

Sistema hipermedia para administrar objetos de aprendizaje en educación secundaria

Hypermedia system to manage of learning objects in secondary education

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Resumen

En la actualidad, las instituciones educativas se han visto en la necesidad de implementar programas de enseñanza apoyados en los avances tecnológicos para la mejora continua de sus alumnos. En el presente artículo se propone un sistema hipermedia administrador de objetos de aprendizaje, cuya aplicación tiene como objetivo mejorar el proceso enseñanza aprendizaje y desarrollar el hábito del auto aprendizaje, además de estar dirigido al nivel de educación secundaria. En la primera etapa se define una estructura para el contenido del objeto de aprendizaje (OA), en la segunda fase se especifica una estructura del dominio del conocimiento y una estructura de almacenamiento a un repositorio de OA. Al crear este repositorio, los OA estarán disponibles para reutilizarse en la estructuración de otras asignaturas relacionadas con su contenido, para lo cual este debe cumplir con el estándar Dublin Core en la especificación de los metadatos durante la integración al repositorio.

Palabras clave: objetos de aprendizaje, sistema administrador, hipermedia, metadatos.

Abstract

Today, the educational institutions are in the need to implement educational programs supported by technological advances for the continuous improvement of their students. This article proposes a system hypermedia administrator of learning objects, whose application aims to improve teaching-learning process and develop the habit of the Autodidacticism, in addition to being aimed at the level of secondary education. The first stage defines a structure for the content of the Object of Learning (OA), at the second phase a domain of knowledge structure is specified and a management structure to an OA repository. To create this repository, OAs will be available for reuse in the structuring of other content-related subjects, for which this must comply with the standard Dublin Core metadata specification for integration into the repository.

Keywords: learning objects, administrative system, hypermedia, metadata.

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Introduction

Nowadays technological advances applied in education allow an improvement in the teaching learning process, these have appeared as educational platforms or systems administrators offering a more attractive way to access knowledge. Also on the web there are a variety of educational digital material (videos, images, texts, graphs, etc.) that can be used for the creation of OA.

On the other hand, teachers need to rely on multimedia resources to make their classes more interesting and attractive for their students. Some teachers download material on the web, while others design and build your own resource. Currently students skills in the use of computers, accessing in social networks platforms, and web sites facilitate the implementation and use of systems applied in education.

In the classrooms of basic secondary level education of Colima State is currently available computer equipment for the teacher and laptops for students, there is also internet connection in every classroom. Utilizing this equipment a web system for educational purposes can be implemented for the teaching-learning process.

Due to the aforementioned situations, we propose a system hypermedia administrator OA at the level of secondary education that allows teachers in an educational institution to capture the contents of a subject through an OA composed of text, images, videos, animations, etc; these in turn can be consulted by students and reused for other subjects. The extensions of files that the system allows are the following: Doc, docx, ppt, pptx, pdf, avi, mp4, png, gif, jpg. For integrating the scheme Dublin Core (DC) for easy access and interoperability is used. This proposal can be seen in the conceptual model in Figure 1.

