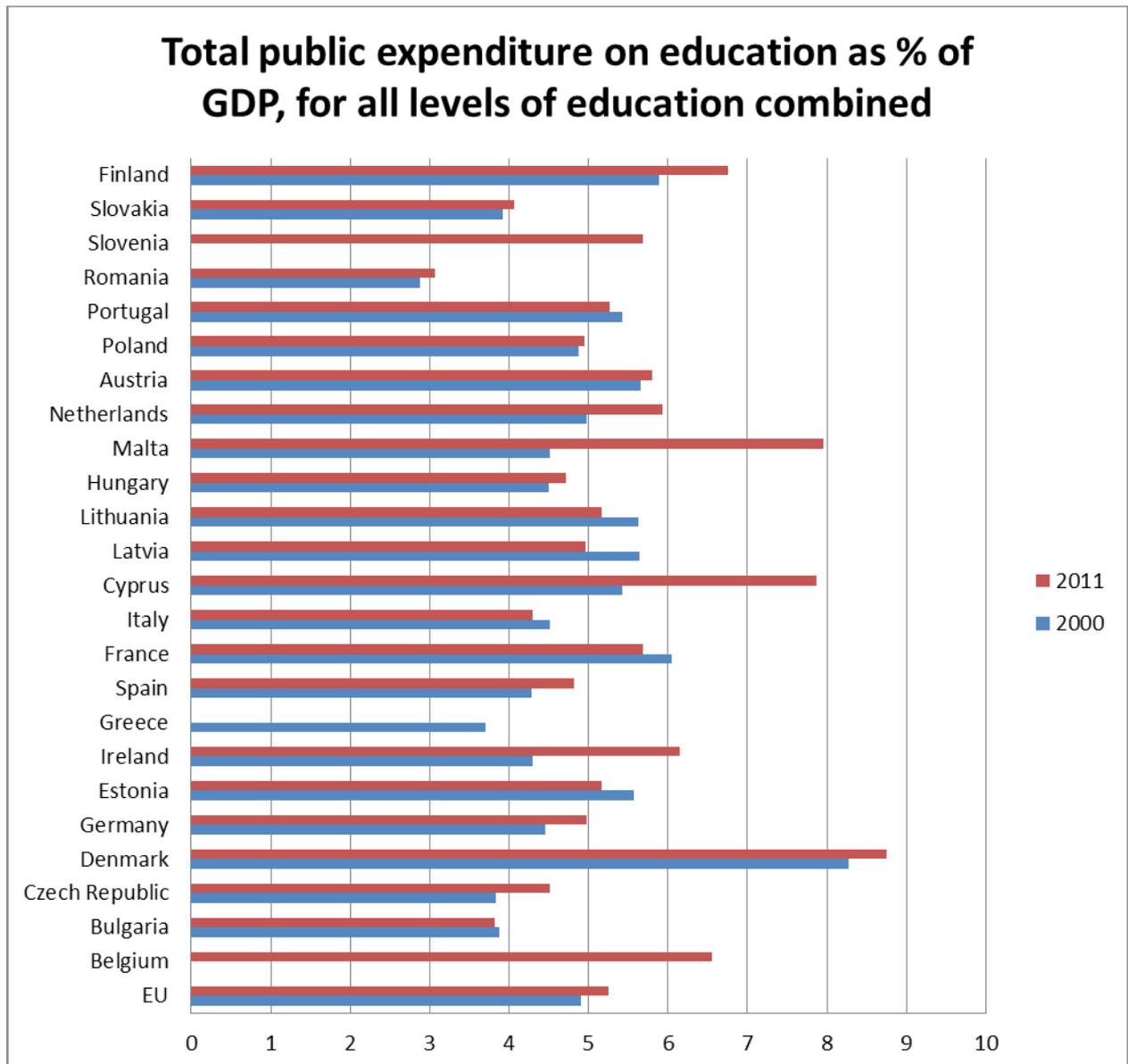
3. European overview

In this chapter, we will provide brief comparative analysis of some of the key indicators of education of EU countries. This perspective aims to capture a longitudinal dimension change in policies in education in the last 10 years, which can give some evidence about how much countries have changed and in what directions. Comparative analysis will try to grasp changes in the selected indicators for past ten years in order to have a development perspective of the European education systems.

The selected comparative indicators we used for brief comparative analysis are: total public expenditure on education, financial aid to students and students as a percentage of total public expenditure, ration of students to teachers and educational attainment levels in EU countries. We relied primarily on EUROSTAT data¹ regardless of the fact that some others databases are also very important (e.g. PISA, TALIS) but they did not enter this brief overview due to the small room for analysis and because they are more directed towards international picture of education and education outcomes. We selected the above indicators because they can show a rough picture of EU differences and because they are most general and least sensitive to different context, and in our opinion most comparable.

Regarding the total public expenditure on education as a part of GDP, EU average in 2011 was 5.25% and for eleven years, it has increased by 0.35% (Graph 1). Public expenditure has rapidly increased for the past eleven years in Malta, Cyprus and Ireland. Public expenditure has decreased for the last eleven years for Lithuania, Latvia, France and Estonia probably because of specific situation in those countries and due to the austerity measures. Countries of North Europe together with Nordic countries allocate most finances for education (Finland 6,76%, Denmark 8,75% and Belgium, 6,55%) together with Slovenia, Ireland, Slovakia, Portugal, Lithuania, France, Estonia, Netherlands and Austria (all above 5%). Malta and Cyprus allocated near 8% of GDP for education in 2011. Investing in education at the national level is an indication of awareness of education importance and the connection between education and growth of economy highlighted in EU 2020 strategy. EU, on average, has increased investment in education, but the investment could be more substantial regarding the importance of diffusion of knowledge for social mobility and decreasing economic inequalities in the economies based on knowledge and technology.

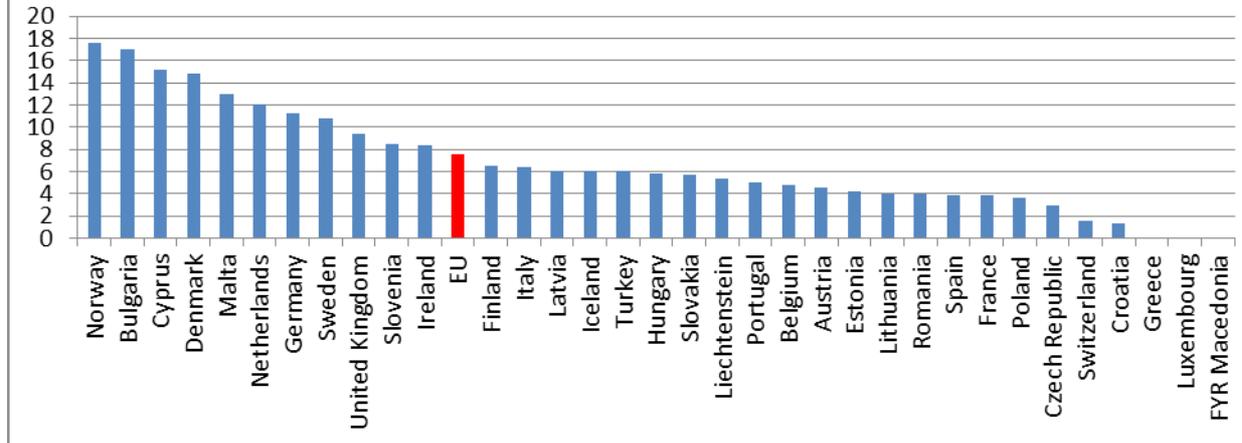
¹ Note: When data is missing in graph for some country, it means that data were not available for that country in public EU statistic.



Graph 1 Total public expenditure on education as % of GDP
 Source: Eurostat, date: 19/09/2014

If we look at how much countries invest from their total public expenditure on education in financial aid to students and students, we see that countries differ a lot regarding the extent of support to the impoverished students. It can be due to the different national policies regarding social security as well as public budget amounts. Norway allocates 17.6% of public budget for education for financial aids for students. Out of EU countries, Bulgaria provides the most financial aid to students (17%) of the total national budget for education, while Croatia the least (1.3%) according to Eurostat data (Graph 2).

Financial aid to students as % of total public expenditure on education, for all levels of education combined in 2011

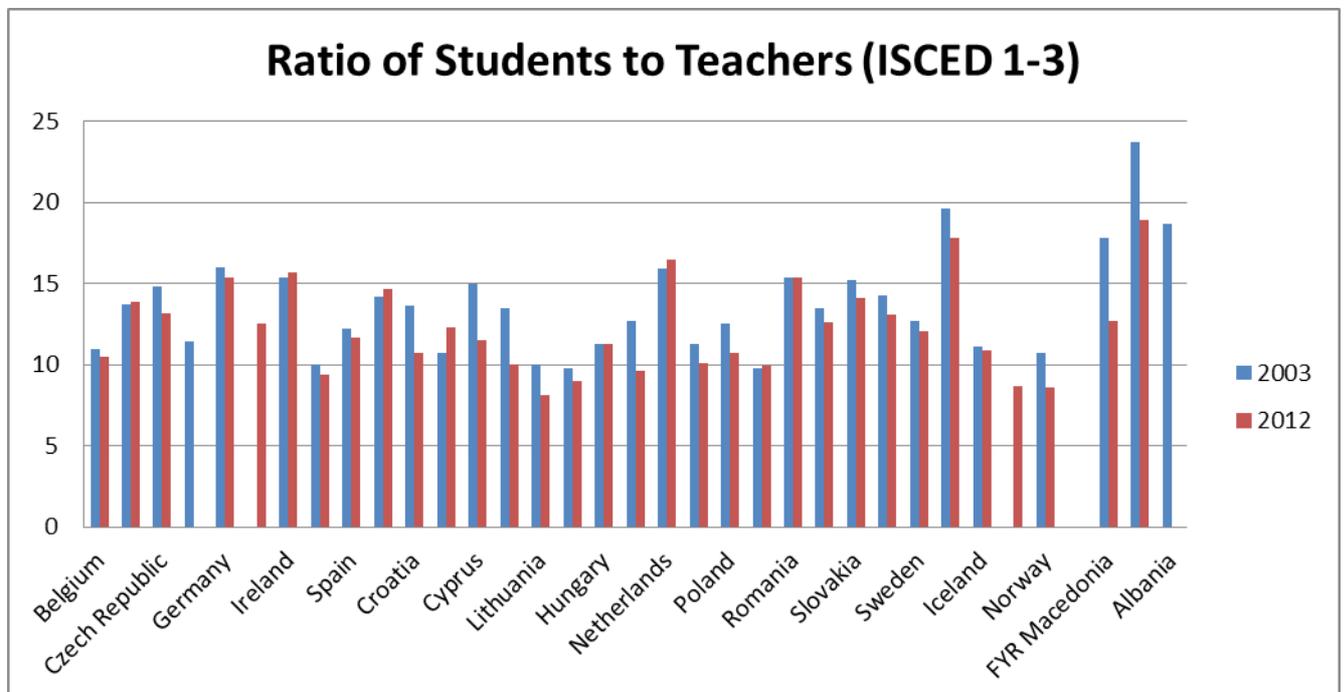


Graph 2 Financial aid to students as % of budget for education

Source: Eurostat, date: 19/09/2014

Regarding the number of students per teacher in pre-tertiary education, Turkey and UK have the most students per teacher (18.9 and 17.8 respectively). Norway and Lithuania have the smallest number of students per teacher (8.6 and 8.1, respectively). This ratio can provide evidence about network of schools, teacher employment policies and conditions for quality of teaching (Graph 3).

Ratio of Students to Teachers (ISCED 1-3)



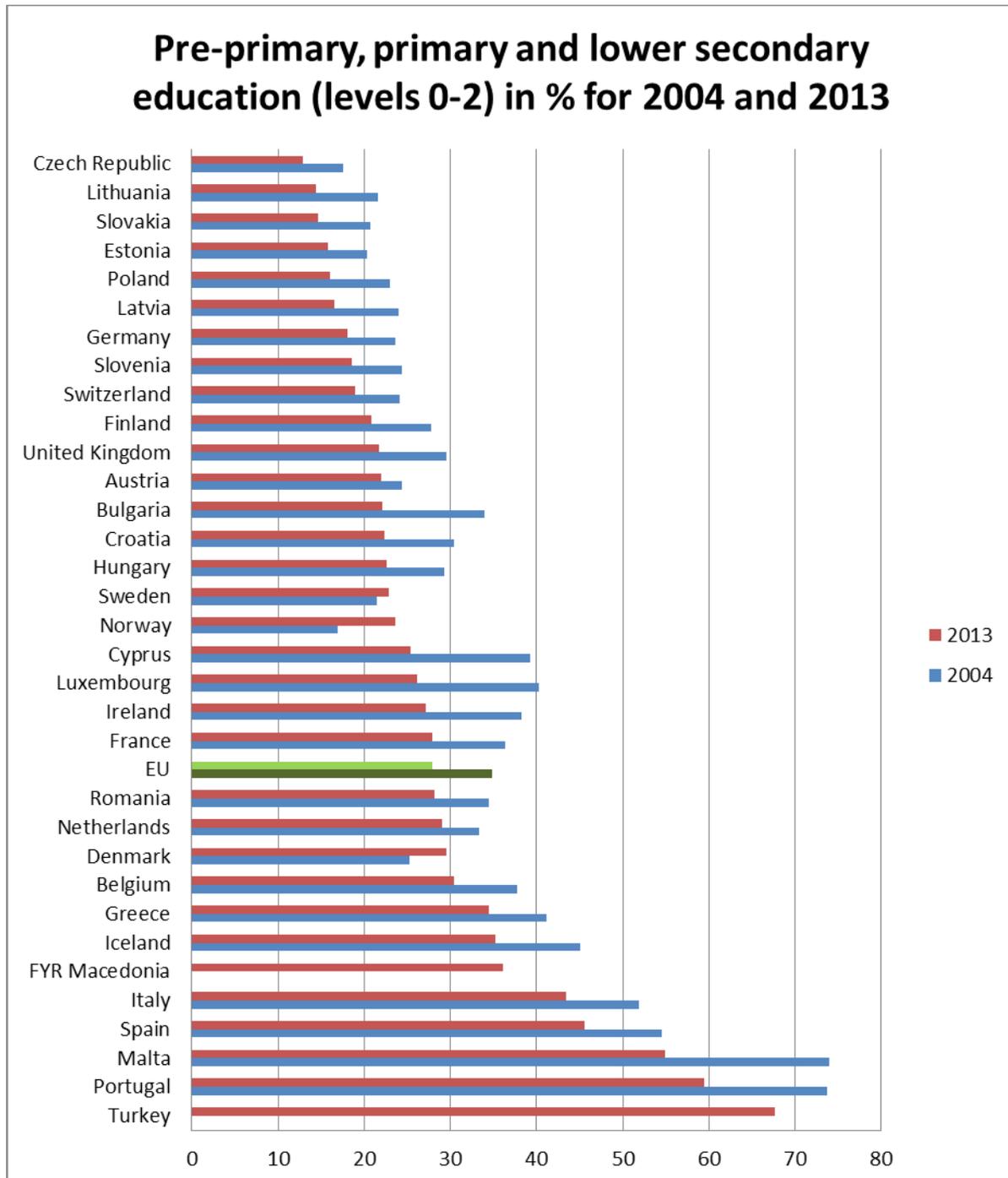
Graph 3 Ratio of students to teachers (ISCED 1-3)

Source: Eurostat, date: 19/09/2014

When we look at the biggest changes in teacher-student ratio, Cyprus, Croatia, Latvia, Malta, UK, Norway, FYR Macedonia and Turkey have decreased the teacher-student ratio in the past ten years

which can be the evidence of changes in their education policies and tendencies for improving conditions for good educational practice.

