

# Open Virtual Mobility

## O5 Open Credentials and Gamification:

### O5-A1: Gamification Concept

#### MILESTONE 5: FINAL CONCEPT AND REPORT

Outcome 5 Activity 2 : Conceptual and Visual Design of Gamification for Learning in OpenVM MOOCs.	
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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 is related to milestone 5 (O5-A2.5), i. e. Final concept and report.

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## Executive summary

This paper is the **final concept and report** (milestone 5) on OpenVM Gamification. The final concept is based on design iterations described in publications related to milestones 1, 2, 3 and 4 (see below). The report is based on the data from the online evaluation survey with n = 1412 learners in the OpenVM Learning Hub. This publication is the final document following the workflow in O5-A2:

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

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

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

Milestone 4: O5-A2.4: Implementation in the VM Learning Hub and User-Testing (February 2019)

Milestone 4: O5-A1.5: Final concept and report (May 2020)

## What are the objectives of this paper?

This paper presents the final gamification concept for learning in OpenVM MOOCs, which results from joint and iterative design, implementation and user-testing in the OpenVM Learning Hub:

<https://hub.openvirtualmobility.eu>

The aim of this report is to:

A. Present the final gamification concept with the focus on:

1. **Meaningful gamification approach** applied to support learning OpenVM MOOCs
2. **Microlearning approach** applied to enhance engagement in OpenVM MOOCs

B. Present the results from the online survey with n = 1412 learners in OpenVM MOOCs.

## 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 open digital credentials 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 two key topics related to OpenVM Credentials: (1) final concept, and (2) report on evaluation results.

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## Contributors

### **Prof. Dr. Ilona Buchem**

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 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.

### **Chiara Carlino**

Chiara Carlino works at CINECA, the main Italian inter-university consortium, as consultant for Cineca's Business Unit dedicated to Universities. Chiara Carlino holds a Master Degree in Philosophy from the University of Bologna and a second level Master Degree in Web Technologies. Starting with semantic web, she developed competencies in digital communication, web analysis, user interface and experience design, functional requirements analysis for software applications and the communication of IT projects, products and activities. She has worked with Open Badges since Bestr startup in 2015, supporting public administration and companies in identifying which improvements the technology could add to their processes. She has participated in the organization of conferences (ePic 2016 and 2017), presented at numerous events on the subject.

## Acknowledgements

The authors would like to acknowledge with gratitude all those who made a contribution to Outcome O5-A2.4 "Implementation and User-Testing of the Gamification Concept" including all project partners who participated in the gamification design online surveys and provided their helpful feedback. Our special thanks go to students from project partner organisations who participated in the survey evaluating the design and the implementation of the Gamification Concept in the OpenVM Learning Hub.

# 1. Previous work

The main aim of Output 5 Activity 2 (O5-A2) was to design, develop, implement and test concepts for gamification for learning in OpenVM MOOCs. O5-A2 focused on designing, implementing and testing of meaningful gamification and specific gamification design elements implemented in the OpenVM Learning Hub. Badges (O5-A1) and gamification (O5-A2) are related concepts and both aim at motivating learners to engage in desired activities. Badges and gamification concepts were aligned with each other in Output 5. Gamification means using game elements in non-game contexts (Deterding et al. 2011) and was applied to design OpenVM MOOCs to trigger specific user activities like taking e-assessments (developed in O4) and participating in MOOCs (developed in O6). Gamification was aligned with the overall design of the Learning Hub (developed in O2) to create a meaningful and enjoyable learner experience with the aim of promoting virtual mobility in HE.