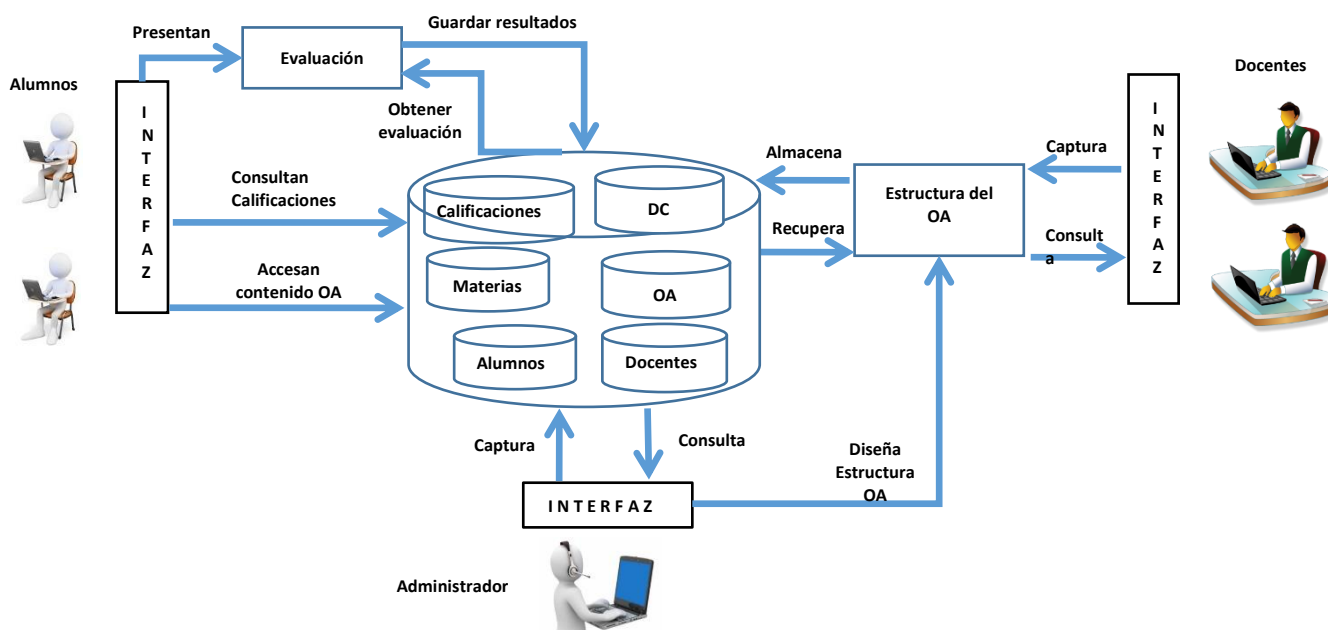


Figura. 1. Modelo Conceptual Sistema Hipermedia Administrador de Objetos de Aprendizaje para Educación Secundaria

In the conceptual model it can be seen that there are three types of users the administrator user, the user teacher and student user. Each has a specific function through an interface that varies according to user privileges. All actions performed by each type of users are made to the same database.

Administrator user: User with the function to maintain the proper functioning of the system, and updates the database catalogs and give permissions to users to the system.

Teacher: User using the tool to capture, modify, delete, and query OA for the delivery of their subjects.

Student User: User student is the student who enters the system to check the contents of OA of your subject for learning and then your assessment of knowledge acquired and stored the qualification obtained in the database.

SIMILAR SYSTEMS

Some administrators education systems existing today are:

Edmodo (2014) is a program whose main objective is to allow communication between teachers and students. It is a social networking service created specifically for use in education that provides teacher of a private virtual space where you can share messages, files and links, a calendar of classroom and suggest tasks and activities and manage.

It was created in 2008 by Jeff O'Hara and Nic Borg, although a few years ago was acquired by Learning Revolution. The project is available in Spanish and in 7 languages.

It is available to the entire educational community for free. In addition there is a "lively" project that is constantly being improved by the team in charge of development, surprising promptly with interesting improvements in functionality.

Moodle (2014), or Modular Object-Oriented Dynamic Learning Environment (Environment modular object-oriented dynamic learning. It is a platform of free use GNU, and is the most used worldwide including prestigious universities. Internet Site where They can perform all educational activities related to the transmission and distribution of content and materials. It has the ability to add tools like chat, discussion forums, statistics qualifications, work in groups and many others.

This document is organized into sections, Section I describes the current situation regarding the application of technology in education, the skills of the key players teachers, students and the availability of computer equipment in secondary schools; the proposal also shown in the conceptual model. In section II defined concepts and elements necessary for the development of the proposals in section III the proposal of the internal structure of OA described, the domain structure of the knowledge of OA and navigation structure are described search OA. In Section IV the results representing the system interface shown. In the V section discusses and concludes with the results obtained with the proposal for the teaching-learning process.

II. CONCEPTS AND DESCRIPTION OF ELEMENTS

Before describing the structure of OA, the domain structure of knowledge and repository storage structure review some definitions to support the proposal:

OBJECT OF LEARNING

Astudillo (2011) defines it as a digital learning unit designed to achieve a goal of simply learning, and to be reused in different virtual teaching and learning, and in different learning contexts. You must also have metadata conducive location, and allow discussion of its contextualization.

Varas (2003) defines as individual self-contained, reusable pieces of content that serve instructional purposes. Learning objects must be hosted and organized on Meta-data so that the user can identify, locate and use for educational purposes in Web-based environments. Potential components of a learning object are:

- Instructional Objective

- Content

- Activity learning strategy

- Evaluation

OA FEATURES

For Maris Massa (2012) OA must have the following characteristics:

Reusability: ability to be used in different contexts and educational purposes and to adapt and combine in new training sequences.

