The current and estimate future knowledge and skills needs
OLAREX project report

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This report has been developed for the needs of OLAREX: Open Learning Approach with Remote Experiments Project. Based on the national analyses have been done by the consortium the current knowledge and skills needs of target groups, their future requirements were evaluated.

4/25/2012
## Document revision history

<table>
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<th>REVISION</th>
<th>DATE OF RELEASE</th>
<th>PURPOSE</th>
</tr>
</thead>
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<tr>
<td>Luis Ochoa Siguencia</td>
<td>23.04.2012</td>
<td>First proposal</td>
</tr>
<tr>
<td>Katarzyna Kruszyńska</td>
<td>07.05.2012</td>
<td>Final version</td>
</tr>
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1 Introduction

The main goal of the project is to innovatively implement ICT-based learning materials, remote experiments, and e-didactic methods into formal and non-formal lifelong learning setting. In order to reach this goal the four sets of the questionnaires (D2.1) for different target groups: (1) students secondary school and university; (2) secondary school teachers; (3) managing and administration staff of the secondary school and (4) managing staff of the enterprises. The questionnaires were developed in such way that analysis of them allow to do a conclusion about knowledge and skills requirements, learning materials demand for contemporary and future secondary schools in consortium countries.

This report represents the main outcome from the e-surveys responds. The each partner of the consortium drew the analysis of the current situation in their country based on the survey results and other available sources of information where target groups’ knowledge needs analysis is discussed and developed. The full national analysis reports are enclosed as Annexes.

The report is divided on the chapters corresponded to the consortium countries. Each chapter includes

- the Profiles for the survey participants: secondary school students, teachers, school and industry/enterprises;
- the analysis of required knowledge and competence for teachers from a viewpoint of teacher as well from a viewpoint of secondary school administration (directors, headmasters, leader of departments, etc.);

the study of students knowledge needs based on the teachers responses and basic engineering knowledge in school framework based on the needs from specialised topics suggested by industry.

The final outcome based on the national reports for each country is provided at the end of each Chapter. The outcome discusses the specific knowledge needs related to goals of the project, cognitive and formative knowledge of the target groups, their learning levels, availability of the ICT instruments and remote laboratories as well currently used continuation education methods and sources.
2 POLAND

In the OLAREX survey take place in March-April 2012. 98% of all responses were collected in March 2012. Four target groups have participated:

91 students of secondary schools and universities have participated. All forms were completed.

57 teachers of secondary schools have participated in the survey. All forms were completed.

26 representatives of administration staff of secondary schools have participated in the survey. All forms were completed.

21 responders from managing staff of enterprises were received. 95.2% - 20 forms out of 21 – were completed.

2.1 General Profiles

2.1.1 Profile of Students

The students participated in the survey represent 2 groups: secondary school students and students of the University. The age range of students is between 16-20 years old for secondary schools and 19-over 21 years old for the University. Most of the students (around 80%) can communicate and study in English. Most students have access to Internet at home and at school - classroom library or internet cafe. Definitely the most often i.e. 89% of students use Laptop or PC for internet connection, the other tools are used seldom. The most of students use Internet both for personal and learning purposes communication (email) and social networking (Facebook, Twitter, etc.). Since they like to try something new, they are interested in use of remote experiments in the classroom.

2.1.2 Profile of Secondary Schools Teachers

All participants believe that their competencies for the tasks at their job are good or satisfactory: they can quickly learn and adapt new teaching methods, learn and adapt new technology for education, find and evaluate the ICT tools, and able to design course with online assignment. Some of them need training in order to be more efficient in new technology and teaching methods. 63% of participants have sufficient knowledge to study and communicate in English. Most have very good or satisfactory basic knowledge and skills in use: hardware (plotter, scanner, digital devices), e-mail and internet research, the Microsoft Applications: word processing, Excel, Power Point programs.

However at the same time, most participants shared their concern that their knowledge of ICT implementation in classroom, and organizing collaborative e-activity with students are insufficient or only sufficient. 67% of them is actively involved in at least one Internet forum and 95%participate in the social networks.
70% of participants do not participate regularly in trainings. “Lack of time” and “Organized training was not relevant to my subject” are most popular reason for those who do not participate in trainings.

75% of all participated at least once in online training using Internet as a source of continuing education. Very often courses organized outside of the school and seminars are education source also. 63% of them have heard of remotely accessible laboratories before.

Almost 84% of the participants believe that distance training can be efficient for teaching and building students’ STEM competency.

The reason for participation in the continuing education are: to obtain financial, improved income (86%) and new knowledge (82%), to be more effective in use of the new tools (86%), to motivate students (75%), promotion (77%)

2.1.3 School Profile
The school profile is based on the responses of administrating and managing staff of the secondary school. All schools have good Internet connection. They can offer approximately 20 computers for education purposes. The ICT have been used in school more than 5 years. The most used software and support available for administration and education are Word processing and Internet (100%), a little less popular is jest E-mail (96%) and Spreadsheet/Excel (85%). School can provide some education application in Mathematics, Technology, Science and English. The laboratory practical components are offered in classroom, mostly it is in Chemistry and Physics. 58% of responders have heard about remote laboratory and experimentation.

2.1.4 Company Profile
The general representative of the company is person from 25 till 50 years old, with at least Bachelor or Master Degree.

More than half (62%) of companies do not have any programs involving youth in their organization activity or production Youth practical placement program (Summer Internship, Open Door activity) offers mostly for University students. For secondary school students Practicum usually is suggested.

In general industry are agree to work with university on building Co-op programme for university students. 50% of responders skipped the question for the students of secondary and professional schools, what can represent that they are not ready for development such kind of cooperation.

