



RELEVANT ASSESSMENT AND PEDAGOGIES FOR INCLUSIVE DIGITAL EDUCATION



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## APPENDIX 1- TECHNICAL SPECIFICATION ON DASHBOARDS SUPPORTING IMPLEMENTATION OF INNOVATIVE PEDAGOGIES

24/10/2022



TITLE	TECHNICAL SPECIFICATION ON DASHBOARDS SUPPORTING IMPLEMENTATION OF INNOVATIVE PEDAGOGIES
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ABSTRACT:	THIS DOCUMENT PRESENTS A SHOWCASE ON IMPLEMENTATION OF INNOVATIVE PEDAGOGIES PREPARED WITHIN IO3.
KEY WORDS	IO3, DASHBOARD, LEARNING ANALYTICS, FLIPPED CLASSROOM

## EXECUTIVE SUMMARY

The aim of this document is to present a showcase on implementation of innovative pedagogies. The showcase consists of three parts:

- prototype of a “Engagement activity” plug-in to support implementation and usage of innovative pedagogies (such as Flipped Classroom - FC, Work Based Learning - WBL, etc.) in the Moodle LMS;
- student and teacher dashboard supporting implementation of FC;
- e-course prepared in line with FC principles to enable better insight in functionalities of student and teacher dashboard supporting implementation of FC.

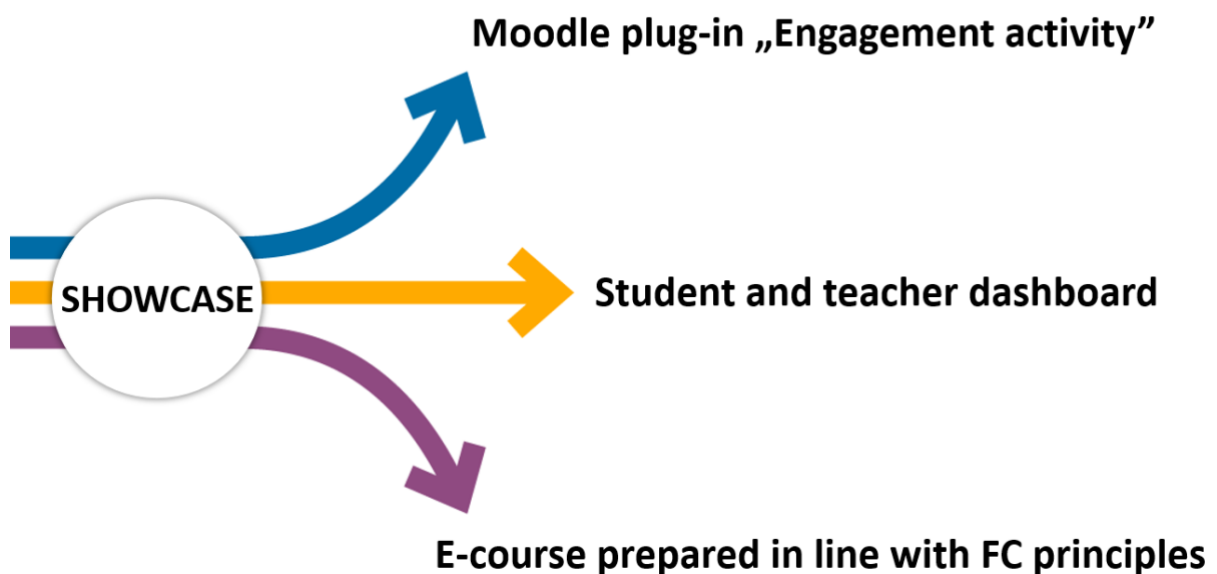


Figure 1: Showcase on implementation of innovative pedagogies

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## E-COURSE

For the purpose of testing and validating Moodle plugin prototype supporting implementation of innovative pedagogies, specifically FC approach, we have prepared e-course in line with FC principles as presented at Figure 2.















Figure 2: FC principles

## E-COURSE DESCRIPTION

Following, e-course consists of three topics – Prepare! (pre-class phase), Engage! (class phase), Extend! (post-class). Further, activities and resources in Prepare! topic are divided into two categories: **Independent learning** and **Self assessment**; activities and resources in Engage! topic are divided in two categories: **Problem solving** and **Discussion**; activities and resources in Extend! Phase are divided in two categories: **Investigation** and **Production**.

For the purpose of this showcase the Engage! phase is in progress.

Prepare! (pre-class phase)	
<b>Independent learning</b>	<input type="checkbox"/>
 Learning material 1	<input type="checkbox"/>
 Learning material 2	<input type="checkbox"/>
 Learning material 3	<input type="checkbox"/>
<b>Self-assessment</b>	<input type="checkbox"/>
 Quiz 1	<input type="checkbox"/>
 Quiz 2	<input type="checkbox"/>
Engage! (class phase) - In progress	
<b>Problem solving</b>	<input type="checkbox"/>
 Assignment	<input type="checkbox"/>
 Quiz 3	<input type="checkbox"/>
<b>Discussion</b>	<input type="checkbox"/>
 Discussion on topic	<input type="checkbox"/>
Extend! (post-class phase)	
<b>Investigation</b>	<input type="checkbox"/>
 Instructions on investigation activity	<input type="checkbox"/>
 Critical review	<input type="checkbox"/>
<b>Production</b>	<input type="checkbox"/>
 Project assignment	<input type="checkbox"/>
 Peer-assessment	<input type="checkbox"/>

**Figure 3: Structure of e-course**

## DASHBOARDS

As defined by Schwendimann et al. 2016, learning analytics dashboards are “single displays that aggregate different indicators about learner(s), learning process(es) and/or learning context(s) into one or multiple visualisations”<sup>1</sup>.

As already mentioned, for the purpose of this showcase we designed dashboards supporting implementation of FC.

The design process of dashboards is in line with the Deming cycle Plan-Do-Check-Act (DCA) cycle (Innovative. Authentic. Deming., <https://deming.org/explore/pdsa/>) as presented at **Figure 4**.