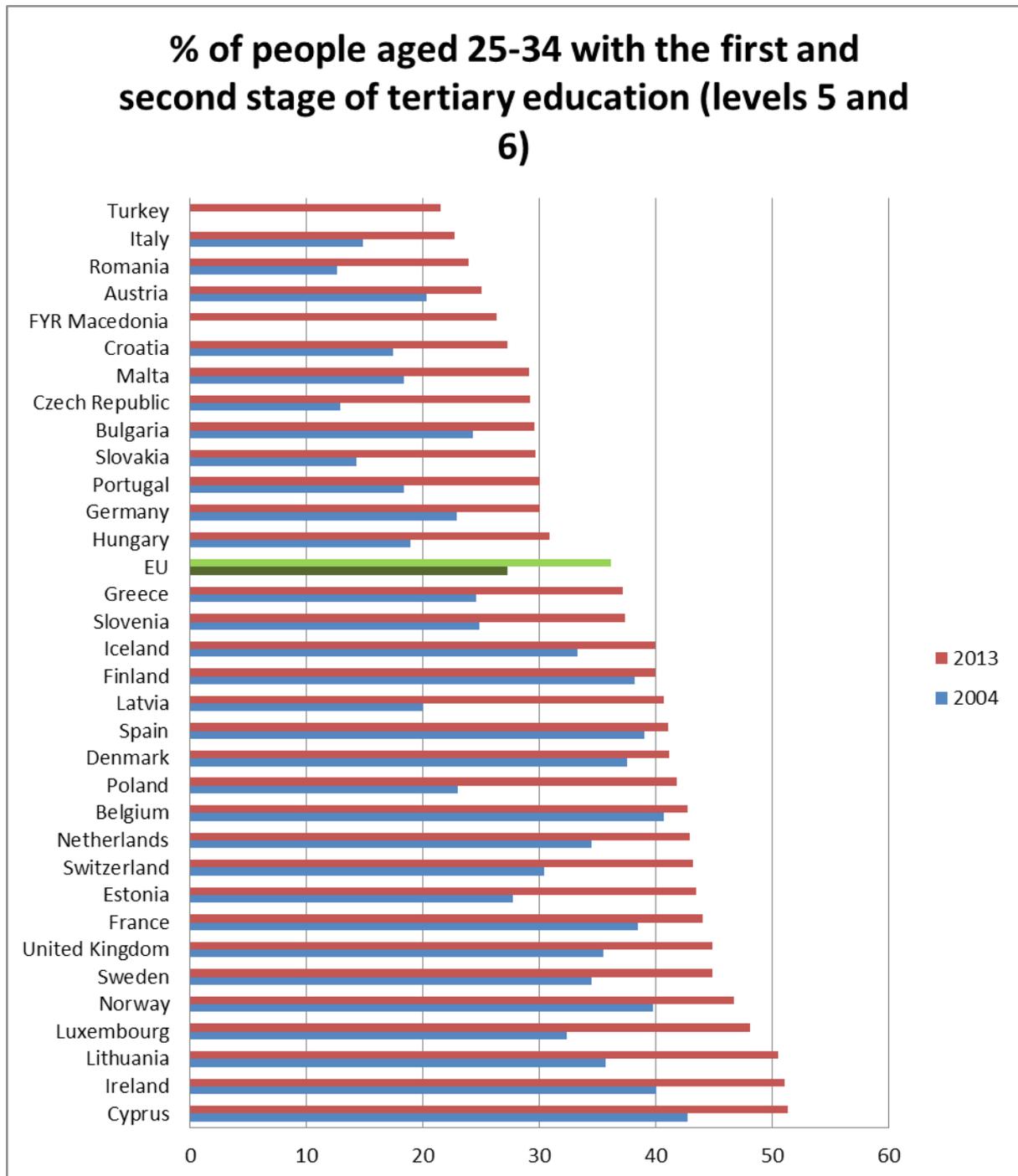
There is a positive trend in EU to increase the number of people with faculty degree and to decrease the number of people with secondary and lower secondary degrees in order to establish more competitive knowledge-based economies. If we look at the percentages of people with low-level educational degree we can see the trend of decreasing the number of less qualified people for labour market (Graph 4). Turkey, Portugal and Malta are the countries with the highest percentage of people with the low level of education in 2013.



Graph 4 Percentage of population with lower secondary and below education level for 2004 and 2013.

Source: Eurostat, date: 19/09/2014

Spain and Italy are countries that also have a large number of people with the low level of education (45.6% and 43.4%, respectively). EU average is 28% of people with the low level of education. Czech Republic, Lithuania, Slovakia, Estonia, Poland, Latvia and Germany are countries with the lowest percentage of people with the low level of education (Czech Republic – 12.9%, Germany – 18%).



Graph 5 Percentage of population between 25 and 34 with higher education level for 2004 and 2013.
 Source: Eurostat, date: 19/09/2014

When we look at the data regarding percentage of people joining the labour market who are in the first decade of their working careers (aged 25-34), the generation that could have been influenced by new EU policy recommendations for the increase in the number of highly educated people in EU, we see that Cyprus, Ireland and Lithuania are the only countries with 50% and above of selected

population with tertiary degrees. Norway, Sweden, UK, France, Estonia, Belgium and Netherlands have percentages high above the EU average regarding people with university degree in population from aged 24-35. Italy, Romania, Macedonia, Croatia and Austria have below average percentages of selected population with university degree. Encouraging for EU economy, as well as for positive social outcomes (life satisfaction, democracy, and social participation) is the increase in the percentage of population with the university degree. Today in EU, compared to the situation of ten years ago, there are 9% more people with the university degree. In Latvia, Poland, Czech Republic and Estonia, percentage of people aged 24-35 with the university degree has almost doubled.

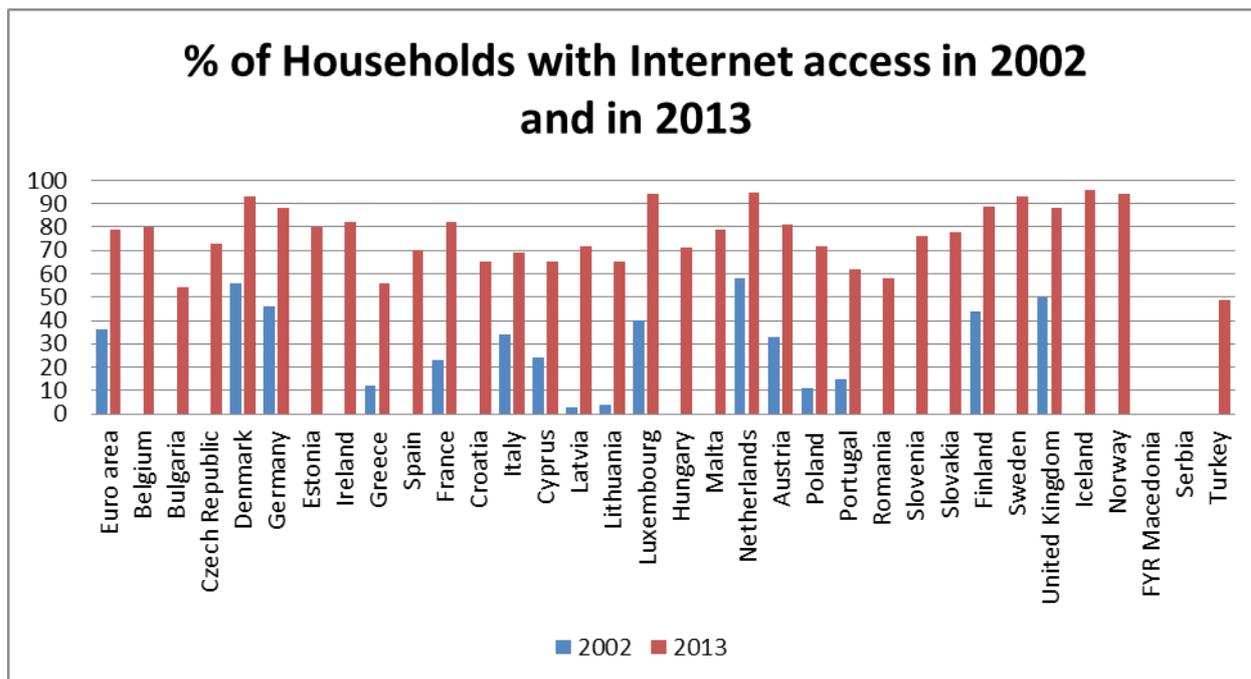
3.1. ICT in EU countries

The importance of ICT for the economy can be seen through the objectives of Digital Agenda for Europe (DAE) which aims to reboot Europe's economy and help Europe's citizens and businesses to get the most out of digital technologies. It is the first of seven flagship initiatives under Europe 2020, the EU's strategy to deliver smart sustainable and inclusive growth. EU data are showing that the digital economy is growing at seven times the rate of the rest of the economy. The full implementation of the Digital Agenda goals would increase, according to the estimation, European GDP by 5%, or 1500€ per person, over the next eight years, by increasing investment in ICT, improving ICT skills levels in the labour force, enabling public sector innovation, and reforming the framework conditions for the internet economy. ICT in education is, in this context, very important for entering to the new labour market and increasing the economy.

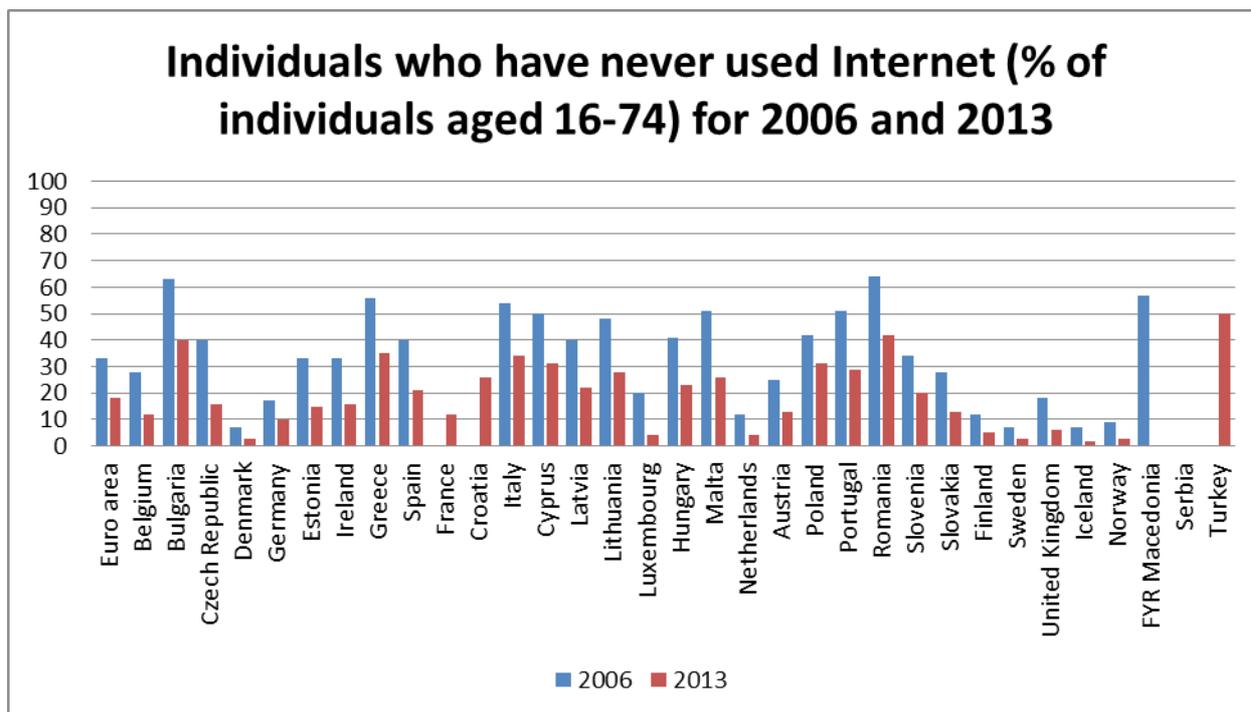
According to the last European report about ICT usage in homes and schools (Eurydice, 2011), the percentage of households with children with access to computers and the Internet has increased in all countries even in countries with low GDP per capita. PISA study from 2009 shows that children's usage of computer at homes is almost twice as more about entertainment than about education and school-related activities (46% students use it once a week for educational purposes). The analysis of the use of ICT in schools shows that (TIMSS, 2007) 60% of students on EU average have teachers who have never asked them to use a computer for studying natural phenomena through simulation and 51% of them have never been asked to use ICT for some kind of experimentation. In European countries, according to PISA 2009, at least 50 % of students attend schools where one computer is available for every two students. These data reveal a significant reduction in the disparities between schools in the last 10 years given that in PISA 2000 there were between 25 and 90 students per computer across countries. On average, during their Math classes, almost 55 % of fourth grade students and 45 % of eight grade students have available computers.