2.2 Current and estimate future knowledge and skills needs in Poland

2.2.1 Knowledge needs for teachers (teachers)
The presented courses for teacher’s online training can be divided on five topics:
Remote experiments: introduction and integration to curriculum
Evaluation of e-learning materials, and ICT tools and applications
Virtual learning: LMS and virtual mobility
ICT museum programs in the classroom
ICT for management and professional development

The courses from previous five topics which are most interesting for the teachers from Poland are following:

- Empowering education: How correctly evaluate e-learning materials (50%)
- ICT museum programs in the classroom/school teaching process (50%)
- ICT – enhanced Research and Professional Development (50%)
- Transforming curriculum with remote experimentation: how to integrate it in secondary school classroom (50%)
- Designing curriculum for Moodle virtual learning environment (50%)

The teachers informed that they have an interest to test remote experiments in their curriculum.

They also are interested to get more information about the Open Courseware and Free online lectures and how to use it in their curriculum.

The teachers have suggested requirements for a support from and cooperation with online trainers. Extensive apply of collaboration instructional methods will be beneficial for the online training as well. The focus on project-based training was recommended: the theory provided in training should be connected with solving everyday practical problems occurs during teaching.

2.2.2 Knowledge needs for teachers (decision making/administration staff)

According the decision making representatives, for their teachers they would recommend the follow list of trainings:

(1) Empowering education: How choose ICT instruments and applications for purpose of your curriculum (ca 50%)
(2) Empowering education: How correctly evaluate e-learning materials (40%)
(3) Transforming curriculum with remote experimentation: how to integrate it in secondary school classroom (ca 50%)
(4) Designing curriculum for Moodle virtual learning environment (ca 40%)
(5) ICT museum programs in the classroom/school teaching process (ca 35%)

In addition the headmasters/directors of the secondary have interest to implementation the remote experiments in the school curriculum, believing (most 60%) that this tool can enhance the practical components of science curriculum in their schools.
The ability to integrate the technology into curriculum, ability to use ICT to efficient communicate with students, ability to use ICT support to development of students skills, and ability to use ICT for creating of professional knowledge development community are also knowledge and skills demands for the teachers in order to work efficiently.

At the same time, it was indicated that obstacle influenced on the ICT integration in curriculum are lack of knowledge to use ICT instruments for education purposes, not enough software/applications copies for educational use, and lack of knowledge on hardware and software characteristics.

2.2.3 Knowledge needs for students (teachers)

The students are interested to get knowledge of remote experiments implementation in the classroom. The helpful courses will be:

- How does the current flow? – Ohm Low (using remote laboratories equipment)
- Working as a computer Logic gates
- Biological experiment - Growing beans (Using remote lab equipment)
- What does oscilloscope give us…. representation of functions and calculating integrals (Using remote lab equipment)
- Black body radiation of common light sources
- Simulation using existing simulation tools

2.2.4 Knowledge needs for students (company)

According to the managing staff of the industry, STUDENTS should build competences in

- using of engineering software
- a work with remote experiments;
- using of hardware equipment (e.g. computer, plotter, scanner, digital devices)
- using of word processing programs (Word, Excel, and PowerPoint)
- ability to use materials e.g. diagrams, technical instructions properly, basics in topic “Electricity” and basics in computer science
- quickly adaptation to new technologies
- collecting and selecting information from various sources (e.g. library, internet)

as well as

- English knowledge to use it in the professional context
- solving problems occurring during work
- interpersonal skills- works with others

2.3 Final Outcome

Survey results confirmed that the main project target group in Poland was successfully reached.

Educational and knowledge needs and current state of continuous education for teachers in Poland
were determined. Based on those needs 1 online course for teachers and 3 didactic courses for students in format of modules are suggested.

The questionnaires results as well high level of interest in OLAREX online training show that proposed online training composed of all steps of curriculum design with remote experiments practical components actually meets the needs of secondary school teachers, and their students. Digital competence together with soft skills will be good basis for transition of students to their career development either by university or directly by industry.

Participants also provided a few of comments and suggestions which are indeed helpful at preparing of learning materials and practical contents for the training. In the most responses participants ask for knowledge which can help to solve the problems occurring in the daily praxis.

3 SPAIN

In the OLAREX survey take place in March-April 2012. 98% of all responses were collected in March 2012. Four target groups have participated:

464 students of secondary schools and universities have participated. 99.6% - 462 forms out of 464 – were completed.

101 teachers of secondary schools have participated in the survey. 91.1% - 92 forms out of 101 – were completed.

6 representatives of administration staff of secondary schools have participated in the survey. All forms were completed.

9 responders from managing staff of enterprises were received. All forms were completed.

3.1 General Profiles

3.1.1 Profile of Students

The students participated in the survey represent 2 groups: secondary school students and freshman students of the University. The age range of students is between 14-16 years old for secondary schools and 19-20 years old for the University. Most of the students (around 98%) can communicate and study in English. Most students have access to Internet at home and at school - classroom or library. After PC and Laptop on the frequency of internet connection, Smartphone stays on the second place. Usually students use Internet for personal communication (email) and social networking (Facebook, Twitter, etc.). Students seldom use ICT for the learning purposes. Since they like to try something new, they are very interesting to use remote experiments in the classroom.

3.1.2 Profile of Secondary Schools Teachers

All participants believe that their competencies for the tasks at their job are good or satisfactory sufficient: they can quickly learn and adapt new teaching methods, learn and adapt new technology for education, find and evaluate the ICT tools, and able to design course with online assignment.
Some of them need training in order to be more efficient in new technology and teaching methods. 45% of participants have sufficient knowledge to study and communicate in English. Most have very good and good basic knowledge and skills in use: hardware (plotter, scanner, digital devices), e-mail and internet research, the Microsoft Applications: word processing, Excel, Power Point programs.