<sup>1</sup> Schwendimann, B., Rodriguez-Triana, M., Vozniuk, A., Prieto, L., Boroujeni, M., Holzer, A., Gillet, D., Dillenbourg, P.: Perceiving learning at a glance: a systematic literature review of learning dashboard research. IEEE Trans. Learn. Technol. 10(1), 30–41 (2016)



Figure 4: Dashboards design in line with PDCA cycle

## DASHBOARDS PLANNING (PLAN PHASE)

In the “Plan” phase we conducted the following activities:

- literature review on dashboards (*presented in Chapters 3 and 4*);
- research among FOI students 2017 and 2022 and School of Medicine (UniZg) students 2022 (*presented in Chapter 3*)
- identified principles of FC and BDP (*presented in result IO1*).

The results of these activities present a preconditions for effective design of student and teacher dashboard supporting implementation of FC approach.

## DASHBOARDS PROTOTYPING (DO PHASE)

“Do” phase is dedicated to the defining aim and functionalities of the student and teacher dashboards and prototyping.

In general, the aim of the dashboard is to:

- support implementation of FC approach
- enable more effective student and teacher engagement
- allow more advanced monitoring of students’ progress.

**Main functionalities of the dashboard are:**

- messaging system
- alert system
- calendar
- easy to read graphs
- more detailed activity completion and progress report.

## STUDENT DASHBOARD

The aim of the student dashboard is to:

- enable better monitoring of students learning path through FC activities
- raise students' awareness on their progress during FC activities
- motivate students to increase their engagement in FC activities
- provide students with clear overview of FC activities and of their and peer results.

### Elements of student dashboard

Student dashboard consists of four blocks:

- Block 1: Welcoming block
- Block 2: Prepare! block
- Block 3: Engage! block
- Block 4: Extend! block

and detailed report on student' activities.

#### Block 1: Welcoming block

- welcome message (motivational, pay attention to, ...)
- short status message
- overall progress (for all phases) – coloring (green – phase is competed, red – phase is not completed) - enabling positioning for students (not comparison)

#### Block 2: Prepare! block

- phase status (closed/in progress/not started yet) and duration
- types of activities (categories)
- indicator of completion of categories of activities
- number of activities per category
- details on performed activities in phase (completion status, peer statistics – accessed, completed, grade, average grade) - enabling positioning for students (not comparison)

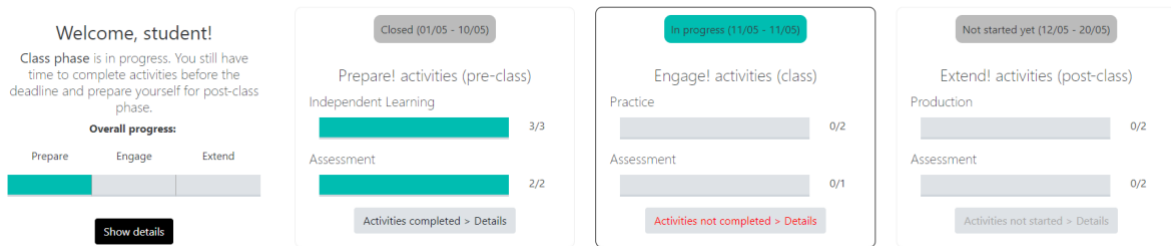
#### Block 3: Engage! block

- phase status (closed/in progress/not started yet) and duration
- types of activities (categories)
- indicator of completion of categories of activities
- number of activities per category
- details on performed activities in phase (completion status, peer statistics – accessed, completed, grade, average grade) - enabling positioning for students (not comparison)

#### Block 4: Extend! block



- phase status (closed/in progress/not started yet) and duration
- types of activities (categories)
- indicator of completeness of categories of activities
- number of activities per category
- details on performed activities in phase (completion status, peer statistics – accessed, completed, grade, average grade) – enabling positioning for students (not comparison)



**Figure 5: Student dashboards (Engage! Phase is in progress)**

Detailed review of student' activities enable student insight into completion status on each activity, peers statistics on activities (accessed and completed) achieved student grade and achieved average grade of all students in the course per activity.

Resource / Activity	Completion status	Peer statistics - accessed	Peer statistics - completed	Grade	Average grade
<b>Independent learning</b> 📅 07/05/2022					
📄 Learning material 1	🟢	80%	70%	/	/
📄 Learning material 2	🟢	90%	85%	/	/
📄 Learning material 3	🟢	60%	55%	/	/
<b>Assessment</b> 📅 10/05/2022					
📄 Quiz 1	🟢	90%	85%	3.5	4.2
📄 Quiz 2	🟢	60%	55%	14	12

**Figure 6: Activities details**

## TEACHER DASHBOARD

**The aim of the teacher dashboard is to:**

- enable better monitoring of students progress through FC activities in three phases
- support adaptation of teaching strategies and individual support to students
- enable better post-analysis of FC activities

### Elements of teacher dashboard

Teacher dashboard consists of four blocks:

- Block 1: Welcoming block
- Block 2: Prepare! activities (pre-class)
- Block 3: Engage! activities (class)
- Block 4: Extend! activities (post-class)

and detailed report on students' activities.

Block 1: Welcoming block

- Message on students' progress
- Overall students' progress per phases (Prepare, Engage, Extend) – percentage of students that completed activities in phase

Block 2: Prepare! activities (pre-class)

- phase status (closed/in progress/not started yet) and duration
- percentage of students that completed activities in category of activities
- details for each student (completion summary – number of completed activities in phase, review of all activities per category, access and completion indicator for each activity, number of achieved scores for assessment activity,

Block 3: Engage! Activities (class)

- phase status (closed/in progress/not started yet) and duration
- percentage of students that completed activities in category of activities
- details for each student (completion summary – number of completed activities in phase, review of all activities per category, access and completion indicator for each activity, number of achieved scores for assessment activity,

Block 4: Extend! Activities (post-class)

- phase status (closed/in progress/not started yet) and duration
- percentage of students that completed activities in category of activities
- details for each student (completion summary – number of completed activities in phase, review of all activities per category, access and completion indicator for each activity, number of achieved scores for assessment activity,

