DigiProf project

Training Material

How to monitor, support and engage students based on the evidence generated by digital technologies

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Introduction

Introduction to the course's main concepts:

- Evidence of learning
- Digital evidence analysis
- Data literacy
- Self-regulated learning
- Learning Analytics (LA)
- LA and metacognitive decision-making
- LA and engagement
- LA: Algorithms and Dashboards
- Moodle tools and recommendations for practice
- Optional readings

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Evidence of learning

Evidence-informed teaching

the principle that teachers should use objective evidence—most commonly, educational research or metrics of performance— to make informed decisions with regards to learning.

Teacher

set learning outcomes

gather
➔ "quantitative" data
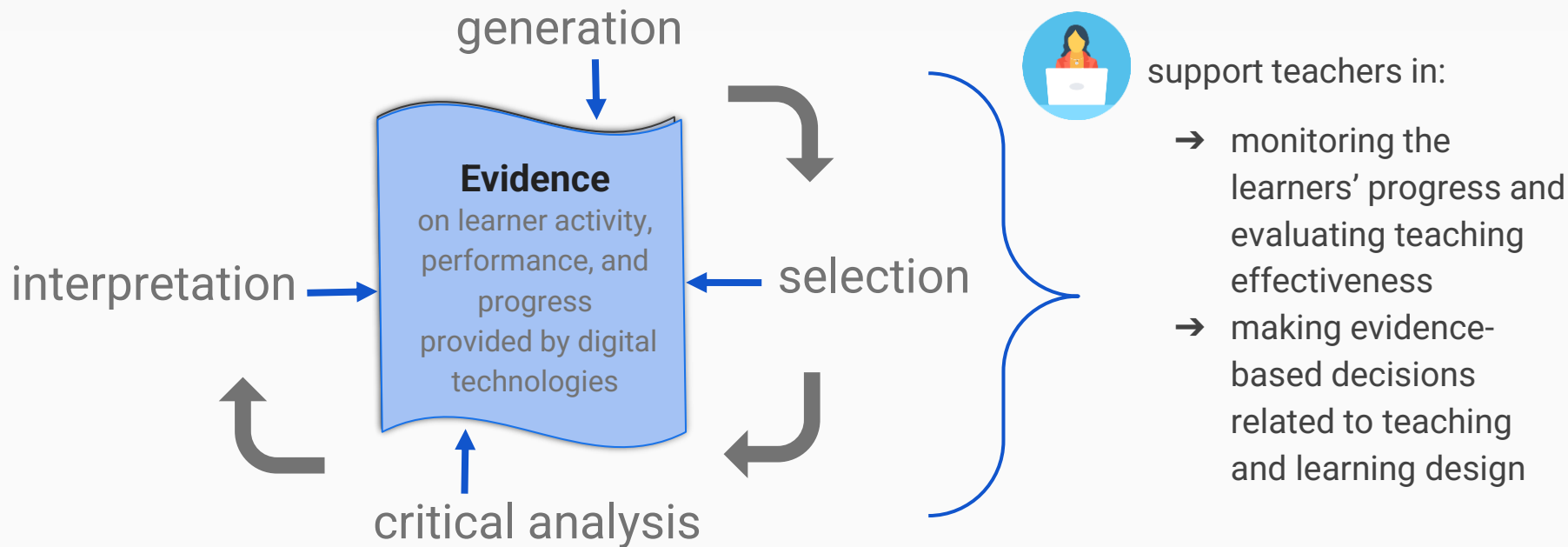➔ "qualitative" information (discussions, work products, results of surveys, observations, etc.)

assess student's achievement

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Evidence of learning

For more information please click here

Direct evidence	Indirect evidence	Supporting evidence
Capstone projects	Interviews	Course grades
Rubrics	Focus groups	Job placement rates
Student portfolios	Student surveys	Graduation rates
Examinations	Alumni surveys	Student publications
Performance evaluations	Student self-evaluations	Student presentations
Quizzes	Students' attitudes	Course pass rates

Digital evidence analysis

generation

Evidence
on learner activity, performance, and progress provided by digital technologies

interpretation

selection

critical analysis

support teachers in:

➜ monitoring the learners' progress and evaluating teaching effectiveness
➜ making evidence-based decisions related to teaching and learning design

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DigCompEdu Framework and Digital evidence analysis

Educators' professional competences

Educators' pedagogic competences

Learners' competences

DigCompEdu Framework (Redecker, 2017)

set of **digital competences** for educators to seize the potential of digital technologies for enhancing and innovating education

1. PROFESSIONAL ENGAGEMENT

2. DIGITAL RESOURCES

3. TEACHING AND LEARNING

6. FACILITATING LEARNERS' DIGITAL COMPETENCE

4. ASSESSMENT

4.1 Assessment strategies

→ **4.2 Analysing evidence**

4.3 Feedback & planning

5. EMPOWERING LEARNERS

To generate, select, critically analyse and interpret digital evidence on learner activity, performance and progress, in order to inform teaching and learning.

