

# Experiences of technology-rich innovation in European schools within the Open Discovery Space project

## Experiencias de innovación tecnológica en las escuelas europeas del proyecto Open Discovery Space

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### Abstract

The Open Discovery Space (ODS) project was conceived to introduce innovative resource-based teaching and learning practices in European schools, to promote the creation of communities between European school members and to boost the demand for open educational resources among teachers. After 3 years of applying the ODS innovation model, more than 2,000 European schools have carried out diverse experiences of technology-rich innovation to achieve the project aims. This paper describes the experiences and results of ODS in 7 different European countries, along with the international activities that aim at expanding the scope of the project beyond the European limits.

### Keywords:

Resource-oriented learning; learning networks; open educational resources; learning object repositories.

### Resumen

El proyecto Open Discovery Space (ODS) fue concebido para introducir prácticas innovadoras de enseñanza y aprendizaje basadas en recursos en escuelas europeas, para promover la creación de comunidades entre escuelas europeas y para impulsar la demanda por parte de los profesores de recursos educativos abiertos. Después de tres años aplicando el modelo de innovación ODS, más de 2.000 escuelas europeas han llevado a cabo diversas experiencias de innovación tecnológica para lograr los objetivos del proyecto. Este artículo describe las experiencias y resultados de ODS en siete países europeos, junto con las actividades internacionales que pretenden ampliar el alcance del proyecto más allá de los límites europeos.

### Palabras Clave:

Aprendizaje orientado a recursos; redes de aprendizaje; recursos educativos abiertos; repositorios de objetos de aprendizaje.

# 1. Introduction

The Open Discovery Space project's main goal is to demonstrate different ways of involving school communities in innovative teaching as well as learning practices through the effective use of eLearning resources. The project intends to enhance the adoption of eLearning resources by illustrating their potential for meeting the educational needs of school communities across Europe. This is done through the implementation of a socially empowered multilingual portal that provides access to more than 800,000 digital materials together with a federated set of digital repositories (see Figure 1). In current teaching and learning processes, digital resources are promoted to be used in the most effective way. The process of Re-schooling (OECD, 2006), eLearning and Open Educational Resources (OERs) are key tools to support and allow educational establishments to comply with their central social function. UNESCO (2002) has defined Open Educational Resources (OERs) as the “technology-enabled, open provision of educational resources for consultation, use and adaptation by a community of users for non-commercial purposes”. The OER movement is a technology-empowered initiative that aims to create and share educational resources, which are freely available and accessible on a global level. In this context, eLearning can play an important role in supporting communication and knowledge management

through shared databases, access to unique digital educational resources and archives, advanced instruments as well as tools.

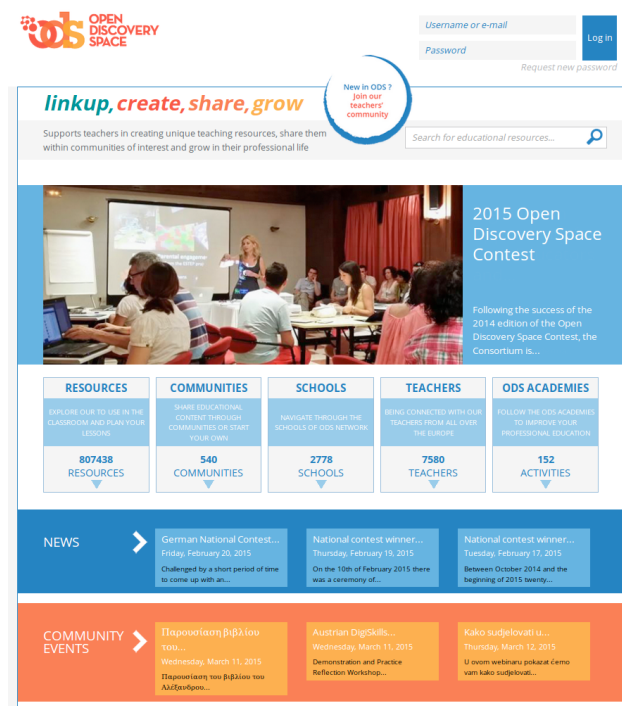


Figure 1. ODS Portal screenshot available at portal.opendiscovery.space.eu

However, there are a number of factors constraining the development of reusable learning activities based on sharable teaching resources. Apart from the fact that teachers often lack the skills to develop activities based on a wide range of educational models, both, teachers as well as learners often view technology in terms of helping them to manage resources rather than to support their teaching or learning process. Additionally, it is generally very time-consuming and difficult for teachers to search for generic learning activities from various subject disciplines (Conole, 2008). Whilst browsing resources may be an effective strategy for

a single collection of a small number of activities, it may be difficult for a more wide-spread search. Therefore eLearning practice is moving towards the reuse of generative resources, e.g. resources which have been developed by learners during their own learning process. However, most teachers lack the necessary expertise to archive and analyse the learning outcomes of an activity and therefore to evaluate and eventually revise it for a more effective use in the future (Cameron, & Campbell, 2010). Whilst definitive resources can be inflexible learning

materials that do not cater for individual learning contexts, more flexible materials offer teachers the opportunity to customise generic components. This way, students can be provided with a more tailored learning material, in line with their real learning needs (Oliver, Kellogg, Townsend, & Brady, 2010). The main question posed by the ODS Spanish team is: How can we motivate teachers, students and parents to actively use eLearning resources and to share and exchange their experiences?

