

OPEN CONTENT, OER REPOSITORIES, INTERACTIVE TEXTBOOKS, AND A DIGITAL SOCIAL PLATFORM: THE CASE OF GREECE

Elina Megalou¹, & Christos Kaklamanis^{1,2}

¹Computer Technology Institute & Press “DIOPHANTUS” (Greece)

²University of Patras (Greece)

Abstract

Open digital educational content is a key priority of the Greek national K-12 educational policy. “*Digital School I*” national initiative (2010-2015) resulted in 7,500 Open Educational Resources (OERs); 100+ open, interactive textbooks; a modern digital repository infrastructure (*Photodentro*) for hosting, organizing, and sharing K-12 OERs, along with a national educational content Aggregator service and portal for harvesting and providing seamless access to externally hosted OERs; and a social educational platform for pupils and teachers (*e-me*). The paper presents the current status in Greece regarding K-12 digital educational content and e-services, in line with the Greek K-12 digital policy, and the new nation-wide program “*Digital School II*” (2017-2018) that extends and upgrades the current infrastructure.

Keywords: OERs, K-12 digital educational content, national strategies, repositories, digital platforms.

1. Introduction

Over the past few years there has been an increased interest for high-quality open educational resources (OER) in K-12. OERs (i.e. teaching, learning and research materials of any type, which are either in the public domain or released with an open copyright license (UNESCO, 2012)), are more and more recognized as an important component of educational policies. Many national and international initiatives are promoting the creation and sharing of OERs. The trends and implications of open content for learning and education are discussed in (Geser & Schaffert, 2017).

1.1. The Greek national policy for digital educational content

Digital educational content is a key priority of the Greek national digital educational policy for primary and secondary education, which is reflected in the design of national programs for ICT in K-12. From the first nation-wide pilot program for integrating ICT in all school subjects that was implemented in Greece back in 1996-2001 (Hatzilacos et al, 2001) and the large-scale national project that followed for localizing international educational software products to the Greek educational system (1998-2004), up to the first major national effort to develop Greek educational software and digital content (2001-2008) by involving both K-12 teachers and the Greek software market, considerable experience has been gained for the establishment of a *National Policy for Digital Educational Content*. Following the directions of the 2020 digital agenda of Europe and the international trends, the key action lines of the *national policy* are:

(1) *Promotion of Open Educational Resources (OERs)*: all teaching and learning resources of any type that are developed with public funds should be publicly accessible resources for any user, to use, re-mix, improve and redistribute under the Creative Commons license;

(2) *Fostering re-usability*: the development of *Learning Objects*, i.e. small, self-contained, reusable OERs that are semantically and functionally autonomous (Wiley, 2000) is highly recommended;

(3) *Easy access to OERs*: the development of a *modern digital infrastructure and e-services* to promote learning, to reduce social inequalities, and to foster social inclusion is a priority;

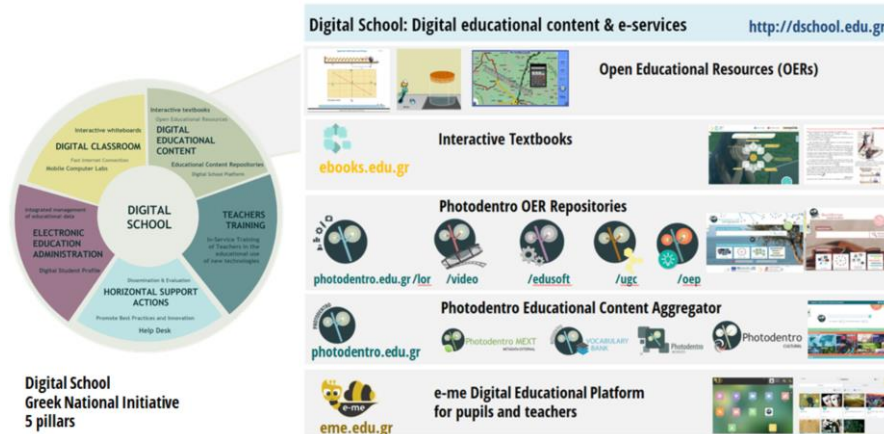
(4) *Supporting the role of teachers and pupils as content creators*: teachers and pupils are encouraged to use openly licensed materials and to have an active role in the creation of OERs.

1.2. The “Digital School” Greek national initiative

Digital School is the Greek national initiative for the digital transformation of K-12 education. Following a holistic approach, the initiative addresses all major aspects for effectively integrating ICT in the Greek state school system. Launched in 2010 by the Ministry of Education (MoE), it funded programs

in five pillars (Figure 1). *Digital educational content* is one such pillar; in-service *teacher training* and the *digital classroom* (classrooms equipped with interactive teaching systems and supported by a nation-wide school network), are the other two pillars, both strongly linked with the provision of digital content. *Horizontal support actions* and *electronic administration platforms* complement the group of pillars.

