

ADAPTIVE SCORM OBJECTS SYSTEM FOR MOODLE

DOCUMENTATION

First Steps

SCORM Object: Generation and Labeling

We have decided to use the *Reusable eLearning Object Authoring and Delivery* (RELOAD)[1] software in order to generate a *Sharable Content Object Reference Model* (SCORM) [2]. RELOAD can be downloaded from its [official website](#) where it is possible to find its [documentation](#). However, in order to show a rapid guide about the aspects we are interested in, we are going to introduce the main elements of RELOAD that we need for adaptation in this section.

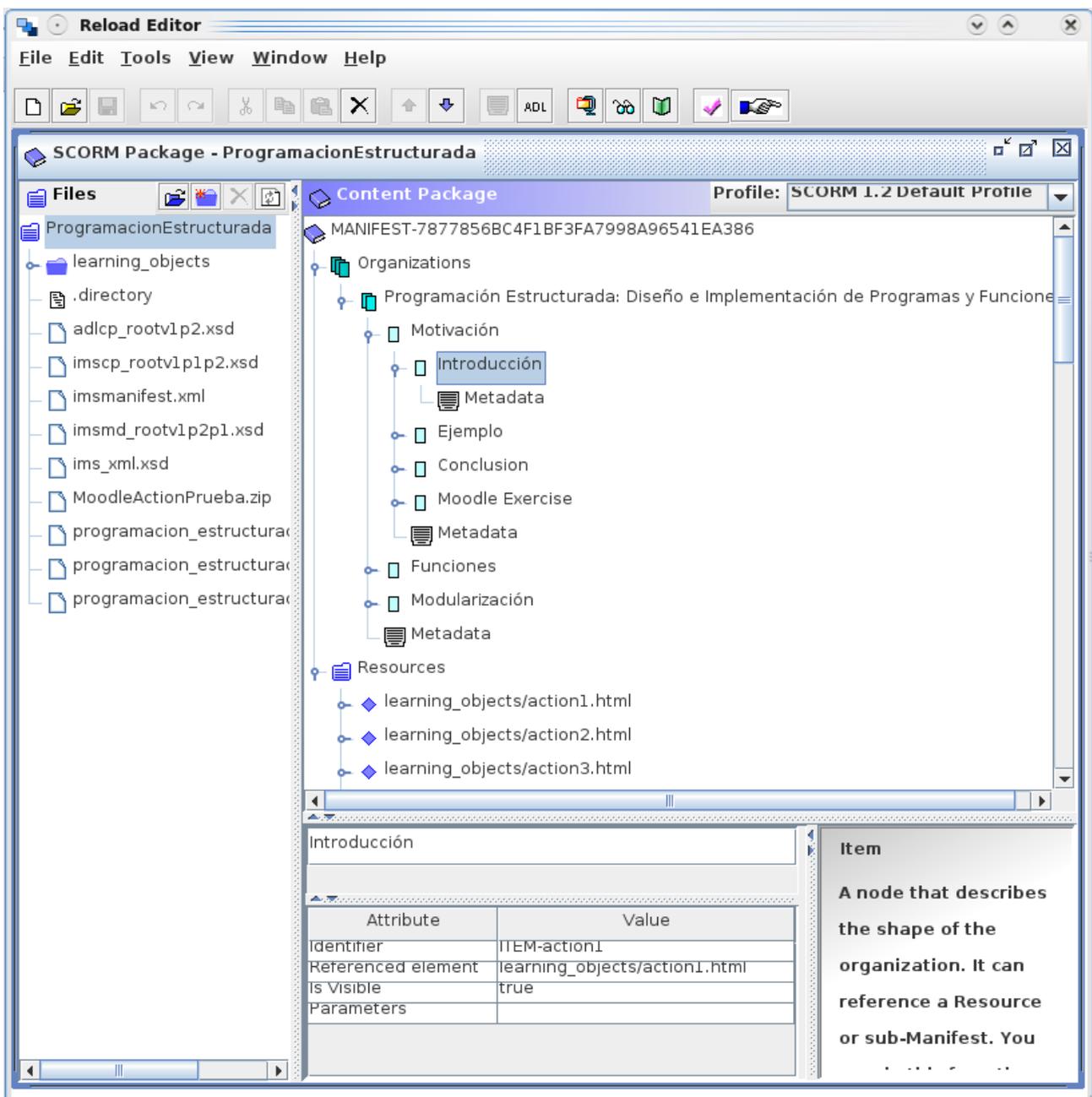


Figure 1: RELOAD Main Window

SCORM is an e-learning standard, its structure is stored in a manifest file in the XML schema; and the same happens with the structure and information provided by the IMS Metadata standard [3] which is stored inside it.

In the XML manifest a main subject or concept is called *organization*, while the sub-subjects are called *items*, as well as those learning activities or activities with a related resource.

A resource can be an existing web page referenced by its web address or a Web page created for that specific purpose that is in a local directory, as well as Power Point documents, Acrobat pdf, word, flash, video, audio, etc. Each of these resources must be created by the teacher, administrator and/or a course content designer, or could be obtained from a learning objects repository.

It is recommended to save any activity created for this particular course in a sub-folder inside the main folder where the SCORM manifest is saved. This sub-folder may be called resources, items, learning_activities or learning_objects. We are going to call *resources* to this sub-folder through this document. On the other hand, the images used by Web pages or Power Point documents, among others, must be stored in a sub-folder called *images* inside the resources folder.

METADATA LABELING

Figure 2: Metadata window in RELOAD

Each *item* and *organization* must have mandatorily several basic metadatas related. This metadatas are part of IMS-MD standard and are the next ones:

- Identifier and name.** These metadatas can be filled in the main window of RELOAD that shows the SCORM package. Once you have selected the item to label (Figure 1), will be displayed a box at the top center from the attributes panel. The first field to fill is the *name* that references to the name of the activity. After that, we have to fill the *Identifier* within the table with columns attribute and value. The identifier must be unique and catchy, so it is suggested to change the default name and rename it based on the following criteria:
 - Subjects and sub-subjects must be named ITEM-taskx.
 - Activities with a related resource must be named ITEM-actionx.
 - The main organization must be named ORG-taskx.
 The x should be a consecutive one number starting by 1 for each of the different groups of nomenclatures.
- Items* which are learning activities, must

have an associated resource that should be assigned by filling the field **Referenced element** in the attributes panel.

- The **General** → **Coverage** metadata have to be filled with values *Mandatory* or *Optional*, according to the necessity of a concept to be taught through this activity.
- The **General** → **Language** metadata have to have the values *en* for English and *es* for Spanish.

There are no more specified languages yet, but it is expected in a short future.

- For **Technical** → **Other Platforms Requirements** metadata it is necessary to specify if the activity requires a specific software or hardware. If this is required, then the field have to be filled with the *Multimedia* value; if it is not, then the value of the field must be *NoOne*.
- **Educational** → **Learning Resource Type** metadata serves to indicate the resource type for the learning activity. At this moment this metadata is used to define an ordering of activities based on a Honey-Alonso Learning Style definition that only accepts the next values:
 - *Exercise* for exercises that must be done in the activity,
 - *Narrative Text* for readings,
 - *Example* for readings with examples about the topic (but this is not a standard value in RELOAD then you have to fill it by hand),
 - *Problem Statement* for exercises that should be done outside the SCORM activity, and
 - *Simulation* for videos and slides which tell us how to interpret or do something.*
- **Educational** → **Difficulty** metadata indicates the relative difficulty of the activity according to the tutor criteria. So, if the student has a high performance and the activity difficulty has a high value the activity could be shown to the student, but if the student has a low performance, then the activity must not be included in his/her personalized learning path. The values that this metadata can take are: *very easy*, *easy*, *medium*, *difficult* and *very difficult*.
- **Educational** → **Typical Learning Time** → **Date/Time** metadata establish the *number of average minutes* that a student needs to finish an activity.