## 2. Description

### 2.1. Objectives

The project aims to act as an accelerator of the sharing, adoption, usage and re-purposing of the already rich existing educational content base. With this purpose in mind, the ODS project sets the following specific objectives:

- To propose a methodology for the effective introduction of innovative practices at schools.
- To build up a teacher group as change leaders who are in charge of sharing leading eLearning practices.
- To propose and implement a more effective exploration of the rich but disperse educational contents available in the digital repositories across Europe.
- To deploy an OER infrastructure that will aggregate existing repositories and tools into a critical mass of eLearning content resources.
- To deploy a social platform and data management layer that will facilitate web-based community-oriented features around the contents.
- To adapt, enhance and deploy components that will allow new communities of users to easily set up and deploy their own thematic views of the ODS portal.
- To test and evaluate the effects of the ODS approach and to validate it implementing the designed scenarios in a large number of schools in different parts of Europe.



## 2.2. Outcomes

### 2.2.1 Open Discovery Space Innovation Model

The first contribution of the Open Discovery Space project is the ODS Innovation Model. ODS develops its Innovation Model following a “pull” approach as opposed to a “push” approach. This is done through collaborative ways of learning and enquiry processes between professionals. The idea is to avoid simply creating interesting but isolated pockets of learning experiences. Through the involvement of innovative teachers from the outset of the project, ODS ensures that the pull approach will organically develop via close collaboration in local and regional communities as well as at the European level through online communities. ODS allows for an innovative methodology derived from the available evidence base. With this idea in mind it uses a group of empowered practitioners, motivated by a common purpose and supported by innovation agencies working in partnership with key national bodies. The ODS consortium considers that such an approach could be the catalyst for mainstreaming more eLearning tools in the area of education.

In the early stages of the process, different scenarios are used to plan the methodology

and to characterise episodes or, even sequences of several activities. These will provide the context in which activities will be carried out: giving an insight into the needs, difficulties and motivations users might have in specific learning contexts. Key elements for the ODS scenarios are firstly, the users and their resistance to change their goals and needs. Secondly, the sources of information accessed during the activities, along with the information generated by the users themselves. Therefore it is fundamental that group dialogue takes place and that teaching techniques and activities are introduced to both promote student-student interaction as well as to focus students’ learning on problem solving and applications to real-world experiences. The project’s approach is shown in Figure 2.

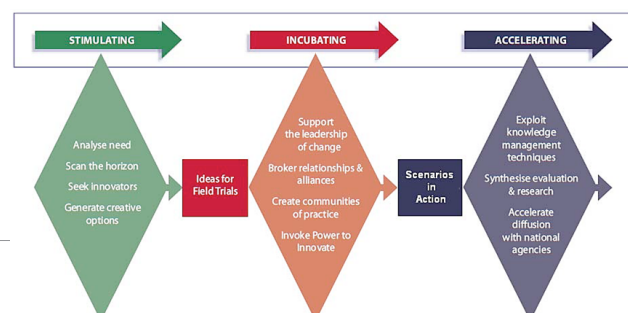


Figure 2. Original ODS Innovation Model (Sotiriou et al., 2012)

## 2.2.2 Spanish experiences

The ODS project is based on different kinds of workshops and events. In the following we will describe only those workshops we consider most relevant. Each participating country in the project organises its own events, some of which are international.

Keeping in mind the purpose of the ODS project, a number of training events and workshops are being held in more than 23 European countries. Such events have the ultimate goal of getting teachers involved as active OER practitioners in innovative educational practices.

Therefore visionary workshops took place in the first year of the project familiarising schools' teaching staff first with already existing and available resources on the Web and then with the forthcoming ODS infrastructure. The goal of these events was to engage participants around both national as well as subject-focused communities. Additionally, the mission of teachers as change-agents in ODS is introduced through so called change-agent workshops. These aim to discuss obstacles, types of resistance as well as ways to tackle them. Finally, a number of practice reflection workshops (see Figure 3) were held. The latter intended to first present the different educational activities and resources, that were developed during the project, and then to discuss their impact on students learning.



