

SCORM for Learning basics of programming

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Abstract

The present article is developed in the context in which the learning management platforms (LMS) implement standards that enable the integration of resources with educational content external to the system. The standard to be used for this type of content is SCORM which enhances the visual quality and interactivity of the study material on the LMS systems. The creation of the SCORM for the subject of basics of programming required the development of independent drives calls learning objects that incorporate multimedia elements, hypermedia, images and text, using the model ADDIE i settling in an LMS based on Moodle. The implementation will allow greater interactivity with study materials, evaluations and immediate feedback. It is concluded that the development of this type of educational materials based on the SCORM standard makes the teaching resources are dynamic, interactive, visually attractive and of specific content.

SCORM, learning objects, LMS

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Introduction

The use of ICTS and their adaptation to a learning online is a great challenge for designers of these courses within the educational institutions, due to this form of learning is a transformation of the traditional models, therefore requires knowledge of ICT tools, instructional design and some methodology for the development of digital educational materials. Through the development of on-line learning scenarios are given the opportunity to generate digital teaching educational resources focused on students, i.e. that all study materials together with activities are focused to attract the attention of the student, hold it and at the same go generating knowledge and raising their levels of competence.

These study materials should be visually attractive, interactive so that you can navigate through them in an intuitive way and with instant feedback, in addition to be flexible so that students can proceed at their own pace.

However, students in the area of computer science, as every professional in this branch are suggested to have programming knowledge and for this must be from conceptual elements that are provided through the foundations of the own programming, it is here where many of the students require educational materials that enable them to develop the necessary logic, creativity indispensable, confront challenges and challenges, to do this the teaching materials must contain features such as dynamic, interactive and visually appealing.

For engineering students learn a programming language proves to be a complex task due to the high demand of the logic, intellectual, creativity, dedication, long hours of study and experimentation required.

To achieve this requires not only the technology but the content development that comply with the aforementioned characteristics in addition to the monitoring of a methodology that ensures the good development of the contents. For educational materials that meet these requirements are required for external tools to the LMS systems, but which in turn are compatible with them. The standard to be used for the generation of this type of content is SCORM.

This article is structured in the following way: introduces the theoretical framework and a brief description of the SCORM standard. Continues with the development of the case basics of programming in the stages of design, construction of learning objects and evidence of the same in the Moodle platform, and ends with the results and conclusions.

Theoretical Framework**SCORM**

Content development under a standard as SCORM (Sharable Content Reference Model), which was an initiative of the United States Department of Defense has features such as accessible, reusable, multiplatform, dynamic and durable. In accordance with Preduelo (2004) SCORM divides the world of the learning technology in two fundamental components: the training platform (LMS) and interchangeable content objects (SCO - Sharable Content Objects-). The SCO become what is known as learning objects (LO).

A LMS platform that contains content or digital teaching educational resources based on SCORM offers both to the developers of the courses as well as users with a user-friendly environment that allows you to manage your own content and give a follow up to the students. For Akhshabi (2011) a SCORM must have two things:

1. All content in a single package or package.
2. This content can run in real time and have exchange of information.

The components of this model are three:

1. Model of Agregation of Content (CAM), who is responsible for ensuring the format and procedures for the storage and retrieval of contents.
2. Execution Environment, has the function of the definition of the API (Application Program Interface) for communication with the LMS system and the data model.
3. model of sequencing and navigation to the presentation of a dynamic and interactive of the didactic content or material of study, houses the rules of sequence that has introduced the designer.

The SCORM integrates from LO, provides a solution that spans from the packaging, structure and labelling, passing through the communication and storage of information until the flow definition of the sequence of content (Blanco, 2011).

The entire contents of a SCORM is packaged in a package interchange file or in a file compression in zip format, the content can be integrated by a combination of the following types of components,

- 1- Animations
- 2- Pictures
- 3- Videos
- 4- Text
- 5- Podcast
- 6- Hyperlinks

Learning Objects

The LO are digital resources that have specific characteristics and to be able to develop them you must follow a methodology of instructional design. For Cortés (2009) a learning object is an informative content organized with a formative intentionality, it is also subject to some standards of cataloging that facilitate their storage, location and digital distribution and that can operate on different platforms of tele-training (e-learning).