Once each activity of the course that has a related resource has been labeled whit this value, will be necessary to add all their values to assign a global typical learning time to the main organization of the subject with the next format *maximum minutes*, *minimum minutes*. Where *maximum minutes* is the addition of all the activity times and *minimum minutes* is subtraction of maximum minutes less the addition of optional activities durations.
- Organizations from a SCORM object have not usually related relationships. But items have to have the *Is Part Of* relationship at least and the *Is Based On* one if necessary.
 - *Is Part Of* describes a hierarchical relation between two items, e.g. the sub-subject ADDITION could be thought through the activity items DEFINITION, EXAMPLES, EXERCISES, and QUIZ; then, each of them have to have an *Is Part Of* relationship whit addition.
 - *Is Based On* relationship describes an order relation between two or more items, e.g. to do the QUIZ from sub-subject ADDITION first we should have read the DEFINITION, watched the EXAMPLES and done the EXERCISES. Then the activity quiz have to have an *Is Based On* relation pointing to the identifier from each of them.To define a relation kind we are going to fill the **Relation** → **Kind** → **value** metadata. To indicate which is the activity or subject identifier this relation is pointing we are going to fill the **Relation** → **Resource** → **Identifier** metadata whit this identifier. We have to add a value and identifier metadata for each activity or subject pointed for the activity or subject we are labeling at the moment. For example, QUIZ activity have to have three relation metadatas with them related identifiers by *Is Based On* relation and another one for the *Is Part Of* relation.

To AVOID ERRORS

When we are labeling relationships, we must take special care on do not generate cycles between activities. This can happen in different cases, but specially when several ordering relations are defined between two activities, e.g. when ACTION1 is based on ACTION2 and, in turn, ACTION2 is based on ACTION1. Another similar case could happen with hierarchical relations when a higher level subject is defined as part of a lower level subject that depends of this higher one. For example, arithmetic is part of addition which in turn is part of arithmetic.

To GIVE ROBUSTNESS TO THE SUBJECT

It is important to remark that we can generate activities part of a same subject with the same name and utility, but different on their durations, languages, and hardware/software requirements. Doing this we could give robustness to the learning path for each student, because the intelligent planner could decide which activity show according to the student profile, e.g. if a student has a low availability, then a shorter activity will be shown, or for a student who has not a good English level will be shown a Spanish activity.

Finally, once we have finished to define relations between subjects, sub-subjects, and activities by metadata labeling, we have to use the *zip Content Package* option of RELOAD in order to generate an standard package supported by Moodle[4] that will be used in the next section.

Installing and Configuring the add-on into SCORM Moodle module

HOW TO UPLOAD THE SCORM PACKAGE IN THE CORRESPONDING MOODLE COURSE?

Once the SCORM package has been generated properly, you have to login as an administrator or teacher into the Moodle course where you want to upload the package and turn on the edition options.

The zip file package that has been generated following the steps in last section have to be uploaded using the *Add an Activity...* option where you have to select the SCORM/AICC activity as shown in Figure 4.

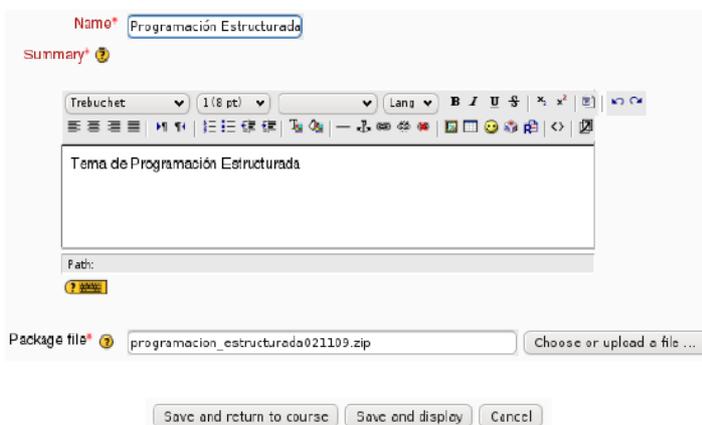


Figure 4: AICC/SCORM activity attributes

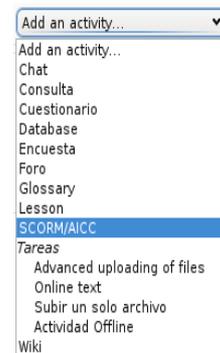


Figure 3: How to add a SCORM/AICC activity in Moodle?