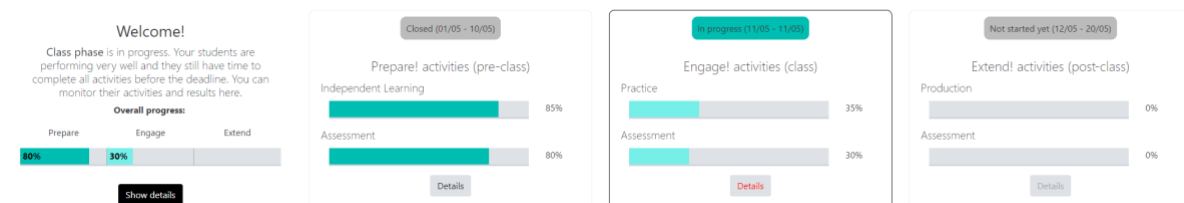


Figure 7: Teacher' dashboards (Engage! Phase in progress)

Student	Completion summary	Independent learning			Assessment	
		Learning material 1	Learning material 2	Learning material 3	Quiz 1	Quiz 2
Jessie Bell	5/5	👁️👁️	👁️👁️	👁️👁️	👁️👁️ (4)	👁️👁️ (13)
Austin Chambers	1/5	👁️👁️	👁️👁️	👁️👁️	👁️👁️	👁️👁️
Carolyn Stevenson	3/5	👁️👁️	👁️👁️	👁️👁️	👁️👁️	👁️👁️
Shari Meyer	3/5	👁️👁️	👁️👁️	👁️👁️	👁️👁️	👁️👁️
Terrance Schultz	3/5	👁️👁️	👁️👁️	👁️👁️	👁️👁️	👁️👁️
Marshall Webb	3/5	👁️👁️	👁️👁️	👁️👁️	👁️👁️	👁️👁️
Tabitha Beck	5/5	👁️👁️	👁️👁️	👁️👁️	👁️👁️ (4.4)	👁️👁️ (11)
Average grade					4.2	12

Figure 8: Students' activities details

Detailed review of students' activities provides teacher better insight into students' activities through completion summary of all activities per each student, status on each activity per each student (viewed/completed), achieved scores for assessment activities, and average grade per assessment activity.

CHECK THE DASHBOARDS (CHECK PHASE)

In order to check the usefulness and functionalities of designed student and teacher dashboards supporting implementation of FC approach we conduct 3 focus groups with 5-7 participants during the Learning, Teaching and Training activity in Frankfurt, 27-29 April, 2022. The focus groups participants were: HE teachers, instructional and learning designer, support staff for technical and teaching issues in HE. In the plenary session dashboards from the previous phase were presented to the participants and then they are splitting in the focus groups for the next 90 minutes.

The conduction of focus groups was organized around following discussions:

**1. Discussions on student FC dashboard:**

- 1.1. Do you think the design of the dashboard is user-friendly or would you suggest improvements? If so, which?
- 1.2. Do you think any additional features are needed in a student FC dashboard? If so, which?
- 1.3. Do you find such a dashboard helpful in terms of enhancing students' learning in FC? If not, why?

**2. Discussions on teacher FC dashboard:**

- 2.1. Do you think a dashboard would be useful for teachers in managing FC?
- 2.2. What functionalities and visualizations do you find the most useful to support teachers?

**3. Discussion on dashboards for other T&L approaches:**

- 3.1. Would the functionalities of FC dashboards also be applicable to other T&L approaches?
- 3.2. Particularly, what functionalities do you consider important for PBL?

**1. Notes on student FC dashboard:**

- 1.1. Most of the participants agreed that designed FC dashboard for student is user-friendly - simple, nice design, informative and useful. As a disadvantage is stated accessibility, i.e. colour adjustment for people with disabilities.
- 1.2. As an additional needed feature participants stated: overall learning path encompassing all phases and activities to enable quick visual review of learning journey through FC, phases/activities diversification through colours, better emphasis of deadlines of upcoming activities (e.g. number of remaining days/hours to deadline, expected workload of activities, personal planner (including deadlines), notification module (or recommendations – what if you missed some activities?), collecting comments from participants.
- 1.3. Most of participants consider dashboard helpful for students giving them better overview in learning activities and enabling them easier following the intended pedagogy. Participants also opened the discussion on usefulness of using dashboard in different sciences (e.g. natural and social sciences).

**2. Notes on teacher FC dashboard:**

- 2.1. Regarding the teacher FC dashboard participants also consider that dashboard is useful for teachers enabling them to see if students accepted the flipping concept, how to manage in FC concept and enabling them timely reaction to underperforming students.
- 2.2. As an additional needed features participants stated: upgrade of alert system (indication of students in risk, which students require special attention because of their underperformance, sorting, filter and search option, “jump out” notifications. Participants also mentioned that offsite activities during the FC concept are not easily captured so it is important in some way design accompanying activities such as assessments/tasks/selfreport.

**3. Notes on dashboards for other T&L approaches**

- 3.1. Participants agreed that functionalities of FC dashboards are designed as configurable (enable defining number of phases, categories of activities, messages) and as such applicable to other T&L approaches.
- 3.2. Concerning the Problem Based Learning approach which is mostly organized as group/team activity, participants suggested to add features related to team-work and peer-assessment, monitor of individual and group performance.

## DASHBOARDS UPGRADE – ACT PHASE

Based on the performed focus groups and collected feedback we updated the student and teacher dashboards.

The following features are added at student dashboard:

- Number of days left before the deadline
- Expected workload per category of activities
- Sorting

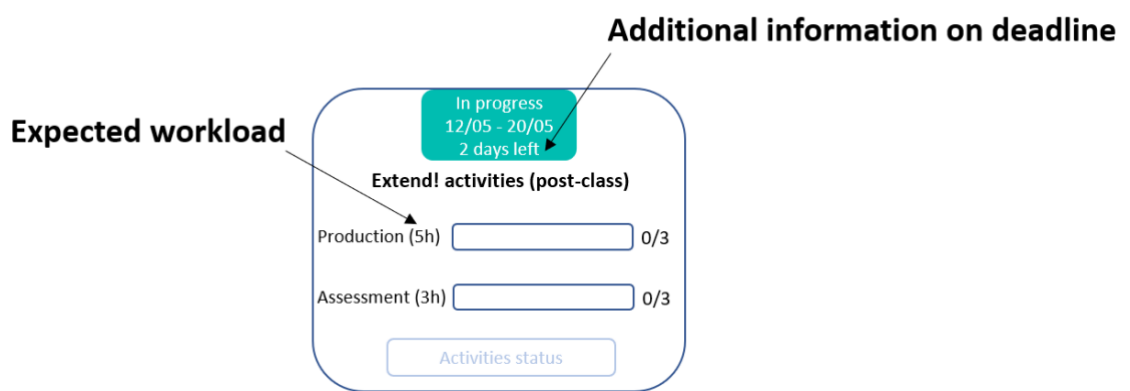


Figure 9: Student dashboard updated

The following features are added at teacher dashboard:

