

# Open Virtual Mobility

## Gamification for the OpenVM Learning Hub

- Final draft -

Outcome 1 Activity 2: Gamification Concept for Learning in the Open Virtual Mobility Learning Hub	
Document submission and review information	
Declared due date of deliverable	31.10.2018
Reviewed due date of deliverable	03.12.2018
Actual submission date	02.12.2018
Organisation name of lead contractor	Beuth University of Applied Sciences
Review	Final draft
Author and reviewer information	
Name of the author	Ilona Buchem
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*The creation of these resources has been (partially) funded by the ERASMUS+ grant program of the European Union under grant no. **2017-1-DE01-KA203-003494**. Neither the European Commission nor the project's national funding agency DAAD are responsible for the content or liable for any losses or damage resulting of the use of these resources.*

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## Imprint

**Imprint:** This publication is related to output O5 “Open Credentials and Gamification” of the Open Virtual Mobility Erasmus+ strategic partnership founded by the European Commission 2017 - 2020 under **2017-1-DE01-KA203-003494**, URL: <https://www.openvirtualmobility.eu/>

This paper is a public document produced as part of Outcome O5-A2 “Conceptual and visual design of Gamification for Learning” and describes the process, methodology and results of designing the gamification strategy for the OpenVM Learning Hub in the Open Virtual Mobility project. The conceptual and visual design of gamification for learning presented in this paper will be used for implementation and user testing in the Open Virtual Mobility Learning Hub in the next step:

<https://hub.openvirtualmobility.eu>

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## Suggested citation

Buchem, Ilona & Carlino, Chiara (2018). Conceptual and Visual Design of Gamification for Learning in the Open Virtual Mobility Learning Hub. Open Virtual Mobility Erasmus+ (2017-2020). Retrieved from <https://www.openvirtualmobility.eu/topics/outputs>

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## Executive summary

This paper is a public document produced as part of Outcome O5 “Open Credentials and Gamification”, O5-A2 “Conceptual and Visual Design of Gamification for Learning” in the Open Virtual Mobility Erasmus+ strategic partnership (2012-2020) and describes the process, methodology and results of designing gamification for learning in the Open Virtual Mobility project.

This publication summarises the results from the first three milestones in O5-A2:

Milestone 1: O5-A2.1: Definition of the design process and tools (February 2018)

Milestone 2: O5-A1.2: O5-A2.2: Meaningful gamification concept (May 2018)

Milestone 3: O5-A2.3: Design of gamification elements (October 2018)

The concept of gamification for learning described in this paper is used for implementation and user testing in the Open Virtual Mobility Learning Hub in milestone O5-A2.4: Implementation in the VM Learning Hub and User-Testing (January 2019): <https://hub.openvirtualmobility.eu>

## What are the objectives of this paper?

This paper intends to present the current outcomes of joint work on gamification for learning and to stimulate discussions around meaningful gamification designs in online learning environments, especially in context of the Open Virtual Mobility Learning Hub: <https://hub.openvirtualmobility.eu>

This publications also serves as a documentation of results in Outcome O5 “Open Credentials and Gamification”, O5-A2 “Conceptual and Visual Design of Gamification for Learning” for the reporting period from 01 September 2017 until 31 December 2018 to accompany the interim report submitted by the Open Virtual Mobility partnership to the Erasmus+ National Agency DAAD.

## Who is this paper for?

This paper addresses educators, students, international officers and higher education leaders as well as a wider academic audience interested in gamification designs for learning, especially in context of international mobility in higher education in Europe and beyond. This paper also addresses the reviewers of the interim report for the Open Virtual Mobility project assigned by the National Agency DAAD.

## What topics are addressed in this paper?

This paper addresses the following key three topics related to the design of open credentials:

1. Gamification design processes, methods and tools used in the Open Virtual Mobility project
2. Design considerations related to meaningful gamification for learning
3. Design of a gamification elements to be implemented in the OpenVM Learning Hub

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## Contributors

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Ilona Buchem is Professor for Media and Communication at Beuth University of Applied Sciences Berlin, Faculty I Economics and Social Sciences. She is the coordinator of the Open Virtual Mobility Erasmus+ strategic partnership. Ilona Buchem has led a number of projects dedicated to Open Education and international exchanges in higher education, including Open Badge Network (Erasmus+, Strategic Partnership, KA2 2014-1-DE01-KA200-000675), BeuthBonus and CreditPoints (Qualification Programs for Migrant Academics, German Federal Program "Integration through Qualification") and Digital Future (Digital Strategies for Higher Education, Stifterverband - German Association of Foundations for Science). Her current research focuses on fostering diversity through educational technology and new media, and closing the digital divide. Ilona Buchem has an extensive experience in designing and fostering national and international virtual mobility actions in higher education including: Seminar 2.0, iCollaborate, Future Social Learning Networks projects.

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## Acknowledgements

The authors would like to acknowledge with gratitude all those who made a contribution to Outcome O5-A2 "Conceptual and Visual Design of Gamification" including all project partners who participated in the gamification design online surveys and provided their helpful feedback.

# 1. Aims and scope

**Aims:** This publication aims at presenting the design methodology, tools and results of the design process of design for gamification for learning in the Open Virtual Mobility project.

**Scope:** This publication summarises the results from the first three milestones in O5-A2, i. e.:

1. Milestone 1: O5-A2.1: Definition of the design process and tools (February 2018)
2. Milestone 2: O5-A1.2: O5-A2.2: Meaningful gamification concept (May 2018)
3. Milestone 3: O5-A2.3: Design of gamification elements (October 2018)

The concept of meaningful gamification described in this paper is used for implementation and user testing in the Open Virtual Mobility Learning Hub in milestone O5-A2.4: Implementation in the VM Learning Hub and User-Testing (January 2019): <https://hub.openvirtualmobility.eu>

# 2. Background and rationale (State of the Art)

The current state of the art as a starting point for this publication was summarised in the joint research paper titled “Designing a Collaborative Learning Hub for Virtual Mobility Skills. Insights from the European Project Open Virtual Mobility” (Buchem et al., 2018) presented at the Human Computer-Interaction International Conference, HCII 2018<sup>1</sup> and published by Springer in the HCII 2018 conference proceedings<sup>2</sup>.

The HCI 2018 paper is accessible online:

[https://link.springer.com/chapter/10.1007/978-3-319-91743-6\\_27](https://link.springer.com/chapter/10.1007/978-3-319-91743-6_27)

and has been presented on the OpenVM project website:

<https://www.openvirtualmobility.eu/learning-hub/1068-openvm-at-hci-international-2018/>

The OpenVM Learning Hub aims to create engaging and effective learner experience by making use of *meaningful gamification* as an approach to enhancing learner engagement in online learning environments by enabling learner control and ownership of the learning environment, which have been identified as core defining attributes of Personal Learning Environments (Buchem, Attwell & Torres, 2011). Gamification has been defined as using game elements in non-game contexts (Deterding et al., 2011). Gamification has been also described as a design based on game thinking and game elements with game thinking defined as the use of game-like approaches to create better experiences (Marczewski, 2015). The gamification design approach in the OpenVM project builds

<sup>1</sup> <http://2018.hci.international>

<sup>2</sup> [https://link.springer.com/chapter/10.1007/978-3-319-91743-6\\_27](https://link.springer.com/chapter/10.1007/978-3-319-91743-6_27)

on the approach of meaningful gamification by Nicholson (2012a, 2012b) and the Personal Learning Environment approach by Buchem et al. (2011, 2014), emphasizing the shift of control and ownership from the educator or the designer of the learning environment to the learner.