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DigCompEdu Framework
(Redecker, 2017)

Competence 4.2 — Analysing evidence

Activities

- To **design and implement learning activities which generate data** on *learner activity and performance*.

- To **use digital technologies to record, compare and synthesize** data *on learner progress*.

- To **be aware that learner activity in digital environments generates data** that *can be used to inform teaching and learning*.

- To **analyse and interpret available evidence** *on learner activity and progress*, including the data generated by the digital technologies used.

- To **consider, combine and evaluate different sources of evidence** on *learner progress and performance*.

- To **critically value the evidence** available to *inform teaching and learning*.

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Data literacy

Optional reading **here**

Evidence analysis

requires

Data literacy

The ability to find, evaluate and read data critically, often beyond their numerical and quantitative form. While learning analytics is focusing on the collection and generation of learners' data to improve teaching and learning experiences, it depends on teachers' and learners' digital literacy skills whether LA-generated data informs teaching and learning or not.

Teacher   **Student**

Data literacy skill

➔ technical abilities (how to concretely access and manage a large amount of data)

➔ reflective practices (how to critically interpret these data and with which objectives)

Access
Monitor
Analyse
Interpret

LA-generated data

improvement of **teaching and learning progress** and processes

enhancement of the **self-regulated learning** (SRL)

customised and timely support during course delivery

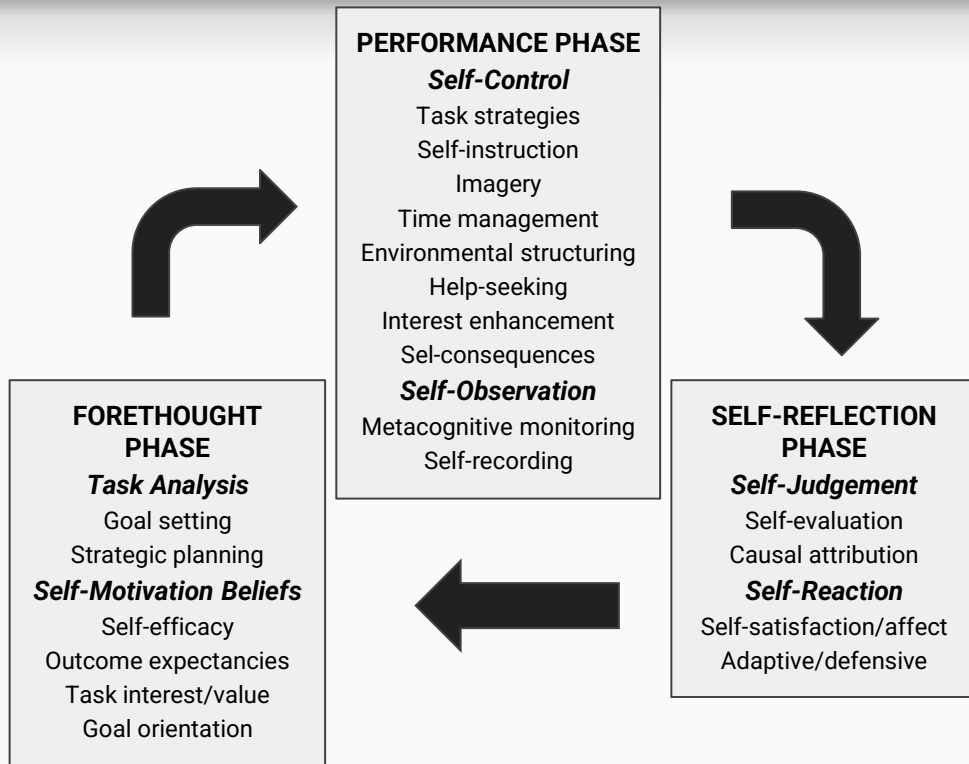SRL enhancement through course design

curriculum adaptation

Self-regulated learning

Self-regulated Learning (SRL)

