# Web Authoring Tool and Repository for Learning Objects

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**Abstract.** This article purposes to present an authoring tool for learning objects (LOs) with metadata filling in the OBAA standard and SCORM packaging generated in scientific initiation research. The software, in early stage of development, is noted to be free and easy to use, programmed for the Web platform pointing towards features to enhance the user experience. The application is internationalized and has a repository function, which stores the LOs in a database accessed through the search feature. Its origin took place on the lack of tools making use of the characteristics applied to this one and its goal is to simplify, to the teacher, the creation of teaching materials, as well as encourage students to invent their own content. Therefore, a study was conducted of LOs, their metadata, specifications and related tools as well as of the technologies needed to create the system, such as concepts, languages and programming standards.

**Keywords:** Learning Objects, OBAA, SCORM, e-learning.

## 1 Introduction

According to Wiley [1], Learning Objects (LOs) are digital educational content, whose basic feature is their ability to be used on other occasions. Thus, LOs are made up of texts, images or videos, for example, along with their metadata, which, together, form a reusable LO. The metadata are essential to the educational material since the repositories use them to catalog and store objects. To facilitate cataloging, several metadata specifications have been developed, such as IEEE LOM (international reference standard), CanCore (Canadian standard) and OBAA (Brazilian standard).

To simplify the generation of LOs and their metadata, there have been developed some authoring tools. However, most of them present themselves complex, require computer skills or additional installation to be used, or, still, demand payment. Even so, there are few which allow the making of objects in the OBAA standard or make use of SCORM during the files packaging.

The present research, conducted focusing on the relevant basic concepts and on the current situation of the subject, as well as on the technology needed to create the software, has been characterized as preparation for the construction phase, which

generated a tool - at the time in early stage of development - of simple and easy procedure, that, besides standardizing the metadata description and LO packaging, requires only a web browser with Internet access to work. It was also sought to adapt the tool to different devices and internationalize it. It is expected, with its use, to facilitate the teacher's task to create educational content, encourage students to invent their own materials and disseminate the OBAA model.

This document is divided into four chapters. First there is an introductory text about the covered issues, followed by the Theoretical References appropriate to the research phase (split into Methodology Used, OBAA standard, SCORM standard and Authoring Tools). In third takes place the presentation of the proposed tool, with details about its project and development as well as examples of its current operating condition. Finally, it is concluded the article and elucidated how the project will be continued.

## 2 Theoretical Reference

### 2.1 Methodology Used

Until the present moment, this work is based on qualitative research because it used bibliographic research approach in order to understand the concepts to be smeared on the tool. Next, this study turns into applied research since it aims its use in practice, involving future instructional designers as subjects.

Initial research marks itself with online studies, in websites as well as in academic papers, aiming to understand the fundamental concepts connected to the project subject, such as the study of the PHP language and the theories and applications of learning objects (LOs) and their metadata. After, there has been a reading of Wiley's [1] and Silva's [2] works, which are widely cited in papers of their areas, in order to supplement the initial concepts notion. It has also been sought to understand the current situation of the tools and technologies available for the creation and maintenance of LOs.

Following the initial research stage, it has been run a study of the languages and tools compulsory to the software creation (emphasis on PHP, JavaScript, CSS, HTML, Database/MySQL), and, from the model proposed by the mentor teacher, it was then given start to the development. Additionally, it has been adopted the OBAA standard of metadata describing through XML files and the SCORM standard for file packaging.

The following research steps aim to verify using it in the potential scenarios: describing a LO, packing a LO, searching for a LO on the repository, etc. For that, it will be developed schedules which, when applied, it will be adopted non-participant observation, in order to register the interaction with the tool. Furthermore, it is possible to include a log record which will indicate how and when the users used the system, supplying quantitative and qualitative data.

## 2.2 OBAA

Knowing that a LO is any educational media that can be reused, OBAA has emerged as the Brazilian proposal for the educational and technical description of these objects through metadata, in order to facilitate their retrieval and access. The model, whose acronym translates to "Agent-Based Learning Objects", was developed by UFRGS in partnership with UNISINOS, aiming to specify standards for technical and functional requirements in response to interoperability problems of some digital contents that, in short, were settled by the XML syntax typical of this standard [2].