The gamification concept of was developed throughout the project lifetime following the workflow in O5-A2 (as described in the project application):

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

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

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

Milestone 4: O5-A2.4: Implementation in the VM Learning Hub and User-Testing (February 2019)

Milestone 4: O5-A1.5: Final concept and report (May 2020)

The results from all milestone were published step by step on the project website and all publications are available on the web page dedicated to Output 5:

<https://www.openvirtualmobility.eu/topics/outputs/o5-credentials-gamification/>

The previous publications are listed below. Please refer to the listed documents for further details related to the specific milestones and topics related to OpenVM credentials:

## **Report on milestones 1, 2 and 3 (September 2018 / Quality Gate 2):**

Buchem, I. & Carlino, Ch. (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/wp-content/uploads/2018/12/OpenVM\\_O5-A2-publication2018.pdf](https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM_O5-A2-publication2018.pdf)

## **Reports on milestone 4 (November 2019 / Quality Gate 3):**

Buchem, I. & Carlino, Ch. (2019). Implementation and User-Testing of Gamification for Learning in the Open Virtual Mobility Learning Hub. Open Virtual Mobility Erasmus+ (2017-2020). Retrieved

from

[https://www.openvirtualmobility.eu/wp-content/uploads/2019/11/OpenVM\\_O5-A2-Gamification\\_QG3\\_2019\\_CURRENT.pdf](https://www.openvirtualmobility.eu/wp-content/uploads/2019/11/OpenVM_O5-A2-Gamification_QG3_2019_CURRENT.pdf)

### **Gamification concept in the OpenVM Brochure:**

Elements of the gamification concepts were also portrayed in the OpenVM brochure:

<https://www.openvirtualmobility.eu/wp-content/uploads/2020/04/OpenVM-Erasmus-brochure.pdf>

### **Academic publications**

Beside the above mentioned project reports and the brochure, the outcomes of O5-A1 were documented in the academic papers in journals and conference proceedings:

- Buchem, I., Carlino, C., Amenduni, F. & Poce, A. (2020). Meaningful Gamification in MOOCs. Designing and Examining Learner Engagement in the Open Virtual Mobility Learning Hub. INTED2020 Proceedings of the 4th International Technology, Education and Development Conference, 2-4 March, 2020, pp. 9529-9534, Valencia, Spain. ISBN: 978-84-09-17939-8. Retrieved from: <https://library.iated.org/view/BUCHEM2020MEA>
- Buchem, I., Poce, A. & Tur, G. (2019) Microlearning in MOOCs. A case study on designing engaging micro-learning experiences in the Media and Digital Literacy MOOC. Comunicación y Pedagogía, No. 315-316, Microlearning, pp. 7-12, Retrieved from: <http://www.centrocp.com/comunicacion-y-pedagogia-315-316-microlearning>
- Tur, G., Firssova, O., Rajagopal, K., Buchem, I. (2018). Open Virtual Mobility: A learning Design 4 SRL. Proceedings of the EDEN 2018 Research Workshop, Barcelona 2018. Retrieved from: <https://research.ou.nl/en/publications/open-virtual-mobility-a-learning-design-4-srl>
- Buchem, I.; Konert, J., Carlino, Ch., Casanova, G., Rajagopal, K., Firssova, O. & Andone, D. (2018). Designing a Collaborative Learning Hub for Virtual Mobility Skills – Insights from the European Project Open Virtual Mobility. In: P. Zaphiris and A. Ioannou (Eds.) Learning and Collaboration Technologies. Design, Development and Technological Innovation. Springer International Publishing AG, Lecture Notes in Computer Science, vol. 10924, pp. 350-376. ISBN 978-3-319-91742-9, Retrieved from: [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)

## 2. Final Concept

The final gamification concept of OpenVM credentials comprises of two approaches:

- **Meaningful gamification approach** applied to support learning OpenVM MOOCs
- **Micro-learning approach** applied to enhance engagement in OpenVM MOOCs

These two approaches were implemented in the OpenVM Learning Hub (O2) and the OpenVM MOOCs (O6) hosted in the **OpenVM Learning Hub**:

<https://hub.openvirtualmobility.eu/login/index.php>

The sections below describe the two approaches of meaningful gamification in more detail.

### 2.1 Meaningful gamification

The gamification concept in the OpenVM Learning Hub is based on the **RECIPE model** by Nicholson (2012a, 2012b). The OpenVM Learning Hub aims to create **engaging learning experiences** by making use of **meaningful gamification** as an approach to enhancing learner engagement in online learning environments. The meaningful gamification approach aims to enhance learner engagement and motivation to engage in learning activities without emphasising external rewards (Nicholson, 2012a, 2012b). The approach to meaningful gamification in the OpenVM Learning Hub is aligned with the *Universal Design for Learning (UDL)* which asks the central question “*How does the design benefit the user?*” for every design decision (Nicholson, 2012a).