## 2.1 Self-regulation and learner control

Both engagement and motivation are central to gamification. All gamification approaches attempt to enhance engagement and motivation using different approaches and methods. Meaningful gamification approach aims to enhance learner engagement and motivation to engage in learning activities without emphasising external rewards (Nicholson, 2012a, 2012b). The concept of meaningful gamification builds on research studies, such as the meta-analysis by Deci, Koestner & Ryan (2001) and examples provided by Kohn (1999), which show that many forms of external rewards, such as scoring-based gamification also called BLAP (Badges, Leaderboards, Achievements, Points), offer only limited possibilities for an individual to make choices without external *control* and may even have negative effects on *self-regulation* (Nicholson, 2012b).

With active, *self-regulated learner skills* being one of the key skills identified by Firssova & Rajagopal (2018) in Output 1 of the OpenVM, the gamification concept for OpenVM has to take the risk of gamification negatively affecting self-regulation into consideration. Self-regulated learning is manifested in active monitoring and regulation of learning processes such as setting and orientation towards learning goals, strategies used to achieve goals, management of resources and reactions to feedback such as in formative assessment (Nicol & Macfarlane-Dick, 2005). According to Nicol & Macfarlane-Dick (2005), self-regulated learning can be supported by clarifying criteria for good performance, facilitating self-assessment, delivering high-quality feedback, encouraging dialogue, encouraging positive motivation, providing opportunities to close the gap. Based on these considerations, the meaningful gamification concept for learning to be implemented in the OpenVM Learning Hub should focus on enhancing self-regulation through transparent criteria for attainment, assessment and recognition of VM skills, meaningful feedback and opportunities for self-assessment.

The approach to promoting *self-regulation* can be meaningfully combined with the approach to enhancing *learning control* in *personal learning environments (PLE)* as described by Buchem et al. (2011, 2013), which emphasises the importance of designing learning environments to allow learners take decision and make choices, not only in terms of choices related the content or the sequence of the learning steps, but especially in relation to choosing appropriate learning tools a to support one's own learning, including co-creation of learning content and fostering the development of *personal learning networks (PLN)* (Buchem et al., 2013). Fostering learner control and learner ownership also encompasses learners taking responsibility for own learning, being more independent in choices related to the goals, process and outcomes of learning, as well as in forging social relationships as part of the learning process (Buchem et al., 2013).

Therefore, the OpenVM concept of meaningful gamification builds on the concepts described above and combines reward-based methods with non-reward gamification to enhance self-regulated learning, learner control and learner ownership by (a) facilitating the understanding of the importance of a learning activities, (b) helping learners to find meaning and relevance in learning activities in relation to own background, interests and needs, as well as (c) promoting learner control in relation to (i) goals, (ii) tools, (iii) rules, (iv) tasks and (v) social connections, all of which have been considered as components of learner control as described in relation to personal learning environments by Buchem et al. (2013).

**Table 1:** Dimensions of learner control (Buchem et al., 2013)

Dimensions of learner control	Examples of learner activities
A. Control of learning goals/objectives	The learner can <ul style="list-style-type: none"> <li>● Determine learning goals and outcomes</li> <li>● Manage data, services, resources, content</li> <li>● Use scaffolding and guidance</li> </ul>
B. Control of tools for learning	The learner can: <ul style="list-style-type: none"> <li>● Select and use tools according to own needs</li> <li>● Reuse and remix content</li> <li>● Aggregate and configure tools</li> </ul>
C. Control of learning tasks/activities	The learner can: <ul style="list-style-type: none"> <li>● Specify own needs (e.g. user profile)</li> <li>● Self-monitor own progress</li> <li>● Adjust performance based on (peer) feedback</li> </ul>
D. Control of rules	The learner can: <ul style="list-style-type: none"> <li>● Configure the environment (own preferences)</li> <li>● Negotiate rules of communication/collaboration</li> <li>● Negotiate intellectual property rights</li> </ul>
E. Control of social connections	The learner can: <ul style="list-style-type: none"> <li>● Choose with whom to communicate</li> <li>● Choose who can communicate with him/her</li> <li>● Initiate discussions and collaborations</li> </ul>



## 2.2 Co-Creation and Learning through Design

The meaningful gamification approach in the OpenVM Learning Hub aims to create *meaningful*, *engaging* and *rewarding* learning experiences. The meaningful gamification design is applied to the key learning and collaboration activities in the OpenVM Learning Hub:

1. Co-design of Open Educational Resources (OER),
2. Collaborative learning activities in the OpenVM MOOC,
3. Peer-assessment as part of e-assessment of OpenVM skills.

Involving learners in co-designing OER and parts of the MOOC will be accomplished by using such approaches as “Crowd Creation” (Solemon et al., 2013) and “Open Learning through Design” (Bartoletti, 2016). One way to support the process of co-creation of learning resources and activities by means of meaningful gamification is to allow users to describe own goals within the OpenVM Learning Hub. The design challenge here is to support and guide the learner in setting own, achievable goals providing learning experiences which enable to reach these goals (Deterding, 2011). The co-design approach aims to engage students and educators, who wish to develop their Open Virtual Mobility skills and enhance own readiness for virtual mobility, in co-creating learning resources and collaborating through learning activities with peers.

A number of different collaboration and content design tools can be integrated into the OpenVM Learning Hub (which is build using the Moodle<sup>3</sup>) and applied to support meaningful gamification, e. g. tools for interactive content creation, e. g. H5P<sup>4</sup>, Mahara<sup>5</sup> and other tools listed in the section 4.2 “Moodle plugin for implementation of gamification designs” below. These tools can be applied depending on the skills of users and combined with activities which lead to issuing/earning a digital credential using the bestr<sup>6</sup> badging system integrated in the OpenVM Learning Hub. The aim is thus to engage students and teachers in co-design, collaboration and peer-assessment, while project partners lead this process in the pilot phase.

As any gamification approach, also meaningful gamification requires not only freedom of learners in describing own learning goals and/or choosing tools and content to support own learning but also encompasses rules and constraints of the “game”, which are placed upon learners’ choices and in this way provide *guidance* and *orientation* in the learning process. Therefore the design of meaningful gamification in the OpenVM Learning Hub focuses both on meaningful guidance and personalization of the learner experience as described by Buchem et al. (2013).

