

Education and Culture DG

Lifelong Learning Programme

LibreEOL e-Assessment platform

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E-assessment

- The E-assessment is fundamental in modern teaching/e-learning approaches, in fact it ensures:
 - The deployment of exams in a very fast way, particularly in cases where the number of students are very high
 - A standardization of tests carried out by teachers
 - A simplification in tests deployment procedures
 - A process speed up in publishing the results



LibreEOL

- LibreEOL is a software project started at the end of 90's as an outcome of a EU Leonardo project
- Presently it has 10 different types of questions with which the teacher can express questions and responses
- LibreEOL has been selected to run the EchemTest tests, to assess (and certify) the competencies in the various areas of Chemistry



LibreEOL and Echemtest+

- **EchemTest+** is based on LibreEOL, an open source product developed by Perugia University
- LibreEOL is a Web application based on open standards **Ajax, HTML5, Javascript,** and **CSS**. The present version runs on a Linux-Apache- MySQL-PHP (LAMP) architecture.



Released under a GPL 2.0 license

Uses Open Source/Freesoftware components



Recommended browsers

<http://www.libreeol.org>



EOL features

- EOL is a web application that represents a complete environment for performing the **e-assessment** of a **large number** of students who access the system from computer labs, under the control and the supervision of the **examiner/teacher**.
- Each **student** is assigned an **individual** test. Each Exam has associated a univocal **password** the student has to specify to access the test.
- The questions of the test are fished up from a set of questions the teacher defined for the **topics** of the named **subject**, classifying each question according to 3 levels of difficulty (**low, medium, high**).



EOL features (I)

- It is possible to **force** the **inclusion** in the test of some questions available in the subject
- EOL may support multiple **languages** for each question (For each question is defined in the reference language and related translations)
- Exams are defined with various **settings** (type of students registration automatic/ manual, **topics** selected, evaluation metric, optional bonus, editable score, etc)
- **Reports** may be produced to show trends and results