Learners' beliefs about their capability to engage in appropriate actions, thoughts, feelings, and behaviors in order to pursue valuable academic goals, while self-monitoring and self-reflecting on their progress toward goal-completion. (Zimmerman, 2000)

Zimmerman's SRL cyclical phases model.
Adapted from Zimmerman and Moylan (2009, p. 300)

PERFORMANCE PHASE
Self-Control
Task strategies
Self-instruction
Imagery
Time management
Environmental structuring
Help-seeking
Interest enhancement
Sel-consequences
Self-Observation
Metacognitive monitoring
Self-recording

SELF-REFLECTION PHASE
Self-Judgement
Self-evaluation
Causal attribution
Self-Reaction
Self-satisfaction/affect
Adaptive/defensive

FORETHOUGHT PHASE
Task Analysis
Goal setting
Strategic planning
Self-Motivation Beliefs
Self-efficacy
Outcome expectancies
Task interest/value
Goal orientation

Self-regulated learning (SRL) and digital technologies

SRL necessitates learners to monitor and regulate their cognitive, affective, metacognitive, and motivational (CAMM) processes to accomplish learning objectives (Wiedbusch et al., 2021).

Digital technologies

enhancement of SRL strategies

➔ enable learners to plan, monitor and reflect on their own learning

➔ provide evidence of learners' progress

➔ enable to share insights and come up with creative solutions

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DigCompEdu Framework and Self-regulated learning

DigCompEdu Framework (Redecker, 2017)

set of **digital competences** for educators to seize the potential of digital technologies for enhancing and innovating education

Educators' professional competences

Educators' pedagogic competences

Learners' competences

1. PROFESSIONAL ENGAGEMENT

2. DIGITAL RESOURCES

4. ASSESSMENT

3. TEACHING AND LEARNING

3.1 Teaching

3.2 Guidance

3.3 Collaborative learning

→3.4 Self-regulated learning

5. EMPOWERING LEARNERS

6. FACILITATING LEARNERS' DIGITAL COMPETENCE

To use digital technologies to support self-regulated learning processes, i.e. to enable learners to plan, monitor and reflect on their own learning, provide evidence of progress, share insights and come up with creative solutions.

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Funded by the European Union

Competence 3.4 — Self-regulated learning

Activities

- To **use digital technologies** (e.g. blogs, diaries,planning tools) *to allow learners to plan their own learning*.

- To u**se digital technologies** to *allow learners to collect evidence and record progress*, e.g. audio or video recordings, photos.

- To **use digital technologies** (e.g. ePortfolios, learners' blogs) to *allow learners to record and showcase their work*.

- To **use digital technologies** to *enable learners to reflect on and self-assess their learning process.*

What are Learning Analytics (LA)?

LA

LA are a tool for assessment, interpretation, and analysis of **learner-generated data** in the **online learning environment**, in order to make the learning and teaching processes more efficient by the teacher on interventions needed to advise or consult learners in due time to enhance their academic success. (Volungeviciene et al., 2021, p.12)

There are four main categories of learning analytics:

➔ descriptive (what happened?)
➔ predictive (what will happen next?)
➔ diagnostic (why did it happen?)
➔ prescriptive (do this to improve)

In general they look at (Fergusson, 2012):

➔ System efficacy (to predict students' dropout)
➔ Support for teaching decisions (prevent failure, orientate in-depth studies)
➔ Support of learner autonomy and self-regulated learning

All analytics are based on pedagogical/educational hypotheses.

Click here to go to the source

Insights into LA

❏ Read the definition of LA according to the Society for Learning Analytics Research (SOLAR)