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<sup>3</sup> <https://moodle.org/>

<sup>4</sup> <https://h5p.org>

<sup>5</sup> <https://mahara.org/>

<sup>6</sup> <https://bestri.it/>

## 2.3 Universal Design for Learning

The process of co-creation of learning resources and activities as part of the meaningful gamification approach in the OpenVM project is driven by theory of Universal Design for Learning (UDL), which is used as a guide to create meaningful learning experiences that are appropriate for a diverse group of learners (Rose & Meyer, 2002). Using UDL principles allows to design for diverse needs and interests of students and creating possibilities to demonstrate how learners have met learning outcomes, e. g. by providing evidence as part of the e-assessment and embedding the evidence in digital credentials based on the Open Badges<sup>7</sup> metadata standard. In order to take the diversity of learners' needs and interests into consideration, three UDL strategies recommended by Rose & Meyer (2002) will be taken into consideration:

1. Presenting content in different ways, i. e. *the "what" of learning*,
2. Providing different activities for the learner, i. e. *the "how" of learning*, and
3. Allowing for different pathways to achieve goals and make meaningful connections, i. e. *the "why" of learning*.

The approach to designing learning activities and meaningful gamification in the OpenVM Learning Hub is aligned with the Universal Design for Learning (UDL) which again is based on the theory of *user-centered design*. User Centered Design (UCD) asks and answers the question "*How does the design benefit the user?*" for every design decision (Nicholson, 2012a). Based on this approach, the meaningful gamification design in the OpenVM project focuses on the WHY, WHAT and HOW of learning as proposed by the Guidelines of Universal Design for Learning (UDL)<sup>8</sup>:

1. WHY (ENGAGEMENT): The why of learning focused on designing diverse ways of how learners can engage to learn. The diverse ways of engagement are related to individual variation in including culture, personal relevance, background knowledge and other factors. As there is no one way of engagement optimal for all learners in all contexts, it is essential to provide multiple options for engagement.
2. WHAT (REPRESENTATION): The what of learning is related to the different ways in which learners perceive and comprehend information, e. g. language or cultural differences, different ways of approaching content. It is important to include multiple representations to allow learners establish meaningful connections within and between concepts.
3. HOW (ACTION): The how of learning is related to the way learners can navigate a learning environment, e. g. learners with language barriers may be able to express themselves well in written text but not in speech. It is important to recognise that learners differ in action and expression and include diverse forms of learning activities.

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<sup>7</sup> <https://www.imsglobal.org/activity/digital-badges>

<sup>8</sup> <http://udlguidelines.cast.org/engagement>

The meaningful gamification design based on the *why, what and how of learning* as described above aims at fostering deeper engagement of learners and in consequence readiness for virtual mobility. The OpenVM Learning Hub is thus designed as a flexible system which allows learners to choose from a variety of options and creates possibilities for customization.

To sum up, the meaningful design of the OpenVM Learning Hub allows learners to:

1. *Express learning objectives and goals* based on the understanding of how the goals of learning activities may connect to personal goals to engage in *meaningful learning*;
2. *Choose from and develop own ways* of engaging with the activities such as co-design of learning content including OER to design and use *meaningful content*;
3. *Provide evidence to demonstrate* how the learning goals/outcomes have been achieved as part of evidence-based assessment and in this way establish *meaningful connections*;
4. *Choose from available open credentials* used to mark achievement of OpenVM skills and which can be used outside the OpenVM Learning Hub to allow for *meaningful recognition*;
5. *Provide peer-assessment* as part of e-assessment and possibly attached as evidence to open credentials to give and receive *meaningful feedback*;
6. *Collaborate in groups* formed using relevant group formation criteria (e. g. language, learning goals, complementary prior knowledge) to enhance *meaningful engagement*;
7. *Network and share* with others, also outside the OpenVM Learning Hub e. g. with colleagues and students, in social media, to allow for *meaningful communication*.

### 3. Design process: methods, results and requirements

The following methodology and tools have been applied to design meaningful gamification for learning in the OpenVM Learning Hub (O5-A2.1: Definition of the design process and tools):

1. Online survey about personalisation/customization options related to the elements of the OpenVM Learning Hub and involving project partners in the definition and prioritization of *Must/Should/Could/Won't* (MoSCoW method) requirements (March 2018);
2. List of key design features for meaningful gamification mechanics clustered into the *why, what and how of learning* (based on UDL principles) involving partners in the definition of user-appropriate and feasible gamification mechanics (June 2018);
3. User-centered design of the meaningful gamification concept including UML diagrams and mock-ups of the user interface of the OpenVM Learning Hub (November 2018);

4. Testing of the gamification concept involving all project partners and selected potential learners, i. e. teachers and students from partner organisations (January 2019).

### 3.1 Methods: Online surveys and key features

In order to arrive at a list of key features for meaningful gamification designs, two online surveys were conducted in 2018 inside the OpenVM partnership, i. e.:

1. Meaningful gamification survey (Online Survey #1, April 2018, n = 13)
2. Shortlist of meaningful gamification design features (Online Survey #2, July 2018, n =10)

The meaningful gamification survey (Online Survey #1) was based on the meaningful gamification approach in designing the OpenVM Learning Hub according to which the OpenVM Learning Hub is designed as a flexible system which allows learners to choose from a variety of options and creates possibilities for customisation and personalisation. As the conceptual design is driven by the theory of Universal Design for Learning (UDL), the online survey was divided into three parts: WHY, WHAT and HOW of learning, each including a list of possible meaningful gamification features.

The partners were asked to select relevant features and prioritise them using the MoSCoW method, i. a. Must/Should/Could/Won't requirements for meaningful gamification design. The MoSCoW method allows to prioritise requirements as follows:

1. **MUST:** Requirements labeled as "MUST" are critical for the success. If a MUST requirement is not included, the project will be a failure.
2. **SHOULD:** Requirements labeled as "SHOULD" are important but not a first priority. They are important but not as time-critical as MUST and will be implemented after MUST.
3. **COULD:** Requirements labeled as "COULD" are desirable but not necessary, e. g. they can improve user experience for little cost and can be included if time / resources permit.
4. **WON'T:** Requirements labeled as "Won't" are least-critical or are not appropriate/feasible for the project. Won't requirements will be dropped.

Based on the results of the first survey, which delivered a long and comprehensive evaluation of design possibilities, the second survey "Shortlist of meaningful gamification design features" was applied to indicate which of the features are (a) important for which output, (b) can be implemented in which output, and (c) are doable/feasible for the OpenVM project. The partners were asked to indicate the importance, the ownership and the feasibility of the features of meaningful gamification which were clustered into the following ten groups, which emerged from the first survey: (1) goals, (2) content, (3) activities, (4) assessment, (5) progress, (6) feedback, (7) engagement, (8) collaboration, (9) personalisation and (10) support of learning.

The aggregated results from the first and second survey are described below.