Perceiving the ICT as important tool in improving teaching practices is recognised in the great majority of countries. Regulations in more than half of European countries foresee ICT competence as an obligatory part of an initial teacher education. In addition, the majority of countries suggest innovative pedagogical approaches that include ICT as well as the ways to help teachers implement these teaching methods in their teaching. All European countries, except Denmark and Iceland, report that the development of teachers' ICT skills is included in centrally promoted programs for Continuous Professional Development (Eurydice, 2011).

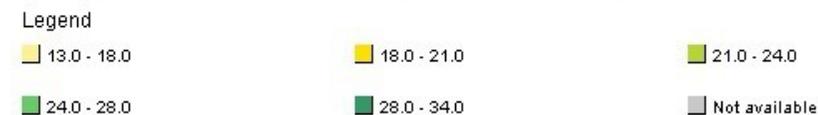
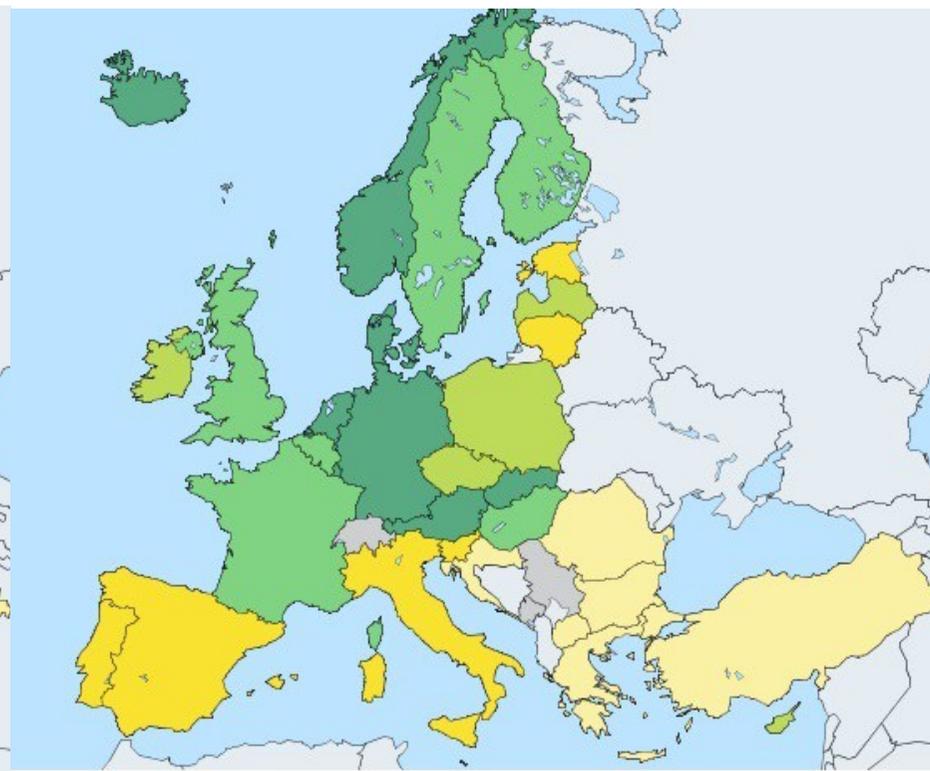
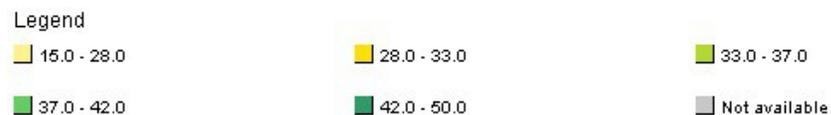
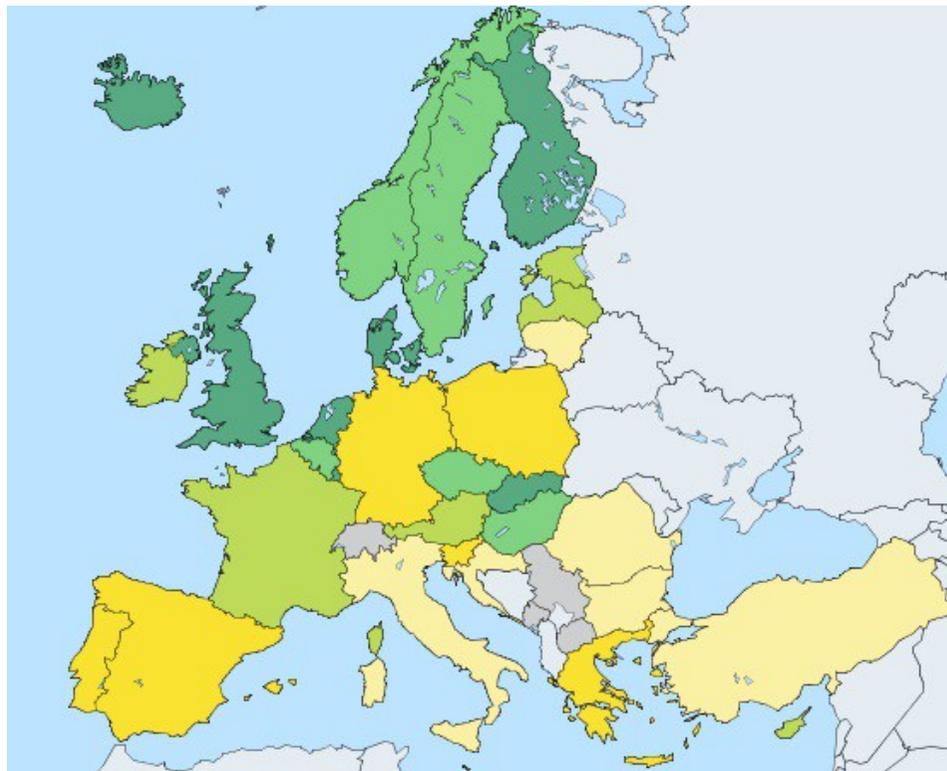
Regarding availability of computers and internet at the home level, looking at some more recent data (Eurostat, 2014; Graph 6 and 7), most partner countries in the project are far below the EU average (Romania, Bulgaria, Serbia - according to national data and Croatia) - below 76% which is EU-28 average. Slovakia and Hungary are little below EU-28 average while Germany and Austria are above EU-28 average. Regarding internet and computer competencies, countries from the Danube region are, except Germany are below EU-28 average (Map 1 and Map 2).



Graph 6 Availability of Internet in households (% of households with internet connection) for 2002 and 2013
 Source: Eurostat, date: 19/09/2014



Graph 7 Individuals who have never used Internet (% of individuals aged 16-74) for 2006 and 2013
 Source: Eurostat, date: 19/09/2014



Map 1 Individuals' level of internet skills - % of the total number of individuals aged 16-74 in 2013 who have developed internet skills (3 and 4 out of 6)²

Map 2 Individuals' level of computer skills - % of total number of individuals who have developed computer skills (3 and 4 out of 6)³ - Source: Eurostat, date: 19/092014

² Level of Internet skills are measured using a self-assessment approach, where the respondent indicates whether he/she has carried out specific tasks related to Internet use, without these skills being assessed, tested or actually observed. Six Internet-related items were used to group the respondents into levels of Internet skills in 2005, 2006, 2007 and 2011: use a search engine to find information; send an e-mail with attached files; post messages to chatrooms, newsgroups or any online discussion forum; use the Internet to make telephone calls; use peer-to-peer file sharing for exchanging movies, music etc.; create a web page. Low level of basic Internet skills: Individuals who have carried out 1 or 2 of the 6 Internet-related items. Medium level of basic Internet skills: Individuals who have carried out 3 or 4 of the 6 Internet-related items. High level of basic Internet skills: Individuals who have carried out 5 or 6 of the 6 Internet-related items.

³ Level of basic computer skills are measured using a self-assessment approach, where the respondent indicates whether he/she has carried out specific tasks related to computer use, without these skills being assessed, tested or actually observed. Six computer-related items were used to group the respondents into levels of computer skills in 2006, 2007, 2009, 2011 and 2012: from copy and moves file to connected printer and so on.

European countries also include other general or cross-curricular skills in their steering documents. ICT is seen as one of most important cross-curricular skills, which should empower other cross-curricular skills, such as problem solving, critical thinking, creativity, collaboration and communication. In some countries (e.g. Bulgaria), only one cross-curricular skill is aimed to be assessed (in this case creativity) while in most of the countries all skills are assessed and ICT is seen as a tool for their increase.

The European Commission has also put digital literacy as a learning outcome high on its agenda for the next decade (European Commission, 2010).

The countries which have all the listed objectives in their steering documents for either primary or secondary education are Bulgaria, Germany, Greece, Spain, Latvia, Hungary, Malta, Poland, Slovakia and the United Kingdom (Wales and Scotland). In the meantime, some listed objectives entered into the national educational goals of Romania (*Strategy Education and Research for the Knowledge Society*, with its main purpose to develop the education and research for the period 2009-2015) and in Serbia with *Guidelines for Improving ICT Use in Education*.

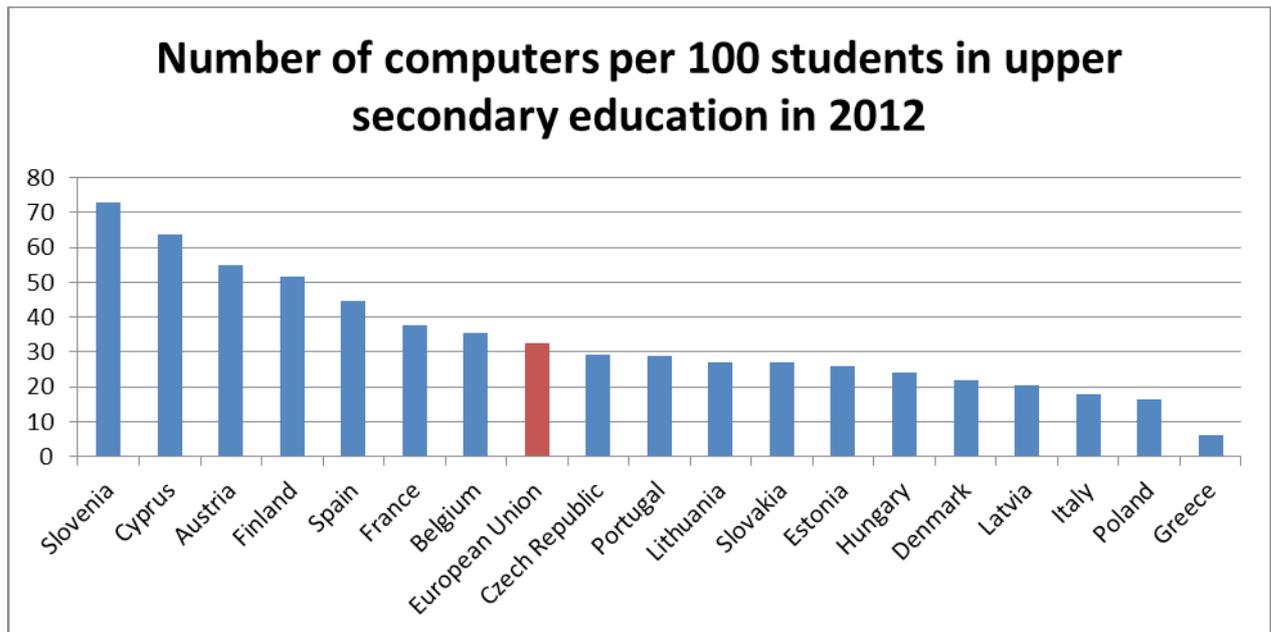
Recommendations for innovative pedagogical approaches regarding using ICT in teaching, at both primary and secondary level (e.g. in project learning, personalised learning, scientific investigations, online learning) are present in great majority of European countries. In countries in the Danube region and partners on the projects, there are more informal ways of support than formalised recommendations (Eurydice, 2011: 43).

In many European countries in 2007, fourth grade students attended school that had on average one computer for 4 students. At the secondary level there was on average one computer for two students. In Denmark at the primary level and in the United Kingdom (England and Scotland) at the secondary level, at least one computer was available for each student. In contrast, only three countries (Italy – eighth grade, Austria and Turkey) have more than six students per computer.

In most European countries, at least 50 % of students are in schools where one computer is available for every two students. Nevertheless in Greece, Italy, Poland and Slovenia and to a lesser extent Belgium (French Community), Bulgaria and Sweden, larger disparities exist in computer availability. In these countries, one computer is available for four to eight students. In Turkey, the gap is even greater as there are fewer than 4 students per computer in some schools and more than 11 in others. These data reveal a significant reduction in the disparity between schools in the last 10 years. In 2000 there were between 25 and 90 students per computer in the different countries (Eurydice, 2011).

In Romania, at the age of 15, there is almost 3 students per one computer, in Bulgaria, near 2.6, in Slovakia near 2.5, in Germany, somewhat above 2, in Austria, around 1, in Hungary, around 2.6 (Eurydice, 2011: 76). There are not reliable data for Serbia and Croatia. In their national report for the purpose of this project, Croatia reports about one IT classroom per school and in Serbia, there are some studies reporting a very high number of students per one computer (19 students per one computer).

If we look at some more recent data of Digital Agenda, we can see that on average, 3.06 students come on one computer in upper secondary education (Graph 8). In Slovenia, this ratio is the best where 1.37 students come to 1 computer, and, on the other hand, the fewest computers per children are in Greece, where there are 16.6 students per one computer. There are not available data for all countries in Europe and some countries from the Danube region.



Graph 8 Number of computers per 100 students in 2012 in upper secondary education.
 Source: Digital Agenda, date: 14/10/2014

3.2. ESD in EU countries

Sustainable development (SD) has been defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Sustainable development in the European Union, 2011). By linking economic development, protection of the environment and social justice, it aims at the continuous improvement of the quality of life and well-being for present and future generations, and therefore concerns all citizens in the EU, as well as of the whole world⁴.