To create this activity correctly you have to fill at least the mandatory attributes Name and Summary (see Figure 4), and after that to upload the zipped SCORM package with the *Choose or*

Upload a file... option.

Finally, you should press the Save and Display button that show us the package, its hierarchies and resource contents correctly; and this the way to test its proper operation.

THE USER PROFILE HAVE TO HAVE SPECIAL FIELDS FOR THE ADAPTATION TOOL WORKS WELL: HOW CAN I ADD THESE FIELDS TO MOODLE PLATFORM?

The second step after upload the SCORM into Moodle will be ask to the system administrator to add some adaptation fields to the user profile.

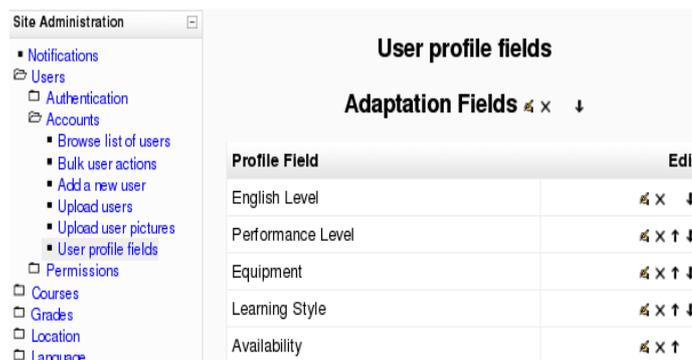


Figure 5: New user profile fields for adaptation

This can be done by modifying the default user profile fields section from route **Administration → Users → Accounts → User Profile Fields**. After accessing there, the administrator have to create a new *profile category* which is recommended to call *adaptation*, and add to this new category at least five new menu of choices fields with the next mandatory attributes name, short name, options and default value. The recommended values for these attributes are listed in the next table.

NAME	SHORT NAME	OPTIONS	DEFAULT VALUE
English Level	EnglishLevel	Excelent Acceptable Low Poor	Acceptable
Performance Level	Performance	High Medium Low	Low
Equipment	Equipment	Multimedia NoOne	Multimedia
Learning Style	HALS	Theoretical Reflexive Pragmatic Active	Active
Availability	disponibilidad	Much Little	Much

In a short future will be possible to define the specific hardware and software required for the activities of the course.

HOW TO INSTALL THE PLANNING AND ADAPTATION ADD-ON INTO OUR MOODLE PLATFORM?

The third step will be unzip the add-on distribution into the moodle/mod/scorm folder from our

Moodle installation. This will be unzipped in a folder called planner.

The configuration file inside this folder must be modified, specifically the global variable “fields_group” which is an array. In the right side of the array will be specified the shot name of the adaptation category fields. If you have followed strictly the steps described until now, this variable will no be necessarily changed, but it will be if you have decided to change any of the short names.

On the other hand, if the adaptation fields category has not been the first category added to the user profile fields, then you have to find its identifier in the moodle database with the sql query: `select * from pre_user_info_category` (where *pre* is the prefix of moodle tables) and change the constant `PLANNER_PROFILE_ADAPTATION` with the id of the adaptation category.

Utilities for create adapted Scorm packages

Options

- [Planner](#). Utileria para generar planes
- [Checar comunicación con Sepia](#). Revisa la comunicación con el servidor de planes [sepia.ugr.es](#)
- [LDAEMUL utilities](#).

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Figure 6: Utilities for adaptation and use of a SCORM package

There is another thing in the config.php file that will be very important to change when the development will be finished. The key to access to the planner server with the IP ranges you have contracted.