❏ Watch the video "Learning Analytics in a nutshell"
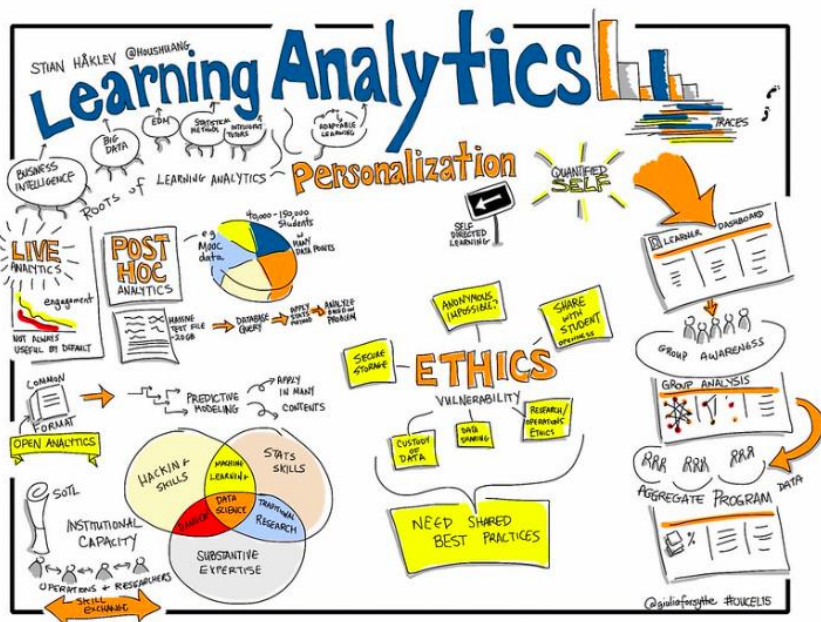
LA and metacognitive decision-making

Metacognitive decision-making

Awareness of specific teaching and learning design decisions and the reasons behind those decisions (Griffith *et al.*, 2016)

Teacher

Design **metacognitive activities** to generate evidence

LA

LA-generated data

Measure and monitor **students metacognition, engagement and behaviour through using** diverse data visualisation tools based on their needs and data literacy skills

provide students with timely personalised support

adjust and adapt the curriculum to respond to learners' needs and abilities
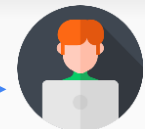
Student

➔ raise awareness of their own cognitive skills
➔ foster a stronger sense of community
➔ promote active engagement
➔ increase motivation and reduce drop-outs

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LA and learner engagement

How students engage with their course and how this engagement can be monitored and improved through LA?

Engagement

Students engagement is concerned with the relation between the time and effort that has been invested by in optimising the experience and enhancing learning (Trowler 2010). Engagement can be situated in behaviour, in thinking processes and in signs of emotion. In other words engagement is perceived in a behavioral, cognitive and emotional dimension.

Behavioural
- Attending lectures
- Getting involved (e.g. asking questions)
- Adhering to classroom protocols (e.g. not being disruptive)

Cognitive
- The student is seeking to learn by going beyond the requirements of the material to enhance their knowledge of the subject

Emotional
- Reactions that are felt to the material being taught
- e.g. feelings of interest and enjoyment

Aspects of student engagement within taught contexts.

(Dobbins & Denton, 2017, p.542)

[Click here to go to the source](#)

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Learner engagement data

Digital technologies (DT)

➔ promoting learners' active and creative engagement with a subject matter

➔ using DT within pedagogical strategies that foster transversal skills, deep thinking and creative expression

➔ opening up learning to new, real-world contexts, which involve learners themselves in hands-on activities, scientific investigation or complex problem solving

foster learners' active engagement

provide the opportunity to observe, measure, and understand learning and assess engagement

➔ log data (e.g. clicking behavior, responding to quizzes in learning environment)

➔ contributions of students (e.g. forums, blogs, etc. for qualitative analysis)

➔ audiovisual data (e.g. observations, computer vision techniques)

➔ physiological data (e.g. emotional responses in students)

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LA: Data analysis and representation

LMS's database:

– Logs and Clicks
– Connection time
– Performance in intermediate tasks
– Number of forum posts
– Sociograms in collaborative tasks
– Quantitative analysis of discourse in a forum or homework
And so on…

Reporting

❏ who? what? when?

Data are selected and combined for descriptive and monitoring purposes (e.g. Moodle built-in reports or third-parties plugins: LearnerScript of Moodle)

LA

❏ why? how well?

Data are selected, combined and converted into "actionable" information through algorithms according to a pedagogical hypothesis (e.g. analytics model of Moodle Learning Analytics API).