- Notification on students at risk
- Sorting on completion

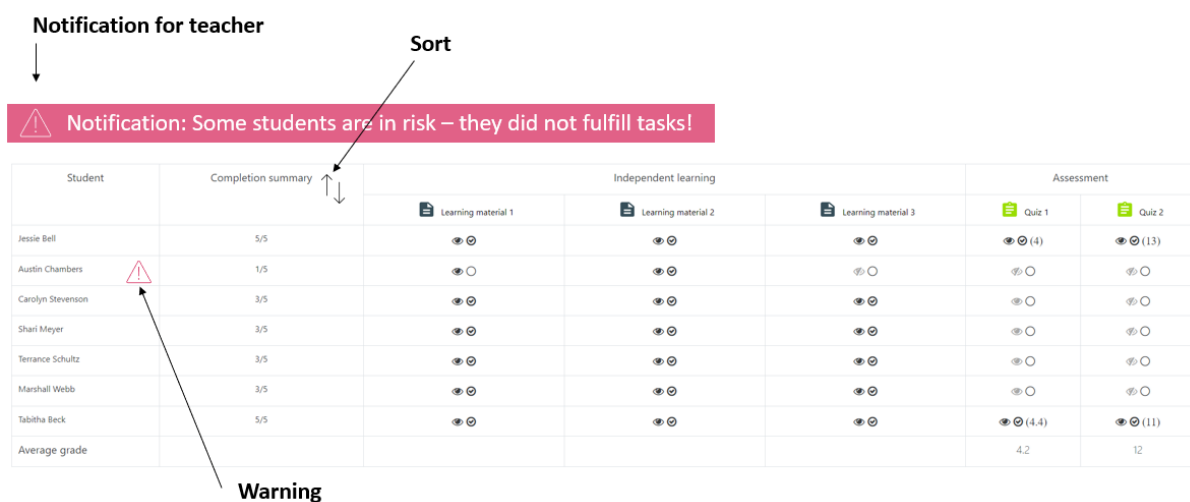


Figure 10: Features added at teacher dashboard

## MOODLE PLUG-IN “ENGAGEMENT ANALYTICS”

In order to support implementation and usage of innovative pedagogies (such as FC, WBL, etc.) in the Moodle LMS, we have developed a prototype of a „Engagement activity“ plugin.

The main aim of the plugin is to enable more effective student engagement but also to allow more advanced monitoring of students progress for the teachers. The plug-in enables configuration of arbitrary educational phases by creating custom categories and assigning Moodle activities and resources into created categories, defining deadlines and context related messages.

Since the plugin is intended for students and teachers, all the relevant information is presented through 2 main dashboards, specially designed for these two roles.

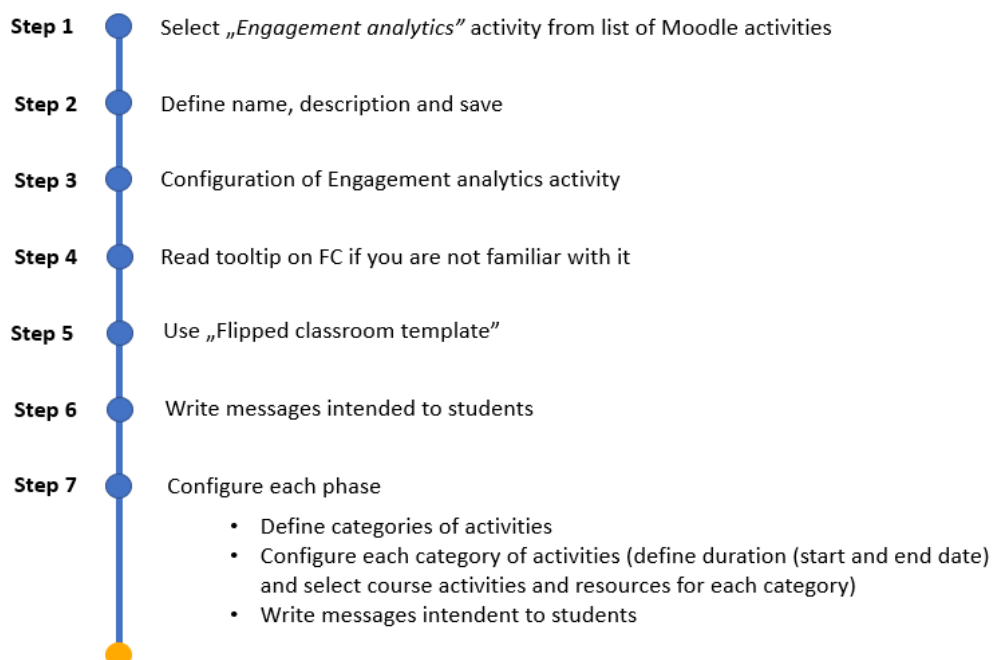
Although the plugin could potentially support various pedagogical approaches while delivering specific lessons, in the prototype phase, we have focused on FC approach offering templates for typical FC approach, implemented through 3 phases (pre-class, class, post-class), containing logically structured educational resources and activities.