However at the same time, most participants shared their concern that their knowledge of ICT implementation in classroom, and organizing collaborative e-activity with students are insufficient and inadequate. More than 70% are actively participating in the social networks: Facebook (50%), Twitter (17%), Google+ (12%). 43% participate in forums and particularly professional forums.

77.4% of participants regularly participated in training. “Lack of time” and “Organized training was not relevant to my subject” are most popular reason for those who do not participate in trainings.

70% of all participants use Internet as a source of continuing education. Very often “courses organized outside of the school” (69% paid by the school and 36% paid by the teachers) and seminars (28%) are education source also. More than 68% have already participated in online training. 55% of them have heard of remotely accessible laboratories before.

Almost 86% of the participants believe that distance training can be efficient for teaching and building students’ STEM competency.

The reason for participation in the continuing education are: to obtain new knowledge (89%), to be more effective in use of the new tools (86%), to motivate students (69%), promotion (11%).

3.1.3 School Profile
The school profile is based on the responses of administrating and managing staff of the secondary school. All schools have good Internet connection. They can offer more than 20 computers for education purposes. The ICT have been used in school more than 5 years. School can support the teacher with presentation software (75%), CD/DVD Encyclopaedia (60%), communication and collaboration tools (60%). School can provide some education application in Mathematics, Social science and English. The laboratory practical components are offered in classroom, mostly it is in Chemistry. 83% of responders never have heard about remote laboratory and experimentation.

3.1.4 Company Profile
The general representative of the company is person from 25 till 45 years old, with at least Bachelor or Master Degree.

Youth practical placement program (Co-op, Summer Internship, Practicum) offers mostly for University students. For secondary school students usually Open Door activity is suggested.

In general industry are agree to work with university on building Co-op programme for university students. 60% of responders skipped the question for the students of secondary and
professional schools, what can represent that they are not ready for development such kind of cooperation.

3.2 Current and estimate future knowledge and skills needs in Spain

3.2.1 Knowledge needs for teachers (teachers)

The presented courses for teacher’s online training can be divided on five topics:

- Remote experiments: introduction and integration to curriculum
- Evaluation of e-learning materials, and ICT tools and applications
- Virtual learning: LMS and virtual mobility
- ICT museum programs in the classroom
- ICT for management and professional development

The courses from previous five topics which are most interesting for the teachers from Basque Country, Spain are following:

- Empowering education: How correctly evaluate e-learning materials (72%)
- ICT museum programs in the classroom/school teaching process (69%)
- ICT – enhanced Research and Professional Development (69%)
- Transforming curriculum with remote experimentation: how to integrate it in secondary school classroom (62%)
- Designing curriculum for Moodle virtual learning environment (36%)

The teachers informed that they have an interest to test remote experiments in their curriculum.

They also are interested to get more information about the Open Courseware and Free online lectures and how to use it in their curriculum.

The teachers have suggested requirements for a support from and cooperation with online trainers. Extensive apply of collaboration instructional methods will be beneficial for the online training as well. The focus on project-based training was recommended: the theory provided in training should be connected with solving everyday practical problems occurs during teaching.

3.2.2 Knowledge needs for teachers (decision making/administration staff)

According the decision making representatives, for their teachers they would recommend the follow list of trainings:

- Empowering education: How choose ICT instruments and applications for purpose of your curriculum (ca 100%)
- ICT – enhanced Research and Professional Development (ca 100%)
- Transforming curriculum with remote experimentation: how to integrate it in secondary school classroom (ca 80%)
• Designing curriculum for Moodle virtual learning environment (ca 80%)
• ICT museum programs in the classroom/school teaching process (ca 60%)

In addition the headmasters/directors of the secondary have strong interest to implementation the remote experiments in the school curriculum, believing (most 100%) that this tool can enhance the practical components of science curriculum in their schools.

The ability to integrate the technology into curriculum, ability to use ICT to efficient communicate with students, ability to use ICT support to development of students skills, and ability to use ICT for creating of professional knowledge development community are also knowledge and skills demands for the teachers in order to work efficiently.

At the same time, it was indicated that obstacle influenced on the ICT integration in curriculum are lack of knowledge to use ICT instruments for education purposes, not enough software/applications copies for educational use, and lack of knowledge on hardware and software characteristics.

3.2.3 Knowledge needs for students (teachers)

The students are interested to get knowledge of remote experiments implementation in the classroom. The helpful courses will be:

• How does the current flow? – Ohm Low (using remote laboratories equipment)
• Biological experiment - Growing beans (Using remote lab equipment)
• What does oscilloscope give us…. representation of functions and calculating integrals (Using remote lab equipment)
• Black body radiation of common light sources
• Spectral analysis of light sources
• Simulation using existing simulation tools

Moreover, the interviews with representatives of Uradenta school (P2), Olatz Alzola Colinas - Physics and Mathematics teachers, and Alberto Bejarano Montesinos - head of department of Biology study, confirmed that actual knowledge needs are summarised and presented in the sections 7.2.1. and 7.2.3.