Finally, into the `http://moodleserver/moodle/mod/scorm/planner/` page, where *moodleserver* is the web address where your moodle server is allocated, you can find two configuration options. The first one is *Check Planning Server Communication* which is used to test the connection with the planner server that provide the adapted SCORMS to Moodle. The second one is *LDAEMUL utilities*, where you have to select the *Update Database* option in order to add an extra field called `userid` into the Moodle table `pre_scrom_scoes`; this procedures it mandatory in order to save a scorm adapted for each student in the database and does not affect the scorm objects from another courses that don want to be adapted according to our criteria. The *Pretty Print Fields* option is used to visualize in an indicative way any previously generated plan for each student from each course and scorm inside it. And, if any error related with user profile fields occurs, you can check it via web through the *profile user fields* option, but it must be changed by modifying the config.php file in the Moodle server.

Using the Adaptation add-on

To use the add-on for adapting the learning paths of a scorm activity just go to the `http://moodleserver/moodle/mod/scorm/planner/` web page and select the option *Planner*. This option has not user restrictions yet, but in the future only teachers or administrators may do this.

COURSE, SCORM, QUIZ AND GOAL VARIABLES

By accessing the Planner option will be possible to select the course where the scorm activity that we want to adapt, the name of the scorm, the quiz that had been done before the scorm and the scorm main subject or subjects in of more than one organization has been defined in its creation.

The previous quiz selection is necessary to improve the adaptation according to the next rules.

- If the student has a score between 80 and 100 (8.0 and 10.0), then his/her performance level will be incremented till the higher value.
- If the student has a score between 50 and 80 (5.0 and 8.0), then his/her performance level will be modified to medium level.
- And if the score has a value less than 50 or 5.0, then the performance will be modified till the lowest value, but his/her available time will be turned to the maximum in order to enforce the knowledge about the topic with optional activities.

Utility to Generate Plans

Course: Educación e IA

Scorm: Introducción a las Técnicas de la Inteligencia Artificial en la Educación

Quiz: Quiz 1

Goals:

Introducción a la Inteligencia Artificial

Get Plan

Plans created for next students:

When a student has not been graded in the selected quiz, his/her profile values will not be modified, and the same happens when there are no a previous quiz for the scorm we want to plan.

For people who want to use the quiz adaptation option and do not know how to manage quizzes in moodle, there is a mini tutorial on how to evaluate questions that have no an automatic evaluation in appendix A.

Finally, you have to select the *goal* of the scorm subject, it means the concept you want to teach and adapt. We will usually have only one organization, but could be more if the subject needed more than one concept to be explained.

USING THE PLANNING WEB SERVER

After selecting the course, the scorm, the previous quiz, and the goal, will be time to click the *Get Plan* button. This button calls to the planing web server in order to obtain the adapted scorms. The calling may take several minutes according to the number of students in the selected course, the scorm size and the number of relations between the activities in the scorm.

If the calling was successful, this will return the adapted scorm sequences for each student and will allow us to watch them in a guidance way. However, if an error occurs with server communication or with adaptive activity sequences generation, it will notify you.

Errors can be of three types:

1. A problem with a mandatory action which can not be done by any of the students because of

victoryanez
alexmatico
joralmocha
thelma
ulises
cariander
samuel
angelo
arturoe
alerios
diego
rubensn
anafior
amairani.bq
eusebio
adalmiranda
yara
edgararvizu
fernando.adriel
jesusp
alumno
zhuzho
ferminivan
garlant
pakoruelas
ciberdragon
lizbeth
chej
marycruz
lizetgt
damaris

Figure 7: Plans Generation Utilities

its restrictions. Particularly when the action has not another alternative action with the same name but different restrictions. This alternative action must be mandatory too and part of the same task as its “twin”.

2. When a hierarchical or ordering relationship points to an action or task identifier that does not exist. It could have happened due to finger errors when filling metadata.
3. Because between ordering or hierarchical relationships has been created an infinite loop by mistake. For example, when actiony is based on actionx and actionx is based on actiony. Another example may be when task2 is part of task1, task3 is part of task2 and task1 is part of task3. Can you see the cycle there?

Frequently Asked Questions

What is the last Moodle version you are developed this API?

1.9 2008/03/10

In summary, Which adaptation variables may I use as part of the user profile on Moodle?
English Level, Performance Level, Equipment, Learning Style and Availability

If I have previously done activities with Moodle tools, Can I recycle these learning materials to be used inside a SCORM activity?