OBAA was established in the IEEE LOM, an international reference standard extensively used which allowed some changes that were considered necessary for the creation of OBAA. Consequently, OBAA aggregated the LOM categories, applying modifications and adding new items [3].

## 2.3 SCORM

SCORM (Sharable Content Object Reference Model) is a collection of specifications and standards which define the interrelationship of content objects and data models so that the objects are sharable on systems that follow this model [4]. This specification promotes reusability, accessibility, durability and interoperability of learning content, and facilitates migration between different learning management systems. SCORM is responsibility of Advanced Distributed Learning and was originally released in 2000, with the latest version being the SCORM 4th Edition, of 2009.

Tarouco and Dutra [5] explain that resources (also called educational media) are the smallest physical units within the SCORM material. Examples include web pages, images, videos and flash applications. Its main feature is to be reusable, and for this to be possible, it is used the asset's metadata. SCOs (Sharable Content Objects) are the sets of resources which represent the smallest logical units of the material: they can represent a class, a topic or a module in a course. SCOs cannot communicate among themselves because they are independent.

## 2.3 Authoring Tools

According to Leffa [6], the term authoring tool (AT) refers to a type of software which objectives to generate Learning Objects such as texts, images, videos, audios, among others. These tools are both offline or online and have as targeted audience students and teachers. The author states that the preference for these systems is due to their ability to offer a quick and easy way to create quality educational content, requiring only the input of knowledge and creativity.

Among the advantages of ATs should be cited the high level of interaction the user is likely to have with the object – making learning easy –, and the low cost of material generation [6]. However, it is important to note that despite these advantages, the produced objects should not replace the teacher, but rather complement the work in the classroom. There are several ATs: ALOHA, Ardora, CourseLab, PALOMA and eXe-Learning, for instance.

It is noteworthy, though, that most of those tools have hardware and/or software compatibility issues, require installation of additional applications, do not use the OBAA standard or are not free or user-friendly.

## 3 Proposed Tool

This document proposes an authoring tool for learning objects capable of generating educational content and its metadata in the OBAA format, and performing the packaging with the SCORM standard, as well as saving the created object in the tool's own repository, conferring user's wish. Its main characteristic is to differentiate itself from other applications for not requiring any kind of installation and being free, intuitive and easy to use. For this, the system takes advantage of the Web platform, being a prerequisite for its use just any web browser with Internet access.

### 3.1 Project

The tool here presented is intended to be a mixture of repository with authoring tool, presenting itself simple, easy to use and intuitive. For this, it has been pursued to take advantage of a clean and friendly interface as well as presenting the possibility to change language and the use of a feature which automatically adjusts the layout in accordance to the screen resolution. Consequently, the user should not spend too much time looking for where to click or trying to understand what must be done. Furthermore, by changing the layout, functions are released or hidden, avoiding, for example, that someone using the system in a mobile phone access, by mistake, the option of content creation, which requires text or image input, formatting... in short, a task that would rarely be accomplished through that type of device.

Of the repository and authoring tool functions, the system comprises four independent components, which can be used singly or in combination, as the user wishes. Such divisions are detailed below.

- *Educational material making:* the tool features an editor capable of performing content creation based on text and media (audio/video/image), the output of which is the metadata filling screen. The editor can be accessed through the main page on desktop computers and laptops.
- *OBAA metadata filling:* following the use of the editor or directly through the home screen, for desktop computers and laptops, it is presented a metadata form according to the OBAA standard. The form handling performs the creation of the pertinent files and the packing in SCORM, and stores the object in the tool's database. After submitting the form, the user will receive a ZIP file (the very Learning Object itself) via direct download and will be prompted whether to keep or not the object in the repository.
- *SCORM packaging:* packaging occurs automatically after submitting the metadata form or, if the LO has been previously made, it can be accessed through the home screen on desktop computers, laptops or tablets. If the latter, it will be shown a screen where the user uploads his LO and the system converts it to SCORM

format. In both cases, the LO will be saved in the repository and the user will be prompted if they want to keep it that way or remove it, in addition to receiving their packaged LO via direct download.