The RECIPE model applied to the design of learning in the OpenVM MOOCs includes the following elements proposed by Nicholson (2014):

- **Reflection** – assisting participants in finding interests and past experiences that can deepen engagement and learning;
- **Exposition** – creating stories for participants that are integrated with the real-world setting and allowing them to create their own;
- **Choice** – developing systems that put the power in the hands of the participants;
- **Information** – using game design and game display concepts to allow participants to learn more about the real-world context;
- **Play** – facilitating the freedom to explore and fail within boundaries;



- Engagement – encouraging participants to discover and learn from others interested in the real world setting.

**The meaningful gamification design** implemented in the OpenVM Learning Hub is based on the results from online surveys and MoSCow prioritisation of key features which were clustered into functional and non-functional requirements. Based on the survey results from 2018, elements of meaningful gamification in the OpenVM project were divided into ten groups, 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. All elements were implemented following a unified design for learning in each mini-MOOC as described in the O5-A2 report (Milestones 1, 2, & 3): [https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM\\_O5-A2-publication2018.pdf](https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM_O5-A2-publication2018.pdf)

**The meaningful gamification elements** implemented in the OpenVM Learning combine non-reward (e. g. choices) with reward-based elements (e. g. digital credentials) to help learners find meaning and relevance in learning activities and to allow learners to make decisions about learning goals, steps and activities (Buchem at al, 2020). The implemented meaningful gamification are summarised in table 1 and can be accessed, viewed and tested in the OpenVM Learning Hub: <https://hub.openvirtualmobility.eu/login/index.php>

**Table 1:** Meaningful gamification elements implemented in the OpenVM Learning Hub

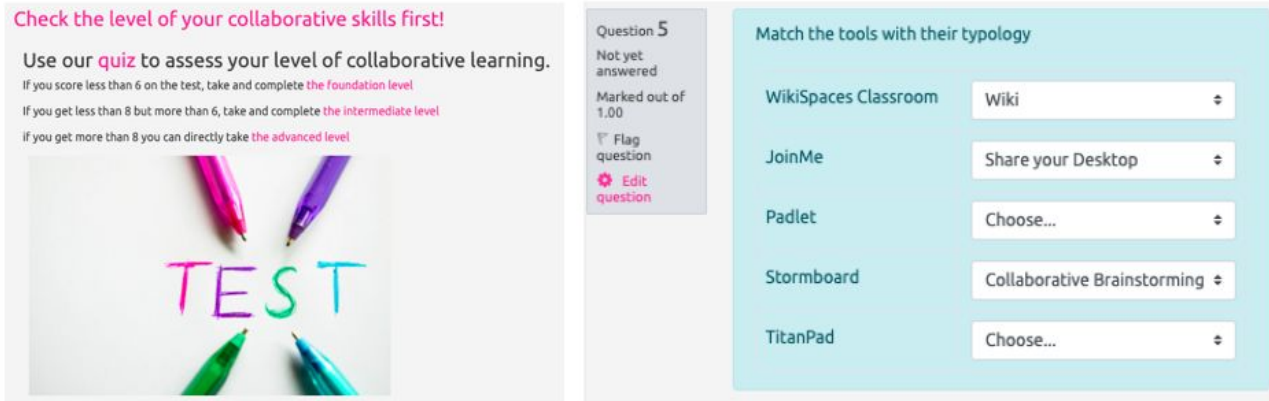
RECIPE model	Gamification in the OpenVM Learning Hub
<b>Reflection</b> assisting participants in finding interests and past experiences to deepen engagement and learning	<b>E-assessments and forums:</b> Diverse e-assessments (O4) such as pre-assessment, automated self-assessment, peer-assessment) and reflection questions in forums for encouragement of self-/reflection and deepening of learning in MOOCs
<b>Exposition</b> creating stories for participants that are integrated with the real-world setting and allowing to create own	<b>Micro-learning content:</b> Open (OERs) and short (micro-content) learning materials (O6) with links to real-world contexts and embedded in real-world settings, including interactive H5P content <sup>1</sup> .
<b>Choice</b>	<b>Choice of learning pathways:</b>