Information presented in visual mode: "dashboards"

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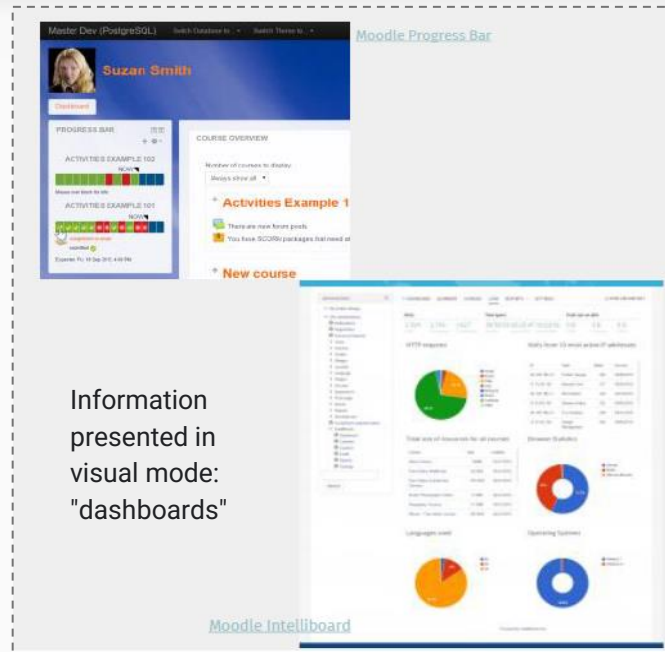
Dashboards

For more information please click <u>here</u>

Learning Analytics Dashboards

Learning Analytics Dashboards are an important subset of learning analytics and refer to the visual representation of the data automatically generated by the system. LADs are data visualisation tools displaying and representing information in a user-friendly way and providing "meaningful and actionable insights at a glance" (Pokhrel & Awasthi, 2021:93).

(Gutiérrez et al., 2020)

DATA COLLECTION

interactions, library and learning materials usage, past grades, timeliness of assignment submissions, etc.

Teacher-facing dashboards

➤ represent students' learning progress through one or more visualisations.
➤ influence teachers' decision-making in order to foster learning and students' SRL
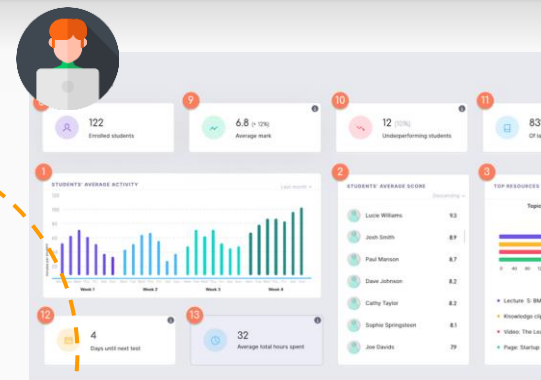
Student-facing dashboards

➤ provide learners with insights about their study progress through visualisations of the learner and learning data.
➤ facilitate self-regulated learning.

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What are course reports in Moodle?

- Watch the <u>video</u> on **course reports**
- Read the article: <u>What are the best Moodle Reporting Plugins for Moodle</u>

In Moodle there are also configurable reports for more advanced users and admin profiles. This <u>reading</u> is optional.

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Moodle reporting plugins -Intelliboard

Watch the [video](#) on **Intelliboard** (optional)

Try the [live demo system](#)

❖ Pros:
➢ Student and teacher dashboards
➢ Customizable
➢ Monitors and reports

❖ Cons: Not free

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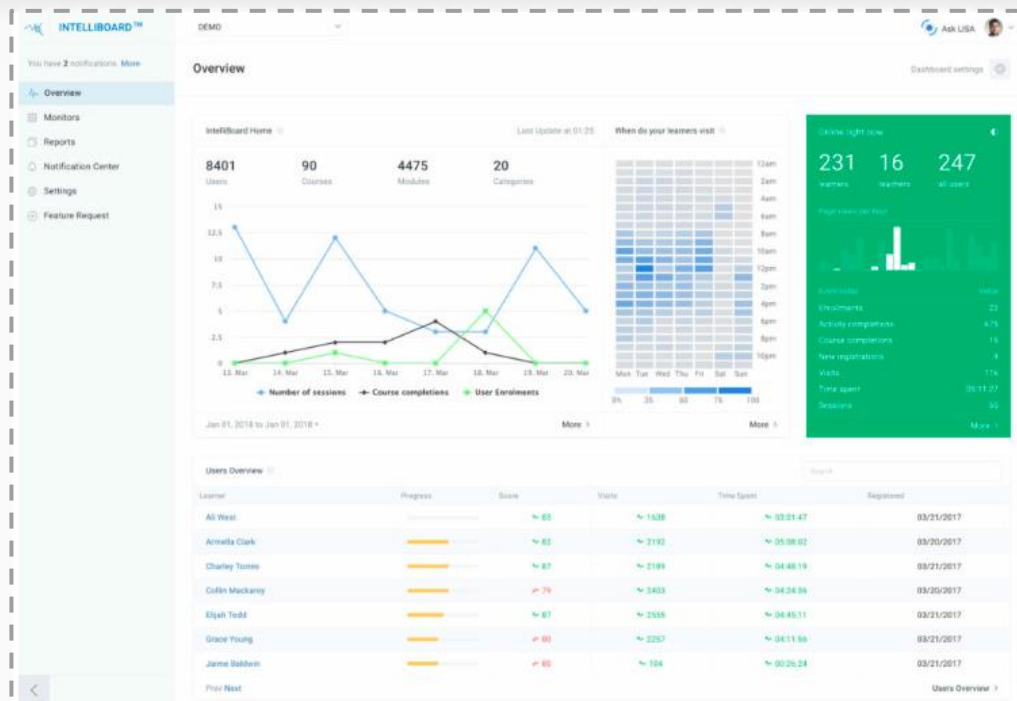
Moodle reporting plugins -LearnerScript