3.2.4 Knowledge needs for students (company)

According to the managing staff of the industry, STUDENTS should build competences in

– a work with remote experiments;
– using of hardware equipment (e.g. computer, plotter, scanner, digital devices)
– using of word processing programs (Word, Excel, and PowerPoint)
– quickly adaptation to new technologies
– collecting and selecting information from various sources (e.g. library, internet)

as well as
- English knowledge to use it in the professional context
- multitasking (perform tasks in parallel)
- solving problems occurring during work
- interpersonal skills- works with others

3.3 Final Outcome

Survey results confirmed that the main project target group in Spain was successfully reached. Educational and knowledge needs and current state of continuous education for teachers in Spain were determined. Moreover, knowledge needs were discussed and finalised by direct interviews with the members of P.Andrés de Urdaneta School. Based on those needs 1 online course for teachers and 3 didactic courses for students in format of modules are suggested. The 3 didactic courses for students will be prepared by University of Deusto (Spain) in collaboration with P.Andrés de Urdaneta School (Spain); the online course for teachers will be developed with Carinthia University of Applied Sciences (Austria).

The contemporary survey has similar finding that provides 2011 Eurydice report on “Key Data on Learning and Innovation through ICT at School in Europe”\(^1\). Data shows that although computers are available, they are not used widely in STEM curriculum. It was show in section 6 of this report the teachers are encouraged through central level recommendations, suggestions or support material to use a variety of ICT hardware and software in the classroom – and this applies in almost all European countries including Spain, to all core subjects of the curriculum. However, in terms of the actual use of ICT in the classroom, evidence shows that teachers make little use of these opportunities and so a large implementation gap currently still remains.

At the same time, in this survey, teachers show a huge interest and demand of the OLAREX training courses, which can developed their ICT competency. Almost 68% of e-survey contributors left their e-mail addresses in order to receive an invitation to OLAREX online pilot training.

The questionnaires results as well high level of interest in OLAREX online training show that proposed online training composed of all steps of curriculum design with remote experiments practical components actually meets the needs of secondary school teachers, and their students. Digital competence together with soft skills will be good basis for transition of students to their career development either by university or directly by industry.

Participants also provided a few of comments and suggestions which are indeed helpful at preparing of learning materials and practical contents for the training. In the most responses participants ask for knowledge which can help to solve the problems occurring in the daily praxis.

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\(^1\) European Commission. EACEA P9 Eurydice, 2011
4 HUNGARY

4.1 General Profiles

4.1.1 Students

111 students have participated in the survey, all of them from secondary schools. The age group of the participated students is between 15-21 years, however 72% of them are 16-19 year old pupils. 75% of the participants are male.

68% of the respondents have English language knowledge (according their evaluation), 17 % can communicate in German; 12% in Spanish language. E-mails are used by 82% of the students with different frequency, for private purposes but also for learning goals (41 %), while Moodle and collaborative learning tools are less used. Hungarian students almost never tweet, but they use the Facebook on a daily basis mostly for private purposes (85 out of 110).

4.1.2 Teachers

56 teachers have participated in the survey, all of them are from Hungarian institutes. Participation of the female gender is 79%.

Age: 94% of the respondents are between 30-60 years, half of them is middle-aged (48% are between 41-50 years), thus 41% have 21-30 years teaching experience; 32% 11-20 years of experience.

79% of participants obtained master degree (MA,MSc) and have sufficient knowledge in English to use it in a professional context. 30-30 % teach mathematics and/or phisics, the others are specialized mostly in chemistry (15%), science studies, informatics, biology.

46% of responders do not use practical laboratory components currently in their curriculum; while 54% apply the lab experiments in the class. Most of the experiments are done in physics and chemistry classes.

4.1.3 Administration staff

5 representatives of Administration staff of secondary schools participated in the survey.

20% of the respondents are between 31-40 (1 people) with 4-7 years of experience, 4 people are above 40 years with 11-20 years of experience. 4 males and 1 female have participated. All of them have Master Degree, all of them are Directors/Headmasters of the schools.

67% of responders have sufficient English knowledge to use it in the professional context. The others speak German language. Most of them are responsible for General Management of the schools and decision makers, in addition they also responsible for different administrative tasks and exams.
All responders use ICT applications (often/very often) for daily management activities. Most of them use ICT tools for report preparation (80%) and for students’ skills analysis (80%), however 20% of them almost never use these applications for administration/exam administration. They have been using ICT tools generally for 5-10 years, 2 of them more than 10 years.

4.2 Current and estimate future knowledge and skills needs in Hungary

Based on the survey results we can conclude that there is a need to generally introduce the pedagogical and technical concept of remote experiments in Hungary.

In general a large percentage of the students and teachers is not aware of the ICT application: remote laboratory, most of them do not even know the definition or the educational/technical concept behind. Therefore a more theoretical, informative material on that will be useful to access in Hungary. Regarding students the same could be stated on the open courseware and online lectures applications.

On the other hand the general interest is high regarding remote experiments, even if students seem less enthusiastic about their use in the classroom than the teachers. 40%-40% of the students and teachers do not have adequate English knowledge to study/teach science topics in this foreign language. Therefore in Hungary there will be still high demand to translate all learning material.

Teachers evaluated that they have the necessary basic IT skills and learning competences to learn, evaluate and use ICT applications in their classes. Where there would be need of further training is to develop the courses with online assignments using learning management systems. What is interesting that when asking specifically about the applications, such as Courseware, M-learning or simulations/games the teachers state that their knowledge about the usage of the applications is unsatisfactory or inadequate. The probable reason behind is that they think they would be capable to learn using these applications, but they have not done yet or they used them only on a basic level. The use and integration of these ICT applications in the curriculum is not the lack of knowledge, but lack of enough technical support, equipment, software and hardware and even space, which all leads back to lack of funds to equip the schools with computers, legal software and with Internet access.

According the decision making representatives, for their teachers they would recommend all training topics listed in the questionnaire except the international virtual mobility. On the other hand they would not be able to support the teachers in their participation in OLAREX trainings. Teachers will need strong self-commitment.