<sup>1</sup> <https://h5p.org/>

<p>developing systems that put the power in the hands of the participants</p>	<p>Structure of OpenVM MOOCs which allows learners to choose to participate in any level of the MOOC following the recommendations for learning based on the results pre-assessments, which are not a must, only a recommendation to allow for personally meaningful choice</p>
<p><b>Information</b></p> <p>using game design and game display concepts</p>	<p><b>Information visualisation:</b></p> <p>Display of key information to support learning including the use of: a. graphic advance organisers, b. icons, and c. progress bars.</p>
<p><b>Play</b></p> <p>facilitating the freedom to explore and fail within boundaries.</p>	<p><b>Playful design:</b></p> <p>Encouragement to explore the MOOCs and MOOC-content following own interest and level of skills, which is enhanced by OpenVM credentials (O5-A1). E-assessments can be taken as many times needed (fail and try again).</p>
<p><b>Engagement</b></p> <p>encouraging participants to discover and learn from others interested in the real world setting</p>	<p><b>Group-activities and e-portfolio with peer-assessment:</b></p> <p>Group activities at intermediate and advanced levels supported by the group-formation tool (O3) and peer-assessment as part of e-portfolio (advanced level)</p>

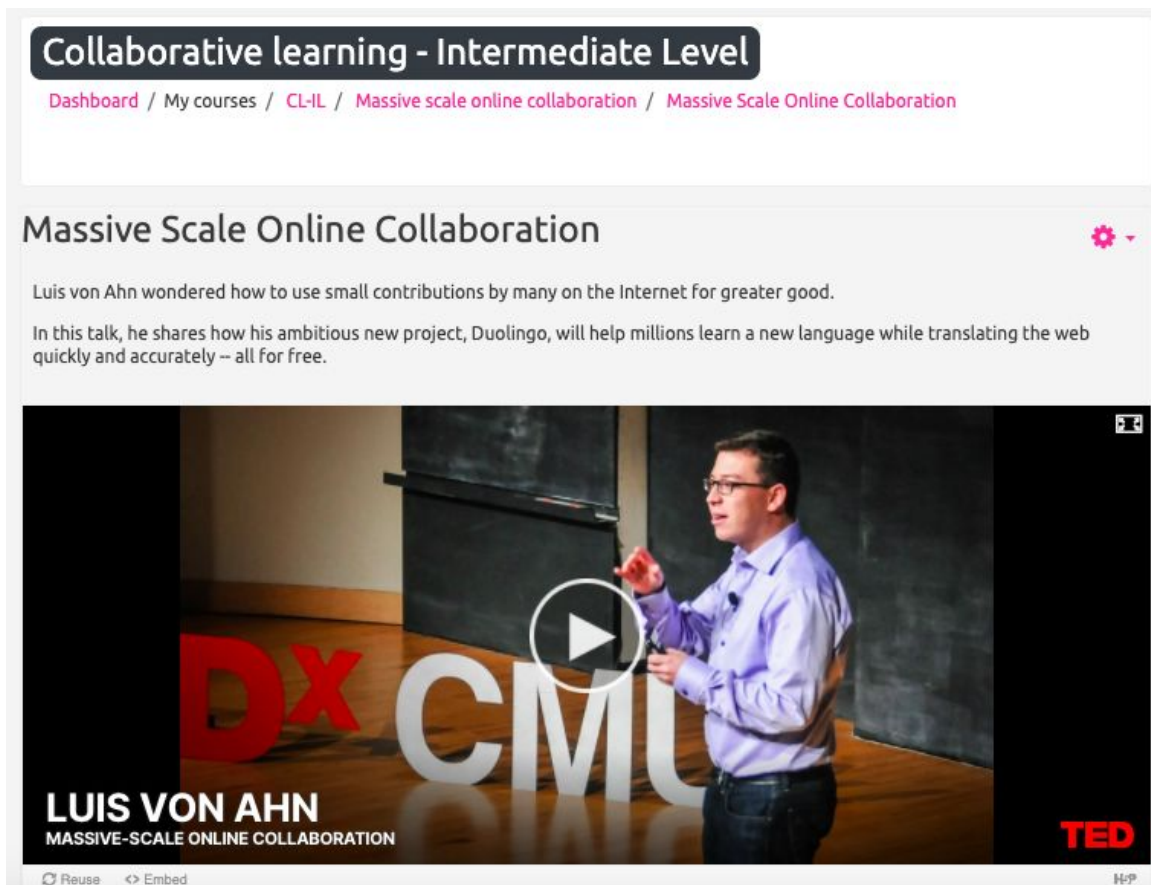
The figures below visualise the elements of the RECIPE model implemented in OpenVM MOOCs:

**1. REFLECTION:** Figure 1 below shows an example of the pre-assessment from the Collaborative Learning MOOC which aims to support self-reflection and evaluation of own skills.



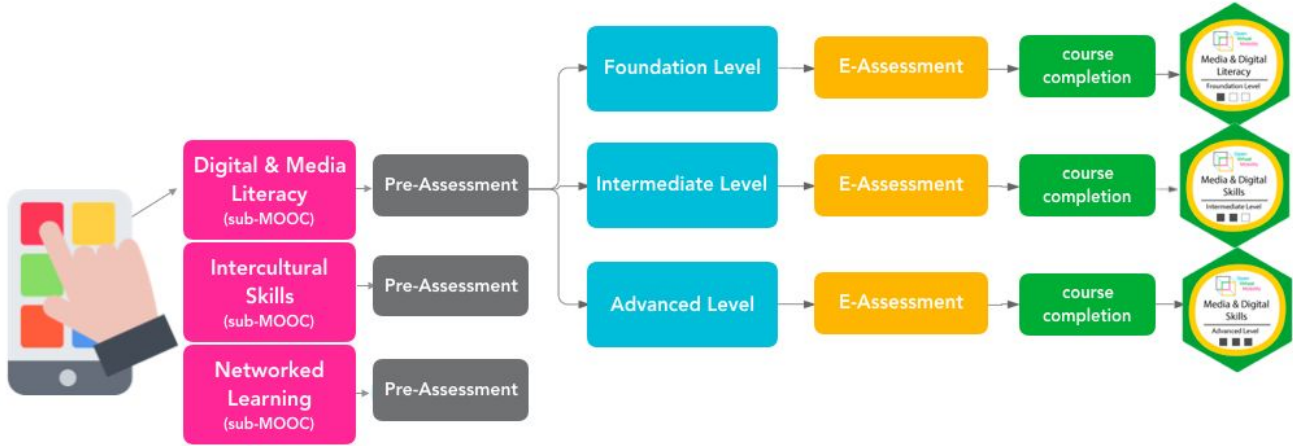
**Figure 1:** Example of a pre-assessment as a design element aiming at supporting reflection.

**2. EXPOSITION:** Figure 2 below shows an example of micro-learning content (short video in H5P format) from the Collaborative Learning MOOC which connects learning in the MOOC to real-world.



**Figure 2:** Example of micro-learning content as H5P embedded TED video (length: 16 minutes).

**3. CHOICE:** Figure 3 below shows the structure of OpenVM MOOCs which allows learners to choose their own learning pathway, following (or not) the recommendation from the pre-assessment.



**Figure 3:** Choice of possible MOOC pathways in the OpenVM Learning Hub.

**4. INFORMATION:** Figure 4 below shows an example of how key information to support learning is displayed in OpenVM MOOCs: graphic organisers, icons, progress-bar, badges.


**Figure 4:** Diverse forms of information display in the OpenVM Learning Hub.

5. **PLAY:** Figure 5 below shows an example of how learners are encouraged through playful design of learning activities to explore the MOOCs and MOOC-content following their own interest.

**Using "Wattpad" to write... collaboratively!**

Using "Wattpad" to write... collaboratively!

How does collaborative writing work?