### 3.2 Results: Meaningful gamification design elements

The first online survey was divided into three parts: WHY, WHAT and HOW of learning, each including a list of possible meaningful gamification features prioritised using the MoSCoW method. The key features prioritised as Must and Should requirements are summarised in the table below:

**Table 2:** Must and Should requirements for meaningful gamification design

	<b>MUST</b> (critical for the success)	<b>SHOULD</b> (important but not a first priority)
<b>WHY</b> (engagement)	<ul style="list-style-type: none"> <li>● setting own learning goals</li> <li>● protection of personal information for public display</li> </ul>	<ul style="list-style-type: none"> <li>● difficulty/complexity core activities</li> <li>● degrees of freedom for acceptable performance</li> </ul>
<b>WHAT</b> (representation)	<ul style="list-style-type: none"> <li>● visual steps of the learning process</li> <li>● opportunities to revisit/reflect key ideas</li> <li>● visualising previously learned skills</li> <li>● visualising desired outcomes/skills</li> <li>● checklists and templates</li> </ul>	<ul style="list-style-type: none"> <li>● type of content for practicing skills</li> <li>● type of content for assessing skills</li> <li>● type of learning activities</li> <li>● type of evidence for e-assessment/badges</li> <li>● culturally relevant content</li> <li>● age appropriate content</li> <li>● ability/skill appropriate content</li> <li>● support for vocabulary &amp; terms</li> <li>● visual, non-linguistic support for vocabulary</li> <li>● connections to previously learned structures</li> <li>● prompts to activate prior knowledge</li> <li>● cues to draw attention to critical concepts</li> <li>● scaffolds to support learning</li> <li>● multiple entry points for learning process</li> <li>● different types/levels of peer interaction</li> <li>● different types of computer support / feedback</li> <li>● different types of human</li> </ul>

		support / feedback
<b>HOW</b> (action)	<ul style="list-style-type: none"> <li>● transcripts for video and auditory clips</li> <li>● social media options</li> <li>● questions to guide self-monitoring/reflection</li> <li>● representations of progress</li> <li>● awards for reaching final goals</li> <li>● challenges (tasks that require effort to solve)</li> <li>● storytelling (e. g. typical user journey)</li> </ul>	<ul style="list-style-type: none"> <li>● size of text, images, graphs</li> <li>● interactive tools like discussion forums, chats</li> <li>● multiple examples of solutions to authentic problems</li> <li>● awards for reaching subgoals</li> <li>● cooperations (learners must work together to reach a shared goal)</li> <li>● transactions (trading between learners)</li> <li>● teams (defined groups of learners)</li> <li>● emotions (emojis, audio hand clapping)</li> </ul>

The results from the second survey are divided into ten groups of meaningful gamification design elements, i. e. (1) goals, (2) content, (3) activities, (4) assessment, (5) progress, (6) feedback, (7) engagement, (8) collaboration, (9) personalisation and (10) support of learning. The three key features (highest score in the online-survey) per group are described in the table below.

**Table 3:** Key features of meaningful gamification design

Design element	Key features
Goals	<ol style="list-style-type: none"> <li>1. Learners can customise pre-defined goals</li> <li>2. Learner can see desired outcomes/skills/credentials</li> <li>3. Learners receive awards for reaching sub-goals and final goals</li> </ol>
Content	<ol style="list-style-type: none"> <li>1. Learners can use multiple examples of solutions to authentic problems</li> <li>2. Learners can choose skill appropriate content (e. g. pre-assessment)</li> <li>3. Learners can see connections to previously learned structures (e. g. concept map)</li> </ol>
Activities	<ol style="list-style-type: none"> <li>1. Learners can create own content</li> <li>2. Learners are offered challenges (tasks that require effort to solve)</li> <li>3. Learners can choose types and levels of learning activities</li> </ol>
Assessment	<ol style="list-style-type: none"> <li>1. Learners can choose types of assessment (e. g. automated, evidence-based)</li> <li>2. Learners can choose types of evidence for e-assessment and badges</li> <li>3. Learners have opportunities to revisit/reflect key ideas</li> </ol>
Progress	<ol style="list-style-type: none"> <li>1. Learners can see previously learned skills (e. g. badges received)</li> </ol>

	<ol style="list-style-type: none"> <li>2. Learner can see a representation of the learning progress (e. g. progress bar)</li> <li>3. Learners can compare their progress with others (e. g. rankings)</li> </ol>
Feedback	<ol style="list-style-type: none"> <li>1. Learners are offered different types of human feedback</li> <li>2. Learners are offered different types of computer feedback</li> <li>3. Learners can express and see emotions (emojis, audio hand clapping)</li> </ol>
Engagement	<ol style="list-style-type: none"> <li>1. Learners are provided with cues to draw attention to critical concepts</li> <li>2. Learners are engaged through storytelling (e. g. typical learner journey)</li> <li>3. Learners have multiple entry points (e. g. use the MOOC in a non-linear way)</li> </ol>
Collaboration	<ol style="list-style-type: none"> <li>1. Learners can build teams (defined groups of learners)</li> <li>2. Learners can choose to work together to reach a shared goal</li> <li>3. Learners can use interactive tools like discussion forums, chats</li> </ol>
Personalisation	<ol style="list-style-type: none"> <li>1. Learners have access to culturally relevant content (e. g. national examples)</li> <li>2. Learners have access to content in different languages</li> <li>3. Learners can connect with peers based on different criteria</li> </ol>
Support	<ol style="list-style-type: none"> <li>1. Learners receive support for vocabulary and terms (e. g. glossary)</li> <li>2. Learners have visual, non-linguistic support for vocabulary (e. g. icons)</li> <li>3. Learners have mechanisms to protect personal data for public display</li> </ol>

### 3.3 Basic meaningful gamification concept and requirements

The analysis of key features of meaningful gamification summarised above established a meaningful gamification concept based on *narrative scenario-based learning, challenges and recognition of skills and contributions* with set of *functional (FR) and non-functional (NFR) requirements*.

The meaningful gamification concept is based on narrative scenario-based learning, challenges and recognition of skills and contributions. This means:

- **Narrative scenario-based learning:** Learning in the MOOC (and each sub-MOOC) is embedded in an authentic scenario and adjusted to the perspective of a specific persona, which the user can choose at the beginning (student, teacher, international officer);
- **Challenges:** Each learning sequence (e. g. level in each su-MOOC) is embedded in the narrative scenario and initiated by a challenge derived from real-life situations and adjusted to the perspective of a specific persona (student, teacher, international officer);
- **Recognition of skills and contributions:** Learner skills (in the eight areas and at three different levels) as well as user contributions (e. g. engagement in peer-assessment, co-creation of OER) are recognised with digital credentials based on Open Badges standard.

This basic meaningful gamification concept purposefully does not apply BLAP gamification elements in the traditional sense but redefines the BLAP model in view of meaningful gamification concept as summarised in the table below:

**Table 4:** Redefined BLAP concept for the meaningful gamification design in the OpenVM project

	<b>Traditional gamification</b>	<b>Meaningful gamification in OpenVM</b>
<b>Badges</b>	Use badges to demarcate a certain level of point threshold.	Use Open Badges as digital credentials to recognise skills.
<b>Leaderboards</b>	Use leaderboards as scoreboards to visualise individual performance against the score of users in a group.	No leaderboards, instead visualisation of skill areas and levels for each user and display of digital credentials.
<b>Achievements</b>	Achievements offered as awards once a task is completed.	Linking achievement to peer-feedback to enhance learner perception of skills.
<b>Points</b>	Encourage users to do things by collecting points and award scores.	No points to collect, instead recognition of contributions in the community.

The basic concept for the meaningful gamification design in the OpenVM project results in a list of functional and non-functional requirements for implementation in the OpenVM Learning Hub. Functional requirements (FR) define what a system is supposed to do. Non-functional requirements (NFR) define how a system is supposed to be. Functional and non-functional requirements serve as implementation recommendations for the next iteration as described in section 4.