#### Aim of the plug-in for innovative pedagogies:

- Enable better monitoring of implementation of innovative pedagogies
- Raise students’ awareness on their progress during activities such as FC and WBL
- Increase students’ engagement in those activities
- Support implementation of innovative pedagogies by providing guidelines, clear overview of activities, student and peer progress

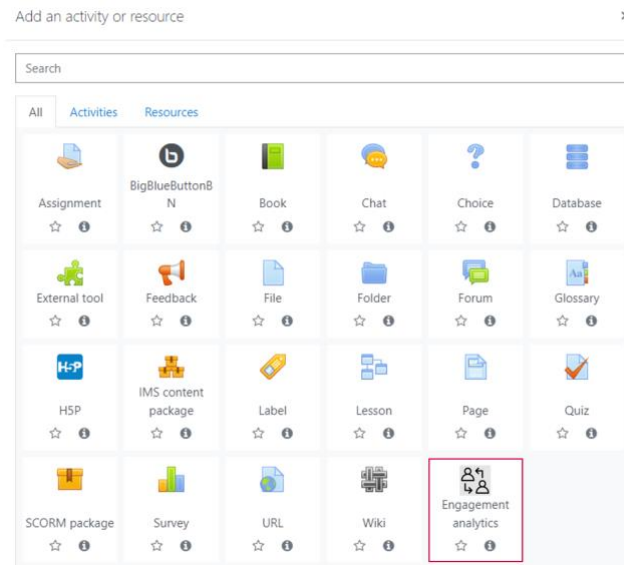
**Moodle plug-in “Engagement analytics” is designed as standard Moodle activity available from the list of Moodle activities.**

#### Timeline for configuration “Engagement analytics” activity for FC



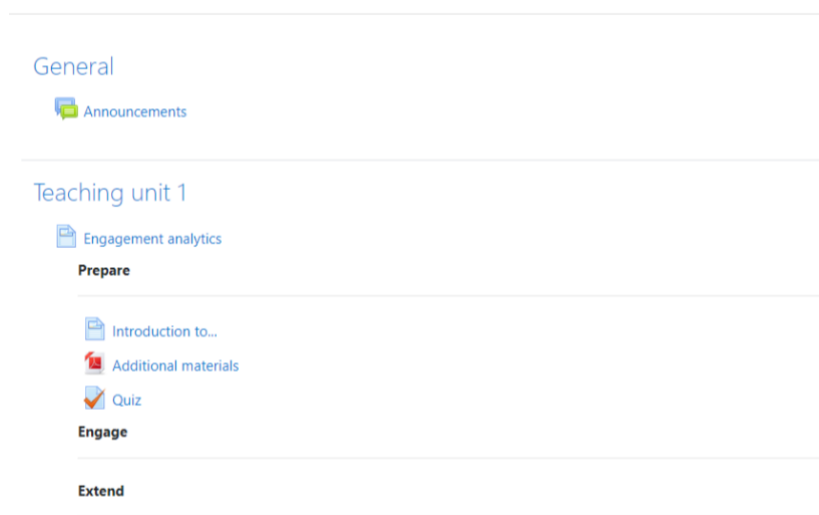
Dashboard supporting implementation of FC configured

**Step 1: Select „Engagement analytics” activity from list of Moodle activities**



### Step 2: Define name, description and save

Engagement analytics activity can be added to any course topic.



### Step 3: Configuration of Engagement analytics activity

The Engagement analytics activity can be configured in two ways:

1. Arbitrary configuration
2. Load from templates


Test

[Dashboard](#) / [My courses](#) / [Test](#) / [Topic 3](#) / [Engagement analytics](#)

---

Engagement analytics

[Analysis](#) [Configure](#) [Templates](#)



**Nothing configured yet**

[Configure manually](#) [Load from template](#)


If you select **Load from template** you can use FC template or Work Based Learning template

**Step 4: Read tooltip (*Details*) on FC if you are not familiar with it**

Engagement analytics

[Analysis](#) [Configure](#) [Templates](#)


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**Flipped Classroom Template**

Use this template to deliver lectures based on FC model...

[Use this template](#) [Details](#)



**Work Based Learning**

Use this template to deliver lectures based on WBL model...

[Use this template](#) [Details](#)

**Engagement analytics – FC template**

The flipped classroom (FC) is generally defined as a strategy that flips the traditional education setting, i.e., the information transmission component of a traditional face-to-face lecture is moved out of class time. The FC is an active, student-centered approach that is designed to increase the quality of the period within class, provides opportunities for structured, active learning and encourages students to inquire and to interact with teachers, peers, employers and learning materials. Moreover, it has potential to enable teachers to cultivate critical and independent thoughts in their students, building their capacity for lifelong learning, and thus preparing future graduates for their workplace contexts. The FC relies on technology and is therefore suitable for online or blended learning.

FC consists of three phases: **pre-class** (independent student activity), **class** (interaction with teacher and other students) and **post-class** (independent/team student activity).

Recommended types of activities per phases and Moodle resources and activities that can be used for each corresponding activity type:

Phases/Type of activity	Acquisition	Discussion	Investigation	Practice	Production	Assesment
<b>Pre-class</b> Independent student activity	✓	✓	✓			✓
<b>Class</b> Interaction with teacher and other students		✓	✓	✓	✓	✓
<b>Post-class</b> Independent/team student activity		✓	✓	✓	✓	✓
<b>Moodle resources/ activities</b>	File Book Lesson Page URL	Forum Chat	Assignment Database Wiki Forum	Assignment Quiz Workshop	Assignment Workshop Glossary Database	Assignment Quiz

Figure 11: Tooltips

**Step 5: Use “FC template”**

In FC template are pre-defined three phases: Prepare, Engage and Extend.

**Step 6: Write messages intended to students that will be displayed at dashboard depending on phase status**  
(1. Before start; 2. After end – activities completed; 3. After end – activities not completed)

Engagement analytics

Analysis | Configure | Templates

**Flipped Classroom Template**  
Use this template to deliver lectures based on FC model...

**Main messages**

Before start

Your learning journey within this topic will be performed as flipped classroom approach consisting of three phases (pre-class, class, post-class).

After end – activities completed

Flipped classroom journey ended. You completed all activities. Congratulations!