From the foregoing it establishes that the development of a go requires a technological part and another part teaching that implies a instructional design. Said Wiley (2003) that the central idea of learning objects is: the instructional designers can build small components of instruction (in relation to the size of a full course) that can be reused several times in different contexts of study.

It is important to highlight that the LO are independent and formed by small structures which must be composed of the following components:

- Learning Objectives (they want to achieve in the student).
- Informational content (information needed to achieve the goal).
- Learning Activities (actions that must be performed by the student designed to achieve the goal).
- Evaluation (allows the student to recognize the level of competence achieved).
- Metadata (data that allow the search and accommodation of LO in a repository or bank of LO).

Learning Management System

The OA are encapsulated in a zip file which is called SCORM and it is possible to manage it through LMS platforms like Moodle, Blackboard Dookeos, Edmodo, inter alia, allowing students to interact with the content. An LMS is an environment that allows communication between teachers and students that uses the web technology as a means of distribution of the contents, resources or study materials and activities to be developed by the student. Boneu (2007) said that the LMS (learning management system) provide an environment that enables the upgrade, maintenance and expansion of the web with the collaboration of multiple users.

Are oriented to learning and education by providing tools for the management of academic contents, allowing to improve the skills of the users of the courses and their intercommunication, in an environment where it is possible to adapt training to the requirements of the enterprise and the own professional development.

ADDIE model

Of agreement with Cortés (2009) internal organization of LO, it should possess the necessary structural elements to perform a autonomous learning, which it does not necessarily mean that either alone, individualistic or that do not take into account that learning is a social construction, but that in the learning process takes an active part in one who learns and also that the LO has been built by people who have contributed their knowledge even when they are not physically in the moment of the delivery of the final product; in addition, that the LO is an educational content and as such is only a part of the process of which they also part the student and the teacher or tutor.

Therefore it should be borne in mind that for the development of LO is required of the pedagogical and didactic aspect of the study materials that promote the teaching content and achieve programming in students.

ADDIE is a model of instructional design that provides a sequence of steps for the development of LO, consists of the following stages:

- 1- Analysis: It is the first step and where you should obtain information about the students, content and environment of training needs.
- 2- Design: sequences and organize content, specifies how to learn.
- 3- Development: production of materials.
- 4- Implementation: implementation and in practice the materials with the participation of the students.
- 5- assessment: Determine the points of improvement of the instructions within the materials.

Figure 1 graphically shows the stages of the ADDIE model and sequence of the same.

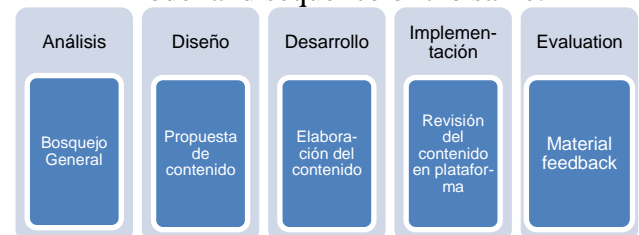


Figure 1 Stages of the ADDIE model

Related work

According to Del Blanco (2011) there are several applications for the SCORM, among them is their use for the integration of games and simulations as part of courses implemented in LMS systems or virtual teaching (EVE).

Muñoz (2008) uses the SCORM within the project AulaWeb to establish the management of learning, the inclusion of interactive multimedia content and which permit the monitoring by the teacher/tutor to students that for the first time received computer skills as a subject face within the plan of studies of Industrial Engineering.

Lopez (2015) exposes the development of LO and implements it in an LMS for the teaching of programming to people with hearing disabilities. These are some examples of the usefulness and application of the LO and SCORM for the teaching of various skills that can be used in different areas and are available for it to be revised at times that are necessary on the part of the students.

Methodology

For the development of the SCORM through which presents the study materials for basics of programming is used the model ADDIE following the Decalogue which proposes :

Espinosa (2015) about the recurring design criteria for LO which subsequently integrated the SCORM, in accordance with the properties and capabilities offered by the internet as a medium for communication and an LMS as a scenario for presentation, these criteria are:

- 1- Organization of information
- 2- Motivational aspects
- 3- Interactivity
- 4- Multimedia
- 5- Hypertext Multimedia
- 6- Navigability
- 7- Interface
- 8- Usability
- 9- Accessibility
- 10- Flexibility

following the model ADDIE for the instructional design of the LO in the Table 1 shows the actions and products of each the stages.