Watch the video on **LearnerScript**

Watch the Webinar on LearnerScript

Click here for demo and free trial

❖ Pros:
  ➢ Student and teacher dashboards
  ➢ Customizable
  ➢ Built for Moodle

❖ Cons: Might be complex to use

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Moodle Learning Analytics (API) and prediction models

👆 [Click here to go to the source](#)
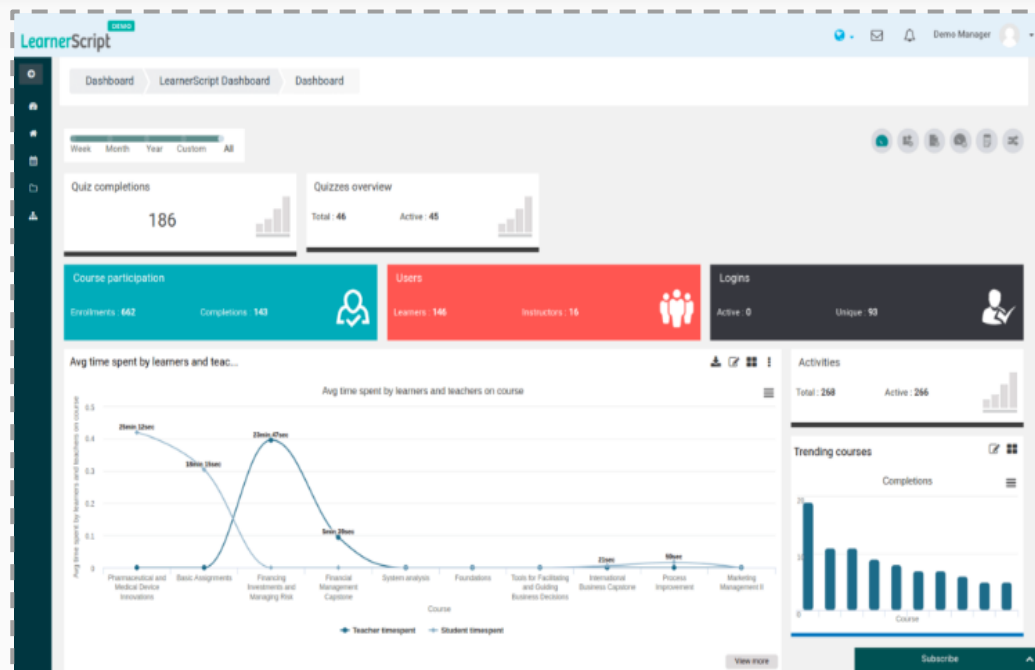
The **Moodle Learning Analytics API** allows Moodle site managers to define prediction models that combine indicators and a target.

It is an open system that can become the basis for a very wide variety of models.

Models can contain:

➢ indicators (a.k.a. predictors),
➢ targets (the outcome we are trying to predict),
➢ insights (the predictions themselves),
➢ notifications (messages sent as a result of insights), and
➢ actions (offered to recipients of messages, which can become indicators in turn).