After end – activities not completed

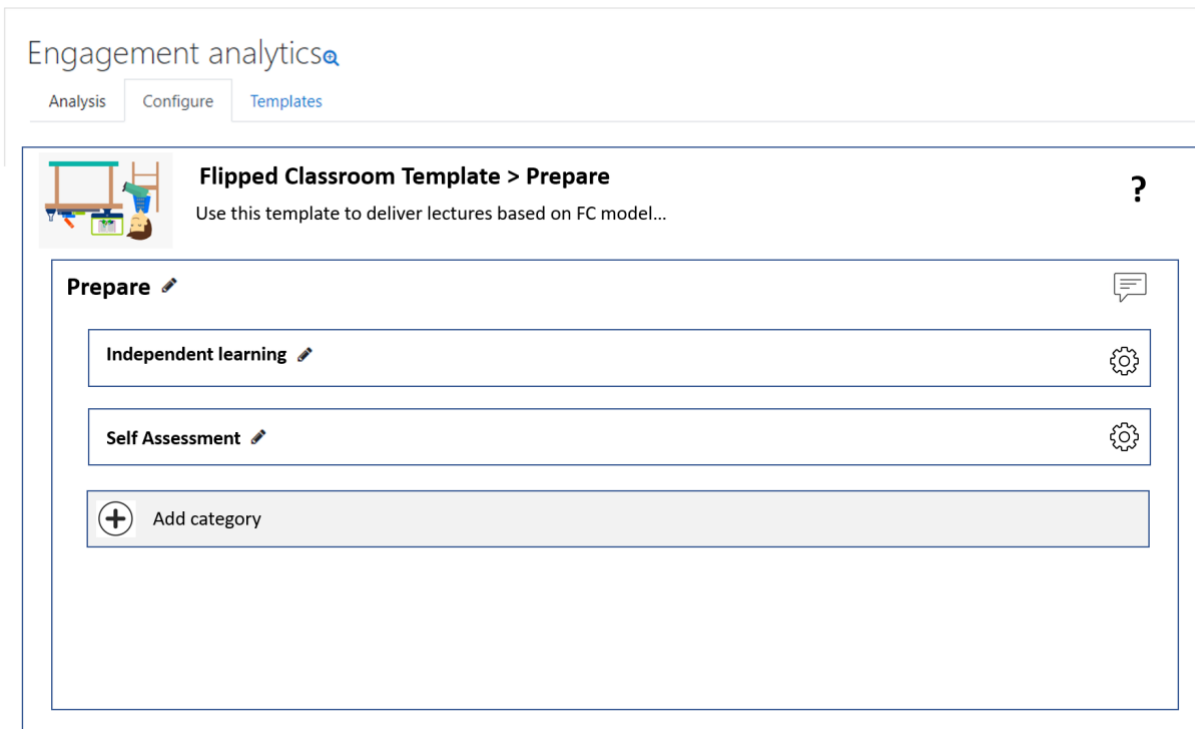
Flipped classroom journey ended. Unfortunately, you did not complete all flipped classroom activities.

**Step 7: Configure each phase**



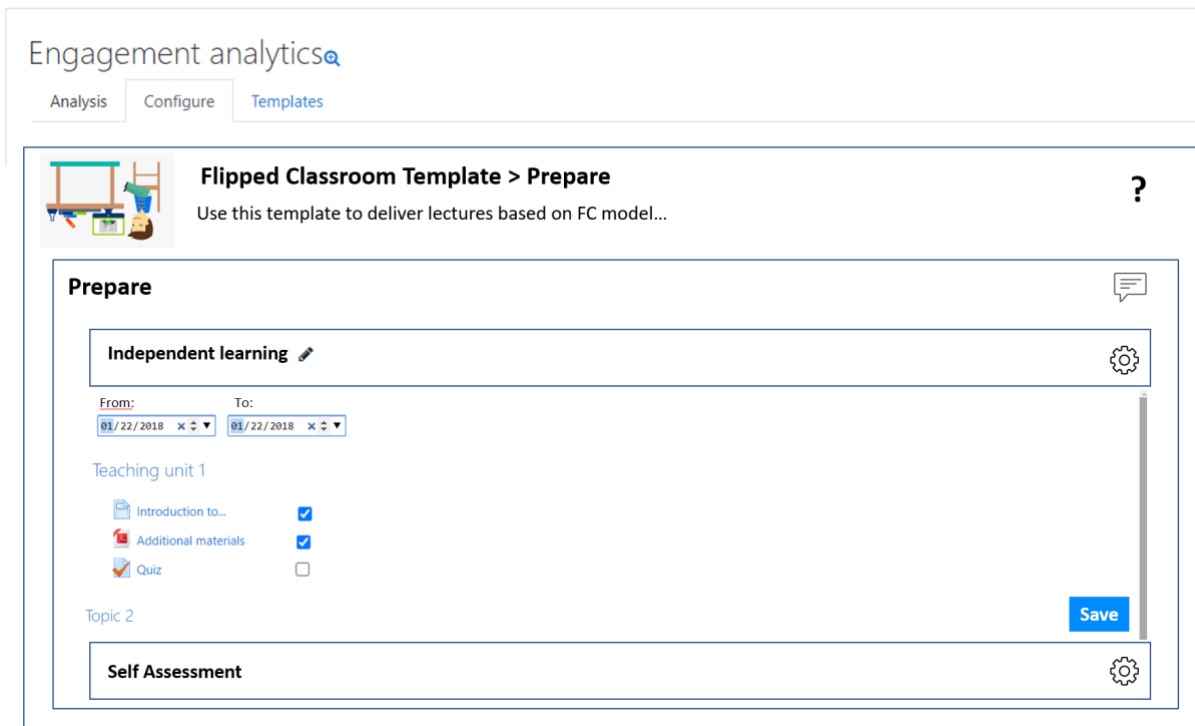
The precondition for efficient configuration of each phase is that course activities and results are already defined.

