TeSLA project - Towards an evaluation system reliable online
Moodle Moot Spain 2018

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- Moodle Partner
- Office of Learning Technologies UOC
- UOCs LTI
- xAPI and Calliper
- UOC Data Mart

https://www.tresipunt.com
What does (e)Learning mean?

✓ The teaching and learning process is conducted (totally or partially) through the net
✓ **Wide range** of LMS & VLE
✓ Use of **ICT tools** and resources
✓ Teacher as a **facilitator**
✓ Learner: **autonomous**, responsible, **(pro)active**.
✓ E-assessment processes with personalised and continuous feedback
✓ No traditional universities
E-assessment is a continuous electronic assessment process where information and communication technology (ICT) is used to present, solve, record and evaluate assessment activities (Crisp, 2007).

✓ Summative, continuous and formative assessment models coexist

✓ Activities easy to correct or automatic correction is proliferating (i.e. tests, multiple choice exams).

✓ Continuous assessment is combined with final exams.

✓ Blended/Online universities maintain on-site final exams. It is considered the most reliable way to verify students identity.
Real scenario
traditional exam/ assessable activity
– 1 [crime_scene]
traditional exam/assessable activity - 2 [solution_1]
traditional exam/assessable activity
- 3 [unlimited_imagination]
The education has evolved with ICT but NOT e-assessment processes

- We believe that ICT can make the educational system more reliable and credible

Challenge
to update the whole Educational process through e-assessment

Best solution?
Authentication and Authorship
An Adaptive Trust-based e-assessment System for Learning

Overview

Call submitted
Horizon2020 – INFORMATION AND COMMUNICATION TECHNOLOGIES
Topic: Technologies for better human learning and teaching.
Type: Innovation Action, with Large Scale Pilots.
Consortium

18 Partners (130 members)

8 Universities
3 Quality Agencies
4 Research Centers
3 Enterprises
TeSLA concept

**Teacher**
- Did he/she copy from websites?
- Who has done the activity?
- How can I enhance the assessment process using ICT?
- Did he/she deliver the activity on time?

**Students**
- I couldn’t deliver the activity on time because my internet connection failed during the file transfer!
- Can I pass the subject through online assessment?
- When tough moments arise, copy-paste is the solution!
- I asked my colleague to do the essay!

**Need**
Resolve the gap in the current online evaluation system.

There is not a European framework on e-assessment.
There is a lack of technologies to support authorship and authentication.
Main objective

The overall **objective** of the TeSLA project is to define and develop an e-assessment system, which ensures learners **authentication and authorship** in online and blended learning environments while avoiding the time and physical space limitations imposed by face-to-face examination.

The TeSLA project will **cover teaching and learning processes as well as ethical, legal and technological aspects**.
Status

- 3rdB Pilot
- Testing system in 7 Universities
- A free version will be distributed to schools, higher education institutions and vocational training centers, although a commercial-premium version will be also launched on the market.
- More information on [http://www.tesla-project.eu](http://www.tesla-project.eu)
Instruments
Each instrument is considered a black box. TeSLA does not care on what the instrument is doing, only the result. Instruments selected taking into account standard learner resources:
- Webcam
- Microphone
- Keyboard

Enrollment:
- Some instruments require to learn a model for the learner (biometric profile)
- Special activities (‘enrollment activities’) are designed to gather required information.
Instruments in TeSLA system

**What**

- Authentication
  - Face Recognition
  - Voice Recognition
  - Keystroke Dynamics
  - Forensic Analysis
- Authorship
  - Forensic Analysis
  - Plagiarism
- Confidence
  - Face Recognition Anti spoofing
  - Voice Recognition Anti spoofing
  - Time Stamping

**When**

- During activity
  - Face Recognition
  - Face Recognition Anti spoofing
  - Voice Recognition
  - Voice Recognition Anti spoofing
  - Keystroke Dynamics
- After activity
  - Face Recognition
  - Voice Recognition
  - Forensic Analysis
  - Plagiarism
  - Time Stamping

**Biometric profile**

- Required
  - Face Recognition
  - Voice Recognition
  - Keystroke Dynamics
  - Forensic Analysis
- None
  - Face Recognition Anti spoofing
  - Voice Recognition Anti spoofing
  - Plagiarism
  - Time Stamping
Face Recognition

- **Input Data**
  - Video or still images containing a face
- **Goal**
  - Is the user the person in the picture/video?
- **Output**
  - User verification score [0 – 1]
- **Scenario**
  - While the learner is performing an activity, images are captured and analyzed
  - Once a video activity is submitted, it is analyzed
Voice Recognition

• **Input Data**
  – Audio segment of about 10 seconds

• **Goal**
  – Is the user who is talking?

• **Output**
  – User verification score [0 – 1]

• **Scenario**
  – While the learner is performing an activity, audio is captured and analyzed
  – Once an oral activity is submitted, it is analyzed
FR and VR Anti-Spoofing

• Input Data
  – Video in case of FR and audio in case of VR

• Goal
  – Is the user trying to fake the system?