### 3.3.1 Functional requirements (FR)

Functional requirements define specific functions of a system. Functional requirements are usually defined in the form of "a system must/should/could *do* <requirement>". The key functional requirements are summarised in the table below.

**Table 5:** Functional requirements for meaningful gamification design.

<b>ID</b>	<b>Category</b>	<b>Description</b>
FR01	Goals	Start menu in which the user can choose the persona (teacher, student, international officer)
FR02	Goals	Options menu in which the user can choose options for learning (skill goals, sub-MOOCs, levels, e-assessment, digital credentials)
FR03	Assessment	Pre-assessment of skills and recommendation for sub-MOOC and/or level in the sub-MOOC
FR04	Assessment	Different types of assessment for different skills at levels (basic, intermediate, advanced, e. g. automated test, evidence-based assessment, peer-assessment)



FR05	Content	Skill appropriate MOOC content based on pre-assessment
FR06	Content	Multiple examples of solutions to authentic problems
FR07	Activity	Challenges at each level in the sub-MOOC
FR08	Activity	Activities aimed for and recognising content co-creation (e. g. producing and/or submitting OER)
FR09	Progress	Visualisation of assessed skill areas and levels
FR10	Progress	Display of earned digital credentials in the profile
FR11	Personalisation	Profile in which the user can specify own attributes (e. g. experience, language, academic field, earned credentials) <sup>9</sup>
FR12	Engagement	Narrative scenario-based learning for different personas
FR13	Feedback	Different types of human and computer support/feedback
FR14	Collaboration	Group formation and collaborative activities/challenges
FR15	Support	Mechanisms to protect personal data for public display

### 3.3.2 Non-functional requirements (NFR)

Non-functional requirements (NFR) are requirements which defined the quality attributes of a system, in contrast to functional requirements which define specific functions. Non-functional requirements are usually defined in the form of "system must/should/could *be* <requirement>".

**Table 6:** Non-functional requirements for meaningful gamification design

ID	Category	Description
NR01	Content	Visualisation of connections and structures (e. g. concept maps)
NR02	Feedback	Opportunities to express emotions (e. g. emojis, audio hand clapping)
NR03	Personalisation	Culturally relevant content (e. g. national examples)
NR04	Personalisation	Content in different languages
NR05	Personalisation	Video subtitles
NR06	Support	Visual, non-linguistic support for vocabulary (e. g. icons)
NR07	Support	Mobile version of the Hub

<sup>9</sup> [https://de.slideshare.net/DCU\\_MPIUA/user-profiles-personas-39303051](https://de.slideshare.net/DCU_MPIUA/user-profiles-personas-39303051)

## 4. Implementation recommendations

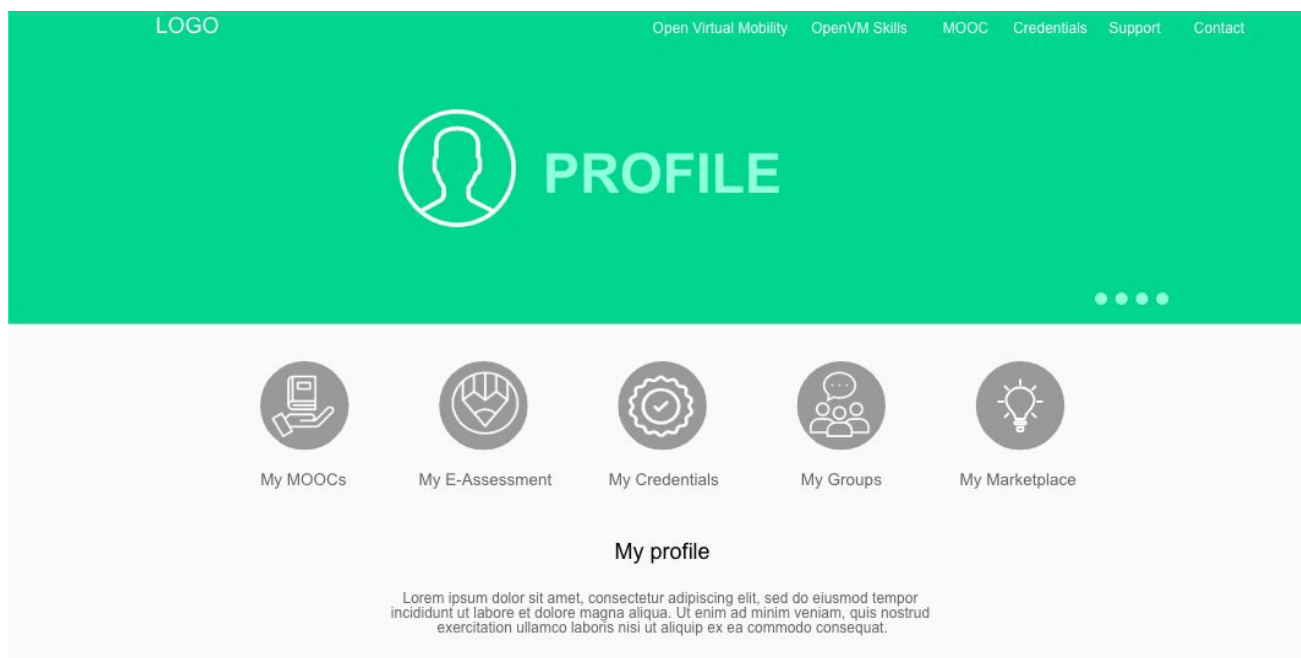
This section describes the key recommendations for the implementation of the meaningful gamification concept in the OpenVM Learning Hub.

### 4.1 Meaningful gamification at the level of the learning hub

The key recommendations for the implementation of the basic meaningful gamification concept at the level of the OpenVM Learning Hub include:

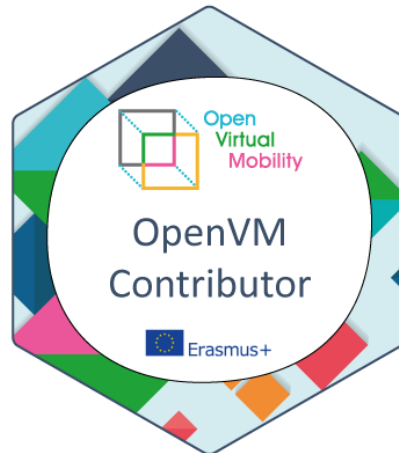
1. User profile with attributes relevant for learning pathways and group formation as well as with visualisation of recognition of skills and contributions with digital credentials;
2. Possibilities to choose learning pathways (e. g. different sub-MOOCs), as well as to connect, share experiences and plan collaborations with peers (e. g. marketplace);
3. Visualisation of progress in skill development, e. g. number of sub-MOOCs taken, e-assessments completed, digital credentials earned.

The design of the user profile in the OpenVM Learning Hub should allow for personalisation and customisation of learning in connection with meaningful gamification elements such as individual learning pathways, e-assessment of skills, credentials, groups and social connections in the marketplace (Figure 1).