According to the EU Sustainable development strategy in 2011, SD is a fundamental and overarching objective of the European Union, enshrined by the Treaty. The EU sustainable development strategy, launched by the European Council in Gothenburg in 2001 and renewed in June 2006, aims for the continuous improvement of quality of life for current and future generations.

⁴ European Union has developed indicators for measuring SD. For Socioeconomic development indicator is Real GDP per capita, for Sustainable consumption and production indicator is Resource productivity, for Social inclusion indicator is Risk of poverty or social exclusion, for Demographic changes indicator is Employment rate of older workers, for Public health indicator is Life expectancy and healthy life years, for Climate change and energy indicator is Greenhouse gas emissions and Consumption of renewables, for Sustainable transport indicator is Energy consumption of transport relative to GDP, for Natural resources indicator is Abundance of common birds and Conservation of fish stocks, for Global partnership indicator is Official development assistance. Results of monitoring of SD can be found at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-31-11-224/EN/KS-31-11-224-EN.PDF. The Eurostat monitoring report, based on the EU set of sustainable development indicators, provides an objective, statistical picture of progress towards the goals and objectives of the EU sustainable development strategy. It is published every two years and is intended to contribute to the biennial review on the implementation of the strategy by the European Council. The statistics cover a wide range of issues related to sustainable development, and will contribute to raising awareness of the opportunities and challenges lying ahead. Quantitative rules applied consistently across indicators, and visualised through weather symbols, provide a relative assessment of whether Europe is moving in the right direction, and at a sufficient pace, given the objectives and targets defined in the strategy. The data presented cover the period from 1990 to the latest year available (2009/10 where possible).

Education for Sustainable Development is, therefore, important part of improving SD in EU and in 2014 DESD (Decade of Education for Sustainable Development) is ending. In UNECE strategy for ESD, there are listed themes that should be included in education and studied in holistic approach. "Key themes of SD include among other things poverty alleviation, citizenship, peace, ethics, responsibility in local and global contexts, democracy and governance, justice, security, human rights, health, gender equity, cultural diversity, rural and urban development, economy, production and consumption patterns, corporate responsibility, environmental protection, natural resource management and biological and landscape diversity. Addressing such diverse themes in ESD requires a holistic approach" (III, 15. UNECE Strategy for ESD).

Regarding the status of ESD in EU, UNESCO, as an organisation responsible for monitoring and evaluating progress of ESD during the DESD (2005-2014), their report pointed out that ESD is emerging as the unifying theme for many types of education that focus on different aspects of sustainability, (e.g. climate change, disaster risk reduction or biodiversity). ESD is increasingly perceived as a catalyst for innovation in education and something that loosen boundaries between schools, universities, communities and the private sector are blurring due to a number of trends and also something that develops new pedagogical methods due to the interdisciplinary character of SD. In this report, UNESCO stated that ESD's role is much bigger than it was two years ago.

Within the UNESCO, several surveys have been conducted: Global Monitoring & Evaluation Survey (GMES) - an on-line survey was created and sent to UNESCO National Commissions of UNESCO Member States to get a better sense from countries of the various types of learning employed and/or emerging under the ESD umbrella in the various educational sectors for 102 countries; National ESD-journeys (NESDJ) – Eight detailed reviews from countries in different regions of the world; Key Informant Survey (KIS) – Key ESD informants around the world represent a range of local, regional, national and trans-national organisations active in ESD and as well as case study in online form and desk analysis of existing and institutional data.

Results show many positive changes regarding ESD and one of them is that ESD is not important only for SD per se but it has a positive influence on developing new teaching methods and innovative pedagogy but the causal relationship between ESD and new teaching practices should be confirmed, according to UNESCO, in further studies.

Something in ESD may have contributed to the new and creative teaching methods: the ESD principle that each individual should have a chance to participate in local and global discussions about our common future has been increasingly highlighted. Learning is seen as a key component of innovation that leads to social change. However, there is a need for more traditional approaches and ESD materials that teachers use in a more traditional manner (for those teachers who work in education systems with mandated curricula and textbooks). In some cases, national government must approve these materials.

Data show that many new teaching methods have emerged during ESD. ESD also stimulates processes which encourage innovation within curricula as well as through teaching and learning experiences; also processes of active and participatory learning and processes which engage the 'whole system,' and processes of collaboration and dialogue (including multi-stakeholder and intercultural dialogue).

Several types or forms of learning associated with ESD have been distinguished such as: discovery learning –transmission learning, participatory/collaborative learning, problem-based learning, disciplinary learning (taking questions of a disciplinary nature as a starting point, to better understand underlying principles and expand the knowledge base of that discipline), interdisciplinary learning (taking issues or problems as a starting point, then exploring them from different disciplinary angles to arrive at an integrative perspective on possible solutions or improvement), multi-stakeholder social learning (bringing together people with different backgrounds, values, perspectives, knowledge and experience, from both inside and outside the group initiating the

learning process, to set out on a creative quest to solve problems that have no ready-made solutions), critical thinking-based learning, systems thinking-based learning (looking for connections, relationships and interdependencies to see the whole system and recognise it as more than the sum of its parts and to understand that an intervention in one part affects other parts and the entire system) (UNESCO, 2012).

ESD in primary and secondary schools around the world manifests itself in many forms, sometimes under different names. School autonomy is very important for developing ESD. The more autonomy allowed to schools, teachers and students will have more freedom to shape curricula and there are more possibilities for innovation in education and loosening the boundaries of learning and society (UNESCO, 2012). In some cases, ESD is being included in the curriculum of many schools through efforts of NGOs, which incorporate ESD into their education on programmes that include field trips, school presentations and environmental summer camps. In some of the countries outside of Europe, ESD is not a part of curriculum. In EU countries, ESD is integrated into curricula, but there are problems with its interdisciplinarity in some countries of the Danube region. ESD in EU is in a more advanced stage than in other countries.

In order to achieve better preparation of teachers for ESD, UNECE has published Learning for the Future: Competences in Education for Sustainable Development. This document provides recommendations to policy makers on the professional development across all sectors: for teachers/educators, managers and leaders; governing and managing institutions; curriculum development and monitoring and assessment. It also identifies a framework of core competencies in ESD for educators.

The following framework has been selected as it is comprehensive and presents a meaningful set of categories that reflect a wide range of learning experiences: learning to know refers to understanding the challenges facing society both locally and globally and the potential role of educators and learners; learning to do refers to developing practical skills and action competence in relation to education for sustainable development; learning to live together contributes to the development of partnerships and an appreciation of interdependence, pluralism, mutual understanding and peace, learning to be addresses the development of one's personal attributes and ability to act with greater autonomy, judgement and personal responsibility in relation to sustainable development (Learning for the Future: Competencies in ESD, 2012).

UNECE strategy policy has provided several recommendations for improving ESD. Empowering educators must be central to any professional development initiative. Providing training and education in ESD for those in management and leadership positions in educational institutions is of a crucial importance. At the national level, one of the recommendations is that initial teacher education should integrate created competences and decide where they might be best integrated into their programs. There is a recommendation to incorporate some of the key mechanisms for building ESD into the professional development of educators, including those working in NGOs, the media and broader vocational education. There has to be excellent cooperation among international, subregional, national and subnational institutions. ESD, according to UNECE strategy, requires the distribution of power across institutions in order to facilitate educational change.

Regarding competences, it is very important to understand that without creating and defining competences for ESD its implementation could not be so efficient and possible. In Germany, for example, there are developed guidelines for integrating competences for SD into curriculums as a cross-curriculum competence.

Education for sustainable development (ESD) particularly is the acquisition of shaping competence. That ESD competence describes the ability to apply knowledge of sustainable development and to identify the problems of non-sustainable development. It means drawing conclusions on environmental, economic and social developments in their interdependence, based on analyses of the present and studies of the future, and then using these conclusions to make decisions and

understand them before implementing them individually, jointly and politically. Shaping competences can be broken down into ten competences: 1. To create knowledge in a spirit of openness to the world, integrating new perspectives; 2. To think and act in a forward-looking manner; 3. To acquire knowledge and act in an interdisciplinary manner; 4. To be able to plan and act in cooperation with others; 5. To be able to participate in decision-making processes; 6. To be able to motivate others to become active; 7. To be able to reflect upon one's own principles and those of others; 8. To be able to plan and act autonomously; 9. To be able to show empathy for and solidarity with the disadvantaged; 10. To be able to motivate oneself to become active (Guide for ESD at Secondary Level, 2011).

The CSTS Comenius project developed competences for ESD for teachers as a framework for integration of ESD in the curriculum of teacher training institutions. The CSCT project was developed as a response to the call of the UNECE Ministers of the Environment in 2003 for including education for sustainable development (ESD) in the curricula from pre-school to higher and adult education. This project developed a two-dimensional model of a teacher who is competent for ESD, where one dimension is a dimension of profession (in society, school and solely) and the other dimension is competence, which is encompassed through the networking, teaching and reflecting. In teaching and learning for ESD, all five domains (knowledge, systems thinking, emotions, ethics and values and action) have to be applied to each of the professional dimensions and they also relate to all overall competences (Competences for ESD Teachers, 2008).

4. Regional (eSchool4S) Overview

4.1. ICT Capacities

One of the tasks of the Baseline Study was to show whether the countries of the eSchool4S network have the necessary ICT infrastructure for the realisation of the eSchool4S web-based classrooms, as well as to what extent teachers are trained to use ICT.

To answer this question, data from the final report *Survey of Schools: ICT in Education* were used (European Commission, 2013)⁵, as well as the data from national reports (primarily Germany, because the data for this country are not included in the final report due to the low turnout of respondents and Serbia, because it had not participated in this study). Since the eSchool4S project will be implemented in general upper secondary schools, this section shows only the results grade 11, i.e. ISCED level 3.

4.1.1. ICT infrastructure

The data show that, compared to the European average (at grade 11 in general high school the student to computer ratio is 4: 1 at the EU level) western European countries from the eSchool4S network are better equipped with computers than eastern European countries from the same network. In Croatia this ratio is 5: 1. In Austria, Hungary and Slovakia the student to computer ratio is 6: 1 (see fig. 1.1c 6). According to the national report, every school in Baden-Wuerttemberg (except primary schools) is equipped with sufficient computers for a whole class and computer rooms. Data from 2012⁶ show that in Germany, a student to computer ratio is 2:1. On the other hand, schools in Rumania and Bulgaria have fewer computers than the European average.

⁵ European Commission (2013) *Survey of Schools: ICT in Education, Final Study Report: Benchmarking Access, Use and Attitudes to Technology in Europe's Schools*. Luxembourg: Publications Office of the European Union.

⁶ Source: Digital Agenda, date: 14/10/2014

According to the national report, in Serbia there is a high number of students per one computer (19 students per one computer).

Fig. 1.1c: Students per computer
(Grade 11 general, country and EU level, 2011-12)



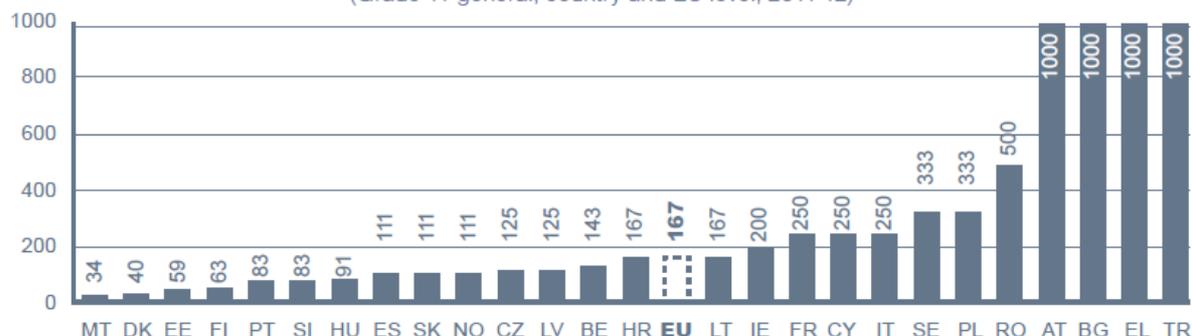
Source: European Commission, 2013, p. 35.

In European schools computers are usually placed in separate classrooms. In Bulgaria, Romania, Croatia, and Slovakia, over 70% of computers in schools are located in the ICT lab. The only exception is Austria where the number is less than 20% (European Commission, 2013, p. 38). There are no data for Germany and Serbia.

Furthermore, a small percentage of the general upper secondary schools are without broadband (4% at the European level). In Austria, Slovakia and Hungary there are no schools without broadband, and the situation in Croatia, Romania and Bulgaria corresponds to the European average (European Commission, 2013, p. 46). There are no data on broadband for Germany and Serbia.

Countries from the eSchool4S network differ significantly in the number of interactive whiteboards. The European average is (grade 11 general) 167 students per one interactive whiteboard. The situation in Croatia corresponds to this average. A smaller number of students per one interactive whiteboard is present in the Hungary (91: 1) and in Slovakia (83: 1). Significantly higher number of students per one interactive whiteboard is in Romania (500:1), especially in Austria and Bulgaria (1000: 1). There are no data about this parameter for Germany and Serbia.