**Step 7.1: Define categories of activities** (e.g. *Independent learning, Self-assessment,...*)

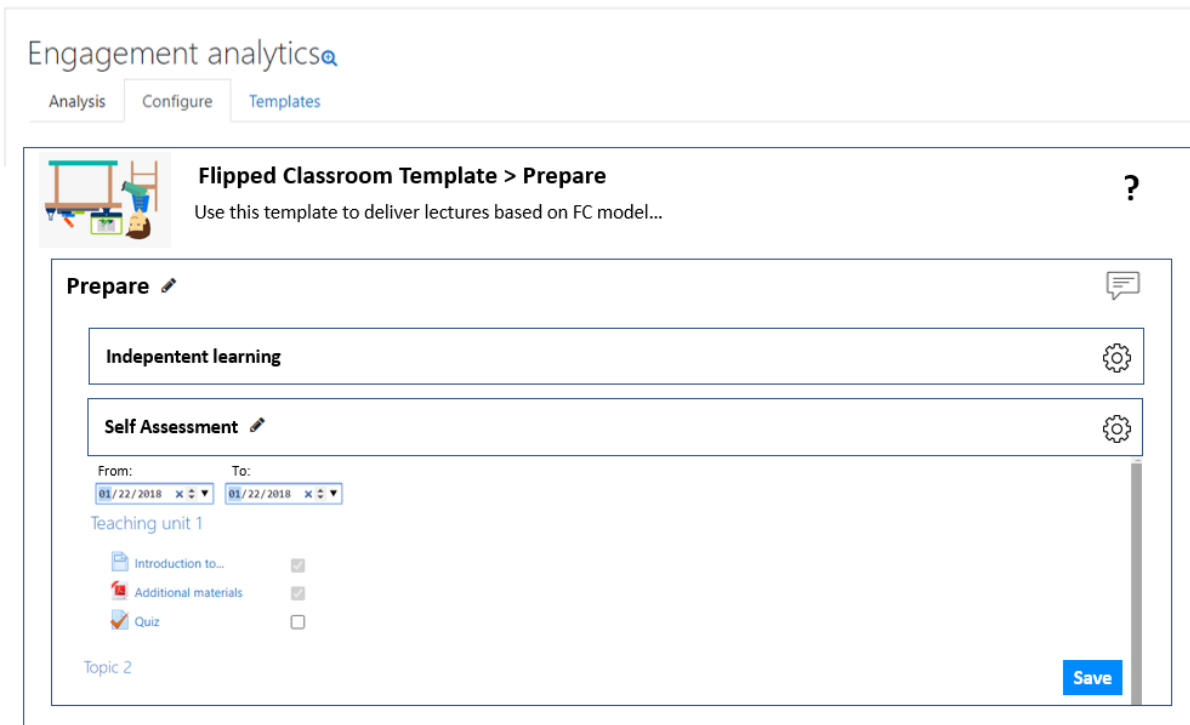


The screenshot shows the 'Engagement analytics' interface with tabs for 'Analysis', 'Configure', and 'Templates'. The main content area is titled 'Flipped Classroom Template > Prepare' and includes a description: 'Use this template to deliver lectures based on FC model...'. Below this, there is a 'Prepare' section with three categories: 'Independent learning', 'Self Assessment', and an 'Add category' button. Each category has a gear icon for configuration.

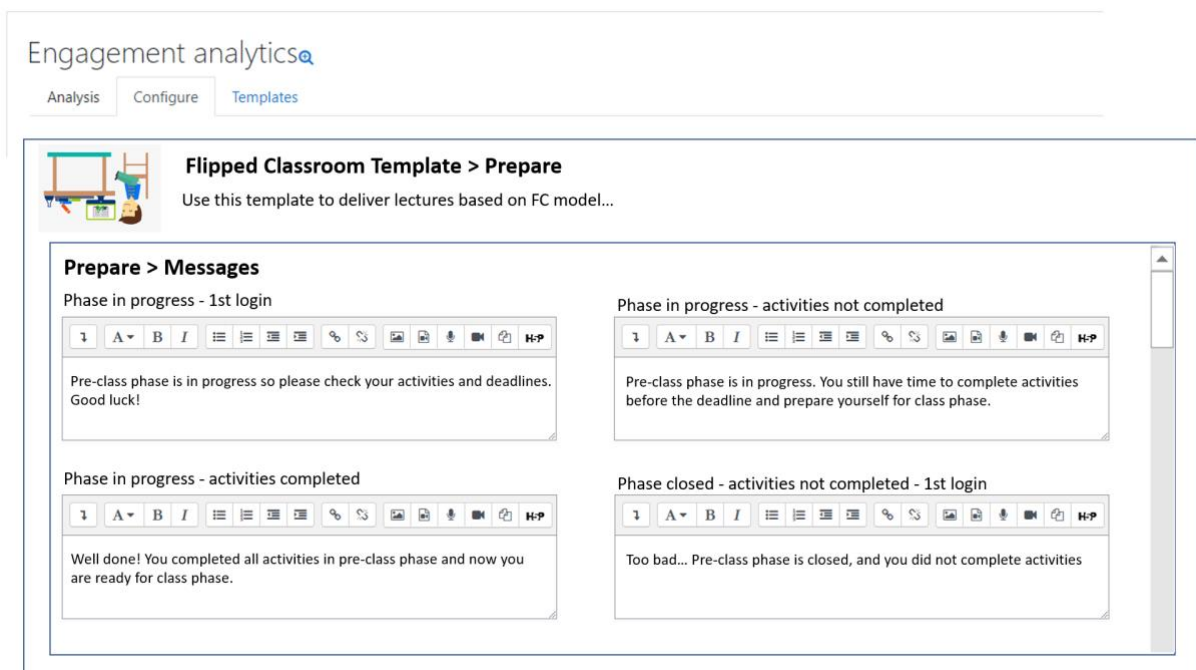
**Step 7.2: Configure each category of activities** (define duration (start and end date) and select course activities and resources for each category)



This screenshot shows the configuration details for the 'Independent learning' category. It includes a date range selector with 'From: 01/22/2018' and 'To: 01/22/2018'. Under 'Teaching unit 1', there are three items: 'Introduction to...' (checked), 'Additional materials' (checked), and 'Quiz' (unchecked). A 'Save' button is visible at the bottom right. The 'Self Assessment' category is also visible below.



**Step 7.3: Write messages intended to students that will be displayed at dashboard depending on their status** (1. Phase in progress, student' 1<sup>st</sup> login; 2. Phase in progress, activities completed; 3. Phase in progress, activities not completed; 4. Phase closed, activities not completed, 1<sup>st</sup> login for next phase)



This is the last step in configuration of Engagement analytics activity through usage of FC template.

The results are student and teacher dashboards supporting implementation of FC approach.