Figure 1. Digital school Greek national initiative pillars - digital educational content & e-services.



1.3. Digital Educational Content within the Digital School National initiative

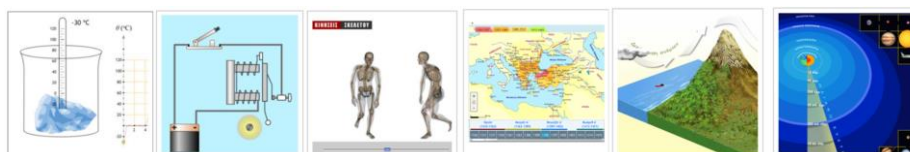
The “*Digital School Platform, Interactive Books, and Learning Object Repository (Digital School I for short)*” (<http://dschool.edu.gr>) is a flagship program that implemented the digital educational content pillar from 2010 to 2015. The whole program was coordinated and realized by CTI, in our capacity as the technical organization supporting the Greek MoE. With a total budget of 8,7 million euro, the program involved more than 200 qualified teachers, pedagogical and domain experts, and academic professors, and around 80 engineers and technical personnel. The program was distinguished as best practice, as it ranked 4th among all projects funded by the European Social Fund in Greece for that period.

The new national program “*Digital School II: Expanding and Exploiting the Digital Educational Platform, the OER Repositories and the Interactive Text Books*” is a continuation of the previous one for the period 2017-2018 (funded by Greek NSRF 2014-2020). The rest of the paper describes the current infrastructure in Greece regarding open digital educational content for K-12 education (section 2); open interactive textbooks (section 3); digital OER Repositories (section 4); an Educational Aggregator (section 5), and a social educational platform for pupils and teachers (section 6) as a result of the Digital School I program; Section 7 focuses on the next steps, giving an overview of the Digital School II project.

2. Open Educational Resources (OERs) & Learning Objects

Since 2011, the *Digital School* community of 200 qualified teachers, working in 12 scientifically supervised domain-specific groups, has developed and maintained 7,500 *open, reusable Learning Objects* (Figure 2), covering a wide spectrum of areas and educational objectives of primary and secondary education, including Mathematics, Physics, Chemistry, History, Geography, Foreign Languages, Religious Education, and Aesthetic Education; another 1,500 OERs were extracted out of existing educational software products. Most learning objects are “click-and-play”. Learning resource types include simulations, visualizations, interactive maps, exercises, timelines, educational games, etc.

Figure 2. Examples of open, reusable learning objects.



3. Open textbooks, interactive textbooks, and the e-books portal

Open textbooks: All textbooks for K-12 education (~300) are openly provided online in various open digital forms, either pdf or editable html that resembles their printed version.

Enriched textbooks with multimedia, interactive learning resources: More than 100 textbooks

have been enriched with click-and-play OERs (Figure 3b). Linking OERs within textbooks' html proved to be a good, alternative approach for associating digital resources with learning goals of the curriculum, offering in addition a familiar browsing interface for teachers and pupils to navigate through learning resources. This was feasible in the centralized Greek educational system, as there is only one official textbook or set of textbooks for each lesson, published centrally by the MoE's publishing organization.

Figure 3. a) e-books portal and b) examples of enriched, interactive textbooks.



The e-books portal (e-books.edu.gr) (Figure 3a) is the official portal of the Greek MoE for hosting and delivering all digital forms of textbooks to pupils, teachers, parents, and the general public. It is open to everyone, while all textbooks are provided for free for non-commercial use. The portal has more than 600.000 unique visitors per month. It has also support for deaf, blind or partially sighted users.

4. The Photodentro national digital repository infrastructure for K-12 resources

The most significant part of the Greek national infrastructure for K-12 educational content is the *Photodentro* ecosystem of five (5) OER digital Repositories, each one serving a different purpose. *Photodentro* provides the *digital infrastructure for hosting, organizing, and allowing easy access to OERs*, with a strong emphasis on *open access*, thus implementing the Greek national strategy for educational content. All resources are freely available to everyone under the CC BY-NC-SA 3.0 license. Three *Photodentro* repositories host certified or curated content (only authorized users can publish there):

(1) *Photodentro LOR* (photodentro.edu.gr/lor) hosts *Learning Objects* for K-12 education, covering a wide range of disciplines and grades (Megalou & Kaklamanis, 2014). Current collections count ~9.000 learning objects developed mainly by the *Digital School* community.