Yes, the only thing you need to do is to put the web address of the moodle activity to a scorm resource, and then assign this resource to an scorm item through its referenced element.

How can I know the identifier and/ short name of user profile fields that have been created for adaptation?

You can make a query in the moodle database. First you should find the identifier of adaptation fields category either in the config.php file inside the planner folder or making the sql query: `select * from pre_user_info_category` Having that category identifier you can make the next query: `select id, shortname, name from pre_user_info_field where categoryid = "adaptation fields category id"`.

Can I add new criteria or rules for adapting the scorm to the users?

We are working on that. In six months or so we hope this will be available, but only by buying an activation license for usage and user support of the planning web service.

Bibliography

[1] RELOAD. Web: <http://www.reload.ac.uk/>

[2] SCORM. Official Standard Web: <http://www.adlnet.gov/Technologies/scorm/default.aspx>

[3] IMS Standards. Web: <http://www.imsglobal.org/>

[4] Modular Object-Oriented Dynamic Learning Environment (Moodle). <http://moodle.org/>

Appendix 1

Guide for Quizzes Scoring

In the main page of the Moodle course you have to select the quiz to score. In the example the quiz is *Test del Tema de Programación Estructurada*. Once you have select it you must select the *Results* flange, and inside it the *Manual Grading* option. Then you may see a window section as shown in the image below.



When you are there just click in the question to score, but if ungraded is 0 you have not to score anybody because you have already done it for every student in the course, as in the case of question *programacion_estructurada1*.

But, when you click in *programacion_estructurada2*, you can see a list like the next one.

[Grade All](#) | [Back to Question List](#)

First name : [All](#) [A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)
Surname : [All](#) [A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)

Page: [1](#) [2](#) ([Next](#))

<input type="checkbox"/>	First name / Surname <input type="checkbox"/>	Completed on <input type="checkbox"/>	<input type="checkbox"/>
	Alejandro Moreno Vega	11 February 2010, 07:27 PM	Grade
	Alma Lizet Garcia Tepetlanco	12 February 2010, 12:58 AM	Grade
	alumno deprueba	12 February 2010, 11:09 AM	Grade
	ana flor acevedo encinas	12 February 2010, 04:02 AM	Grade
	Angello Jahir Hoyos Ibarra	11 February 2010, 08:53 PM	Grade

Here you have the option to click in [Grade](#) and fill the score for each student or scoring everybody at the same time clicking in the [Grade All](#) option.

The suggestion is to click in the [Grade All](#) option, but it depends on likes of the teacher. In any case, you may see a window section as below, where the student name and the number of attempts is shown,

The student name and the number of attempts is the fist thing that you can see. Usually, the number of attempts will be 1 because in a test we expect to obtain information about the real knowledge of the student, not a guessing answer.

Marks: 1

¿Quién desarrolló el proyecto PLATO y dónde lo hizo?

Answer: Fue desarrollado en la universidad de Illinois bajo la dirección de Donald Bitzer y colaboración con Dan Alpert. Fue un equipo que logro facilitar a los estudiantes a aprender mas en un ritmo auto-dirigido. consistia en una red de terminales y un ordenador central. Los estudiantes podrían acceder a cualquiera de las terminales y completar cualquiera de los miles de clases disponibles en el sistema. Y fue realizado en la decadas de 1970.

Correct

Marks for this submission: 1/1.

Comment:

Trebuchet 1 (8 pt) Lang

Path:

Grade: 1 /1

After that, you have the *Marks* that is the percentage value of this question in the global evaluation of the quiz, the wording of the question and the answer of the student. As this question has been scored previously the result (Correct, wrong or partially correcto) and the previous mark for this submission. Finally Moodle give us the oportunity of make a feedback comment for the student and Grade the answer with a number less than the base, that in in this case is one.

Once you have graded the answer, or answers, according to the option previously selected, you have to save the grades with the corresponding button.

It is important to denote that you cannot leave the evaluation in 0/% unless you do not take into account this grade, but the ungraded column will still shown ungraded students.