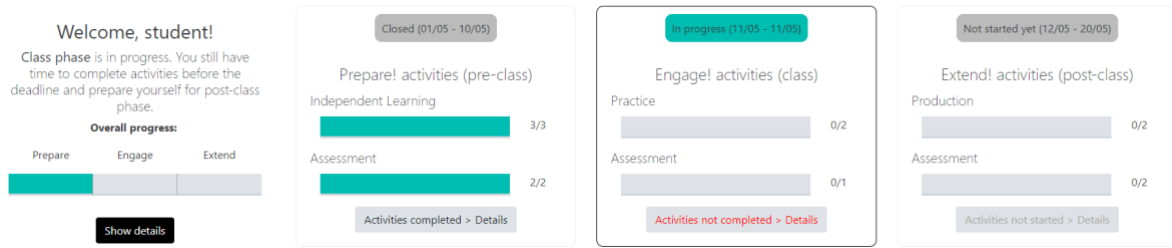


Figure 12: Student dashboard

## APPENDIX 1: PHASES MESSAGES

Phase/Conditions	Phase in progress, 1st login	Phase in progress, activities not completed	Phase in progress, activities completed	Phase closed, activities not completed, 1st login
<b>Phase 1</b>	<p>Pre-class phase is in progress so please check your activities and deadlines.</p> <p>Good luck!</p>	<p>Pre-class phase is in progress. You still have time to complete activities before the deadline and prepare yourself for class phase.</p>	<p>Well done! You completed all activities in pre-class phase and now you are ready for class phase that will start on XY/XY/XYXY. Until then reward yourself with more knowledge on the topic &gt; <i>here!</i></p>	<p>Too bad... Pre-class phase is closed before you have completed all activities successfully.</p> <p>Maybe you will not be able to successfully join the class starting on XY/XY/XYXY.</p> <p>But cheer up! Failure is the opportunity to begin again more intelligently.</p>
<b>Phase 2</b>	<p>Class phase is in progress so please check your activities and deadlines.</p> <p>Good luck!</p>	<p>Class phase is in progress. You still have time to complete activities before the deadline and prepare yourself for post-class phase.</p>	<p>Well done! You completed all activities in class phase and now you are ready for post-class phase that will start on XY/XY/XYXY. Until then reward yourself with more knowledge on the topic &gt; <i>here!</i></p>	<p>Too bad... Class phase is closed and you did not complete activities. Maybe you will not be able to successfully take part in post-class phase but cheer up – there will be other opportunities for learning.</p>
<b>Phase 3</b>	<p>Post-class phase is in progress so please check</p>	<p>Post-class phase is in progress. You still have time</p>	<p>Well done! You completed all activities in post-class phase.</p>	<p>Too bad... Post-class phase is closed before you have completed all activities successfully.</p>

	your activities and deadlines. Good luck!	to complete activities before the deadline.	Now you are ready to learn more on other topics!	But cheer up! Failure is success if we learn from it.
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## APPENDIX 2: ARCHITECTURE

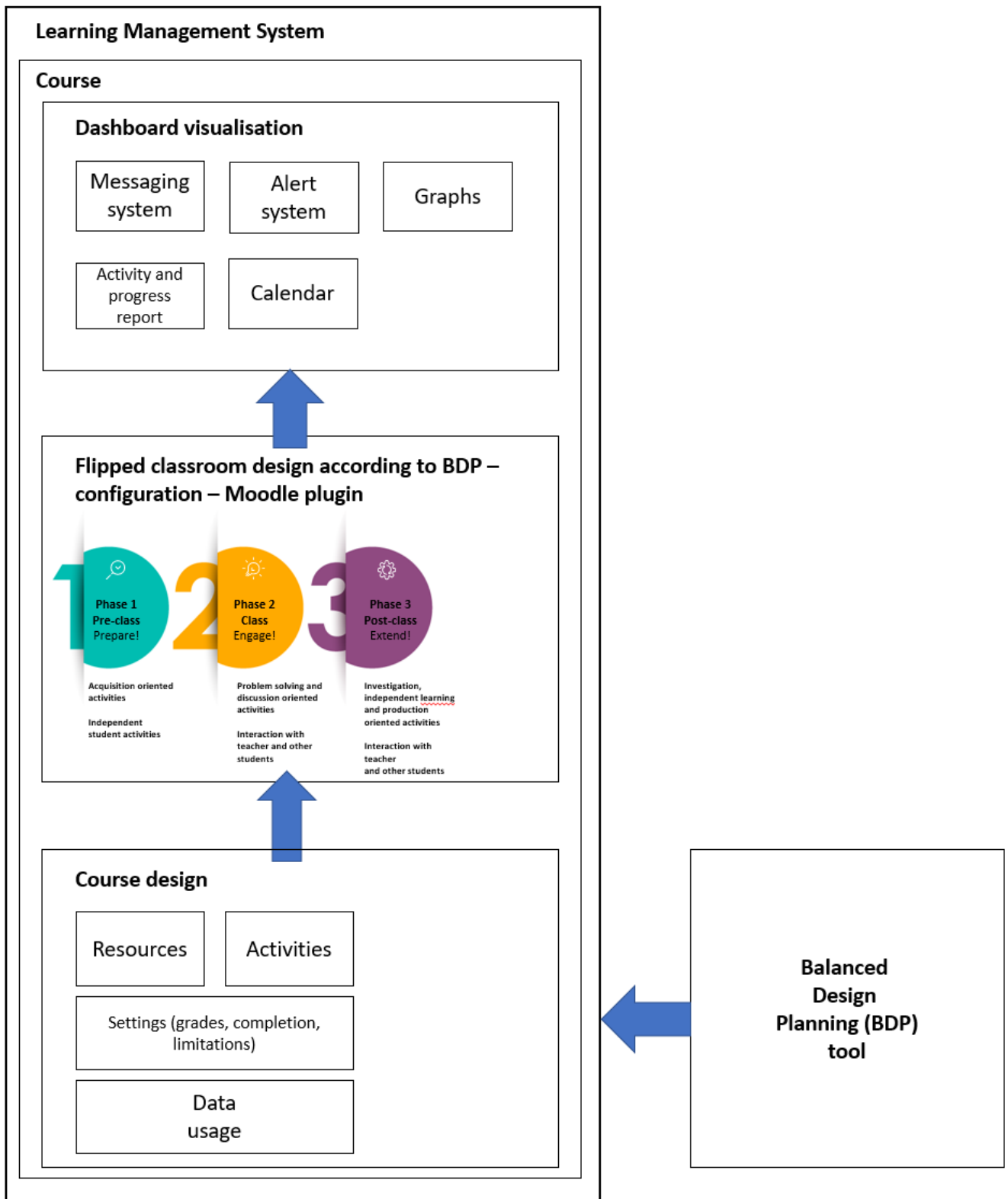


Figure 13: System architecture