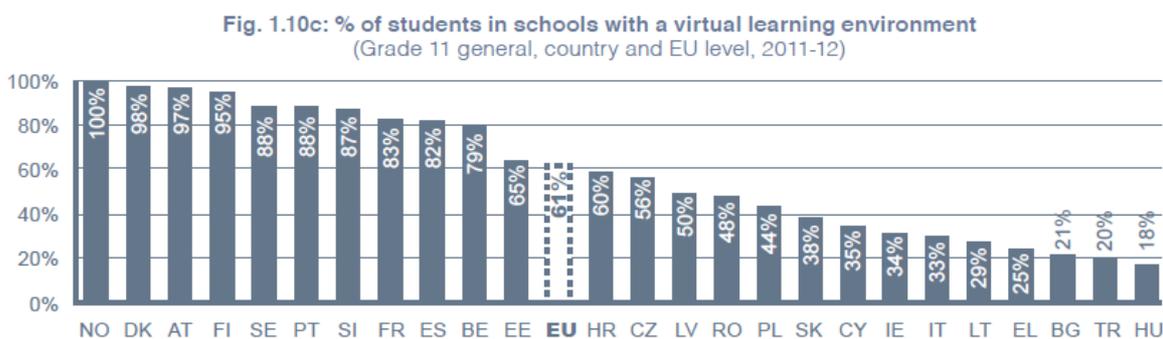
Fig. 1.5c: Students per interactive whiteboard
(Grade 11 general, country and EU level, 2011-12)



Source: European Commission, 2013, p. 41

74% of grade 11 students, on average in the EU, are in schools where more than 90% of the equipment is fully operational. However, Croatia appears to have high levels of non-operational equipment at this level (European Commission, 2013, p. 40). There are no data for Austria, Germany and Serbia.

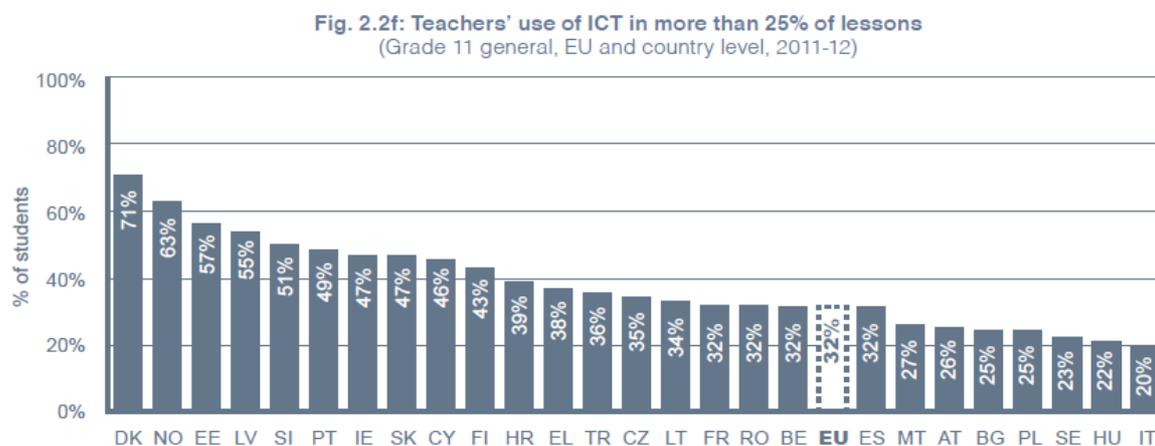
A VLE or learning platform is the strongest indicator of school connectedness. There is also a wide range of percentages of students in schools with VLEs at grade 11 general level (fig. 1.10c30) from 18% in Hungary to 97% in Austria. With respect to other countries from eSchool4S, by VLE Croatia (60%) is near the European average. In Romania, 48% of general upper secondary schools have learning platforms, while the percentage is lower in Slovakia (38%), and the lowest in Bulgaria (21%). There are no data for Germany and Serbia.



Source: European Commission, 2013, p. 48.

4.1.2. Use of equipment

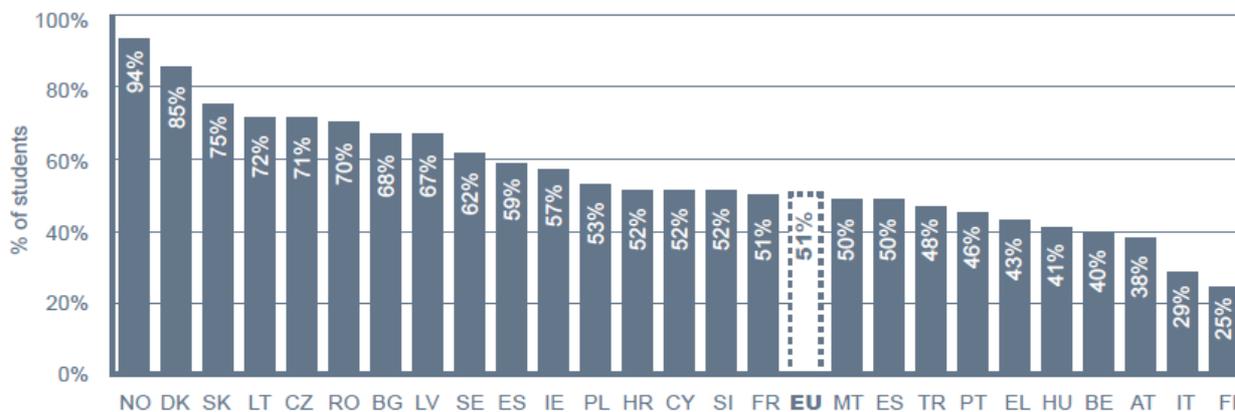
Figure 2.2f ranks countries by the percentage of students in schools where grade 11 teachers use ICT in more than one in four lessons (European Commission, 2013, p. 58). Hungary (22%), Bulgaria (25%) and Austria (26%) are below the European average, Romania (32%) is at the European average, and Croatia (39%) and Slovakia (47%) are above the European average. There are no available data for Germany and Serbia.



Source: European Commission, 2013, p. 58.

Figure 2.2c ranks countries by the percentage in which students use school computers for learning purposes. Compared to the European average, the use of computers by students is the lowest in Austria (38%) and Hungary (41%), the approximate average in Croatia (52%), and higher than the average in Bulgaria (68%), Romania (70%) and Slovakia (71%) (European Commission, 2013, p. 62).

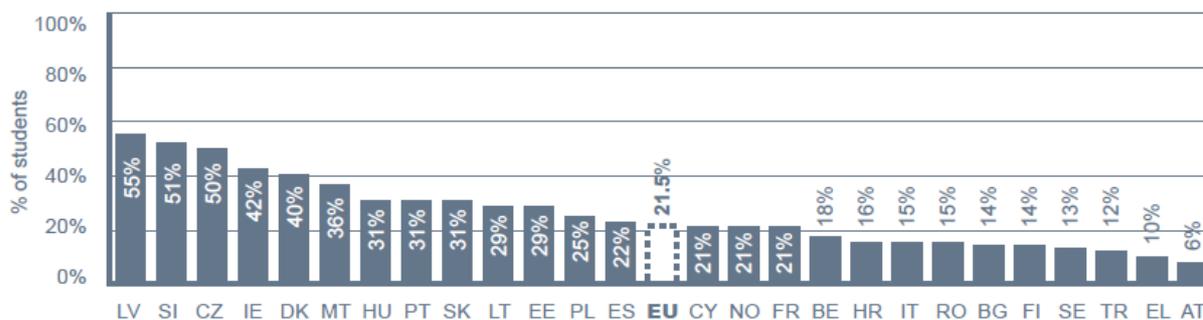
Fig. 2.5c: Use of school desktop/laptop for learning purposes at least weekly
(Grade 11 general, country and EU level, 2011-12)



Source: European Commission, 2013, p. 62.

On average in the EU, one in five grade 11 students use interactive whiteboards in lessons at least weekly. Among the countries of the eSchool4S network, on a weekly basis, most students from Hungary use interactive whiteboards, while in other countries the use of interactive whiteboard is below the European average, especially in Austria (6%). There are no data for Germany and Serbia.

Fig. 2.6b: % students using interactive whiteboard at least weekly
(Grade 11 general, country and EU level, 2011-12)



Source: European Commission, 2013, p. 63.

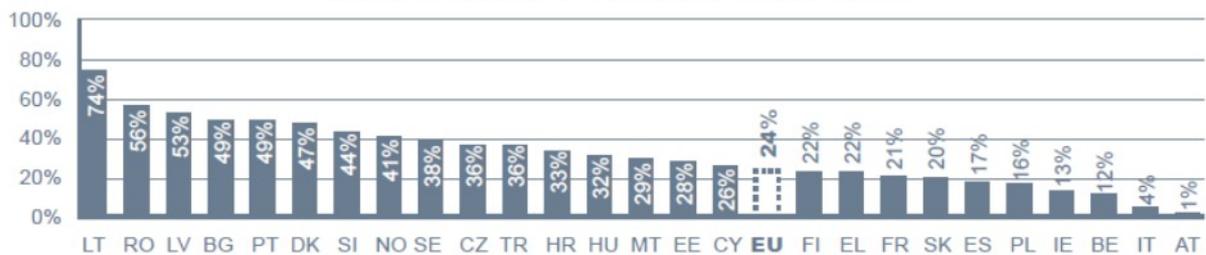
4.1.3. Professional development of teachers

According to Eurydice's 2011 Key Data report on learning and innovation through ICT at school in Europe, ICT training is included in initial teacher education (pre-service) in over half of EU countries (European Commission, 2013, p. 91). However, in practice implementation varies from country to country, which is confirmed by country reports. For example, in Germany the education curricula for teachers at general elementary, secondary and high schools do not contain specific ICT courses. Compulsory courses such as media pedagogics and also courses centering the studied subjects

always include lessons where ICT is used to present modern approaches and methods to teach certain topics. The education curricula for teacher at vocational schools determine the attendance of at least one computer course (e.g. business informatics) as requirement to pass the final exam. In Serbia, ICT courses are a mandatory part of initial education of teachers to work in the primary school, as well as the teachers who teach ICT in schools. Initial education of other teachers (e.g. teachers of Biology, Chemistry, History, Geography) does not contain any elective or compulsory ICT courses.

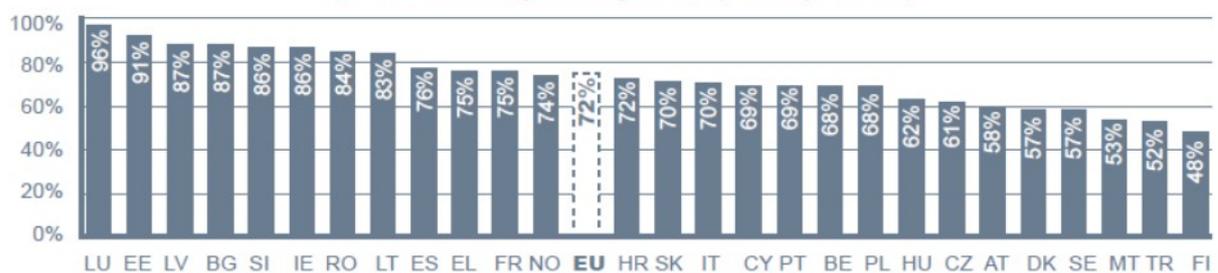
In addition, in European countries the modalities of in-service education of teachers also differ. For example, figure 4.2c (European Commission, 2013, p. 91) shows that countries vary to some degree regarding the percentage of students taught by teachers for whom participation in ICT training is compulsory. Among eSchool4S countries, ICT training is mainly compulsory in Romania (56%), and to the least extent in Austria (1%), while the EU average is (24%). On the other hand, figure 4.4c (European Commission, 2013, p. 94) shows that 73% of students at general school (grade 11) are taught by teachers who have engaged in personal learning about ICT in their own time. Among the countries of the eSchool4S network this type of professional development is most common in Bulgaria (87%) and Romania (84%), while it is the least common in Austria (58%). Another modality of in-service education is ICT training provided by school staff (see figures 4.5c). This type of professional development of teachers is most common in Croatia (65%) and least common in Hungary (36%).

Fig. 4.2c: Teachers' compulsory participation in ICT training
(in % of students, grade 11 general, by country, 2011-12)



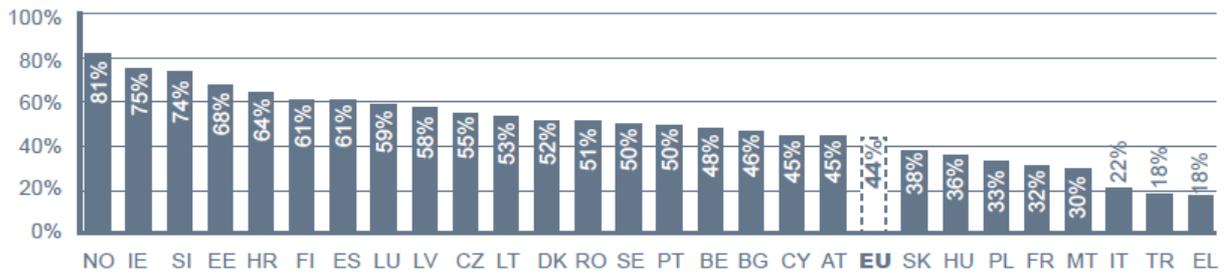
Source: European Commission, 2013, p. 91.

Fig. 4.4c: Teachers' involvement in personal learning about ICT in their own time
(in % of students, grade 11 general, by country, 2011-12)



Source: European Commission, 2013, p. 94.

Fig. 4.5c: Teachers' participation in ICT training provided by school staff
(in % of students, grade 11 general, by country, 2011-12)



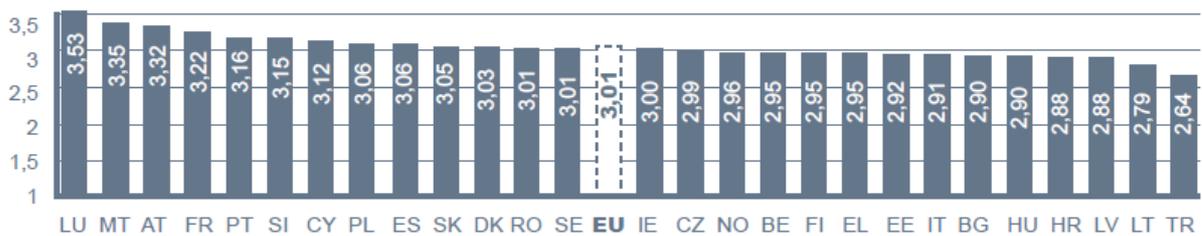
Source: European Commission, 2013, p. 95.