What are the benefits of collaborative writing for yourself? Write a short article about your previous knowledge about collaborative learning. Publish this in this forum and discuss with your group members what can be done better.

*Hint: If you like, you can post it on Wattpad and wait for some exciting comments.*

**Figure 5:** An example of a playful design of learning activities in OpenVM MOOCs with focus exploration.

6. **ENGAGEMENT:** Figure 6 below shows an example of a peer-assessment activity supported by the group-formation tool developed in O3 and implemented at advanced level in all OpenVM MOOCs.

**Collaborative learning - Advanced Level**

Dashboard / My courses / CL-AL / E-assessment / Peer Assessment activity

**Peer Assessment activity** ⚙️

Closed

Setup phase Switch to the setup phase	Submission phase Switch to the submission phase	Assessment phase Switch to the assessment phase	Grading evaluation phase Switch to the evaluation phase	Closed Current phase
<ul style="list-style-type: none"> <li>✓ Set the workshop description</li> <li>✓ Provide instructions for submission</li> <li>✓ Edit assessment form</li> </ul>	<ul style="list-style-type: none"> <li>✓ Provide instructions for assessment</li> <li>✗ Allocate instructions expected: 136 submitted: 67 to allocate: 1</li> <li>⌚ There is at least one author who has not yet submitted their work</li> <li>⌚ Open for submissions from Wednesday, 1 January 2020, 3:44 PM (234 days ago)</li> <li>⌚ Submissions deadline: Tuesday, 19 May 2020, 10:49 PM (95 days ago)</li> <li>⌚ Late submissions are allowed</li> <li>⌚ Time restrictions do not apply to you</li> </ul>	<ul style="list-style-type: none"> <li>⌚ Open for assessment from Tuesday, 19 May 2020, 11:01 PM (95 days ago)</li> <li>⌚ Assessment deadline: Tuesday, 2 June 2020, 10:59 PM (81 days ago)</li> <li>⌚ Time restrictions do not apply to you</li> </ul>	<ul style="list-style-type: none"> <li>✗ Calculate submission grades expected: 136 calculated: 66</li> <li>✗ Calculate assessment grades expected: 136 calculated: 64</li> <li>✗ Provide a conclusion of the activity</li> </ul>	

Workshop grades report

1 2 3 4 5 6 7 8 9 10 ... 14 »

First name	/ Surname	Submission	/ Last modified	Grades received	Grade For submission (of 3.0)	Grades given	Grade For assessment (of 2.0)

**Figure 6:** An example of a peer-assessment activity aiming at enhancing engagement at advanced level.

## 2.2 Micro-learning approach

The meaningful gamification design in the OpenVM Learning Hub and the MOOCs was combined with the *micro-learning approach* which aims to enhance motivation and engagement (Buchem, Poce & Tur, 2019). Microlearning applied to the design of MOOCs is a shift from traditional course formats of early MOOCs to modular designs. This shift has been informed by empirical evidence which shows that learners engage in MOOC activities on and off and complete learning activities in fragmented pieces of time (Sun et al., 2015). These research results were applied in OpenVM MOOCs to create micro-sized learning experiences (Buchem, Poce & Tur, 2019).

The micro-learning approach applied to the design of OpenVM MOOCs is based on the taxonomy of MOOCs by Clark (2016), which distinguished eight types of MOOCs, including mini-MOOCs. Mini-MOOCs are smaller, shorter, cover less content and fewer skills than traditional MOOCs and can be well aligned with micro-credentials such as the ones based on Open Badges issued upon the successful completion of each mini-MOOC (Clark, 2016).

The **granular structure** of OpenVM mini-MOOCs addresses the engagement and motivation loss in longer courses: OpenVM MOOCs are **short** (approx. 80 minutes per level-course) and **modular**: a series of eight mini-MOOCs is offered in the OpenVM Learning Hub, each divided into three levels, i. e. foundations, intermediate and advances, with each level focusing on a specific skill-set to be acquired (Buchem, Poce & Tur, 2019).