The headmasters/directors of the secondary have strong interest to implementation the remote experiments in the school curriculum, believing (most 100%) that this tool can enhance the practical components of science curriculum in their schools.

5 LITHUANIA

In the OLAREX survey take place in March-April 2012. Four target groups have participated:

15 students of secondary schools and universities.

22 teachers of secondary schools.
11 representatives of administration staff of secondary schools.

3 respondents from managing staff of enterprises.

5.1 General Profiles

5.1.1 Profile of Students
The students participated in the survey are secondary school students of freshman university students. Most students are 17 years old (40%) or younger and 13% is 20 or more years old. 2/3 of participants are female. More than half students (62%) can communicate and learn in English language. Most students have access to Internet at home and at school –classroom. PC and Laptop are most usable devices for internet connection, Smartphone and Tablet are used less. Usually students use Internet for personal communication (email) and social networking (Facebook, Twitter, etc.). Students like new technologies and experiments, that’s why they showed interest in remote experiments.

5.1.2 Profile of Secondary Schools Teachers
Most school teachers are 31-50 years old (80%). 22% of them have Bachelor degree and 72% have Master degree. In survey participated 82% female. Participants (77%) marked that they have sufficient knowledge in English to use it in professional context. Most participant competences are satisfactory, good or very good. They are can quickly learn and adapt new teaching methods, learn and adapt new technologies for education, find/evaluate new ICT teaching/learning instruments. They also have good or very good knowledge of hardware equipment, word processing programs (Word, Excel, PowerPoint, etc.), use of email.

60% of teachers participate in distance training. The rest 40% answered that they mostly (39%) do not participate because such training has not been organized in their school, others (33%) marked that training was organized but for different subject, 16% do not have time to participate in such training.

95% of all participants use Internet as a source of continuing education. Very often “courses organized outside of the school” (77 % paid by the school and 45% paid by the teachers) and seminars (95%) are education source also. 68 % have already participated in online training.32% of them have heard of remotely accessible laboratories before.

100% believed that distance training can be efficient for acquiring professional knowledge in their field.

The reason for participation in the continuing education are: 95% - Personal knowledge and interest/Cognitive knowledge, 91% To be more effective in the use of new tools/technologies in my teaching, 54% - To motivate students, 32% - Financial, improved income, 23% - Professional promotion.
5.1.3 School Profile
The school profile is based on the responses of administrating and managing staff of the secondary school. All schools have good Internet connection. 54% of responders answered that in their school is 10-20 computers for education purposes, 27% can offer more than 40 computers with internet connection. The ICT have been used in all schools. 45% of responders use it 1-2 years, 27% use it 3-5 years, 9% use it 6-10 years and 18% use it more than 10 years. School can support the teacher with word processing, excel, presentations software (91%), 45% have database software, 36% - designing graphics software. Several secondary schools provided (18-27%) that they have mathematical software, simulations, educational games, audio/video, encyclopedia, communication tools. Selection of software available in school classrooms are very poor, most schools do not have or have only few software programs. There are programs for Mathematics, Science, Technology, English language subjects.

5.1.4 Company Profile
The general representative of the company is person from 25-40 years old, with at least Bachelor or professional school degree.

Youth practical placement program (Co-op, Summer Internship, Practicum) offers mostly for University students. For secondary and professional school students usually Open Door, cooperative activities is suggested.

On the question: “have you heard of Co-op (Cooperative) program before in your or other countries?” 67% answered that they did hear about this program. And 67% of responders are interested on opportunity to build Co-op program in their enterprises.

5.2 Current and estimate future knowledge and skills needs in Lithuania

5.2.1 Knowledge needs for teachers (teachers)
Courses in the following areas are most interesting for the teachers from Lithuania:

- How choose ICT tools and to design curriculum and learning activities (95%)
- Professional development with ICT (90%)
- ICT Supported teaching and learning organization (90%)
- Evaluation of e-learning (82%)
- Designing curriculum using Moodle virtual learning environment (70%)

The teachers informed that they have interest to test remote experiments in their curriculum.

They are also interested to get more information about the Open Courseware and Free online lectures and possibilities to use it in curriculum.

Teachers thinks that the theory provided in training should be connected with solving everyday practical problems occurs during teaching.
5.2.2 **Knowledge needs for teachers (decision making/administration staff)**

According to the administration staff, for their teachers they would recommend the follow list of trainings:

- Designing curriculum for Moodle virtual learning environment (100%)
- ICT – enhanced Research and Professional Development (100%)
- ICT – Supported teaching and management (100%)
- Empowering education: How correctly evaluate e-learning materials (100%)
- Empowering education: How choose ICT instruments and applications for purpose of your curriculum (100%)
- ICT – Mediated Communication & Collaboration (90%)

Also secondary schools administration staff has strong interest to implementation the remote experiments in the school curriculum.

Administration staff thinks that teachers should have the following knowledge/skills: “Able to integrate the use of technology and technology standards for students into the curriculum” and “Ability to use ICT to support the development of students’ knowledge creation skills”. Almost equally interested, slightly or very interested was on the rest options: Know basic hardware and software operations, Know a web browser, communications software, and presentation software, Know productivity applications software and management applications, Ability to flexibly use subject specific tools and applications in a variety of problem-based and project-based situations, Ability to use network resources to help students collaborate, access information, and communicate with external experts to analyze and solve their selected problems, Ability to use ICT to create and monitor individual and group student project plans, Ability to experiment and continuously learn, and use ICT to create professional knowledge communities.

Respondents also indicated that there is not enough copies of software for education purposes (90%), insufficient time for teachers to prepare ICT–based lessons (81%), teachers lack knowledge/skills in using computers/the internet for instructional purposes (81%), not enough training opportunities for teachers (81%), insufficient number of computers (80%).