Interoperability: the ability of structures and systems integration (educational platforms) different, likely to be exported and imported, without compatibility problems.

Accessibility: easy to be identified, located through labeling with various descriptors (metadata).

Durability: validity of information objects with information on times and upgrade recommendations.

Scalability: capacity for integration into more complex or extensive learning within the domain for which they were created structures.

Generativity: ability to build new OA derived from it. Possibility of updating or modification through community collaboration OA development, increasing its potential.

Conceptual self-restraint: Ability to self explained and possible learning experiences intact.

Granularity: Term related to the size and level of aggregation. A smaller size will be greater granularity because it allows integrating different learning scenarios.

HYPERMEDIA

(Sánchez, Barbara Vargas, 2006). Hypermedia is the technology that enables structure information in a non-sequential manner, by means of nodes interconnected by links. Consider the design information and navigation design. Good design information from the point of view of its organization and usability, will be the one that helps the user to find the information you are looking for the easiest, quickest and easiest way possible.

Hypermedia not only makes the user receiver elaborate messages, but also allows for an exchange of information between the user and the message delivered. In this sense, you can develop messages and most importantly, decide what information sequence must be followed, at what pace, and how much and which provide depth information. All within the limits previously set by the program designer.

REPOSITORY

(Chazarra, Requena, Valverde, 2010) repositories of digital content, also called digital libraries are places where collections of digital resources are stored in an organized manner with a descriptive system through metadata. A digital content repository is a system that uses the Internet, used to store and control the information stored in digital content and facilitates the access of users to this content, usually from anywhere in the world.

Metadata

(Chazarra et al, 2010) The items that are stored within the repositories of digital content, usually labeled by a set of attributes that are defined by metadata. This metadata (composed of the goal lexeme (about) and the lexeme word data) are a set of attributes or elements necessary to describe a resource; and serve to define the data as part of an object.

DUBLIN CORE

(Chazarra et al, 2010) These are descriptive metadata. They were initially created to catalog and share information on books between libraries. This metadata model is sponsored by the DCMI (Dublin Core Metadata Initiative), which is dedicated to promoting the widespread adoption of interoperable metadata standards. Dublin Core is defined by the ISO 15836 standard in 2003, and Z39.85-2007 NISO standard. The specification of the elements that makes Dublin Core consists of the following labels:

- dc.Title Title. The name given to the resource.
- DC.Subject materials and keywords. The theme of the content of the resource.
- DC.Description description content of the resource. You can include an abstract, a table of contents, etc.
- • DC.Source Source. Reference to the resource from which derives the current document.
- • DC.Languaje Language. The language of the content of the resource.
- • DC.Relation ratio. A reference to a resource related to the content.
- DC.Coverage Coverage. Scope of the content of the resource. It may be a legal geographic specification, or temporary.
- dc.Creator Author. Responsible for creating the content. It can be an entity, a person or a service.
- dc.publisher Editor. Responsible for the resource is available.
- DC.Contributor Contributor. Responsible for making contributions to the content of the resource.
- DC.Rights Rights. Information on the rights of intellectual property recuso, such as copyright.
- DC.Date date. Date associated with the creation or modification of the resource. It usually follows the YYYY-MM-DD notation.
- dc.type type or category of content. Key vocabulary words that describe the nature of the resource.
- DC.Format format. Physical description of the resource, such as its size, duration, size, etc. if applicable. MIME types are often used.
- dc.Identifier ID. Unambiguous reference to the resource content. For example a URL or ISBN.

III DEVELOPMENT PROPOSAL

STRUCTURE OA

Then in Fig. 2 we can see the elements of the proposed structure for OA. And then he describes each of them.

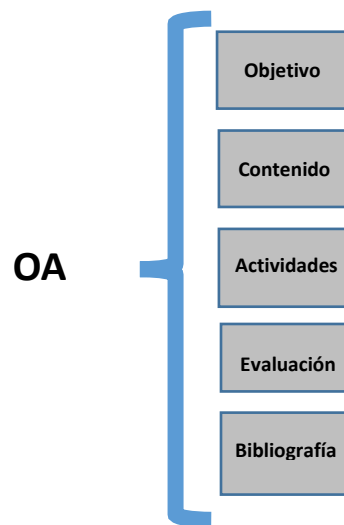


Figura. 2. Estructura del Objeto de Aprendizaje

Objective: This element describes the scope or expected learning by students.