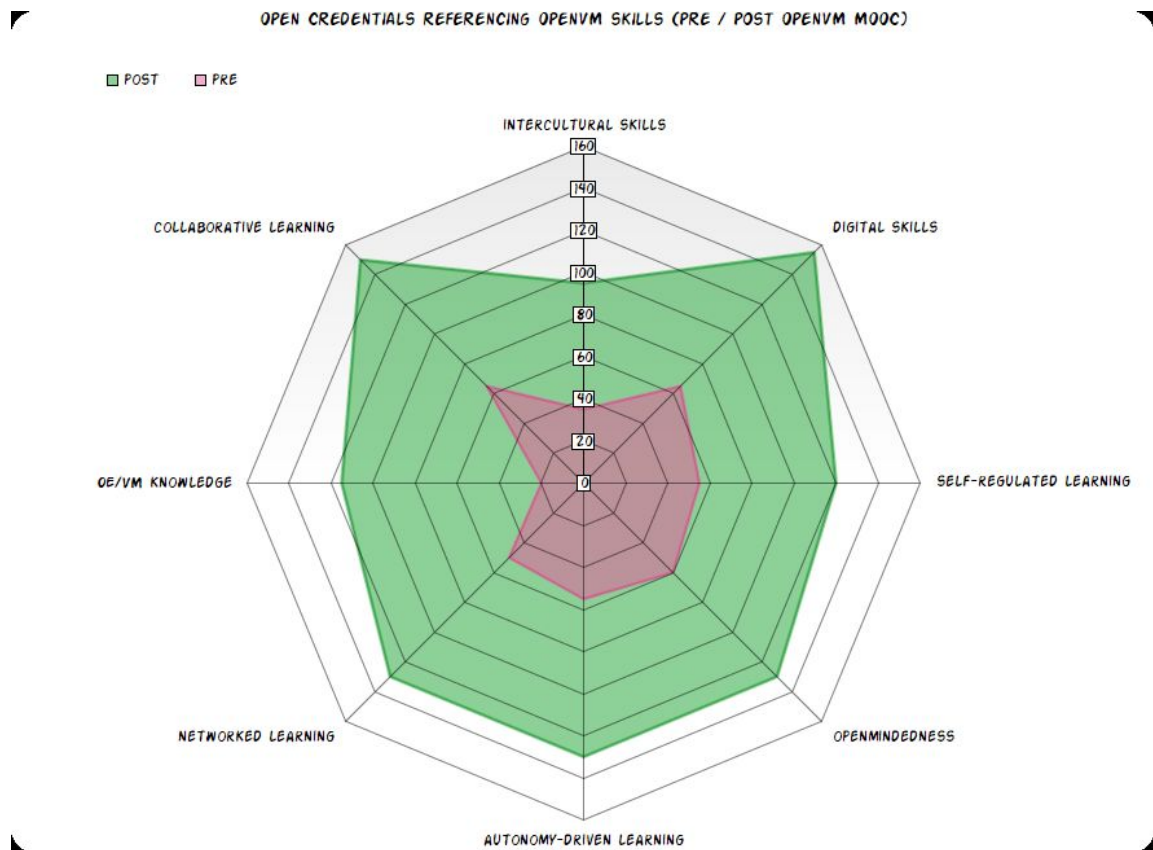
**Figure 1:** Mock-up of the user profile

One of the mechanisms to recognise user contributions in the OpenVM Learning Hub is the contributor badge, which will be used to recognise the contributions to the hub at different levels, e. g. support with peer-engagements, co-design of content (e. g. OER), participation in user-testing (e. g. surveys). Figure 2 shows the current mock-up design of the contributor badge.



**Figure 2:** Mock-up of the contributor badge

One of the mechanisms for the visualisation of progress in skill development is the use of spider web diagrams to highlight skill areas which have been already assessed and skill areas which can be developed further. Figure 3 shows the mock-up of the skill visualisation.



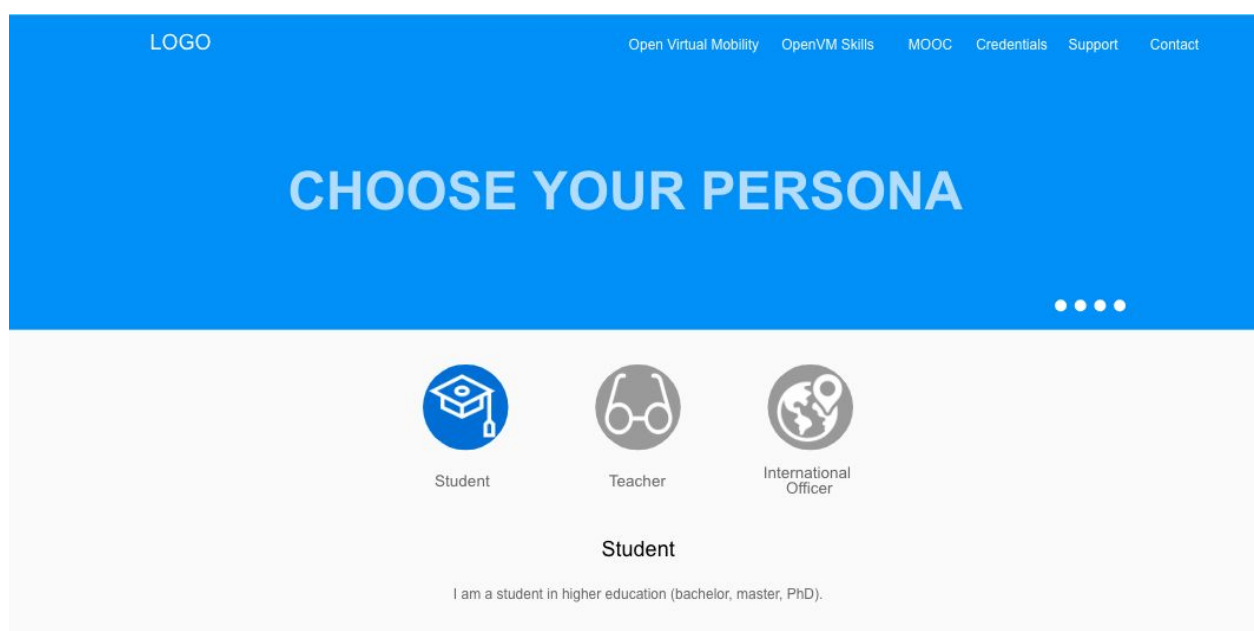
**Figure 3:** Mock-up of the skill visualisation

## 4.2 Meaningful gamification at the level of the MOOC

The key recommendations for the implementation of the basic meaningful gamification concept at the level of the OpenVM MOOC include:

1. Diverse entry points for key personas (student, teacher, international officer)
2. Embedding learning in a narrative scenario based on the chosen persona and skill goal
3. Diverse learning pathways based on the skills which learners wish to develop and recommendations for levels based on pre-assessment