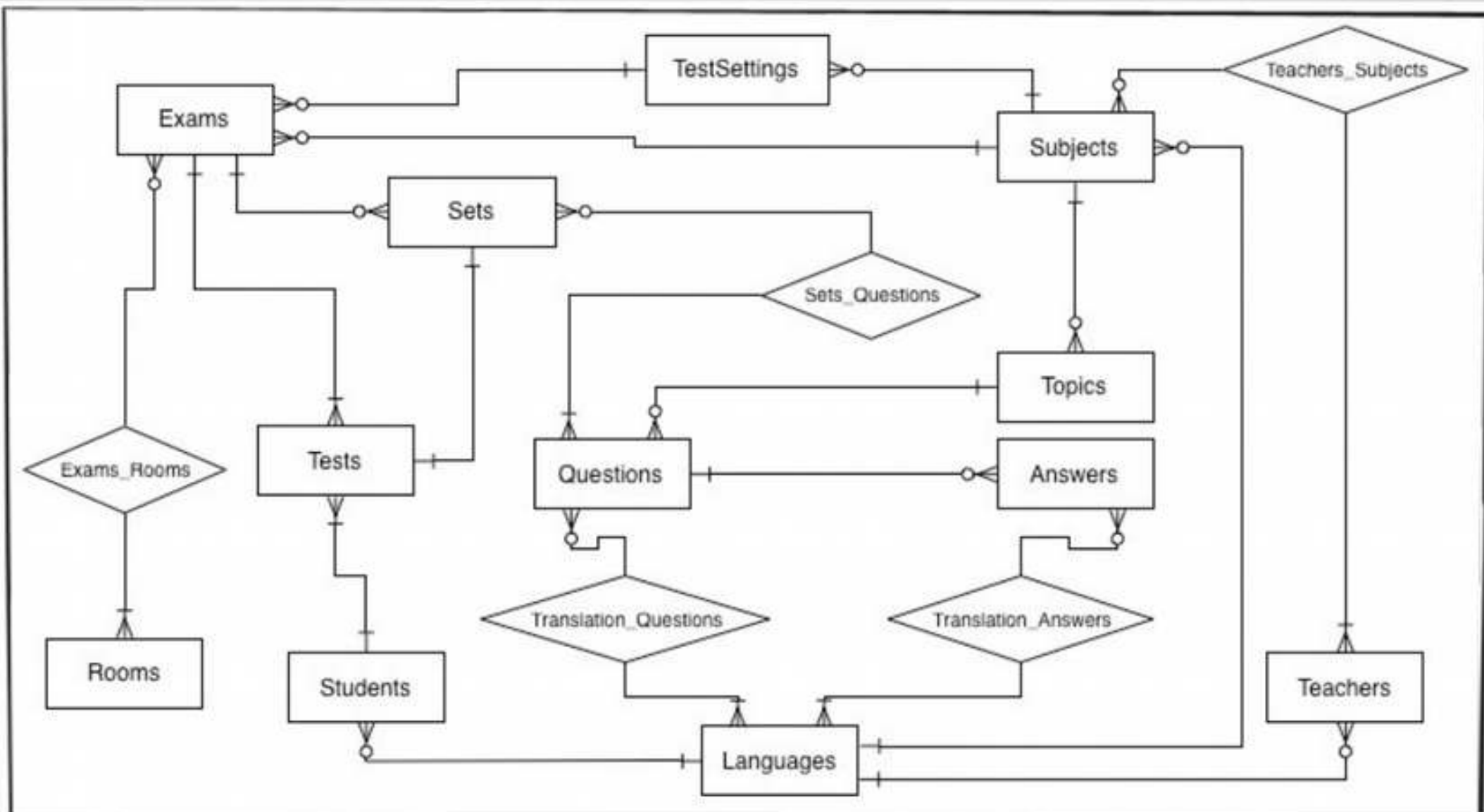


Data Management

- EOL has been designed according to the current best practices: it has been collected the functional and end-user requirements, then a conceptual scheme of entities and relations has been defined.
- The information are stored in a MySQL (MariaDB) RDBMS
- An intermediate layer has been created to simplify the migration to other database management systems.
- The pool of questions are kept separated from the results of the tests/exams, which are accessed by the report procedures