Content: element containing information as concepts, procedures, processes, etc. Through digital resources such as texts, images, videos, animations etc. These should be organized in an appropriate way so that the student's attention is captured and learning by the same is provided.

Activities: Joint exercises or activities to apply the knowledge gained in the content.

Assessment: An element that contains an evaluation regarding knowledge acquired content and activities.

Bibliography: An element that contains the sources and references consulted for the development of OA.

STRUCTURE OF THE DOMAIN OF KNOWLEDGE

The existing structure in a high school in the state of Colima for a course during a school cycle is shown in Figure 3.

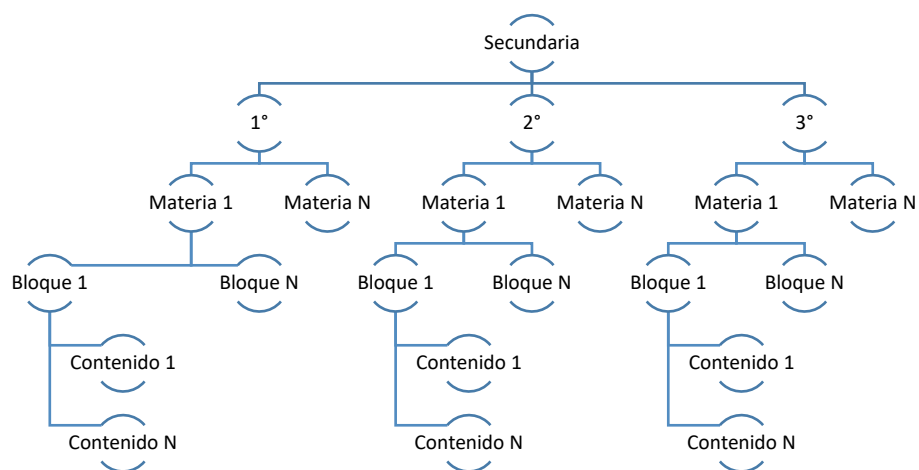


Fig. 3 Structure of the domain of knowledge to access the Learning Object

This tree-like structure will allow access and simultaneously identify each OA. Are main secondary node, once the three grades in secondary and identified 1 for first grade, second grade 2 and 3 to the third degree; at the next level we have set of subjects these were identified from 1 to n that vary in the number of subjects in each grade, the next level is the block that will be identified from 1 to 5 that are divided both the content and assessments 5 blocks and in the last level to be identified content of 1 to n for the number of contents vary by block from this level the OA for each content will be built. In Figure 4 shows the structure of OA identification, this identification will be stored on the Dublin core standard with all other requested items.

Grado	Materia	Bloque	Contenido	Id_OA
1..3	1..9	1..5	1..N	1..N

Figure 4. Structure of the learning object identification

Navigation chart

In figure 5 it is shown how the user would have to navigate to go selecting all the elements necessary to find the requested OA.