4.1.4. Teachers' confidence in their operational and social media skills

Operational ICT skills are the basic skills needed to use ICT tools (such as Word, Excel, Outlook, PowerPoint, etc.), as well as to use the Internet. These skills, for example encompass production of text using a word processing programme; creating a database; emailing a file to someone, creating a presentation with simple animation functions; downloading and installing software onto a computer, etc. *Social media skills* are the skills needed for interaction and collaboration with other people. This group of skills encompasses the ability to participate in an online discussion forum; the ability to create and maintain blogs or websites; the ability to participate in social networks, etc.

In *Survey of Schools: ICT in Education* (European Commission, 2013), teachers assessed the possession of these skills on a four-point scale. The results show that teachers have greater confidence in the operational ICT skills than in the social media skills (fig. 4.13.c. and 4.14.c). When comparing the countries participating in the eSchool4S project, teachers' confidence in their operational skills is somewhat bigger with teachers in Austria, and is at the European average with teachers from other countries.

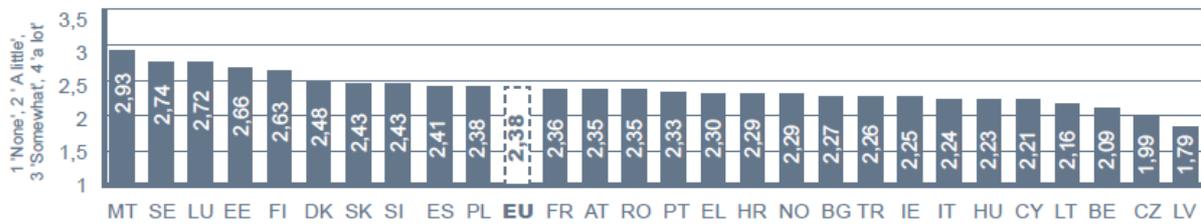
Fig. 4.13c: Teachers' confidence in their operational skills
(mean score of students, grade 11 general, by country, 2011-12)



Source: European Commission, 2013, p. 102.

The assessment of teachers' confidence in social media skills is also uniform among the countries participating in eSchool4S, ranging around the European average. Hungary has the lowest result compared to other members of the eSchool4S network; however, the differences are quite small.

Fig. 4.14c: Teachers' confidence in their social media skills
(mean score by student, grade 11 general, country and EU level, 2011-12)

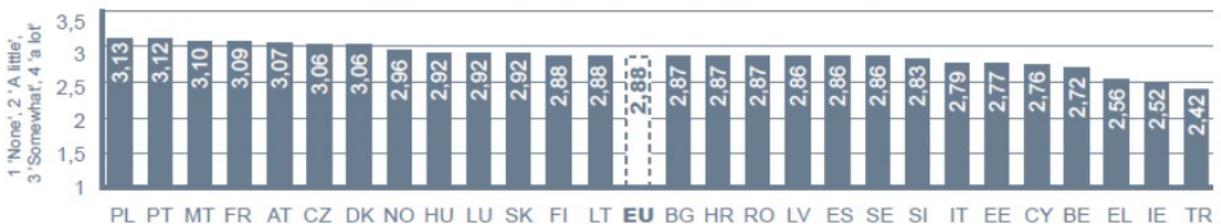


Source: European Commission, 2013, p. 103.

4.1.5. Students' confidence in their operational and social media skills

Students' confidence in their operational use of ICT is at the European average, slightly lower than the teachers' confidence (see fig. 4.18b). Slightly higher confidence in their operational skills, compared to the European average, is expressed by students from Austria, while the confidence of students from other countries is at the European average.

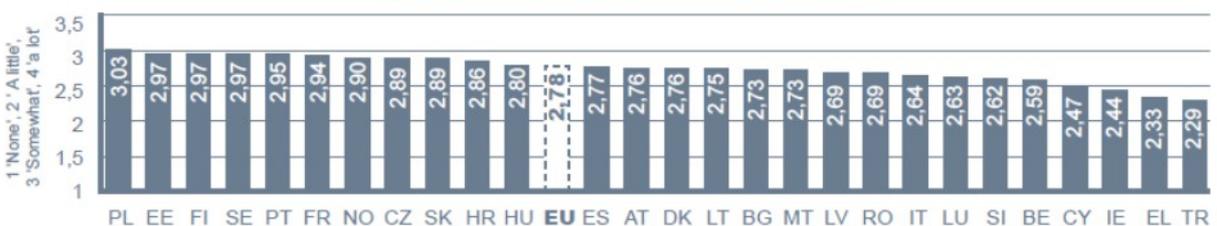
Fig. 4.18b: Students' confidence in their operational use of ICT
(grade 11 general, country and EU level, 2011-12)



Source: European Commission, 2013, p. 106.

When we compare how students from countries of the eSchool4S network experience their capability for social media skills, it is evident that their assessment of their own competence is within the limits of the European average, while somewhat lower confidence in social media skill than the European average is, that of students from Romania, although the difference is not significant.

Fig. 4.19b: Students' confidence in using social media
(grade 11 general, country and EU level, 2011-12)



4.2. Stakeholders' view of need for ICT improvement

As a part of the baseline study, interviews with relevant stakeholders were conducted in order to underline upgrading in ICT infrastructure in past five year, identify gaps between proscribed ICT use in school and actual use and examine need for ICT improvement. In this section an overview of stakeholders' opinions is presented, while more detailed results can be seen in the national reports.

In the opinion of stakeholders, no major improvements have been made in Croatia in the last five years regarding ICT usage in education. Even though national and strategic documents stress the importance of ICT in education and the development of ICT competences in students, nothing has been done on a larger scale. Schools depend upon themselves in efforts to implement positive changes and rely heavily upon their staff and skilled students. Some schools have introduced e-directories and smart boards. The methods of using ICT in education are lacking. Teachers require training and examples of good practice and time and space to experiment personally with the possibilities of ICT application in their own subject(s). There is also a problem of procurement of hardware and continuous update of software used in schools.

The majority of Bulgarian stakeholders consider that is not enough available offers concerning e-learning and e-teaching courses for teachers and students in country, there has not required equipment, and no technical expertise of teachers. Around 75% of respondents think that is strongly necessary technical support for schools to enable teachers to join web-based classrooms.

Stakeholders in Germany emphasise that training measures concerning the use of the media in the classroom has improved the knowledge and skills of teachers in Baden-Wuerttemberg in the last five years. The training addressed the following topics: Moodle, e-learning, design and media techniques, information management and business computer science, multimedia and net-supported learning arrangements, object-oriented programming, etc. The main problems that remain to be solved regarding ICT at schools in Baden-Wuerttemberg are the implementation of data security and copyright regulations in schools when working with Moodle classrooms, establishing websites or using the school network.

The main improvement in Hungary in the last five year has been made regarding virtual learning environment - 70% of teachers have access to the school server (and thus access to educational materials) from home. In school, teachers and students can use notebooks, special software, screen-reading software and self-developed educational materials and devices. Presently, the central issue is the implementation of the new Frame Curricula at the local level (local pedagogical programmes), which is associated with the innovation of the teaching content and implementation of ICT in teaching. Another central issue is the failure of the ICT contents to be largely incorporated in teacher training. In addition, it is necessary to gather good practice examples of how ICT is used in schools and then to ensure their dissemination.

In the stakeholders' opinion, a lot has been done in Romania in the last five years regarding the improvement of ICT infrastructure and teachers training. In some of the schools, e-learning platforms, like Moodle or Advanced eLearning (AeL) have been purchased. Despite the mentioned efforts, in almost all schools computers connected at the Internet are needed because the existing ones are outdated and because there are not enough computers compared with the number of students. In addition, a better Internet connection (wireless), smart interactive whiteboards and tablets are needed. Furthermore, training for teachers is still needed, because only a small percentage of them are using the e-learning platforms (Moodle, AeL) during their classes, even if they have the necessary equipment.

Main improvements in Serbia, in the opinion of stakeholders are schools equipped with computers and other devices, introduction of teacher training in ICT in a catalogue of in-service programs, development of the "Guidelines for Improving ICT Use in Education" and many project activities

related to improving ICT use in schools. However, there is a strong need for spreading teacher training for all teachers – courses dealing with ICT should be introduced both into pre-service and in-service teacher education programs. Internal seminars, organised in schools and led by those who are experts in ICT use (e.g. Computer Science teachers) have to be organised. Online teaching materials in Serbian should be developed and made accessible to all teachers in Serbia. Schools from municipalities with lower GDP should be better equipped.

In the last five years, in Slovakia, the number of computers in primary and secondary schools has increased, as well as the number of fast internet connections but the use of didactic technology and ICT has been rather low and the reason for this is the low level of ICT skills of teachers. There is no systemic support for the use of e-learning (e.g. technical support for hardware and software in schools is missing). Another problem is outdated ICT and insufficient funds for new purchases. It is expected that two recently launched national projects (2013-2015): Modern Education – Digital Education for General Knowledge Subjects (introducing new education content in schools and using innovative teaching forms and methods) and Electronisation of Education System in Regional Schools Sector (a number of schools will be equipped with digital facilities, such as tablets, notebooks, printers and 100 digital classrooms will be set up providing a complex solution to digital teaching and learning) will improve situation in Slovakia.

4.3. Sustainable Development (SD) in Education

Comparative analysis shows that ESD is implemented in all the countries involved in the eSchool4s network and that the implementation models are somewhat different. The starting point for ESD implementation is the Decade of Education for Sustainable Development proclaimed by UNESCO for 2005-2014 according to which the integration of sustainable development in national curricula is of the greatest importance to the future for succeeding generations, and accordance to which most countries have developed their own national strategies for the implementation of ESD. In the majority of countries ESD is not a separate subject but the elements of ESD are implemented at different levels of education (ISCED 1-3) and different types of schools through the programs of different subjects. In Slovakia the topic of SD is included in a cross-cutting topic of Environment Education which is reflected in teaching regular subjects. In some countries the implementation of ESD is supported by various extracurricular activities, primarily by various projects implemented in cooperation with local communities, NGOs and international partners. A brief overview of the different models and the specifics of the implementation of ESD in the countries involved in the eSchool4s network is presented in the remainder of this text, while a more detailed review can be seen in the attached national reports

4.3.1. Austria

ESD has been a Cross-curricular Principle overarching all subject areas and all types of schools in Austria. ESD is also listed as an “Educational Concern” taking up the initiative established by the UN Decade of Education for Sustainable Development, which includes environmental protection as a strategic field of action. The Austrian Strategy for Education for Sustainable Development aims to support a transformation of awareness toward sustainability among teachers and learners alike, and also to interlink the actors. The ÖKOLOG-Network supports schools in their ecological plans and initiatives. Furthermore, ÖKOLOG schools are encouraged to identify ecological projects as part of their quality plan. Austrian policy statement from 2013 recommends the inclusion of ESD in the new curricula for teacher education (University Colleges for Teacher Education & Universities).

In addition to cross-curricula principles, ESD is also specifically mentioned in Austrian curricula at primary (ISCED1) and secondary level (ISCED2 and ISCED3). For example, the Chemistry curriculum

refers to the interaction between Economy and Ecology and an environmentally aware use of the environment (in Class 4 there is a specific reference to the use of sources of energy); the curricula for Geography & Economics includes knowledge and understanding of societal structures and the relationship between nature and man as the impact of man's actions on our environment.

At ISCED 3 level in Austria there is a large choice ranging from general academic education to vocational education. There are specific ESD content mentioned in curricula for general education within the subject areas of Biology and Environmental Education, Chemistry, Physics, Geography and Physical Education. Topics of ESD are mentioned in all branches of schools (Commercial, Tourism, Agricultural and Technical) specifically within subject areas such as technical workshops where the focus is on materials.

4.3.2. Bulgaria

The analysis of the school curriculum in Bulgaria shows that the SD themes are most dealt with in the education area of Sciences and Ecology. The basic principles of sustainable development are intergraded in many subjects of Bulgarian curriculum such as Chemistry, Physics, Geography and Economics, Informatics, etc. For example, certain themes dealt with in teaching Computer Science are related to grid systems, safe use of the Internet and using technology to solving World Global problems. In addition, the analysis shows that the concept of sustainable development is discussed in most details in the subject Geography and Economics. In some subjects, themes related to sustainable development are addressed and are studied in detail, but outside the context of SD. For example, in the subjects of Chemistry and Environmental Protection there is no emphasis on sustainable development, but many of the themes address the principles of SD.

Moreover, in Bulgaria the concepts relating to the SD appear in the form of educational outcomes of individual subjects. For example, through teaching Geography and Economics the following educational outcomes directly related to SD should be accomplished: students will be trained to explain global issues associated with the protection and rational use of natural resources and the environment; to evaluate the concept of sustainable development as a global strategy; to discuss the problems of sustainable development of Bulgaria.

4.3.3. Croatia

The sustainable development themes are present in the Croatian National Curriculum. They are not included in one separate subject but are rather distributed among various subjects. The number of themes and their teaching differ by types of secondary schools and differ in general high schools and vocational schools. Some of the themes present are: environment protection, nature conservation and management of natural resources, biological and landscape diversity, renewable energy sources and energy efficiency, waste management, corporate social responsibility, sustainable production and consumption, etc.

The concept of sustainable development is heavily stressed in the Croatian National Curriculum and the Action Plan for Sustainable Development is ongoing. However, as the operational development of the implementation of sustainable development into classrooms is missing, the obligation to follow certain guidelines is lacking. Therefore, it is up to every teacher to decide the extent of importance they plan to give to the sustainable development topics in their teaching. It is also up to every school and its teachers to decide whether and to what extent the sustainable development topics in various subjects will be interconnected.

4.3.4. Germany (Baden-Wuerttemberg)

In Germany, the national educational standards for certain subjects and subject combinations contain knowledge and competencies in the field of sustainability. Thus every relevant curriculum also contains topics concerning sustainability. In the framework of the national educational standards, general guiding perspectives (education for sustainable development; prevention and health promotion; education for tolerance and interaction with diversity) and topic specific guiding perspectives (professional orientation; media education; consumer education) are formulated. These perspectives are approached across different subjects.