• Output
  – Confidence value [0 – 1]

• Scenario
  – Those tools are executed in parallel to FR and VR and try to detect some known types of fakes
    • Static image in front of the webcam
    • Recorded voice playing on the microphone
Keystroke Dynamics

- **Input Data**
  - Keyboard events (key down and key up)

- **Goal**
  - Is the user who is typing?

- **Output**
  - User verification score [0 – 1]

- **Scenario**
  - While the learner is performing an activity, keyboard events are captured and analyzed
Forensic Analysis (Stylometry)

• Input Data
  – Text documents

• Goal
  – Is the user who wrote this text?

• Output
  – User verification score [0 – 1]

• Scenario
  – Once an activity is submitted (file or open questions in a quiz), it is analyzed.
**Plagiarism**

- **Input Data**
  - Text documents
- **Goal**
  - Are there similar documents to this one?
- **Output**
  - Similarity measure with documents in context [0 – 1]
- **Scenario**
  - Once an activity is submitted (file or open questions in a quiz), it is analyzed.
Time Stamping

• **Input Data**
  – Any electronic document

• **Goal**
  – Has this document modified after a date?

• **Output**
  – Text string used as a receipt
  – Receipt can be validated => OK/Fail

• **Scenario**
  – Once a file is submitted (text, video, audio, ZIP, …) the system provides the learner with a receipt.
  – Teacher can use this receipt to validate the last edition of the file (i.e. accept resubmission of corrupted delivers).
Pilot execution

Consent form signature → Enrolment activities → Follow-up activities

Pre questionnaire → Evaluation → Post questionnaire

Focus group
TeSLA demo

https://vimeo.com/216645337#t=29s
TeSLA Architecture

- VLE Server
- Plug-In
- External Tool
- Learner Tool
- Instructor Tool
- VLE UI Browser
- TeSLA Identity Provider
- TeSLA Portal
- TeSLA Data Provider
- Instrument 1
- Instrument N
- Deployment Manager
- Reporting Tool

TeSLA e-assessment Portal
TeSLA Architecture

- **External tool**: usually a JS that connects with TeSLA
- **TEP**: TeSLA e-assessment Portal
- **TIP**: TeSLA Identity Provider
- **TeSLA Portal**: Portal to manage all TesSLA system for each institution
- **RT**: Reporting Tool
- **DM**: Deploy manager
- **TeSLA Data Provider**: stores instrument data
TeSLA Architecture

Docker Container SERVICE

REQUESTS

Docker Container WORKER

RESPONSES

Docker Container Database

INSTRUMENT
ENVIRONMENT
LIBRARIES
CODE

INSTRUMENT
ENVIRONMENT
LIBRARIES
CODE

RESTful web service

RESTful Client
Moodle UOC Pilots
Consentimientos: 5.262  
Enrolments: 7.897  
Follow-up: 9.072

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<th>MATRÍCULA</th>
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<th>VR</th>
<th>KD</th>
<th>FA</th>
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Total Pilots Sumarization
Moodle TeSLA plugin
Overview

- Local plugin
- Started on January 2017
- Required Moodle version 3.1
- Scheduled tasks
- LTI Support
- Mustache
- Uses a phar with the php TeSLA library
- Internal reporting + Configurable Reports Block
# Callbacks

[https://docs.moodle.org/dev/Callbacks](https://docs.moodle.org/dev/Callbacks)

<table>
<thead>
<tr>
<th>Callback</th>
<th>Description</th>
<th>Moodle version</th>
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</thead>
<tbody>
<tr>
<td>coursemodule_edit_post_actions</td>
<td>Allow to save the tool TeSLA configuration.</td>
<td>3.1</td>
</tr>
<tr>
<td>coursemodule_standard_elements</td>
<td>Allow to add elements to Moodle activity/resource.</td>
<td>3.1</td>
</tr>
<tr>
<td>extend_settings_navigation</td>
<td>Allows to add TeSLA to course Menu</td>
<td>2.1</td>
</tr>
<tr>
<td>extend_navigation</td>
<td>Allows to add the required JS</td>
<td>2.1</td>
</tr>
</tbody>
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Moodle plugin

Callback: coursemodule_standard_elements

Competencies

TeSLA

Instruments to use

- Keystroke Dynamics
- Anti-plagiarism
- Face Recognition
- Face Recognition Online
- Face Recognition and anti-spoofing

Enrollment activity
Moodle plugin

Callback: extend_settings-navigation
Callback: extend_navigation
**LTI Support**

- Version 1.2
- Acts a consumer and provider of LTI
- Consumer: There is external LTI provider developed on Python
  - Enrollment
  - Teacher Module
- Provider: The Tool can be accessed via LTI. Based on [Juan Leyva’s plugin](#)
Thank you!

TeSLA Project: http://www.tesla-project.eu/
Follow us on Twitter: @teslaprojectEU
antoni@tresipunt.com @tunyafix