EOL Entity Relation Model



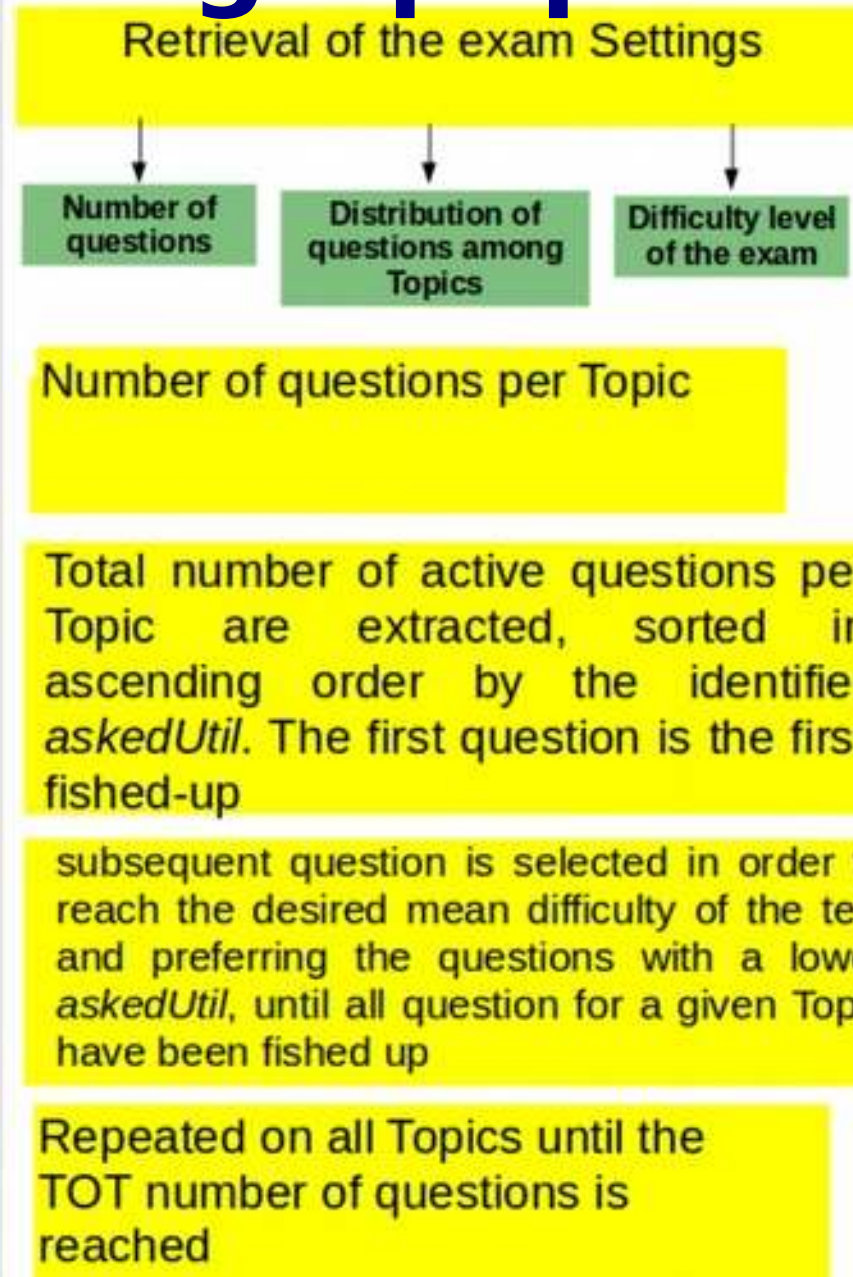


The abstraction layer

- The code is based on the sqlDB method, which allows to abstract the interaction with the RDBMS
- The abstraction layer is composed by:
 - a set of *public methods* to carry out specific operations: `qSubjects`, `qQuestionDetails`, `qStartExam`, etc)
 - a set of *private methods* to communicate with the DBMS (i.e.: `connect`, `execTransaction`, `getError`, etc).
- The present implementation of the DBMS is based on the popular open source DBMS MySQL (MariaDB).



The algorithm used for fishing-up questions





The framework

- To facilitate the development of the EOL system a framework has been introduced
- It is based on the Controller/Action/View paradigm
 - The Controller verify the existance of the required operations and execute them after having verified the access permissions.
 - The Action is a simple operation required by the User and executed by the Controller
 - The View is represented by the PHP code that shows the portion of the web page



Localization of EOL

- The Administrator can easily add a specific language for the **User Interface** and the **web pages**, using an administration panel. For each added language it will be displayed in the relevant web pages the corresponding flag
- It is a teacher duty to translate in a given language the questions and the related responses
- It is not possible to define a greater number of questions in a given localization than in the reference language



Administrator's functions

- Manage the web site information
- Create users (manual registration).
- Assign the **roles** of **teacher** or **examiner** to the user, if necessary
- Manage the **localization** of the User interface and of web pages, enabling the teachers to add the localization of questions and responses
- Define the **classrooms** enabled for tests (IP address range used during exams) and used in settings setup by the examiner.



Teacher's functions:

- Manage **subjects** under her/his control, and per each subject, the related **topics**. EOL do not support sub-topics.
- Create the text (question and responses, in the supported languages) for the various types of questions:
 - Multiple Response
 - Multiple Choice
 - Yes/No
 - True/False
 - Text Match
 - Numeric
 - Filling blanks
 - Pull-down list
 - Matching
 - HotSpot



Examiner's functions:

- Manage **exams, settings** and **students registration**
- Through the **settings** the examiner may select the type of exam in terms of number of questions, duration of the test (the test has to be completed during the selected interval of time), topics covered, IP address range used, how the score is expressed, bonus, score editable or not.
- Respect to QuestionMark, the examiner selects the topics and the relative distribution in terms of the difficulty of the question
- Perform the **reports** (this part has to be still completed)
- The **Testing Center Managers** will be defined with the **examiner** role



Student's operations

- Register to the system, if new. The authentication is managed by the pairs **email-address** /password. In the automatic registration the email has to be true and working.
- Enroll to the test/exam selecting it from the list of the available tests/exams (automatic registration)
- Execute the text in one of the authorized computer room providing the **univocal password** associated to the test/exam, provided by the **examiner/teacher** during the exam.



Migration of the questions from EchemTest[®] to Echemtest+

- Emanuele Gragnoli and Elia Catana wrote the procedure to import the questions from QuestionMark to EOL.
- Fortunately QuestionMark made available the export procedure according to the Instructional Management Systems (**IMS**) (a project of the IMS Global Learning Consortium) the *Question and Test Interoperability* (**QTI**) standard, which encodes the info as XML tags.
- The import of the question has been a great success!



Migration of the questions from EchemTest® to Echemtest+

Type of question	# of questions	# of imported questions in EOL
Multiple choice	7915	7915
Multiple Response	1836	1836
Pull-down list	1146	
Hot Spot	874	
Numeric	684	663*
Text Match	241	230¥
Filling blanks	108	
True/False	36	36
Matching	28	
Ranking	13	
Knowledge Matrix	1	
Total	12882	10680

Not supported:
Knowledge matrix

Not yet implemented:
feedbacks on responses

*: in **21 questions** the **XML tag** related to the **response** were empty
¥: in the case of **11 questions**, the XML parser produced an error parsing the tags and returned an empty string. Such questions are related to the Greek language.