5.2.3 **Knowledge needs for students (teachers)**

The students are interested to get knowledge of remote experiments implementation in the classroom. The courses they expressed the need are the following:

- How does the current flow? – Ohm Low (using remote laboratories equipment)
- Working as a computer – Logic gates (Using remote lab equipment)
- Black body radiation of common light sources
- Spectral analysis of light sources
- Simulation using existing simulation tools
- Analog circuits measurements
5.2.4 Knowledge needs for students (company)  
According to the managing staff of the industry, STUDENTS should build competences in:

- Using of hardware equipment (e.g. computer, plotter, scanner, digital devices)
- Using of word processing programs (Word, Excel, and PowerPoint)
- Quickly adaptation to new technologies
- Time management - selects goal-relevant activities, ranks them, allocates time

as well as

- Organizes and maintains information
- Have enough English knowledge to use it in the professional context English
- Multitasking (perform tasks in parallel)
- Solve problems occurring during work
- Interpersonal - works with others

5.3 Final Outcome  
Survey has been organized and all four target groups were reached. From the questionnaire results it can be clearly seen Lithuanian schools situation. Students and teachers are very interested in remote experiments. Teachers would like to use these experiments in their curriculum, also they would like to learn new things, improve their Moodle knowledge. Most of the teachers are able to communicate in English, so there will be no problem later, while the project runs. Also most teachers have computer with internet connection (as well as students), so there will be no problems to access OLAREX Moodle and other resources.

More than 80% of participants left their email address and are interested in free OLAREX training which will be organized in 2013. This is very good results, as this shows that teachers are interested in this project and would like to learn new things, which can be used in their curriculums.

Vytautas Magnus University (P7) is going to help teachers to prepare courses in Moodle learning management system. There will be practical and theoretical information and a lot of examples of different course development methods.

6 BULGARIA  
In the OLAREX survey take place in March-April 2012. 98% of all responses were collected in March 2012. Four target groups have participated:

52 students of secondary schools and universities have participated. 51 forms out of 52 – were completed.

58 teachers of secondary schools have participated in the survey. 52 forms out of 58 – were completed.
14 representatives of administration staff of secondary schools have participated in the survey. 10 of 14 forms were completed.

6 responders from managing staff of enterprises were received. All forms were completed.

6.1 General Profiles

6.1.1 Profile of Students

The students participated in the survey represent mainly the group of secondary school students. Only 4 % of all responders are students of the University. The age range of students is between 14-18 years old for secondary schools and over 20 years old for the University. Most of the students (over 65%) can communicate and study in English. Most students have access to Internet at home (98%) and at school -classroom or library. After PC and Laptop on the frequency of internet connection, Mobile phone stays on the second place. Usually students use Internet for personal communication (email) and social networking - Facebook, Twitter is not as popular in Bulgaria as Facebook, etc. Students seldom use ICT for the learning purposes. Most of them haven’t heard about remote courseware and laboratories, they are very interesting to use remote experiments in the classroom.

6.1.2 Profile of Secondary Schools Teachers

The biggest group of all participants is the one of teachers in physics, followed by the one of Mathematics and technologies. 83 % of participants have sufficient knowledge to study and communicate in English and most of them has teaching experience over 10 years. All participants believe that their competencies for the tasks at their job are good or satisfactory sufficient: they can quickly learn and adapt new teaching methods, learn and adapt new technology for education, find and evaluate the ICT tools, and able to design course with online assignment. Some of them need training in order to be more efficient in new technology and teaching methods. Most have very good and good basic knowledge and skills in use: hardware (plotter, scanner, digital devices), e-mail and internet research, the Microsoft Applications: word processing, Excel, Power Point programs.

However at the same time, most participants shared their concern that their knowledge of ICT implementation in classroom, and organizing collaborative e-activity with students are insufficient and inadequate. More than 70 % are actively participating in the social networks: Facebook (86%), Twitter (12%), Google+ (54%). 60% participate in forums and particularly professional forums.

62 % of participants regularly participated in training. “Lack of time” and “Organized training was not relevant to my subject” are most popular reason for those who do not participate in trainings.

84% of all participants use Internet as a source of continuing education. Very often reading professional editions (78%), “courses organized outside of the school” (62 % paid by the school and 45% paid by the teachers) and seminars (75%) are education source also. 53 % of teachers have already participated in online training. 64 of them have heard of remotely accessible laboratories before.
Almost 80% of the participants believe that distance training can be efficient for teaching and building students’ STEM competency.

The reason for participation in the continuing education are: to be more effective in use of the new tools (93%), to obtain new knowledge (83%), to motivate students (72%), promotion (55%).

6.1.3 School Profile

The school profile is based on the responses of administrating and managing staff of the secondary school. All schools have good Internet connection. They can offer between 21-30 computers for education purposes. The ICT have been used in school more than 6-10 years. School can support the teacher with presentation software (93%), software for date base (86), CD/DVD Encyclopaedia (36%), communication and collaboration tools (60%). School can provide some education application in Mathematics, Science, Social science, English and other languages. The laboratory practical components are offered in classroom (54%), mostly in Chemistry and Physics. 77% of responders never have heard about remote laboratory and experimentation.

6.1.4 Company Profile

The general representative of the company is person from 25 till 40 years old, with Bachelor, Master Degree and secondary school.

67% of the responders have heard about the Co-op program. Youth practical placement programs (Co-op, Summer Internship, and Practicum) they can offer as for University students, as for secondary school students and students from professional schools.