SD topics are explicitly mentioned at secondary and high schools (general and vocational schools) in the following subjects: Biology, Business Administration, Chemistry, Economics, Ethics, Geography and Scientific work. In addition, the topics like globalisation in politics or cultural knowledge in foreign languages also include sustainable development in a broader sense and do not name the topic explicitly. Sustainable development itself is represented to a smaller extent in the curricula of Baden-Wuerttemberg. Nevertheless it depends on the teacher to what extent this topic is included in the lessons. There are subject combinations at general secondary schools such as MNT (man-nature-technology), scientific work (Biology, Chemistry and Physics) that deal with SD related themes.

4.3.5. Hungary

SD themes are present in the national curriculum of Hungary. At the school level various forms of extracurricular methods (activities, camps, museums and zoo pedagogy, special days, local initiatives competitions, exhibitions, etc.) are used for harmonisation of school subjects related to the environment. Since environmental education has no separate school subject, SD topics are realised mainly in other subjects or in extracurricular teaching activities. This is so-called “diffusion” educational approach. The learning content includes the natural, the constructed environment as well as aspects of economic, civic and democratic education.

The National Strategy for Environmental Education is widely appreciated and the Hungarian Association for Environmental Education has launched a widespread initiative for “school-greening” aiming to enlarge school-based and extracurricular environmental educational good practice. Furthermore, a possibility of introducing a compulsory subject in the secondary schools is considered for the age 11-14, which would integrate the knowledge from other subjects in the holistic concept of sustainable development.

4.3.6. Romania

In Romania, education for sustainable development is promoted by the Ministry of National Education policies. Key themes of sustainable development are included/integrated in disciplines/modules from the common core curriculum or optional subjects at all levels of education, including vocational and technical education. Sustainable development themes are included in several subjects in different extent, according to their specific. Among the most common subjects that integrate SD themes, are: Biology, Geography, History, Economics, Ecology, but also: Advice and Guidance, Entrepreneurship Education, Civic Culture, Developing Human Resources, Sustainable Tourism Development and others. The SD themes are not presented as separate lessons, but integrated in other lessons.

Additionally, ESD in Romania is supported by development and implementation of projects, such as: After School, Environmental Education, Eco-Kindergarten, Health Education; and by organisation of competitions and school contests (for example, Earth Sciences-interdisciplinary contest, FOOD4U,

etc.). In the domain of informal education various competitions are organised by NGOs in order to raise awareness about the education for sustainable development.

4.3.7. Serbia

In Serbia, SD is not a separate school subject but the elements of SD are integrated in the objectives and tasks of a number of subjects such as Chemistry, Biology, Geography, Physics, Sociology, Civic Education and Foreign Language. For example, goals of learning Chemistry is to develop responsible relationship toward oneself, others and environment. Tasks in chemistry teaching related to SD is understanding of importance of chemical production for contemporary society; understanding of connection between chemistry, technology, social sciences and humanities; understanding the importance of chemistry and chemical production for SD; development of responsible attitude toward substance use in everyday and professional life; understanding the relationship between chemistry and technological development, and ecology. Concepts related to SD present in Chemistry are hazardous waste; air, water, soil pollution; petroleum and natural gas; water resources and treatment, roles and importance of vitamins, hormones, antibiotics; carcinogenic substances, etc.

However, subject curricula in Serbia rarely comprehensively present SD. Although SD is mentioned in the goals and tasks of most curricula, it is not visible in the thematic blocks and lessons. It remains present only at the abstract level (especially in the case of Physics). In some cases (Biology, Geography and Sociology), there are many topics implicitly related to SD. Therefore, it is recommendable to introduce SD in more details and more explicitly into all levels – from the level of goals and tasks, to the level of concrete lessons and subtopics, and to provide guidelines for teachers as to how to achieve these goals through concrete teaching methods and materials.

4.3.8. Slovakia

In Slovakia, SD is present in several subjects through the obligation to reflect the themes included in the cross-cutting topic of *Environmental Education*. It includes basic concepts from ecology and environment, biochemistry and geochemistry of the environment, processing and protection of (drinking) water, alternative sources of energy, collection and processing of waste. At general secondary schools, information about SD is revealed through the subjects such as Biology, Geography and Chemistry, and to a smaller extent through Civic Education and languages. The most frequently mentioned topics are protection of nature and land, human activity and the environment, relationship of the man and the environment (local and global problems). SD is included in teaching within thematic areas (e.g. within the area Man and the Nature covering the subjects of Biology, Chemistry, Physics, Geography and cross-cutting topic of Environment Education). Secondary vocational schools included the environmental issues into general subjects as well as professional subjects.

Additionally, participation in various projects, in Slovakia provides the opportunity to make interconnections among subjects in the topic of SD (e.g. “A Chance for the Blue Danube”- an international competition of young artists on ecological topics; Green School - a holistic methodology of environmental protection in schools; participation in the EU LLP programme (Comenius, Leonardo) aimed at SD or environment, etc.).

4.4. Stakeholders' view of SD themes that should be included into national curriculum

As a part of the baseline study, interviews with relevant stakeholders were conducted in order to underline priorities of relevant subject matters of SD that should be included in the national curriculum and assess preparedness of schools and teachers to include these priority issues in their teaching. Opinions of stakeholders will help in formulating recommendations and possible paths for improving ESD use in teaching. In this section an overview of stakeholders' opinions is presented, while more detailed results can be seen in the national reports.

According to the opinion of Bulgarian stakeholders, the representation of sustainable development in the national curriculum matches the importance of that concept for today's world coincides, although not fully. Despite their belief that the performance of SD in the national curriculum is not complete, stakeholders haven't committed to specific recommendations and ideas to include new topics in the national curriculums.

In the opinion of Croatian stakeholders, all the themes listed by the UNECE are important for the national curriculum, but the problem lies in the lack of a defined working framework (e.g. there is no regulation of the teaching process for sustainable development, no methods recommended, no criteria for the assessment and the interconnectedness of the subjects teaching sustainable development remains undefined). Some of the most important themes are citizenship, democracy and government, human rights, elimination of poverty, biodiversity, environment protection, climate changes, environmental health, corporative and social responsibility.

Stakeholders in Germany pointed out that policy paper *Education for Sustainable Development 2005 to 2014 in Baden-Wuerttemberg – designing the future – learning about sustainability* underlines the importance of SD themes in the German national curricula. For that reason, the National Committee of the UN Decade has defined annual topics for the implementation of the UN Decade. The objectives of the annual topics are to better focus on the activities of the decade, to activate new partners and to accentuate the concerns of ESD. The annual topic for 2014 is review of the topics from previous years such as Cultural Variety; Water; Energy; Money; Town; Nutrition and Mobility.

Key issues raised by stakeholders in Hungary are basic values, quality of life; Learning & systems thinking; Labour market, employment; Public administration reform; Regional & rural development; Equality; Family, population, intergenerational issues; Sustainable communities; International cooperation; Infrastructure; Innovation & comparative advantages; Public participation; Sustainable consumption & production; Health; Liveable environment.

According the opinion of stakeholders, the main problem in Romania regarding the SD themes is not their inclusion into national curriculum, but the issues of inter-disciplinarily approach and the level of understanding and awareness of students. The children are receiving precious information about these topics, but they are not able to make connection between them, to have a global overview and approach about what sustainable development means as a whole. In addition, it is important to approach sustainable development at a global scale and to understand equity issues and cultural differences.

Serbian stakeholders indicate the problem of inconsistencies in the existing Law on Education. One of the goals of primary school education is to raise awareness about sustainable development and protection of environment but there is no such statement in Law on Secondary Education. Instead, secondary schools have to develop the program for environmental protection in cooperation with the local government. In the opinion of Serbian stakeholders all SD relevant themes are included in the curricula, but their interconnections could be better and more stressed. Additionally, the

economic crisis and poverty in Serbia are obstacles to thinking of SD as a necessary and important subject for our future.

Stakeholders in Slovakia are waiting for a final draft of a comprehensive *Strategy of Environmental Education in Slovakia till 2030*. A part of the Strategy is formulating the new content of the cross-cutting topic Environmental Education at ISCED 1-3 levels; reflect it to the training of future teachers, as well as present teachers. Regarding the themes, Environmental Education will cover the following: development of relationship between the man and the environment, links between the global and local environmental problems, 16 principles of SD, economic and social aspects of environmental problems, impact of consumerism on the environment, ecological footprint, adaptation on climatic change, self-reliance of individual and communities, environmental legislation, green economy. The Strategy stresses the need to strengthen Environmental Education in social science subjects, especially Civic Education, Ethical Education and History, bring back the subject of technical skills (e.g. gardening workshops) to the national curriculum and preserve the school gardens and other green areas and use them during teaching.

4.5. Teachers' view of e-learning and ESD

Teachers' view of e-learning and education for sustainable development, as well as their interest to engage in the eSchool4S project were received on the basis of group interviews (focus group). In each country of the eSchool4S network two focus groups were carried out, where one focus group involved "highly motivated", and the other one "moderately motivated" teachers. Such a selection of teachers reflects the real situation in schools, where teachers often differ significantly in terms of their motivation and willingness to engage in various extracurricular activities, as well as readiness for continuous professional development. This yields a better insight into how the different categories of teachers perceive e-learning and education for sustainable development. It was expected for teachers in these two groups to have contrasted views on certain topics, which was most evident in teachers from Germany. The obtained data reflect trends in the attitudes of teachers distinctive for individual countries from the e-School4S network. However, these results should be treated solely as guidelines in the project implementation, which suggest everything that should be taken into account (including the cultural specificities of the countries in the eSchool4S network) in order to realise the project successfully, and not as the results that can be generalised to the entire population of teachers. Below are the findings that reflect typical attitudes and opinions of teachers, while the detailed results can be seen in the national reports.

4.5.1. Teachers' attitude towards ICT and e-learning

Teachers in Bulgaria are more confident in using ICT, more positive about ICT's impact on students' learning, and more frequently organise ICT based activities than before. This is especially the case when they are in schools with easy access to pervasive equipment, but also even when they are in schools with low equipment provision.

Teachers in Croatia generally express positive attitude towards e-learning, but there is a lack of implementation of e-learning in the Croatian education system. It seems there are still a large number of teachers in Croatia not interested in expanding their ICT knowledge (outside the basics) or intimidated by the concepts of web-based classroom.

Teachers' attitudes towards e-learning in Germany are divided. On the one hand, there are teachers who take e-learning as a must because their colleagues have agreed upon the use of e-learning for certain parts of their lessons. On the other hand, some interested teachers are aware of the chances

and benefits e-learning brings to students. Both sides support the view that the use of e-learning in lessons depends on the subject, the age of the students and even on the type of school.

Teachers in Serbia perceive ICT technology as a tool that serves for increasing students' achievement. They usually use ICT in project teaching and multidisciplinary teaching, as well as for research and cooperative learning. Implementation of ICT in teaching is mainly the results of individual teachers' endeavours and engagement and not of systemic support and actions. Teachers also see ICT as a way to "extend" the lesson – to motivate students to learn at home and to prepare themselves for upcoming lessons. According to teachers' opinion ICT can enable teachers and students to, for example, do quick tests or quizzes, which can result in effective assessment and self-evaluation. Additionally, teachers believe that they have a role of moderators in classrooms and therefore it is necessary for them to be familiar with ICT, to be able to show students how to use ICT correctly and as a tool for improving their critical thinking.

The attitude of teachers towards ICT supported education is largely negative in Hungary. The available e-learning materials are not fully utilised, since teachers lack competence and motivation.

Regarding e-learning, the teachers from Slovakia had very little experience and were not ready to provide opinions. The interviewed teachers do not have experience in online teaching. E-learning is not widely used at secondary schools in general. Some teachers use some e-learning features in their teaching. However, teachers use various ICT tools.

Teacher in Romania are willing to further implement ICT in educational activities and they have a positive attitude and interest in specific techniques regarding the ICT. Some of them are doing their lessons by using e-learning platform like Moodle or AeL.

4.5.2 Teachers' attitudes toward SD and ESD

Teachers in Bulgaria are not familiar with the topic of sustainable development and its principles, although they understand that a good education is essential to achieving sustainable development.

In general, teachers in Croatia are aware of the importance of sustainable development in teaching and see sustainable development as a teaching element crucial for progress and a better world. They search for ways to ignite the consciousness of the importance of sustainable development in their students. They are looking for ways to implement sustainable development into classroom and ways to make it more interesting to students.

There is division regarding teachers' attitudes toward SD and ESD in Germany. On the one hand, SD is a must for those teachers who are supposed to teach sustainability in their lessons according to the specific curriculum. On the other hand, there are teachers who have positive view of SD topic and who are active on integrating sustainable development in the education of their students.

In Hungary many teachers had difficulties in defining the concepts of SD and ESD with their own words. Teachers' definitions and attitudes are embedded in their value system. According to teachers' opinion, gaining more knowledge on the issues concerning SD can have an impact on people's behaviour, but what is critical is whether they initially have pro-environmental norms. To really make an impact on future generations' attitudes and SD behaviour, a key strategy would be to recruit students with pro-environmental values to teacher education programmes.

Although teachers in Serbia perceive the SD issue as highly relevant, they believe that both they and their colleagues do not feel at ease when it comes to this issue because they do not have adequate knowledge and competence. Some teachers express attitude that the concept "sustainable development" is more "for developed countries" and that there is not enough awareness in Serbian culture about the care for people and their health, for the nature and resources. Additionally, teachers believe that in primary education there are more possibilities to influence pupils' values

and habits and to teach them to appreciate nature, their own health, and to contribute positively to their own society.

In general, the teachers in Slovakia are not aware of the national Strategy of SD from 2001. They teach topics they see important such as greenhouse effect, invasive plants, and illegal landfills. The teachers feel that more attention should be paid to SD practical aspects in people's lives and therefore their classes take part in various environmental projects and environment-friendly activities (e.g. cleaning of streams, collection of old batteries, looking for illegal landfills, separation of waste, examination of water quality, etc.) According to the opinion of teachers, SD is important as it relates to all spheres of life. It relates to all natural science topics but also civic education, foreign languages and physical education.

The teachers in Slovakia believe that SD should be more dealt with, preferably continuously, not divided into several subjects (for example, before 2008, there was a specific subject of Ecology at 4th grade of secondary general schools and so a concentrated attention could be devoted to SD issues). Additionally, teachers think that a more interdisciplinary approach towards topic of SD is needed. The teachers are ready to include SD into their teaching and they try to coordinate the coverage of SD within thematic areas but it is their decision how much time they spend on these topics.