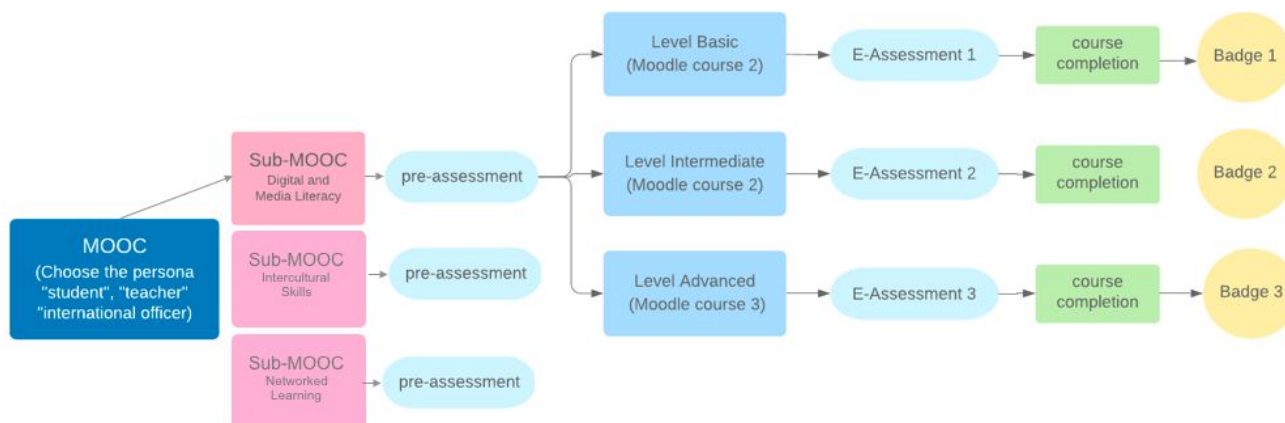
The choice of a persona (students, teacher, international) and thus a personalized access to learning is an important requirement for meaningful gamification design. The figure below presents a mock-up for the choice of the persona at the level of the MOOC.



**Figure 4:** Choice of personas

Individual learning pathways are a further key requirement for meaningful gamification. According to narratives and storytelling approaches to gamification, the key to narratives is to enable meaningful choices in the way to progress<sup>10</sup>. The figure below shows a prototypical narrative choice architecture of the MOOC, in which the learner can choose the sub-MOOC, participate in pre-assessment to assess the current level of a skill in a given area, receive recommendation for one of the MOOC levels, i. e. basic, intermediate, advanced, take e-assessment at the end of the learning sequence to complete the chosen level of the course and to earn a digital credential which will recognise the skill in given area at a given level. Each choice in the narrative architecture gives a different outcome to the learner. The choice the learner makes has meaning for individual skill development. The user journey will be designed to allow learners to make meaningful choices (affected by decisions of learners, e. g. which learning activity to engage with) along the way.

<sup>10</sup> <https://de.slideshare.net/daverage/narratives-and-story-telling-in-gamification>



**Figure 5:** A prototypical narrative choice architecture of the OpenVM MOOC

### 4.3 Moodle plugins for gamification designs

List of Gamification Plugins for Moodle which can be used to implement the gamification concept. Since, for better portability and permanence the project is using Open Badges provided by the Bestr platform, it will be part of O2 integration efforts to verify the possibility of activating selected modules using Bestr’s API to access and show Badges and Badge awards.

Name	Category	Description and use in the LH	Link
<b>Enrolment to the OpenVM Learning Hub (O2)</b>			
Easy Enrolment	Enrolment	Allows to enrol from the website.  This plugin can be used to allow learners to enrol to the Learning Hub from the OpenVM website and via QR code which can be used on dissemination materials	<a href="https://moodle.org/plugins/enrol_easy">https://moodle.org/plugins/enrol_easy</a>
Pedagogic achievement	Block	This plugin automatically awards pedagogic achievements to each user as they reach milestones along their way. Example : "10th login" medal.  This plugin can be used to provide a gamified experience of the user journey in the OpenVM Learning Hub.	<a href="https://moodle.org/plugins/block_achievement">https://moodle.org/plugins/block_achievement</a>
Level up!	Block	Gathers experience points from all the courses a student is participating in. Automatically attributes points to	<a href="https://moodle.org/plugins/block_xp">https://moodle.org/plugins/block_xp</a>

		<p>students for their actions. Generates a leaderboard to display the ranking of the students.</p> <p>This plugin can be used to gamify learner experience in the Learning Hub.</p>	
My courses	Block	<p>Sets default images to render alongside the course. Renders the course summary file beside the course title if it is an image. Tracks grade/ course completion with a progress bar.</p> <p>This plugin can be used to provide a visual orientation in the Learning Hub and display the progress bar for each course.</p>	<a href="https://moodle.org/plugins/block_lw_courses">https://moodle.org/plugins/block_lw_courses</a>
My To Do List	Block	<p>A personal ToDo list on the user's Moodle dashboard.</p> <p>This plugin can be used to enhance self-regulated learning in the Learning Hub.</p>	<a href="https://moodle.org/plugins/block_todo">https://moodle.org/plugins/block_todo</a>
Open Forum	Activities	<p>Forum which aims to increase engagement and provide a modern alternative to standard Moodle forums.</p> <p>This plugin can be used to enhance social learning experience in the OpenVM Learning Hub.</p>	<a href="https://moodle.org/plugins/mod_hsuforum">https://moodle.org/plugins/mod_hsuforum</a>
<b>OpenVM E-Assessment (O4)</b>			
Quiz Analytics	Grade reports	<p>Visualises e-assessment / quiz results.</p> <p>This plugin can be used to visualise assessed competencies.</p>	<a href="https://moodle.org/plugins/gradereport_quizanalytics">https://moodle.org/plugins/gradereport_quizanalytics</a>
Multi Course Grader Report	Grade reports	<p>Pulls grader reports into one page.</p> <p>This plugin can be used to aggregate results from formative e-assessments in the sub-MOOCs into one report.</p>	<a href="https://moodle.org/plugins/gradereport_multigrader">https://moodle.org/plugins/gradereport_multigrader</a>
Arlo for Moodle	Enrolment	<p>Includes “Search for presenters” feature.</p> <p>This plugin can be used to manage</p>	<a href="https://moodle.org/plugins/enrol_arlo">https://moodle.org/plugins/enrol_arlo</a>

		peer-review processes (e. g. assigning reviewers, signaling availability).	
Tutorial Booking	Activity	<p>Allows instructors of a course to create slots that the students can sign themselves up to.</p> <p>This plugin can be used to allow learners to assign themselves to peer-assessment.</p>	<a href="https://moodle.org/plugins/mod_tutorialbooking">https://moodle.org/plugins/mod_tutorialbooking</a>
Moderator Guide	Block	<p>This block displays guides for external teachers/graders.</p> <p>This plugin can be used to create and display guidelines for peer reviewers in e-assessment.</p>	<a href="https://moodle.org/plugins/block_moderator_guide">https://moodle.org/plugins/block_moderator_guide</a>
Exabis E-Portfolio	Block	<p>Key features are: building up ePortfolios with an individual structure, linking ePortfolio-artefacts to competences.</p> <p>This plugin can be used to link e-assessment the 8 competencies.</p>	<a href="https://moodle.org/plugins/block_exaport">https://moodle.org/plugins/block_exaport</a>
<b>Open VM Digital Credentials (O5)</b>			
Certificates Wall	User profile	<p>Displays user achievements in the user profile.</p> <p>This plugin can be used to display badges, points and other achievements in the user profile.</p>	<a href="https://moodle.org/plugins/profilefield_certificateswall">https://moodle.org/plugins/profilefield_certificateswall</a>
Badge Ladder	General	<p>This plugin provides two leaderboards for awarded badges. The first leaderboard shows the available badges sorted by the number of users owning this badge. The second one shows all users sorted by the number of badges owned by them. There is one badge ladder for site badges and one for course badges.</p> <p>This plugin can be used to add a gamification experience to the process of issuing and earning credentials.</p>	<a href="https://moodle.org/plugins/local_bs_badge_ladder">https://moodle.org/plugins/local_bs_badge_ladder</a>
<b>OpenVM MOOC (O6)</b>			
Buttons	Course formats	Buttons is a course format that creates a menu with buttons to access the	<a href="https://moodle.org/plugins/format_buttons">https://moodle.org/plugins/format_buttons</a>