Figure 2. Original ODS Innovation Model (Sotiriou et al., 2012)

A number of workshops and training activities have been organised in ODS, mostly around game-based learning approaches and open source tools. They all aim to pursue an increasing use of ICT at primary and secondary schools, including the following features: the spread of advanced assessment instruments (e.g. EvalComix) as well as the development and use of open game-based computing environments (e.g. e-Adventure and OpenSim). This is done either by using augmented reality tools for learning (e.g. Aurasma) or by creating OER contents with authoring tools (e.g. eXeLearning) and developing games and interactive stories (e.g. Scratch). One of these workshops is illustrated in Figure 4, which shows a workshop on developing games using Java and LibGDX.



Figure 4. LibGDX workshop

There are other ongoing training activities in ODS schools, including the use of gamified mobile environments for foreign language learning and video game computer programming. The two Android applications used for this kind of training activities in schools are: VocabTRAINER A1 (see Figure 5) and Guess it! Language Trainer.



Figure 5. VocabTRAINER A1 workshop

AulaBLOG is a community of Spanish teachers promoting the integration of ICTs in schools. This community was set up in 2005 looking at the use of blogs for educational purposes, although its aims are more widespread. The community helps and advises those who want to introduce innovative methods in their daily teaching practice. They also promote and spread experience exchanges, pedagogical discussions and educational innovations through ICTs. Since 2006, aulaBLOG has been organising one meeting per year in different places around Spain. In 2014 a three day meeting took place in Barcelona. Before the meeting, the participants were asked to propose activities they were interested in and they would like to share with other

course participants. Those projects, which were selected by the organisers, were later on presented by each author to the rest of the course. The activities were presented under the category “Learning by doing”. Three of these activities were conducted by several ODS team members in aulaBLOG 2014, concretely: “Open Educational Resources”, “collaborative work and evaluation through wikis” and, “Aumentaty”. Figure 6 shows a picture of the collaborative work and evaluation through a wiki workshop.



Figure 6. Collaborative work and evaluation through a wiki workshop

Additionally several talks about the dangers of the Internet were given. The target audience of these talks were parents who expressed concerns about their children’s Internet use and possible dangers. Parents concerns related especially to their children’s use of social networks, cyberbullying, sexting, etc. In Spain a Scratch contest has been organised and other contests are to follow. For the Scratch contest the participating teachers were asked to submit a project illustrating the use of Scratch in teaching-learning processes as well as a learning scenario. Furthermore participants had to expose how the Scratch project, submitted by them, could be used by other teachers.

### 2.2.3 Italian experiences

Regarding the Italian experiences, Italian ODS partners started their effort by involving teachers which were already part of networks developed in the framework of previous projects: Dryades (Nimis, Riccamboni, & Martellos, 2012), KeyToNature (Martellos, & Nimis, 2008), SiiT, and “Granai della Memoria”. The collection of feedback on the feasibility of the ODS approach in the country started with that critical mass of teachers. It soon became clear that the interest in innovative teaching and learning practices was widespread. However, due to the curricula limitations, especially in primary schools, it was sound that the full implementation of the ODS approach was difficult. Curricular activities in Italy cover a very high proportion of the teachers’ time spent with their students, so they have only a minimal degree of freedom to implement innovative strategies. Furthermore, as seen by the collected ODS evaluation questionnaires answered by teachers, Italian schools in general and primary schools in particular, are poorly equipped as far as ICT tools are concerned.

The second step of the Italian effort was the recruitment of new teachers. This was done by following two strategies: the first strategy focused on communication through communities of teachers in social media and the second one on face to face meetings in several schools.

The first approach resulted in being ineffective. While reaching wide communities, it was difficult to explain the actual extent of the ODS approach. Furthermore, it was very difficult to explain teachers how ODS could be relevant to their activities without a complete presentation.

These limitations were absent in the face to face meetings. Hence, it was possible to create a new group of teachers and to get them involved in the development process of new educational scenarios. The focus of these scenarios was the use of digital identification tools for studying plants and lichens in schools. For this purpose, each teacher was asked to suggest a scenario (e.g. Let’s discover the plants which grow on old walls), and to cooperate in the development of new digital identification tools, by using resources available in the ODS repositories. This process took place following several steps:

1. The teacher(s) suggest an educational scenario involving the identification of plants or lichens.
2. A local ODS expert was contacted and sent to the school involved.
3. Together with the expert, the teacher(s) created a list of those species, which might be of interest.
4. The list was sent to the National Coordinator which developed a first draft of the digital identification key.



5. The first draft was then sent back to the teacher(s) and the local expert, who checked its accuracy as well as jargon to avoid any mismatch. Both teacher(s) and expert(s) were allowed to propose changes in the digital key in this stage (Martellos et al., 2010).
6. The National Coordinator received the comments and modified the digital key accordingly.
7. The key was finalised and provided to the teacher(s) in three different formats: printable, on CD-ROM, and online.