4.5.3. Participation in the eSchool4S project

A small number of Bulgarian teachers has the opportunity to participate in international education networks and the majority of them need methodological and technical assistance to use the web-based classroom. One of the main problems in Bulgaria is the lack of teachers' motivation.

Teachers from Croatia see the project as a way of personal and professional development and aim to enrich their range of skills, develop their competencies and implement new methods and strategies to teach more successfully. Some teachers recognized eSchool4S project as a continuation of their education in the field of use ICT in teaching and some of them are interested in the topics of e-education and/or sustainable development and because of that would like to join the project. Many teachers in Croatia are interested in international cooperation and are excited about the possibilities of cooperation and exchange of ideas with colleagues on international level. Regarding participation in the eSchool4S project, the major problem for teachers is not so much ICT knowledge and competences, but the knowledge of the English language (as the official language of the project).

The preferred way to work internationally for German teachers is twinning with foreign schools as there is the chance to talk to foreign teachers and students in person and to visit them and get to know their culture in person.

The majority of teachers, in Croatia and Germany, lack experience in cooperation with international educational networks and the work in an international educational network are rather rare. However, some teachers in Croatia are already involved in European projects and want to continue their participation in such projects and others are looking for ways to include students in international projects.

All teachers in Serbia are willing to participate in web-based classrooms. They think that SD is very important, but they do not feel very competent about ICT and SD.

Older teachers in Slovakia were not much interested in the project. However, younger teachers are much more active. Participation in the project means that the school has sufficient ICT equipment, that the teachers know how to use it, and have a good command of English.

Regarding the Romanian teachers' experience in international educational network, most of them participated in projects like *Leonardo da Vinci*, *Comenius* and in several strategic projects.

5. Conclusions and recommendations

Based on the results of the baseline study, following conclusions and recommendations can be made:

- **Building up on existing national practice.** The most common form of implementation is the treatment of individual SD topics through different subjects. The existing practice in the EDS implementation in the educational system of the eSchool4S network countries is a good starting point for the development of the eSchool4S web-based classroom because a number of the teachers have already implemented some SD content into their regular classes and most of the teachers, although lacking the knowledge about the problems of sustainable development believe it is a significant issue that should be included in school curricula.
- **Building up on EU and international experience.** The School4S network should rely on the existing results and positive experience in ESD at the European and international level. For example, the Environment and School Initiatives (ENSI) is an international network which has supported educational developments, environmental understanding, active approaches to teaching and learning, through research and experience exchange. On this network's website there are a lot of useful resources, information about various projects and examples of good practice (among others, example from the eSchool4S network countries – Austria and Germany are presented there).
- **No high priority areas.** The topics that the UNECE Strategy for ESD emphasises as important - poverty alleviation, citizenship, peace, ethics, responsibility in local and global contexts, democracy and governance, justice, security, human rights, health, gender equity, cultural diversity, rural and urban development, economy, production and consumption patterns, corporate responsibility, environmental protection, natural resource management and biological and landscape diversity, in the opinion of stakeholders are still topical and should be handled in the eSchool4S web-based classroom.
- **Interdisciplinary and holistic approach.** The issue of sustainable development is a very complex issue, which means that the above-mentioned topics can be accessed from the perspective of different disciplines. This should be taken into account when developing curricula to be used in the eSchool4S web-based classroom. In addition to the interdisciplinary approach, such diverse themes in ESD require a holistic approach, i.e. it is necessary to take into account all three aspects of sustainable development – environmental, economic and social as a complex interrelationship that exists among them.
- **SD is not viewed as part of social sciences as it should be.** SD is more present in natural sciences curricula than in humanities, but some aspects of SD are very important to be understood from the perspective of social sciences. The issue of sustainable development should not be focused only on the aspect of environment regardless of the fact that it is easily understandable for children and youth, motivating them to action most easily. The economic and especially the social aspect of sustainable development should also be in the focus of the eSchool4S web-classroom in order to develop socially responsible behaviour.
- **Format of the eSchool4S program.** Optimal format of the program to be implemented in eSchool4S web-based classrooms would require two parts – a core part and a national specific part. The core part would contain topics to be dealt with in all the countries of the eSchool4S network. The core part contents should be specified with the participation of all partners in the project. The specific part of the program would contain SD topics of particular importance for each member of the eSchool4S network. When implementing the

program in schools the ratio between the core and the specific part of the program should be tailored to the characteristics of schools and students.

- **Individualised approach.** When developing programs that will be used in the eSchool4S web-based classroom the students' prior knowledge is necessary to take into account. It is desirable for the eSchool4S program to develop at two levels – the basic and advance level. The basic level would be intended for students who have so far had little opportunity to learn about SD. Another option is that students go through the core part of the program at different pace depending on their prior knowledge, and that during the implementation of the program more time and attention is focused on the issues that the students are less familiar with.
- **Forming eSchool4S teams in schools.** It is necessary that schools form interdisciplinary eSchool4S teams of teachers (containing at least 5-6 teachers). In addition to science teachers (disciplines where SD is already represented in the subject curricula), team members should also be teachers of social science disciplines (because the eSchool4S web-classroom needs to increasingly take into account the social aspects of SD issues, as well as to largely incorporate SD issues in social science subjects), ICT teachers (to help other teachers in the web-based eSchool4S platform, and if necessary, provide technical support as in most schools there is not a person who provides this kind of support, but it is usually the teacher who teaches ICT), English language teachers or teachers who speak English well (since in some countries teachers recognised poor knowledge of the English language as the major barrier to participating in the project.) In addition, it is advisable to engage school counsellors and school psychologists in these teams (especially in the countries where they work at the school level) in order to contribute to ensuring that the program is adapted to developmental characteristics and prior knowledge of students.
- **Proper selection of eSchools4S teachers.** Education for sustainable development is education for life, and for everyday behaviour and actions. It involves the acquisition of knowledge, but also the formation of attitudes and the adoption of a value system. Education for sustainable development is not a value-neutral, but is aimed at promoting certain social values such as respect for others (present and future generations); respect for diversity; respect for the natural resources of our planet; understanding, sense of fairness, responsibility, willingness to dialogue; inquiring spirit and responsible action (UNESCO, 2005). In order for teachers to successfully teach the content relating to sustainable development, it is necessary that they themselves are committed to this system of values, which should be taken into account in the selection of teachers who will participate in the eSchool4S project.
- **Empowering students.** It should also be taken into account that some of the problems of sustainable development are very difficult and that students can have the feeling of helplessness when dealing with them. Moreover, different scenarios of cataclysms and catastrophes that await humanity in the future, often promoted in the media can provoke students' fear regarding the uncertainty that the future holds. Both of these feelings are counterproductive and the natural psychological defence reaction to them is avoidance, that is, the refusal to talk and think about these issues. It is therefore important that through the ESD program, which will be implemented in the eSchool4S web-classroom a certain amount of optimism is ensured, despite the recognition of the fact that problems exist in society and in the world. The way to achieve this is to show to students positive and successful examples through the ESD program, to encourage their critical thinking and problem-solving orientation in the domain of their power of influence.
- **Tuning education policy and practice.** Strategies for implementation of ICT and SD in education exists in each country for eSchool4S network and digital competence is recognised

as one of the key competencies but in some cases national policy documents are not correlated (like in Romania) or/and there are no action plans (like in Serbia) and practical guidelines on how to introduce ICT and SD in teaching (like in Croatia). Due to these difficulties, more effort must be invested in some countries.

- **Changing paradigm of teaching.** There is a need to change the paradigm of teaching is stressed in some country (like Croatia and Hungary). The education system needs to make a shift from a transmission of facts to teaching which results in critical thinking, reflection and arriving at conclusions based on available facts. The shift is necessary so that the students can understand the complexity of sustainable development issues and how they relate to environment, society and economic development. SD topics and issues need to be placed in a wider context and their interconnectedness must be clear to students.
- **Providing additional teacher training.** Additional ICT teacher training are necessary in some countries. The need for creating basic ICT training for using web classroom should be taken into consideration in order to ensure participation of motivated teachers without ICT competence. Free training for teachers on the use of ICT should be provided for in-service teacher education. When financial resources are lacking internal seminars (peer-teaching, like in Slovakia) should be organised.
- **Supporting e-learning.** In some countries e-learning materials and platforms are provided and relatively frequently used (like Austria and Germany). However, e-learning is underrepresented even in the countries with well-equipped schools. In some countries, like in Serbia, e-learning materials, including e-textbooks should be developed. Good practice in e-learning should be shared and disseminated more (e.g. through common platforms for all schools and other educational and academic institutions).
- **ICT infrastructure.** In the majority of countries there is a need to further improve the ICT infrastructure. In some countries, the existing equipment is outdated (like in Ireland and Slovakia), it is necessary to increase the number of computers per student (like in Romania and Serbia), and the number of interactive whiteboards. In addition to the desktop computers, schools should be equipped with notebooks and tablets because it allows more flexible use of resources (desktop computers are usually located in separate classrooms, which limits their application). A high-speed internet and software should be provided, as well. Special consideration should be taken for rural schools in Romania and Serbia, and some schools on islands in Croatia.

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8. Annexes

Annex 1. : Methodological framework

Thematic issues	Aim of study and information sources	Methods	Tame table	Responsible organization
Available offers concerning e-learning and e-teaching courses for teachers and students in Europe and, in particular in the Danube Region	Overview of available offers concerning e-learning and e-teaching courses for teachers and students in Europe (LLL program, E	Desk Analysis	April 2014	Serbia
	Overview of available offers concerning e-learning and e-teaching courses for teachers and students in partner country	Desk Analysis	April 2014	Each country
	Analysis of initial teacher training and in service teacher training in partner country in the respect of development of ITC competence	Desk Analysis	April 2014	Each country
Availability of the necessary technical equipment (personal computers, internet access) to the students (at school and at home) which would allow them to join web-based classrooms in the eSchool4S	Overview of available statistical data and existing reports (Eurydice, Eurostat) regarding ICT equipment in school and personal use; ways of funding (state versus private resources).	Desk Analysis	April 2014	Each country
	Analysis of national documents and national strategies (if they exist) for ICT use and ICT implementation in teaching and learning.	Desk Analysis	April 2014	Each country
	Identification of gaps between proscribed ICT use in school and actual used (based on existing national data).	Desk Analysis	April 2014	Each country
Availability of the necessary technical equipment and relevant technical experience of teachers enabling them to take a role in eSchool4S web-based classrooms				

	Identification of main stakeholder for ICT (e.g. Institution that created national strategy for implementation of ICT in education).	Interview with stakeholders	May 2014	Each country
Provisions made in curricula and teaching programmes for secondary schools regarding ESD (e.g. with regard to nature protection, biodiversity, energy savings, waste recycling ...)	Analysis of national curricula and available teaching programmes concerning issues of Sustainable Development (SD).	Desk Analysis	May 2014	Each country
	Analysis of the structure of different areas of Sustainable development (Economics, Culture, Ecology, Politics), underlining the main themes in every area and mapping the interconnection	Desk Analysis	May 2014	Each country
Understanding of the interdisciplinary character of ESD in secondary schools				
Priorities of relevant subject matters in public dialogue in the countries and preparedness of schools and teachers to include these priority issues in their teaching	Identification of main stakeholders for EDC in order to underline priorities of relevant subject matters in public dialogue and assess preparedness of schools and teachers to include these priority issues in their teaching	Interviews with stakeholders	June 2014	Each country
		Focus group with teachers	June 2014	Each country
Awareness of the needs and potentials of ESD in secondary schools	Exploring teachers' perception regarding need and potential of ESD in secondary schools	Focus group with teachers	June 2014	Each country
		Focus group with teachers	June 2014	Each country
Experience in participating in international education networks in the internet	Mapping teachers' experience in participating in international education networks in the internet Mapping teachers			
Teachers' motivation, willingness and ability to participate in the eSchool4S network and to contribute to the eSchool4S web-	Teachers' motivation, willingness and ability to participate in the eSchool4S network and to contribute to the eSchool4S	Focus group with teachers	June 2014	Each country

Annex 2. : An example of the content analysis

Content analysis of presence of sustainable development (SD) in national curriculums

Example for content analysis of biology curriculum

Category is present
Category is not present

Subject	School grade	Themes and concepts of SD are not mentioned	Mentioning of SD - any concept related to SD is mentioned in the lesson in any way	Very comprehensive presentation of SD concepts and themes are present	Description (One should note in which context SD is used, what concepts are mentioned, what are relations of SD to the other themes and everything that might be specific for using that SD concept in teaching).
Biology	1				
	2				
	3				Implicit mentioning of SD in the lesson with content of the basic principles of operation and regulation of living systems. The adaptive character Biological organization. The relationship between organisms and the environment (regulators and Conformers). Biological adaptation: acclimatization and acclimation.
	4				One chapter of the curriculum is devoted to the sustainable development and all relevant issues regarding it. Chapter called "Ecology, protection and improvement of environment and Sustainable Development". Concept that are processed are ecology, living conditions, ecological factors, ecological valence, abiotic and biotic factors, , Life forms - concept , examples and classification. The concept of population and its basic features; The size and density of population; spatial schedule; changes in the abundance of population; the composition and structure of community life; trophic relationships and types of food; chains and networks of food chains; trophic pyramid; Ecological niche - definition,

					<p>examples; Life habitat; Ecosystem as a unity biotope and biocenosis; Circulation of matter and energy flow through the ecosystem; Types and classification of ecosystems; Transformation of the ecosystem; Biosphere - a unique ecological system of the Earth; Biogeochemical cycles in the biosphere; The processes of the circulation of carbon, nitrogen, oxygen, and water; The protection and improvement of the environment and sustainable development; The concept of sustainable development;</p> <p>A man and his relationship to the inanimate and living nature; Environmental changes under the influence of the nature of man; Changes in the physical conditions of the environment; Changes in the composition of the living world process domestication of the land, plants and animals; The process of urbanization and industrialization; Genetic and health effects of polluted and degraded environment.</p>
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Annex 3. : Country specific results

(In separate document)