(2) *Photodentro Video* (photodentro.edu.gr/video) hosts short length, curriculum-related, and suitable for in-classroom use, educational videos. Current collections count ~1000 videos, including Greek educational TV productions, documentaries, and student videos that won in various contests.

(3) *Photodentro EduSoft* (photodentro.edu.gr/edusoft) hosts standalone educational software.

Figure 4. *Photodentro LOR*: a) home page; b) browsing by learning resource type; c) list of results.



Two more repositories are provided for hosting teacher-generated content: (4) *Photodentro UGC* (photodentro.edu.gr/ugc), where teachers upload and share their own OERs, and (5) *Photodentro OEP* (photodentro.edu.gr/oep), for sharing Open Educational Practices (OEPs), i.e. innovative, reusable teaching techniques that draw upon OERs; OEPs include results, experiences, and reflections. A public profile is required for teachers in order to upload OERs and OEPs. A support action (i-participate.sch.gr) and an annual national contest on K-12 OEPs have been established to boost the use of OERs.

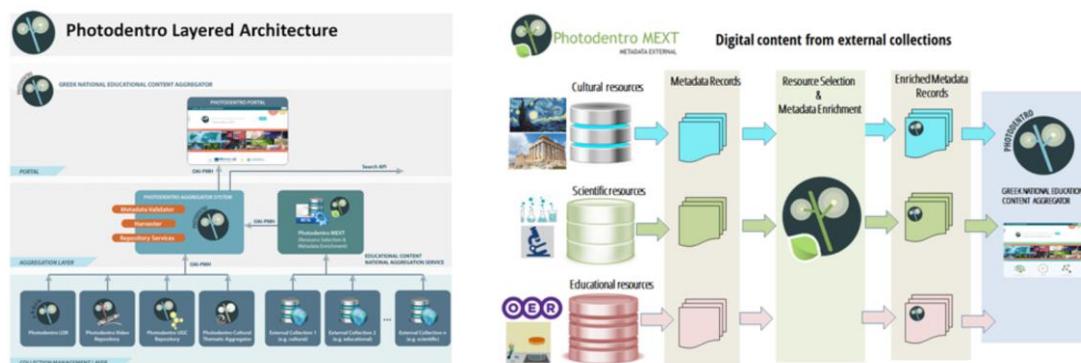
All *Photodentro* repositories support browsing, free text search, and faceted search, allowing users to narrow search results by applying multiple filters (Figure 4). Their implementation is based on DSpace (dspace.org), an open source platform for building digital repositories. They all provide an Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) target and they fully support the IEEE LOM specification for standards-based description and exchange of metadata of educational resources.

Photodentro SaaS: The recently launched *Photodentro SaaS* initiative drives the expansion of the *Photodentro* ecosystem of OER repositories. It is based on the *Software as a Service* model (SaaS), allowing for all interested organizations to implement a *Photodentro* repository to manage their objects.

5. The Greek National Educational Content Aggregator & support sub-systems

The Greek national infrastructure for K-12 educational content includes also the *Photodentro Greek National Aggregator & portal*. The *Photodentro portal* (photodentro.edu.gr) serves as the focal access point to all OERs targeted to the Greek school community. It currently provides seamless access to 17.500 OERs, from 15 repositories and 17 content providers. The *Photodentro Aggregator* is the national service for harvesting and accumulating educational metadata from various, external OER repositories and collections (museums, audiovisual archives, etc.). In order to ensure quality of metadata, all learning resources from external repositories are aligned and enriched -if needed- with educational metadata, according to the *Photodentro IEEE LOM GR Application Profile*. *Photodentro MEXT* is the intermediate system that supports the Photodentro Aggregator service, providing a metadata authoring environment for the selection and annotation of aggregated digital resources with additional metadata.

Figure 5. a) *Photodentro aggregator architecture* and b) *metadata enrichment process of external collections*.



Photodentro Cultural (photodentro.edu.gr/cultural): it is a result of a harvesting process and it operates as a thematic aggregator for cultural OERs; 200,000 resources of Europeana collections (www.europeana.eu) have been harvested, 6,700 objects of which have been selected and enriched with educational metadata by 100 teachers, who highlighted their educational value, by classifying them into the K-12 curriculum goals, topics, age range etc., and by providing guidelines for their pedagogical use.

The *Photodentro* infrastructure includes also support systems, among them:

- *Photodentro microsites*: A microsite is a light-weight, individual web site that supports certain views of the Photodentro portal aggregated content. A mechanism to easily build *microsites* on Photodentro aggregated content has been developed along with a microsite instance for English Language resources (micro.photodentro.edu.gr/english2015).