The most interesting digital identification keys, which have been developed following the aforementioned approach, have been published online on the portal of the Dryades project (<http://www.dryades.eu>).

Even though this approach was extremely successful, it was clear that it was too resource-costly to be sustainable in the long term.

For this reason, a new stage of the Italian effort focused on developing two National

Contests for schools: the first one was the ODS national contest, which aimed at selecting one teacher to represent Italy in the broader European contest; the second one was developed independently by Italian ODS partners and in cooperation with the Italian Lichenological Society.

The latter consisted of using smart-phones and tablets to report the occurrence of four species of easily observable epiphytic lichens (for more details, see the portal of the contest: <http://concorso.lichenologia.eu>). iOS and Android apps were developed for the contest. The results of the first edition were encouraging and the winning school was awarded during the National Conference of the Italian Lichenological Society, in Montecatini (Tuscany). The Italian figures illustrate that, while teachers are often forced to cope with poor ICT equipment and have very little time to look for and organise extracurricular activities, there is nonetheless a great interest for innovation in the area of teaching and learning.

#### 2.2.4 Portuguese experiences

a single collection of a small number of activities, it may be difficult for a more widespread search. Therefore eLearning practice is moving towards the reuse of generative resources, e.g. resources which have been developed by learners during their own learning process. However, most teachers lack the necessary expertise to archive and analyse the learning outcomes of an activity

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### 2.2.5 Lithuanian experiences

The ODS activities performed in Lithuania were coordinated by the national coordinator, who organised national and international events introducing to Lithuanian teachers the innovative teaching model. More than 30 teachers from all over the country participated in the first year of the project. The teachers took part in workshops trying out new technologies before then applying these to everyday learning processes.

In 2013 and 2014 two international ODS

Winter schools were organised and teachers from a variety of countries were invited to participate. They were testing the ODS learning sources database, developing their own learning scenarios, which were later applied to different teaching/learning contexts. The teachers also participated in cultural activities where they had the opportunity to learn more about Lithuania and each other, thus making it easier to share their personal teaching experiences.

### 2.2.6 German experiences

In Germany teachers participated in face to face trainings, which in several occasions were conducted in small groups in order to help them with their specific barriers on an individual basis. During the different teacher training courses best practices focusing on biological topics such as temperate and tropical forests as well as climate change were used to introduce teachers to the usage of OERs. Afterwards teachers implemented their own lessons in their schools and reached together with their colleagues more than 870 students.

In the framework of a German ODS - case study currently 312 10th graders participated

in a half day inquiry a science project named “Tropical Rainforest and Climate Change”. The project imparted knowledge about the complex topic of climate change illustrated through the tropical rainforest and its destruction. Opportunities for actions regarding a sustainable development were shown. This way a set of “soft-skills” and independent learning were promoted. The project supported the education of scientific and social literate citizens, to help them critically evaluate and discuss scientific and political issues. During the project students experienced in an authentic manner the tropical flora in the greenhouses of a botanical



garden (either the University Bayreuth or the Johannes Gutenberg University Mainz). In this informal learning environment they followed an inquiry based approach to learn about the tropical ecosystem and strategies for plant adaptations regarding the climatic conditions in tropical rainforests. In this context the anthropogenic influence concerning the ecosystem was reflected. Possibilities for actions in student's daily life -concerning a sustainable development in the sense of social responsibility were explored. Therefore the project was awarded a contribution to the UN-Decade for sustainable development. A complementing eLearning module (available through the ODS platform - <http://portal.opendiscoveryspace.eu/de/node/669570>) provided a real-life window to a research centre in the tropical rainforest of Ecuador. The students gained insight into the daily life and research of "real" scientists. Thereby students had the unique opportunity to work with original data, which were collected



Figure 7. Students engaging in the digital learning scenario

### 2.2.7 Bulgarian experiences

The ODS project was very successful in Bulgaria. Due to the good collaboration of

during a DFG project (Figures 7 and 8). The idea was to explore realistic scientific problems by themselves. This project was tested and analysed for students' quality perception and learning outcomes when using the eLearning module (Bissinger, & Bogner, 2015) revealing knowledge acquisition and a high quality perception.



Figure 8. Students exploring daily products and their tropical origin

German teachers competed for the first prize within the German national contest "Innovation in classrooms". Herein teachers were fostered to create innovative scenarios on the ODS portal by themselves and to share them with the ODS community. Thereby new schools become engaged with the ODS project.

German content providers were convinced by ODS' innovative approach to contribute to the vast amount of available ODS resources. At the moment 15% of the complete ODS metadata is provided from German content providers.

the ODS project team with the Ministry of Education and Science, a substantial amount of schools were contacted. For a period of 6 months more than 1,200 schools filled in the ODS e-maturity form and prepared the ICT Action Plan.