In general companies agree to work with university on building Co-op programme for university students. 17% of them agree to work also with students of secondary and professional schools. Some responders skipped the question.

6.2 Current and estimate future knowledge and skills needs in Bulgaria

6.2.1 Knowledge needs for teachers (teachers)

The presented courses for teacher’s online training can be divided on five topics:

- Remote experiments: introduction and integration to curriculum
- Evaluation of e-learning materials, and ICT tools and applications
- ICT – Supported teaching and management
- ICT museum programs in the classroom
- Virtual learning : LMS and virtual mobility

The teachers informed that they have an interest to test remote experiments in their curriculum.

They also are interested to get more information about the Open Courseware and Free online lectures and how to use it in their curriculum.
The teachers have suggested requirements for a support from and cooperation with online trainers. Extensive apply of collaboration instructional methods will be beneficial for the online training as well. The focus on project-based training was recommended: the theory provided in training should be connected with solving everyday practical problems occurs during teaching.

6.2.2 Knowledge needs for teachers (decision making/administration staff)

According the decision making representatives, for their teachers they would recommend the follow list of trainings:

- Empowering education: How choose ICT instruments and applications for purpose of your curriculum (ca 40%)
- ICT – enhanced Research and Professional Development (ca 40%)
- Transforming curriculum with remote experimentation: how to integrate it in secondary school classroom (ca 50%)
- Designing curriculum for Moodle virtual learning environment (ca 60%)
- ICT museum programs in the classroom/school teaching process (ca 50%)

In addition the headmasters/directors of the secondary have strong interest to implementation the remote experiments in the school curriculum, believing (most 100%) that this tool can enhance the practical components of science curriculum in their schools.

The ability to integrate the technology into curriculum, ability to use ICT to efficient communicate with students, ability to use ICT support to development of students skills, and ability to use ICT for creating of professional knowledge development community are also knowledge and skills demands for the teachers in order to work efficiently.

At the same time, it was indicated that obstacle influenced on the ICT integration in curriculum are: Lack of funds, Insufficient number of computers, not enough technical assistance for operating and maintaining of computers, not enough training opportunities for teachers, not enough copies of software for educational use.

6.2.3 Knowledge needs for students (teachers)

The students are interested to get knowledge of remote experiments implementation in the classroom. The helpful courses will be:

- How does the current flow? – Ohm Low (using remote laboratories equipment)
- Black body radiation of common light sources
- Spectral analysis of light sources
- What does oscilloscope give us.... representation of functions and calculating integrals (Using remote lab equipment)
- Simulation using existing simulation tools
- Biological experiment - Growing beans (Using remote lab equipment)

6.2.4 Knowledge needs for students (company)

According to the managing staff of the industry, STUDENTS should build competences in
Target group educational needs analysis

- a work with remote experiments;
- using of hardware equipment (e.g. computer, plotter, scanner, digital devices)
- using of word processing programs (Word, Excel, and PowerPoint)
- quickly adaptation to new technologies
- collecting and selecting information from various sources (e.g. library, internet)

as well as

- English knowledge to use it in the professional context
- multitasking (perform tasks in parallel)
- solving problems occurring during work
- interpersonal skills- works with others

6.3 Final Outcome

The Survey results give a good notion about the main project target group in Bulgaria. They are comparatively enough bases to determine the educational and knowledge needs and current state of continuous education for the secondary schoolteachers in Bulgaria. Based on those needs 1 online course for teachers and 3 didactic courses for students in format of modules are suggested.

The teachers show also a huge interest and demand of the OLAREX training courses, which can develop their ICT competency. More than 75% of e-survey contributors left their e-mail addresses in order to receive an invitation to OLAREX online pilot training.

The questionnaires results as well high level of interest in OLAREX online training show that proposed online training composed of all steps of curriculum design with remote experiments practical components will be helpful for the secondary school teachers, and their students. Digital competence together with soft skills will be good basis for transition of students to their career development either by university or directly by industry.

7 AUSTRIA

In the OLAREX survey take place in March-April 2012 and four target groups were participating:

- 292 students of secondary schools
- 25 teachers of secondary schools
- 2 representatives of administration staff of secondary schools
- 1 responder from managing staff of enterprises

The highest number of participant who filled in the students’ survey was registered on 8.03.2012 when 87 Austrian students give us their feedbacks and on 13.03.2012, 6 teachers filled in our survey.

The number of administrative and managing staff was too low and we were not able to realize a statistical evaluation for these two segments.
7.1 General Profiles

7.1.1 Profile of Students
The students participated in the survey were secondary school kids. The age range of secondary is 15 or between 15 and 16 years old. Most of the students (around 98%) can communicate and study in English. Most of the Austrian students have Internet Access at home while 28% of our sample is accessing the internet at school. Notebooks and smartphones are the devices most used by the students to access the internet applications. Usually students use Internet for personal communication (email) and social networking (Facebook, Twitter, etc.). Students seldom use ICT for the learning purposes and almost never communicate with the teachers via Email. Remote Experiments for most of them are interesting and they would like to try them in class.

7.1.2 Profile of Secondary Schools Teachers
25 secondary school teachers took part of this survey and most of them had age between 51 and 60 years old and are teaching mathematics and physics. Even if 87% of the teachers who filled in our survey had never heard about remote experiments, 39 of them said that they would be interesting and that it would be nice to have access to it, 26% were really interested, 17% totally interested and 9%, which means 2 persons in this survey, said that they are totally not interested to have such technology in their school. More than 50% of the participants are able to create a course with online assignments using learning management systems and 43% are able to adapt fast to new technologies. 20 participants out of 25 have enough knowledge to use English in the teaching process. Most have very good and good basic knowledge and skills in use: hardware (plotter, scanner, digital devices), e-mail and internet research, the Microsoft Applications: word processing, Excel, Power Point programs.