- *Photodentro Vocabulary bank* (vocbank.photodentro.edu.gr/) is a web based environment to manage taxonomic schemata (controlled vocabularies and taxonomies) that implements a single point of reference for all sets of vocabularies of *Photodentro IEEE LOM GR Application Profile*.

- *Photodentro Quality Seals* is a new repository of the Photodentro family to support a quality assurance scheme for its content based on *Quality Seals*. A *Quality Seal* can represent either a process, or a set of evaluation criteria, or a brand name. The repository hosts and manages Quality Seals, stamping records for OERs, while it has a Registry of Certifiers.

6. The Greek digital educational platform (e-me)

e-me is an open, safe social digital educational platform for pupils and teachers in primary and secondary education, offering strong support for sharing files and apps (Megalou et al., 2015). It has been designed and implemented by CTI to serve as the main digital working space for 1,000,000 pupils and 120,000 teachers of the Greek K-12 community.

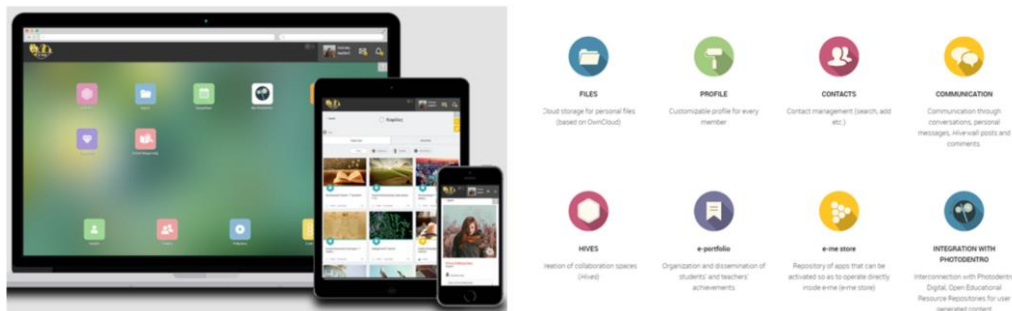
There is a plethora of Learning Management Systems (LMSs) developed so far; *Moodle* (moodle.org) is among the most popular open source ones, however, it imposes a steep learning curve for the end-user. Edmodo (www.edmodo.com) free social platform is a widespread example of next generation LMSs. Personal Learning Environments (PLEs) have emerged to provide easily customizable learning environments and multi-sourced content. *e-me* is an open source implementation of a PLE.

It is known that software become obsolete very quickly; thus, when developing infrastructure with public funds, competing with the market is not a sustainable model. *e-me* is based on a sustainable model for growth and extension. Efforts focused on the development of the underlying “framework”, providing an extendable platform ready to host third party applications, allowing therefore pupils and

teachers to use tools that are familiar with. Sensitive data and apps reside in regulated and controlled infrastructures, while the sustainability model encourages the software market and the educational community to contribute with apps that extend its functionality.

e-me has a user-centered approach, where “pupil” is at the center. It implements a social learning environment with a modern and intuitive user interface, where all pupils and teachers can safely share content, connect and collaborate with peers, publish their work, use a large number of embedded apps, and interact with a wealth of open educational resources. A key structural concept of the *e-me* world is that of “hives”, which accommodate smaller, self-contained social, regulated learn-places. *e-me* provides personal file space on the cloud; e-portfolio; blogs; messaging; tools for content development; a personal repository for OERs; and a variety of apps to support both formal and informal learning experiences.

Figure 6. *e-me*, the Hellenic digital educational platform for pupils & teachers.



7. Next steps: The Digital School II Greek National program

The new nation-wide program “*Digital School II: Expanding and Exploiting the Digital Educational Platform, the OER Repositories and the Interactive Textbooks*” (2017-2018) updates, extends, enriches and upgrades the above educational services. Some hundreds of new OERs are being developed, covering new disciplines and K-12 curriculum goals, including pre-primary education and vocational education; the successful model of involving qualified in-service teachers in the OER development process continues; particular emphasis is given to metadata quality for effective search and retrieval of OER resources, by establishing a central service for continuous metadata curation; the *e-books portal* is being upgraded to a modern standards-based Photodentro-like repository for interactive textbooks, including an advanced search mechanism to allow search within book texts; the Photodentro OER Repositories expand following the Software as a Service (SaaS) model; the Photodentro Aggregator national service is launched, inviting content providers to get connected; harvesting of new collections and repositories is envisaged; the *Quality Seals* repository and service is launched as well; the *e-me* social platform evolves and operates on a large scale, while the educational community is invited to participate with ideas for *e-me apps* adding new functionality; existing functionality is improved, while new is added, including synchronous communication, blogs, assignments and a content development tool.

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