It was the decision of the Ministry of Education and Science to use the ODS e-maturity forms and action plans as a criteria for awarding financial grants for hardware equipment and Wi-Fi connectivity. A comprehensive evaluation was made for all the schools that applied (considering the availability of Action Plans and e-maturity filled surveys) and an expert group within the Ministry, supported by the national ODS coordinator, prepared the final award rating. This resulted in more than 3 Million euro national grants for about 600 schools across the country. At the end of the hardware stage and within the framework of their fulfilled action plans, the awarded schools will be asked once again to fill the e-maturity questionnaire and check their progress due to the implementation. A parallel evaluation was made for the quality of the ICT action plans to award the top ten schools with a symbolic award, which consisted of a smart-phone and a diploma.

Within the framework of the National ICT in schools program in 2014, about 200 new schools started building up wireless networks and their ODS participation reached the highest weight in the formula for the grant award. This way their innovative potential resulted in extended opportunities to implement further innovations in education.

The ODS project played another important role for the implementation of ICT in Education in Bulgaria. The national ODS coordinator, as well as the National coordinator of ISE (a project complementing ODS in the field of linking schools with science) took part in the preparation of the National Strategy for effective implementation of ICT in Education and Science in the Republic of Bulgaria (2014-2020). The Strategy was approved by the Council of Ministers in July 2014 thus giving grounds to the next stage development in innovative education in the country's school system. Some of the basic ODS and ISE principles and targets were set into the building grounds of the strategy. Amongst these principles and targets were the following:

- Development/implementation of digital publicly accessible and universal educational resources.
- Active network interaction amongst the participants in education and science processes.
- Broadening digital distance education forms.
- Developing methodologies for efficient and justified use of ICT in education.
- Informational environment as a basis to improve education management.
- Production and use of information and knowledge.
- Developing a system for horizontal and vertical education and science portals.

The National Strategy is a solid prerequisite for further development of educational



innovation and ICT implementation within the Bulgarian School System. Therefore it is critical for improving the quality of the

education process and raising the level of ICT competitiveness on a national level.

### 2.2.8 Greek experiences

ODS has to-date (January 2015) achieved to engage 433 schools in Greece, whose participation is being coordinated and supported by Ellinogermaniki Agogi Research and Development Department. Other Greek partners are the University of Pireus, the Technical University of Crete, the Greek Research and Technology Network, Agroknow Technologies as well as CTI Diophantus and the Institute of Educational Policy. All are supervised by the Greek Ministry of Education. Out of these schools, 312 were recruited from January 2013 to December 2014 through various channels (ODS visionary and practice reflection workshops, conferences, presentations and other dissemination events, previous projects). After a general call made by the Greek Institute of Educational Policy another 122 schools were added in January 2015. This formal call was a significant step in the official adoption of ODS by the National Educational Policy as well as acknowledgement of its potential impact on the modernisation of school practice in Greece.

A variety of activities was suggested to schools by the Ellinogermaniki Agogi team and a series of respective ODS communities has been set-up to support their implementation. In terms of curriculum areas,

these activities involved Science and High Energy Physics, Environmental Education, Music, Entrepreneurship as well as teacher training on educational design. Furthermore it encompassed a focus on pupils' transversal key competences. The schools were free to choose more than one of the supported activities and, although Ellinogermaniki Agogi provided them with already existing tools and educational scenarios, they were encouraged to adapt these resources according to their own teaching needs, using the ODS template for the school's action plan.

Below we offer a short description of three selected cases along with some implementation activities from Greek schools, which share the following characteristics:

- Connection, community building and sharing of resources among remote schools through the ODS portal.
- Increase of access to resources for remote and –subsequently– underprivileged schools through the ODS portal and tools.
- Teachers' increased familiarisation with digital educational design tools and implementation of innovative teaching methods, such as the inquiry-based model and project-based practices.
- Schools' collaboration through ODS with regional policy makers, universities,

professional artists and other organisations thus creating networks.

### 2.2.8.1 Connecting schools through music

“Akriton Mousiki” was a live interactive event combining Music and Digital Shadow Theatre. The performance was inspired by the Greek Acritan heritage and included the collaborative preparation, co-creation and realisation of an online event between multiple distant ODS schools. The event was linked together via video-conferencing. During the “Linkcast” (webcasted video-conference) pupils from four remote schools presented a virtual-stage role-playing activity by moving digital figures (e-shadow platform) accompanied with shared live Music performance. The scenario included an advanced interaction between these five remote educational communities on the islands of Karpathos, Gavdos, Kastelorizo and Cyprus hosted by Athens. Part of the dialogues arranged for the event were based upon the Byzantine epos of Digenis Akritas, which had been digitised by the University of Crete Anemi Database. The development of the “AKRITON MOUSIKI” (<http://dma.ea.gr/en/node/87>) activity was the first attempt to produce advanced-interaction scenarios between 4 remote Greek islands, including Cyprus via video-conferencing and involving music as a performance art.