Stages of the model ADDIE	Actions	Results
Analysis	Review of the program of study. Objective analysis of the population.	Needs for materials to be developed for the construction of the LO.
Desing	Development of the topics to be presented. Identification of the resources. Definition of the activities. Design of the instructions.	Didactic strategies for the presentation of the contents and the guide instruccional. Initial proposal of the LO.
Develop	To prepare the contents (study materials, activities and evaluation) to be presented and to integrate them by means of the software for the LO construction. To generate the SCORM.	SCORM
Implementation	It tries the SCORM with students' support. It tries on the part of teachers.	Feedback about the SCORM both of students and of teachers.
Evaluation	Application of the feedback generated in the previous point. Use of a survey to obtain additional information and its interpretation in order to improve the instruction and contents.	Final presentation of the SCORM. Final report of the product (evaluation and recommendations).

Table 1 Application of the ADDIE model.

For the production of the LO to must analyze the tool to be used in such a way that would allow the integration of the various elements that compose it together with the rules that allow the interactivity and dynamic content. For this particular case is used the tool eXe Learning because it provides a simple and intuitive environment for the development of the OA and in addition is a free software

To be integrated the SCORM within an online course is accessed through an icon and name that distinguishes it, students can then give follow up to the content, resources and activities designed in such a way as to be a guide in the learning process of the subject of basics of programming.

Results

The visual and interactive elements that a SCORM offers it allows to the students autonomous, intuitive and dynamic learning, in addition to having the opportunity to revise the topics that the LO contains so many times be necessary for the comprehension of the above mentioned topics, acquisition of the skills and/or knowledge.

The access to the SCORM is realized across a course in line implemented inside a platform LMS based on Moodle, the Figure 2 allows to observe the main interface of the SCORM.



Figure 2 Main window of the SCORM

On the main page of the SCORM the students will be able to navigate through the different options that are presented, suggesting for those admitted for the first time to review each paragraph sequentially or in its defect can continue in the section that have visited on his last access. To navigate through the different sections found in the contents: videos, audios, examples, text and images.

As a point of departure in the SCORM is the diagnostic evaluation which is very important for students to have a referent of the previous competitions that require to be able to address the topics to be addressed. In Figure 3 will appreciate some of the questions included in the diagnostic evaluation.

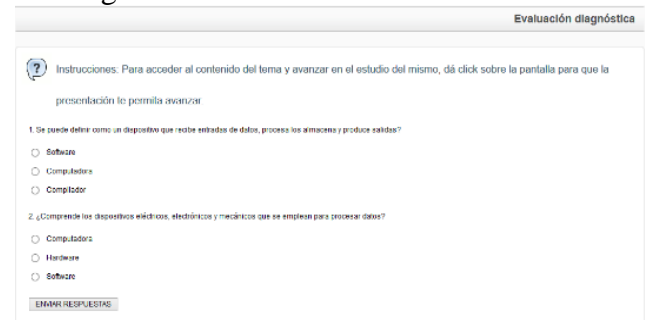


Figure 3 Diagnostic evaluation

Another important aspect within the SCORM is the feedback provided to students when they perform the assessments and the practice exercises, this allows that reinforce the knowledge or correct errors immediately. This form of presenting the contents of study makes the study of the same is in a more simple and depending on the configuration of the online course can that the outcome of the evaluations that are within the SCORM is integrated into the book of qualifications within the course or simply run the SCORM as formative activities designed, planned and organized within the process of teaching and learning.

Conclusions

The progress which we have in technology allows its application in various areas or disciplines among which is without any doubt the education, in such a way that enables the construction of LO which are a means by which you can share knowledge and information to generate and programming skills. The LO packaged as SCORM allow students who wish to discover and take part in the wide world of programming have the opportunity to access the contents placed at its disposal.

This article discusses the use of a SCORM to provide content of fundamentals of programming, through which we wish to reach objectives, indicated within the own SCORM. The use of the standard permits a better utilization since it can be installed on different platforms LMS by their characteristics of communication between the own standard and the platform. After this development has gained experience in the application of the model ADDIE for the creation of LO and the generation of the SCORM, as well as its implementation in an online course, taking advantage of the potential of the tools that facilitate this process of development of the LO for developers.

Following the methodology are products that offer the user, in this case the students materials and resources that will give them the ease of a ubiquitous learning.

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