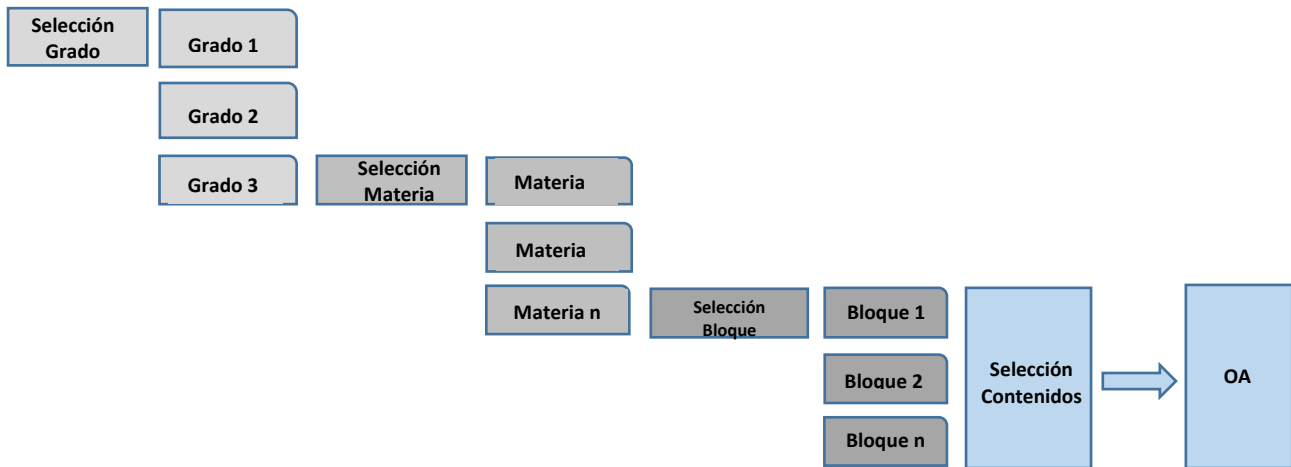


Figure 5. Diagram navigation system administrator hypermedia learning objects

The first element of the grade selection depending on how we appear the subjects enrolled in grade following the block selecting the current assessment which we show the contents giving rise each content to OA.

IV SYSTEM INTERFACE

The technology proposed in the development of this system is particularly Web HTML and PHP was used to give focus to a Web application, as well as use the Apache and MySQL buffer system and database manager system. Figure 6 shows a screen interface for all users can view shown as an OA to consult.

Objetos Aprendizaje | Edu x
localhost/Pagina5/

OALÍNEA

Lino Montiel

Conceptos Gráficos Videos Actividades Evaluación Bibliografía

Menú Selección

Grado
2

Materia
Matemáticas

Bloque
Bloque5

Contenidos

#	Contenido
1.	Resolución de problemas que impliquen el planteamiento y la resolución de un sistema de ecuaciones de 2×2 con coeficientes enteros, utilizando el método más pertinente (suma y resta, igualación o sustitución).
2.	Representación gráfica de un sistema de ecuaciones de 2×2 con coeficientes enteros. Reconocimiento del punto de intersección de sus graficas como la resolución del sistema.
3.	Resolución de problemas que impliquen el planteamiento y la resolución de un sistema de ecuaciones de 2×2 con coeficientes enteros, utilizando el método más pertinente (suma y resta, igualación o sustitución).

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Figure 6. Interface hypermedia system administrator learning objects

You can see the selection of elements to finding the OA is located on the left side of the screen to center the list of contents according to the elements of selection and the top hits on the elements of OA concepts, graphics, videos, activities, evaluation and bibliography.

V RESULTS

The results obtained by applying the hypermedia system administrator OA are access and consultation of OA of different subjects in the secondary level. The following filters selected grade 2 was applied, matter math block 5 and selecting the content 1 shown in Figure 7.

#	Contenido
1.	Resolución de problemas que impliquen el planteamiento y la resolución de un sistema de ecuaciones de 2×2 con coeficientes enteros, utilizando el método más pertinente (suma y resta, igualación o sustitución).

Figure 7. List of contents.

The following figures show the elements of OA is seen in Figure 8 is deployed element theory concept describing the topic of the content, in this case defines a system of equations of two unknowns.