As a result of the project’s impact on ODS, a new community was formed and inspired by the AKRITON MOUSIKI activity. “Travelling in the era of Erotokritos” was

a community of teachers in Chania-Crete exploring educational aspects of Vincenzo Kornaro’s epos of “Erotokritos” and other personalities of the post-Byzantine era. Amongst these personalities were the famous painter Domenikos Theotokopoulos and the composer Frangiskos Leontaritis (<http://portal.opendiscoveryspace.eu/el/node/819182>). Through its manager in Chania the community took part in a group of the “Let Us Share The Music/Let Us Link The World” community along with community-members from Athens and Evros (Northern East of Greece). The group contributed to the preparation of an ODS scenario based on the above prominent Renaissance figures and their Art. After some online training, provided by the parent community manager, the teacher in Chania recorded and edited digital audio files of the participating pupils narrating extracts of a previously selected poem. Digital contributions were uploaded as extracts next to music excerpts from the same era. The latter had been performed by professional musicians, who granted the group permission to use their recording for educational purposes. Original Digital Audio Workstation music was also arranged, composed and produced by the parent-community-manager to accompany the pupils’ narration. Pupils’ paintings were uploaded as well. Finally, the outputs of



these activities formed a Teacher's Music Academy in order to lead future members into advanced methods of exploring ICT in musical interactive scenarios <http://portal.opendiscoveryspace.eu/topic-courses/live-music-education-academy>.

#### 2.2.8.2 Implementing resource- and inquiry-based learning in two remote schools in Greece: Two cases from the area Tychero, Evros

The High School and Senior High School of Tychero are located in a rural agricultural town of North-eastern Greece, near the Evros River. As all rural areas on the border it has restricted accessibility something which the educational authorities officially recognise and are trying to address. The two schools are relatively small in terms of student population and face practical difficulties, such as an inadequate number of teachers, frequently moving staff, poor infrastructure and accessibility issues due to their location. However, in the last few years the schools of Tychero have expressed an increased interest in participating in European networks, in collaborating with peers and other schools and in searching for opportunities to improve their quality of teaching and developing the students' 21st century key- competences. They entered ODS at the beginning of the Pilot Phase 2 (September 2014) after being introduced to it in a Practice reflection workshop, which had been organised by the regional school counsellor, who had been collaborating with the Ellinogermaniki Agogi team. Regional school counsellors were appointed by the Ministry of Education and the experience of ODS in Greece had shown that their role could be significant in disseminating innovative projects, such as ODS, as well as in recruiting and motivating schools to participate in such projects. In addition since they are working, at a local level, they could act as mediators for identifying and supporting those teachers that are already active and motivated. Teachers acting as change agents were recruited from Tychero schools in order to firstly enhance the access of their school to qualitative and innovative educational content from ODS, and especially the repositories of OSR and Discover the Cosmos. Secondly take opportunities for various educational activities and thirdly participate in teachers' professional development training. Within this framework one of the teachers designed four innovative educational scenarios, that were based on the inquiry model and had made use of resources from these repositories and the ODS scenarios authoring tool. The scenarios have either been implemented in the schools of Tychero or are currently still in progress (January 2015) with the support of the Ellinogermaniki Agogi Research and Development Department. The first scenario was implemented within the ICT Curriculum with First-graders (15 years old students) of the Senior High

school of Tychero and was entitled “Pacman with Scratch”. The idea of the scenario was the development of an application in an optical programming environment, such as Scratch. The students worked in groups, designing first the application and then implementing it through Scratch. They then tested and evaluated it and disseminated it to peers and the local community. The results of the Tychero work were presented at the Panhellenic Student Festival of Digital Creativity, which is organised every year by the regional ICT school counsellors. The scenario had been uploaded onto the Greek community of educational Scratch programming of the ODS portal <http://portal.opendiscoveryspace.eu/community/senaria-didaskalias-se-perivallonta-optikoy-programmatismoy-me-plakidia-668762>.

The second scenario was entitled “How did Thales calculate the height of Pyramid of Cheops?” and was implemented at Tychero in school year 2014-2015. The scenario made use of the Project Based Learning approach and engaged students (15 years old) to construct a simulacrum of the pyramid and to calculate its height, following the same method that Thales used in the 6th century B.C. The participating teacher based her work on an original scenario that was already available on the OSR portal <http://www.osrportal.eu/el/node/95028> and which was then adapted by her to her class.