• *Search:* to any device used, one can perform a search in the repository database from the main screen. For smartphones it is only possible to execute textual search, while for tablets, laptops and desktop computers it is possible to make use of a sliding menu of images, representing different themes-filters for search. The output is a screen showing the search results, with brief summaries of found LOs, link to details of each LO and filters to refine results. The details page is also ruled by the resolution of the device in use: mobile is only given the option to view the LO, while for the other devices one can download the LO without SCORM, with SCORM or simply view it.

The prototype of screens and their relationships, as well as the overall class diagram, were proposed by the project's mentor teacher, and then adapted as appropriate during the development process.

## 3.2 Development

The development process began with the study of needed languages and technologies: PHP, HTML, CSS, JavaScript and Database/MySQL; as well as Object Oriented Programming, Model-View-Controller and OBAA and SCORM standards. Next, from the model proposed by the mentor teacher, were developed the tool prototype layouts for the different devices and basic versions of the most significant pages, including: the form for the metadata descripting, the editor for creating the educational content and the home page with the sliding menu used to filter search and the textual search field. Consequent to it happened the database modeling and generating, followed by the construction of the PHP classes which would be responsible for the objects representing the metadata and for the translation function. It is emphasized here that all mentioned components suffered, constantly, changes to meet all specifications and unexpected errors.

It has also been worked on the XML file, done through PHP's DOMDocument class, which allows a XML file in accordance to the OBAA model. It is utilized the ZipArchive class as well, to compress the XML file along with the educational midia and the HTML page which references said midia.

The SCORM components (and several other minor details) were not, yet, worked on as the tool is just in early stage of development.

## 3.2 The Tool Working

In the tool's current version, considered by the authors as early stage of development, are presented, fully operative, the following features (already termed in previous sections): metadata form with XML file generation, creation of educational content through a basic editor, storage in the database, search from textual terms and translation and automatic layout change functionalities.

Figures 1 and 2 illustrate the operation of the tool here shown. Figure 1 shows the main screen with the search system and three buttons: one for each function of the tool. In Figure 2 it can be seen the form for metadata filling as the OBAA standard.
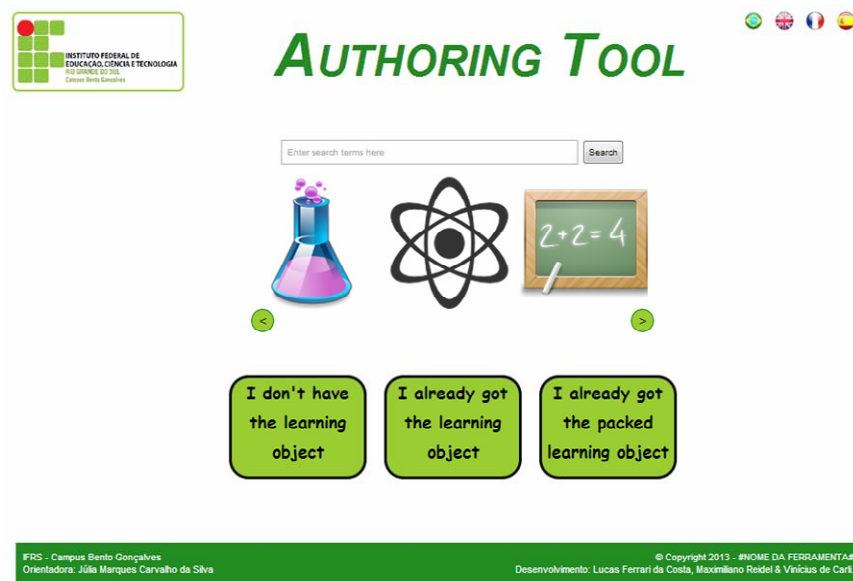


**Fig. 1.** System's home screen.

**Fig. 2.** Screen with the form for OBAA metadata descripting.

## 4 Conclusion

Though little known, the learning objects (LOs) have become popular and necessary, perpetrating imperative the presence of tools to assist in their creation, maintenance and dissemination. Even more important is the existence of applications capable of generating objects in accordance with the Brazilian standard, in order to encourage and disseminate its culture.

With the main features - such as searching for objects from the repository, creating LOs with the editor and inserting objects in the database with the metadata cataloging - already operating, it is tangible that the proposed system, even in early stage of development, meets the accentuated profile.

Next, it is expected to improve the search function with filters and perform the LO conversion to SCORM. It is planned to, in the future, improve the LOs editor and the system layout.

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