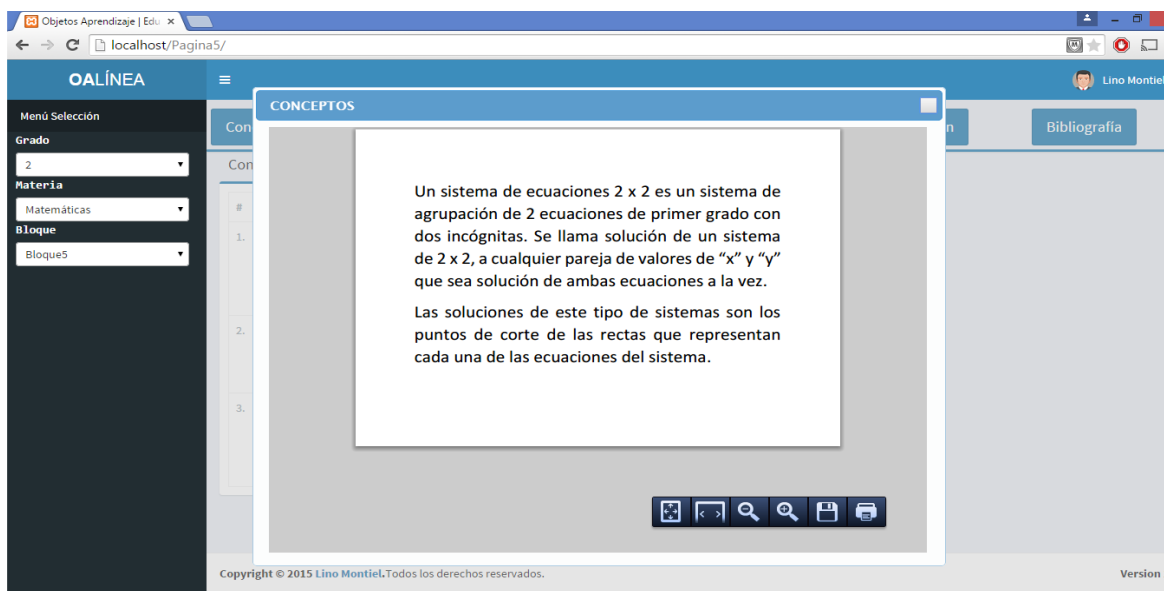


Figure 8. Element concept OA.

Figure 9 displays the graphic element, the teacher has quickly an example to explain the theme of learning.

The screenshot shows a web browser window with the URL localhost/Pagina5/. The main content area is titled 'OALÍNEA' and features a navigation menu on the left with options for 'Grado' (set to 2), 'Materia' (set to Matemáticas), and 'Bloque' (set to Bloque5). A central window titled 'GRÁFICO' displays a system of linear equations:
$$\begin{cases} 5x - 3y = -1 \\ 3x + 2y = 7 \end{cases}$$
 Below the equations, the solution process is detailed in four steps:

1. Se despeja el valor de la incógnita "x" en las dos ecuaciones:

$$5x = -1 + 3y \quad 3x = 7 - 2y$$

$$x = \frac{-1 + 3y}{5} \quad x = \frac{7 - 2y}{3}$$
2. Se igualan las dos expresiones obtenidas:

$$\frac{-1 + 3y}{5} = \frac{7 - 2y}{3}$$
3. Se resuelve la ecuación y se obtiene el valor de "y":

$$\frac{-3 + 9y}{15} = \frac{35 - 10y}{15}$$

$$9y + 10y = 35 + 3$$

$$19y = 38$$

$$y = 2$$
4. Se sustituye el valor de "y" en uno de las expresiones que hemos despejado en el paso uno y así obtenemos el valor de "x".

$$x = \frac{-1 + 3 \cdot 2}{5}$$

$$x = 1$$

 The bottom of the window includes a copyright notice: 'Copyright © 2015 Lino Montiel. Todos los derechos reservados.' and the version number 'Version 1.0'.

Figure 9. Graphical element.

Figure 10 displays the video element, as another option the understanding of learning content.

The screenshot shows the same web browser window as Figure 9. The central window is now titled 'VIDEO' and contains a video player. The video player is displaying a slide with a yellow background and a blue border, titled 'Sistema de Ecuaciones Lineales'. The video player interface includes a progress bar at the bottom showing a duration of 0:03. The same navigation menu and footer information are visible as in Figure 9.

Figure 10. Element Video.

Bibliography

Astudillo Gustavo Javier 2011. Análisis del estado del arte de los objetos de aprendizaje, revisión de su definición y sus posibilidades. Universidad Nacional de la plata. Recuperado de:

http://sedici.unlp.edu.ar/bitstream/handle/10915/4212/Documento_completo.pdf?sequence=1

Chazarra Bernabé Juan, Requena López Víctor Manuel, Valverde Jerónimo Sergio (2010). Desarrollo de un repositorio de objetos de aprendizaje usando DSpace. Facultad de Informática. Universidad Complutense de Madrid. Recuperado de <http://eprints.ucm.es/11078/1/MemoriaSI.pdf>

Maris Massa Estella. (2012). Objetos de Aprendizaje: Metodología de desarrollo y evaluación de calidad. Facultad de Informática. Universidad Nacional de la plata. Recuperado de http://postgrado.info.unlp.edu.ar/Carreras/Doctorado/Tesis/Massa_Stella_Maris.pdf.

Sanchez Vignau Bárbara Susana, Vargas Villafuerte Manuela Marina 2006. Bibliotecas virtuales adaptables: un desafío de la sociedad de la información. Recuperado de: http://scielo.sld.cu/scielo.php?pid=S1024-94352006000400010&script=sci_arttext

Varas, L. M. (2003). Repositorio de Objetos de Aprendizaje. Recuperado: http://www.alejandria.cl/recursos/documentos/documento_varas.doc

Moodle (2014). Consultado de <https://moodle.org/?lang=es>

Edmodo (2014). Consultado de <https://www.edmodo.com/?language=es>