The implementation of the third educational scenario was inspired and initiated by the Eratosthenes experiment [\[ea.gr/\]\(http://www.osrportal.eu/el/node/94691\), an international activity, which was offered to ISE \(Inspiring Science Education\) and ODS schools in March 2014 attracting 350 schools from 37 countries. Once again, the activity, which had been implemented at Tychero with second-graders \(16 year old students\), was based on an original scenario of the OSR portal <http://www.osrportal.eu/el/node/94691>, that the teacher adapted to her particular school and students’ needs.](http://eratosthenes.</a></p>
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Finally, the fourth scenario, that is currently being implemented in the Tychero High School, is entitled “Good night to the stars” and its objective is to first, introduce students (12 to 15 year-olds) to basic concepts of Astronomy and then, to prepare them for a virtual connection with the Faulkes robotic telescopes, that will be conducted with the support of the Ellinogermaniki Agogi R&D team. The scenario will also engage students in constructing a model of the solar system and disseminating their final report in a wiki environment.

The evaluation of the impact of these scenarios on pupils’ learning is still in progress. However some significant remarks made by the two school teachers include: increased interest on the part of the students, greater satisfaction from hands-on learning compared to conventional teaching and thus accomplishment of affective educational objectives. There was also improvement in classroom time management and psychomotor objectives, such as pupils working effectively in groups, taking initiatives and volunteering to work on these projects in their free time.



The teacher also reported that the ODS resources supported her in terms of scientific expertise and inspired her to be more creative.

### 2.2.8.3 Connecting schools through music

The experience of ODS in Greece has shown that building partnerships is important for the successful implementation of pilot activities with schools. A case of such partnerships was a practice-reflection workshop that Ellinogermaniki Agogi organised (Nov/1/2014) in collaboration with the Hellenic Focusing Centre (Person-Centered & Focusing-Experiential Counseling & Psychotherapy <http://new.focusing.gr/>) on Thinking at the Edge (TAE). This is a focusing technique developed by the philosopher Eugene Gendlin (2004) to facilitate pupils' authentic writing. The workshop was delivered by Nikos Kypriotakis, a secondary school teacher of Physics and active change agent at a Greek ODS pilot school.

TAE aimed to highlight the phenomenological and perceptual field of pupils, developing their creativity and experiencing process in general. Furthermore, the TAE method aimed to restate our conceptual and linguistic

“landscape”, where creativity and innovation were required. In TAE, the author's ‘felt sense’ of satisfaction defined the outcome. It is a multi-levelled method with great experiential depth and breadth, in which the ‘more’ of our embodied intricacy, authenticity, intelligence and ‘tacit knowledge’ is being promoted and carried forward through the multiple process of its symbolisation.

Over 40 teachers and school advisers attended the event and actively participated in designing lessons that aim at enhancing pupils' learning experience. The participants acknowledged that TAE could be particularly helpful in unpicking their competences for creativity and innovation. The workshop experience suggested that such practices could further support the implementation of ODS pilot activities. Additionally it could empower teachers' change management skills, that were at the core of the ODS innovation model.

### 2.2.8.4 Final remarks

In summary, the overall experience from the ODS implementation in Greece has shown that the following practices can have a positive impact on schools' engagement in a project that promotes school innovation,

taking advantage of the opportunities it provides them with:

- The ODS approach based on its innovation model could be unprecedented and even challenging for schools, especially



in those countries with centrally governed educational systems, like Greece. Providing individualised and personal support is crucial in helping schools to develop their own innovation strategy and convincing them that they have the power to change and improve education.

- Engaging and collaborating with regional educational authorities and policy makers also helps in creating a safer environment for schools and teachers that seek change and innovation.
- Opportunities for disseminating individual cases of innovative teachers and schools to their local or wider educational

### 2.2.9 International activities

Under the ODS project, several international activities have been organised. These kinds of activities show the strength of these projects as they involve teachers on a worldwide level. The Eratosthenes experiment is an international ODS event based on Eratosthenes' measurement of the Earth's Circumference. In 2014 the second event of this experience took place. A total number of 350 schools around the world participated simultaneously making the measure of the Earth's Circumference by using something as simple as a stick. Figure 9 illustrates a map with a sun label for each participating school. The students were asked to carry out a lesson plan, which can be found on the ODS portal. During the experience, the schools were invited to take photos and submit them in

community (e.g. teachers presenting their own work in conferences or presentations through the press/ media) could have a very positive impact on schools' engagement: Therefore individual efforts were rewarded and further encouraged, acting also as multipliers and sources of inspiration for other teachers and schools.

- Similarly, it is important to promote regular networking activities that bring together teachers from different schools in order to build trust and a common vision that will encourage them to share their resources on a public platform, such as ODS.

order to participate in a photo contest.