The exam

- The user registered to the exam, once provided the univocal password associated to the exam, will receive on the web page all questions to be responded. The sequence of responses do not matter.
- The responses associated to each question are **presented randomly** to prevent frauds.
- To submit the responses to the exam, the user has to press the “send” button.
- **No feedback** is provided to the student about the **final score**.



A sample teacher desk

EOL - Esami On Line

Welcome Osvaldo Gervasi
IP:93.42.39.3
LOGOUT

Home Subjects Exams Profile Administration

SHOWING 4 EXAMS IN PROGRESS

Name	Subject	Day	Time
Architettura Reti Apr 2015	Architettura Reti	10/04/2015	06:27
preappello maggio 2015	Architettura Reti	26/05/2015	09:04
Esame giugno 2015	Architettura Reti	16/06/2015	08:55
July 2015	Architettura Reti	09/07/2015	09:47

SHOWING 7 TEST

Name	Subject	Time Used	Test Score
Budea Thomas	Architettura Reti	00:48:17	15
Gambini Giorgio francesco	Architettura Reti	00:46:38	18.6
Ricciarelli Marco	Architettura Reti	00:43:59	23.7
Sebastiani Francesco	Architettura Reti	00:48:33	11.1
Aceto Pietro	Architettura Reti	00:25:19	12.45
Sebastiani Francesco	Architettura Reti	00:34:38	21.2
Micheli Francesco	Architettura Reti	00:24:04	19.2



List of subjects

EOL - Esami On Line

Welcome
Osvaldo Gervasi
IP:93.40.169.126
LOGOUT

Home Subjects Exams Profile Administration

SELECT SUBJECT New

- Architettura Reti
- Laboratorio di Reti di computer
- Linguaggi di Realtà Virtuale
- Reti di Computer

INFO

Name : Architettura Reti

Description : Architettura Reti di Computer

Main Language : Italiano

Edit Select Subject

Based on [EOL - Esami On Line](#) (v 0.0.5)



List of questions per subject

EOL - Esami On Line

Welcome
Osvaldo Gervasi
IP:93.40.169.126
LOGOUT

Home Subjects Exams Profile Administration

TOPICS **Architettura Reti**
Internet
Network Services
Reti locali e geografiche
TCP/IP

SHOWING 211 QUESTIONS

SEARCH: []

Text	Languages	Topic	Type	Difficulty
A che cosa serve il sistema SSL?	IT	Internet	Multiple Choice	Easy
A che cosa serve IMAP	IT	Network Services	Multiple Choice	Easy
A che cosa serve SNMP	IT	Network Services	Multiple Choice	Easy
A che cosa serve un Mail User Agent	IT	Network Services	Multiple Response	Easy
A che cosa servono le Basic Encoding Rules (BER)	IT	Network Services	Multiple Choice	Hard
A proposito del protocollo ICMP, quali delle seguenti affermazioni è esatta?	IT	TCP/IP	Multiple Response	Medium
AAL definisce le seguenti classi di servizio	IT	Reti locali e geografiche	Multiple Response	Hard
Che cosa si intende per firewall	IT	Internet	Multiple Choice	Easy
Che cosa si intende per Packet filtering	IT	Internet	Multiple Choice	Easy

Single click to select and view question preview, and double click to edit question and answers info. Double click on flags to activate and deactivate question in test

Single click to filter questions and double click to edit topic info

LANGUAGES QUESTION PREVIEW

Click to show translation



Edit questions (teacher)

EOL - Esami On Line

www.eolunipg.it/index.php?page=question

Welcome Gervasio
93.40.169.126
LOGOUT

QUESTION

Question | Answers

IT | EN

Source

Font - Size - B I U S X X' - Zoom -

A che cosa serve un Mail User Agent

Words: 8

EXTRA

- Calculator
- Periodic Table

Description : A che cosa serve un Mail User Agent

Topic : Network Services | Difficulty : Easy

Exit | Delete | Save

TOPICS

- Architettura Reti
- Internet
- Network Services
- Reti locali e geogra
- TCP/IP

LANGUAGES

Type	Difficulty
Multiple choice	Easy
Multiple choice	Easy
Multiple choice	Easy
Multiple choice	Easy
Multiple choice	Easy
Multiple choice	Hard
Multiple choice	Medium
Multiple choice	Hard
Multiple choice	Easy
Multiple choice	Easy



Exams carried out

EOL - Esami On Line

Welcome
Osvaldo Gervasi
IP:93.42.39.3
LOGOUT

Home Subjects Exams Profile Administration

SHOWING 11 EXAMS IN PROGRESS

SEARCH:

Day	Time	Exam	Subject	Settings	Password	Manage
09/07/2015	09:47	July 2015	Architettura Reti	Esame	9XUMezjf	
16/06/2015	08:55	Esame giugno 2015	Architettura Reti	Esame completo	vi7FKxKg	
26/05/2015	09:04	preappello maggio 2015	Architettura Reti	Appello febbraio 2015	EP7C5gzM	
14/04/2015	09:09	Esame straordinario 140415	Laboratorio di Reti di computer	Laboratorio Reti di Computer	uMXzCKdN	
10/04/2015	06:27	Architettura Reti Apr 2015	Architettura Reti	Esame completo	Ne9YnC4c	
18/02/2015	09:02	Laboratorio Reti del 180215	Laboratorio di Reti di computer	Laboratorio Reti di Computer	jx0AZpJf	
17/02/2015	09:00	Appello 17 febbraio	Architettura Reti	Esame completo	S8SXEBNr	
21/01/2015	07:22	Appello gennaio 2015	Architettura Reti	Esame	JL9JpVAZ	
20/01/2015	12:05	Test	Architettura Reti	Esame completo	OZrlkHdk	
15/01/2015	09:00	Preappello	Architettura Reti	Esonero fine corso	MOPTcU46	
20/11/2014	09:15	Primo Esonero aa 2014-2015	Architettura Reti	Primo Esonero	vNXx0Y4Z	

Based on [EOL - Esami On Line](#) (v 0.0.5)



Exam's details

REGISTRATIONS

SHOWING 6 REGISTERED STUDENTS

SEARCH:



ADD

	Name	E-mail	Time Start	Time End	Time Used	Test Score	Final Score	Manage
	Bajaddi Siham	siham-92@hotmail.it	09:51:34	10:31:04	00:39:30	12.3	14	
	Budea Thomas	thomas.budea@studenti.unipg.it	09:50:03	10:29:49	00:39:46	21.3	23	
	Ciprini Riccardo	riccardociprini@hotmail.it	09:55:39	10:10:59	00:15:20	7.65	10	
	Gambini Roberto	kobe_2007@libero.it	09:52:52	10:20:47	00:27:55	18.75	21	
	Yernata simone	simonevernata@ymail.com	09:57:56	10:35:58	00:38:02	19.2	21	
	Valttuoni safiro betsabeth	safiro91@yahoo.it	09:53:03	10:21:21	00:28:18	16.65	19	

Close

Refresh



Organizing the content

- In order to prepare a test on a given discipline, the teacher has to organize the contents in topics, so that he/she can carry out several types of exams (i.e.: pre-exams).
- Questions will be classified by
 - Type
 - Topics
 - Difficulty level



Defining questions

- The Teacher can express questions using 10 different types of questions
- It is a good practice to assign to each question the same number of responses, in order to minimize the statistical variability of responses
- During each test the responses are shuffled

New QUESTION

- Multiple Choice
- Multiple Response
- Yes / No
- True / False
- Essay Question
- Numeric
- Text Match
- Hotspot
- Pull Down List
- Fill in the blanks

Cancel

Next



Defining a new question

- The first step for defining of a new question for a given Topic is the selection of the question type

The screenshot shows a 'New Question' dialog box. At the top, there is a header bar labeled 'New Question'. Below it, a list of question types is displayed, with 'Multiple Choice' selected and highlighted in orange. The other options are: Multiple Response, Yes / No, True / False, Essay Question, Numeric, Text Match, Hotspot, Pull Down List, and Fill in the blanks. Below the list, a larger grey box provides a description for the selected 'Multiple Choice' type: 'Multiple Choice' followed by 'In a Multiple Choice question the participant selects a single choice from a number of choices to answer the question.' At the bottom of the dialog, there are two buttons: 'Cancel' on the left and 'Next' on the right.



Defining a new question

Once defined the text of the question, one enters the various responses

QUESTION

Question Answers

EN IT

Source

Font Size B I U S x₂ x₃ Zoom

Which response is correct?

Words: 4

Description : Which response is correct?

Topic : Internet Difficulty : Easy

Exit Delete Save

EXTRA

- Calculator
- Periodic Table



Conclusions

- LibreEOL allows to carry out tests related to exams of various type (University courses, professional certifications, language skill assessment, etc)
- The most crucial part is the definition of the pool of questions from which the system automatically fishes out the questions of each individual test
- Questions have to be classified by topic and difficulty