		<p>sections, one by one.</p> <p>This plugin can be used to gamify experience in the MOOC by enhancing quick, visual orientation in the course structure.</p>	
E-Task	Course formats	<p>eTask topics format includes grading table on the top of the course page and the activity popover with progress charts.</p> <p>This plugin can be used to visualise achievements and motivate learners to pass activities in the MOOC.</p>	<a href="https://moodle.org/plugins/format_etask">https://moodle.org/plugins/format_etask</a>
Social Wall	Course formats	<p>This plugin includes a post interface, timeline of posts, filtering of the timeline, and integration with Moodle activities and resources.</p> <p>This plugin can be used to enhance the social experience in the MOOC as part of meaningful gamification.</p>	<a href="https://moodle.org/plugins/format_socialwall">https://moodle.org/plugins/format_socialwall</a>
Badge Enrolment	Enrolment	<p>Users can only enrol into a course when they have one or more required site badges.</p> <p>This plugin can be used for the sub-MOOCs.</p>	<a href="https://moodle.org/plugins/enrol_badgeenrol">https://moodle.org/plugins/enrol_badgeenrol</a>
Level Up!	Enrolment	<p>Enrol users in courses when a certain level from Level up! is attained.</p> <p>This plugin can be used for the sub-MOOCs.</p>	<a href="https://moodle.org/plugins/enrol_xp">https://moodle.org/plugins/enrol_xp</a>
QUESTOURnament	Activity	<p>Activity for engaging the students into a game of questions (named as challenges). The students can be authors of challenges. A competitive scoring scheme is used to foster motivation.</p> <p>This plugin can be used to gamify learning experience in the MOOC.</p>	<a href="https://moodle.org/plugins/mod_quest">https://moodle.org/plugins/mod_quest</a>
Stamp Collection	Activity	<p>The Stamp collection allows a teacher to give "stamps" (i. e. picture with a comment, similar concept to badges) to</p>	<a href="https://moodle.org/plugins/mod_stampcoll">https://moodle.org/plugins/mod_stampcoll</a>



		<p>students so they collect these stamps.</p> <p>This plugin can be used to reward and motivate learning activities in the MOOC and stamps can be an alternative to badges, which in the OpenVM Learning Hub would be limited to “Competency Badges” and “Contributor Badges”.</p>	
H5P	Activity	<p>Interactive HTML5 content.</p> <p>This plugin can be used to create interactive learning resources in the MOOC.</p>	<a href="https://moodle.org/plugins/mod_hvp">https://moodle.org/plugins/mod_hvp</a>
Mask	Activity	<p>The teacher can upload their pdf file to Moodle, lay down masks that obscure parts of the underlying document and add questions for the students to answer in order to make the masks disappear.</p> <p>This plugin can be used to create interactive, gamified MOOC activities using documents in the PDF format.</p>	<a href="https://moodle.org/plugins/mod_masks">https://moodle.org/plugins/mod_masks</a>
Team Builder	Activity	<p>Tool for building teams based on a set of criteria.</p> <p>This tool can be used for collaborative learning activities in the MOOC.</p>	<a href="https://moodle.org/plugins/mod_teambuilder">https://moodle.org/plugins/mod_teambuilder</a>
Mycourse status	Block	<p>Comprehensive course report.</p> <p>This plugin can be used to visualise achievements in each sub-MOOC.</p>	<a href="https://moodle.org/plugins/block_mycoursestatus">https://moodle.org/plugins/block_mycoursestatus</a>
Completion progress	Block	<p>Visual representation of activities to be completed. Colour-coded for quick reference. Helps identify students at risk.</p> <p>This plugin can be used to enhance student orientation and self-regulation in the MOOC and help identify and support learners “at risk”.</p>	<a href="https://moodle.org/plugins/block_completion_progress">https://moodle.org/plugins/block_completion_progress</a>
Slider	Block	<p>Simple slideshow block with fade or slide effect.</p> <p>This plugin can be used to present visual</p>	<a href="https://moodle.org/plugins/block_slider">https://moodle.org/plugins/block_slider</a>

		content in the MOOC.	
Content Curation	Block	Easily curate, control and display relevant external content.  This plugin can be used to enhance self-regulated learning in the MOOC.	<a href="https://moodle.org/plugins/block_anderspink">https://moodle.org/plugins/block_anderspink</a>
Ranking block	Block	Capture moodle events, points are added in real time.  This plugin can be used to create ranking list of learners in the MOOC.	<a href="https://moodle.org/plugins/block_ranking">https://moodle.org/plugins/block_ranking</a>
Stash	Block	Add an inventory of items to your course and let your students find items by exploring the activities.  This plugin can be used to create items to encourages participant exploration of the MOOC learning materials.	<a href="https://moodle.org/plugins/block_stash">https://moodle.org/plugins/block_stash</a>

## 5. User testing of meaningful gamification design

This section describes the user testing of meaningful gamification designs involving all project partners and selected potential learners. The paragraphs below outline the key aims, methods and tentative results for user-testing in milestone 4, i. e. O5-A2.4: Implementation in the VM Learning Hub and User-Testing planned for January-February 2019:

- Aims and context:** The aim of user-testing is to test the gamification concept embedded in an exemplary scenario. The exemplary scenario is designed in alignment with the pre-pilot sub-MOOC on digital and media skills developed by a task force group composed of the leaders of the outputs inside the partnership. The pre-pilot sub-MOOC on digital and media skills is developed in December 2018 and will be tested in January 2019 together with the meaningful gamification concept.
- Methods and results:** Scenario-based testing embedded in the the pre-pilot sub-MOOC on digital and media skills. Each output leader test the pre-pilot including the meaningful gamification concept concept with selected students. The pre-pilot is designed for the persona “student”. In later iterations of the MOOC design in O6 further personas (i. e. “teacher” and possibly “international officer” and resulting learning pathways) will be added to the concept. To test the meaningful gamification concept three data sources will be used in the pre-pilot: (1) results from the evaluation survey integrated into the sub-MOOC scenario (e. g. level of engagement, level of enjoyment, level of meaningful interaction), (2) learner activities in the sub-MOOC (e. g. number of visits to the sub-MOOC, number of OERs used for learning, number of badges earned), and (3) results from e-assessments (e. g. number and type of e-assessments taken, e-assessment results).

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