Figure 9. Participating schools in Eratosthenes experiment

Contests are an excellent idea to draw new teachers to the project and collate the teachers who are already involved in the project. In the international contest 2013-2014, named "Let's move teaching

process to the limelight!” the participants (teachers) were asked to create a learning scenario, according to their own interests and teaching preferences. Participants were invited to design the learning scenario using the ODS authoring tool provided on the ODS Portal. Once the submission period was over, all participants had to vote for the best learning scenario. The three winners were distinguished participants of ODS Summer School 2014 in Athens.

In the ODS contest 2014-2015, named “Let’s have teacher to the limelight!” the teachers had not to create a learning scenario according to their personal interest, but it had to be the most innovative and enhancing scenario for their students. This contest had two stages: the national stage and the pan-European stage. At the national stage, teachers had to develop a learning scenario, in their national language, for their students using the ODS authoring tool provided on the ODS Portal.

### 3. Conclusions

Upon the completion of the project, ODS will have contributed to modernising school education, bringing innovative teaching models and resources to European schools. Furthermore ODS will have contributed in engaging teachers to acquire digital competences and to use these to support students in their learning processes.

The National Coordinators of each participating country in the ODS project have encountered different obstacles to

Each country had to announce a winner. At the pan-European stage, only these national winners were eligible for participation. At this stage of the contest, students, the peers, the co-workers and the whole educational community were asked to vote for the best learning scenario.

In ODS, there were not only contests for teachers but also for schools. The “ODS Innovative School Contest 2015” was launched to celebrate the huge number of European schools where ODS had been active. This contest rewarded the 15 most active ODS schools. Some of the criteria to determine the winning schools were (the list of criteria is much longer): number of registered teachers in comparison to the total number of teachers in the school, number of registered teachers with completed competence profiles or number of school community members and how this community has evolved.

support the teachers introducing innovative teaching approaches at schools. This was due to diverse factors, such as, the ICT equipment in schools, the educational system, the support of the educational policy makers or the flexibility to change the curriculum.

Nowadays, communication through the Internet is very common and widespread, which makes it easy to reach people worldwide. Nevertheless, as we can observe from the testimonies and experiences reported by the

different participating countries, the Internet has not been as effective as we expected in disseminating the efficacy of the project. Additionally, the here described experiences have shown that even though face-to-face meetings usually make a high impact on teachers, they require a huge effort in terms of time scheduling and teacher mobility. In contrast this strategy results in being unsustainable on a large scale. However the here described experiences have also proven that other strategies such as, for instance, national and international contests, turned out to be a good strategy to focus teachers' attention on the ODS project. And thus they helped familiarising them with its educational purposes, online platform and widespread network.

The ODS project intended to follow a bottom-up approach in order to introduce innovative teaching and learning practices in schools and to share these on a global stage with other practitioners. These practitioners might be interested in getting new ideas and resources to integrate them into their own teaching practices. An important step in this process was to get in touch and to work very closely with the teachers themselves rather than working solely with the school managers. Regardless of the fact that the project was conceived as a bottom-up approach, the results from Table 1 (the number of ODS schools, teachers and students) led us to

assume that those participating countries, which were supported by their educational policy makers, achieved a significantly higher number of participating schools, compared to those countries which did not get the same support.

During the course of the project we have been observing that teachers often experience difficulties in searching and sharing online educational resources. Amongst the most common reasons are the language barriers, the lack of official acknowledgement in teachers' curriculum as well as the lack of more support by the educational authorities. All the mentioned aspects make it extremely difficult to engage teachers in any kind of project beyond their daily teaching activities, which themselves are very time consuming, focusing not solely on teaching but also on numerous additional activities such as filling in reports on teaching activities, etc.

Despite all these difficulties found during the ODS project, the close collaboration with teachers, parents and stakeholders has highlighted once again not only the enormous need to introduce innovative teaching and learning strategies in schools, but also to support teachers, parents and other stakeholders to: Firstly in familiarising them with the already available e-learning resources and secondly learning how to use or even adapt these resources to their own educational needs and practices.



	Schools	Teachers	Students
Austria	29	42	725
Belgium	68	77	12,760
Bulgaria	426	822	14,067
Croatia	103	841	4424
Cyprus	50	162	1,445
Estonia	74	74	1560
Finland	276	269	7,510
France	49	50	1,795
Germany	27	33	931
Greece	445	2,002	17,839
Greenland	10	10	180
Ireland	62	62	860
Italy	44	186	2,642
Latvia	52	56	995
Lithuania	23	23	495
Netherlands	24	31	385
Portugal	159	213	6,607
Romania	310	1,295	19,870
Serbia	80	278	4,538
Spain	47	209	1,555
UK	77	77	1,790
Hungary	2	2	40
Poland	5	5	100
Turkey	4	9	302
Total	2,446	6,828	103,415

Table 1. Number of ODS schools, teachers and students

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