Create an analytics model

➢ consider the institutional goals the models are meant to support
➢ answer the following questions:
  ❏ What outcome do we want to predict? Or what process do we want to detect? (Positive or negative)
  ❏ How will we detect that outcome/process?
  ❏ What clues do we think might help us predict that outcome/process?
  ❏ What should we do if the outcome/process is very likely? Very unlikely?
  ❏ Who should be notified? What kind of notification should be sent?
  ❏ What opportunities for action should be provided on notification?

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To sum up… Moodle provides

- **Built-in reports based on log data** (descriptive in nature). They provide information on activities and course-completion.
- **Analytics** that generate **models** (prediction models). They should be enabled after careful consideration of the objectives you want to achieve.

Example: A valuable prediction model for student engagement would be:
Students at risk of dropping out
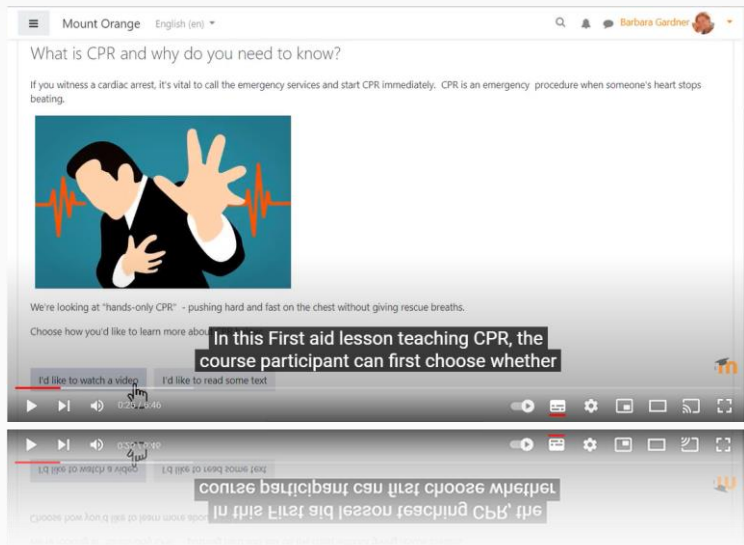
Optional reading **here**

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☝ Click here for further reading on this model

Students at risk of dropping out

Prediction: ⚠ Student at risk of dropping out

Name	Actions
Nannie Hussain	Actions ▾
Mariano Hernandez	💬 Send message
Carmella Carandang	📊 Outline report
Barbara Bhardwaj	🔍 View prediction details
	✔ Acknowledged
	🗑 Not useful

Insights and Actions

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Adaptive Learning

This [video](#) shows how to add a sequence of learning content, how to use quizzes, the connections to jump to different sections and all the affordances of Moodle when you structure a lesson.
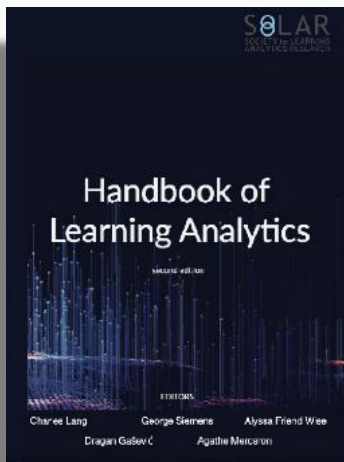
NOTE: It is very important to **PLAN YOUR LESSON STRUCTURE IN ADVANCE!**

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Optional readings

Read the following chapters taken from the Handbook of Learning Analytics – Second edition

➔ Chapter 8. Learning Analytics for Self-Regulated Learning

➔ Chapter 13. Teacher and Student Facing Learning Analytics

➔ Chapter 19. Data Literacy and Learning Analytics

➔ Chapter 21. Human-centered Approaches to Data-informed Feedback

An infographic to conclude

☝ Finally, check the [synthesis](#) of this learning material

We hope you found this introduction useful!

References

Dobbins, C., Denton, P. (2017). *MyWallMate*: An Investigation into the use of Mobile Technology in Enhancing Student Engagement. *TechTrends* 61, 541–549. https://doi.org/10.1007/s11528-017-0188-y

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Trowler, V. (2010). Student Engagement Literature Review. The Higher Education Academy. https://www.heacademy.ac.uk/system/files/studentengagementliteraturereview_1.pdf

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Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R., Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-39). Academic Press.

Zimmerman, B. J., and Moylan, A. R. (2009). Self-regulation: where metacognition and motivation intersect. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (eds), *Handbook of Metacognition in Education* (pp. 299–315). Routledge.