87% of the teachers who filled in our survey had never heard about remote experiments, 13% said that they have an idea about what a remote lab is and 2 of them skipped this question.

Austrian teachers have good basic knowledge in technology but at the same time that they would need support in learning how to use Open Courseware and online lectures in the teaching process.

52% of the participants at the survey have already participated in organized distance trainings, while 48% have never had this opportunity. 15 participants out of 23 think that distance training can be efficient in acquiring professional knowledge in their field, while 8 teachers are disagreeing with this statement.

96% of the teachers think that personal knowledge and interest/cognitive knowledge are the most important reasons to continue with education during life.

The number of hours that the teachers would devote for continuing education through internet varies from 1 hour per week to 7 days per week.
7.1.3 School Profile
The school profile was realized based on the responses of administrating and managing staff of the secondary school. All schools have good Internet connection. They can offer more than 40 computers for education purposes. The ICT have been used in school more than 10 years. The laboratory practical components are offered in classroom; mostly it is in Technology and Sciences. Most of the teachers never heard about remote experiments but are opened to learn how to develop and to work with.

7.1.4 Company Profile
We could not realize a Company Profile only based on the responses of one person, the Cluster Manager. The company is small, only with maximum 5 employers and they do not offer any kind of students programs for students. The person who filled in the management survey never heard about Co-op program but if he/she would be invited to such even he/she would like to take part and proposed to have 1-3 students from universities, professionals’ schools and secondary schools attending it. In our research this answer didn’t lead us to any positive result.

7.2 Current and estimate future knowledge and skills needs in Austria

7.2.1 Knowledge needs for teachers (teachers)
The presented courses for teacher’s online training can be divided on five topics:

- Remote experiments: introduction and integration to curriculum
- Evaluation of e-learning materials, and ICT tools and applications
- Virtual learning: LMS and virtual mobility
- ICT museum programs in the classroom
- ICT for management and professional development

The courses from previous five topics which are most interesting for the teachers from Villach, Austria are following:

- Designing curriculum for international virtual mobility (30%)
- Empowering education: How correctly evaluate e-learning materials & How to incorporate museum ICT programs in classroom (22%)
- Designing curriculum for Moodle virtual learning environment & Transforming curriculum with remote experimentation: how to integrate it in secondary school classroom (17%)
- ICT museum programs in the classroom/school teaching process (13%)

The teachers informed that they have an interest to test remote experiments in their curriculum.

They also are interested to get more information about the Open Courseware and Free online lectures and how to use it in their curriculum.
7.2.2 **Knowledge needs for teachers (decision making/administration staff)**

According the decision making representatives, for their teachers they would recommend the follow list of trainings:

- How to incorporate museum ICT programs in the classroom
- Transforming curriculum with remote experimentation: how to integrate it in the secondary school classroom
- ICT museum programs in the classroom/school teaching process
- ICT-Supported teaching and management
- ICT-enhanced Research and Professional Development

It has to be mentioned that only two administrative staff filled in this survey and because of this the results are not 100% reliable from the statistical point of view.

7.2.3 **Knowledge needs for students (teachers)**

The students are interested to get knowledge of remote experiments implementation in the classroom. The helpful courses will be:

- Working as a computer – Logic gates (Using remote lab equipment)
- What does oscilloscope give us. Representation of functions and calculating integrals (Using remote lab equipment)
- Spectral analysis of light sources
- How does the current flow? Ohm Low (using remote laboratories equipment)
- Analog circuits measurements
- Simulation using existing simulation tools

7.2.4 **Knowledge needs for students (company)**

According to the managing staff of the industry, STUDENTS of secondary school should build competences in:

- Basics in topic “Electricity”
- Basics in computer sciences
- Engineering software; C, MATLAB/Simulink, LabVIEW, etc
- Experience to work with remote experiments/devices
- Able to use materials (diagrams, technical instructions) properly
- Using of hardware equipment (computer, plotter, scanner, digital devices)
- Using of word processing programs (Word, Excel, PowerPoint)
- Quickly adapt to new technologies
- Find and select information from various sources (library, internet)
- Skills in searching internet – Acquires and evaluates information
- Organize and maintains information
- Have enough English knowledge to use it in the professional context English
- Multitasking (perform tasks in parallel)
- Time management-select goal-relevant activities, ranks them, allocates time
- Solve problems occurring during work
- Interpersonal-works with others

These results cannot be generalized while for the managing staff of the industry we had only one person who participated at the survey.

7.3 Final Outcome

Survey results confirmed that the main project target group in Austria was successfully reached. Educational and knowledge needs and current state of continuous education for teachers in Austria were determined. Based on those needs 1 online course for teachers and 3 didactic courses for students in format of modules are suggested. The 3 didactic courses for students will be prepared by Carinthia University of Applied Sciences (Austria) in collaboration with PERAU School (Austria); as well the online course for teachers will be developed with University of Deusto (Spain). The courses for students will be concentrated in the area of optics, electricity and circuits and one topic, which will choosed by the students by themselves. The course for teachers is dedicated to online-labs and how to use the experiments, which will be developed.

In this survey, teachers show a huge interest and demand of the OLAREX training courses, which can develop their ICT competency. Almost 60% of e-survey contributors left their e-mail addresses in order to receive an invitation to OLAREX online pilot training.
8 ANNEXES

Annex 1. Andreas Pester, Diana Pop, “Target audience analysis from online survey: Austria.”


Annex 5. Luis Ochoa Siguencia, “Target audience analysis from online survey: Poland.”