Moreover, a granular system of **micro-credentials** based on Open Badges makes learning outcomes, i. e. eight virtual mobility skill clusters, visible to learners and supports learners in selecting mini-MOOCs and corresponding level-courses (sub-MOOCs) to best match their individual needs and support learning in a personally meaningful way. The design of micro-credentials has been implemented in O5-A1 and is described in the final report for this activity.

Further micro-learning design strategies applied to the design of OpenVM MOOCs include: a. providing parts of the MOOCs in short time slots, b. chunking course materials into smaller units, c. delivering **micro-content** with a sequence of **micro-interactions** to reduce information overload and providing learning resources on-demand to facilitate just-in-time and on-the-go learning (Buchem, Poce & Tur, 2019). Figure 7 below shows the example of micro-content with micro-interactions in a forum specifically dedicated to this particular micro-content.

## Should an open minded person accept any theory?

Read the text and participate in the following discussion. Apply what you have learned to each of the comments. How would you engage in this discussion? Write a hypothetical comment of your own.

### Open-Mindedness

#### Group formation

**Restricted** Not available unless:

- The activity **Quiz 1** is complete and passed
- The activity **Quiz 2** is complete and passed

*First window:* Please fill in the **group formation** questionnaire by 18th of March 23.59 pm CET time. If you don't manage this deadline, you are invited to participate in the second window. From the 19th to the 22nd of March you can participate in the group discussion forums.

*Second window:* Please fill in the **group formation** questionnaire by the 22nd of April 23.59 pm CET time. From the 23rd to the 26th of April you can participate in the group discussion forums.

### What is open minded for you? (forum)



What is open minded for you? Discuss in the group why and when an Open Mindset is good and helpful. Discuss pros and cons.

**Figure 7:** An example of a micro-content and corresponding micro-interactions in the forum.

## 2.3 Further design elements

Furthermore, the meaningful gamification concept in the OpenVM project focuses on enhancing *self-regulated learning* in different phases of the learning process, as proposed Zimmerman (2002), especially through provision of information about learning objectives and skills to be developed, transparent criteria for attainment, assessment and recognition of OpenVM skills, meaningful feedback and opportunities for self-assessment, allowing learners take decision and make choices (e. g. choosing learning tools a to support own learning, co-creation of learning content) in a *personal learning environment* (Buchem, Tur & Hölterhof, 2014). According to Nicol & Macfarlane-Dick (2005), self-regulated learning can be supported by:

- (a) clarifying criteria for good performance,
- (b) facilitating self-assessment,
- (c) delivering high-quality feedback,
- (e) encouraging dialogue,
- (f) encouraging positive motivation, and
- (g) providing opportunities to close the skill gap.

All of the above mentioned points were implemented in OpenVM MOOCs. The meaningful gamification concept in OpenVM Learning Hub focuses on promoting *self-regulation* and *learner control* through the enhancement of active monitoring and regulation of learning processes, e. g. setting and orientation towards learning goals, strategies used to achieve goals, management of resources, feedback and self-assessment (Nicol & Macfarlane-Dick, 2005).

Moreover, the publication on O5-A2.3 (Milestone 3) published on the project website<sup>2</sup> established a list of requirements for implementation of meaningful gamification in the OpenVM Learning Hub based on the principles of Universal Design for Learning (UDL). The requirements are divided into functional requirements (FR) and non-functional requirements (NR). The final implementation status of these requirements as of August 2020 is summarised in table 2 below.

**Table 2:** Implementation status of meaningful gamification requirements (August 2020).

ID	Category	Description	Implementation status
FR01	Goals	Start menu in which the user can choose the persona (teacher, student, international officer)	NOT IMPLEMENTED: This requirement was implemented through <b>group choice</b> functionality in Moodle in the pre-pilot <sup>3</sup> . However, this approach was too inefficient to be implemented in altogether 24 miniMOOCs as it required the design of two different sets of contents per miniMOOC. Therefore the MOOC design team decided to provide universal content in all 24 mini-MOOCs.

<sup>2</sup> [https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM\\_O5-A2-publication2018.pdf](https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM_O5-A2-publication2018.pdf)

<sup>3</sup> <https://www.openvirtualmobility.eu/outputs/1095-o2-learning-hub/>

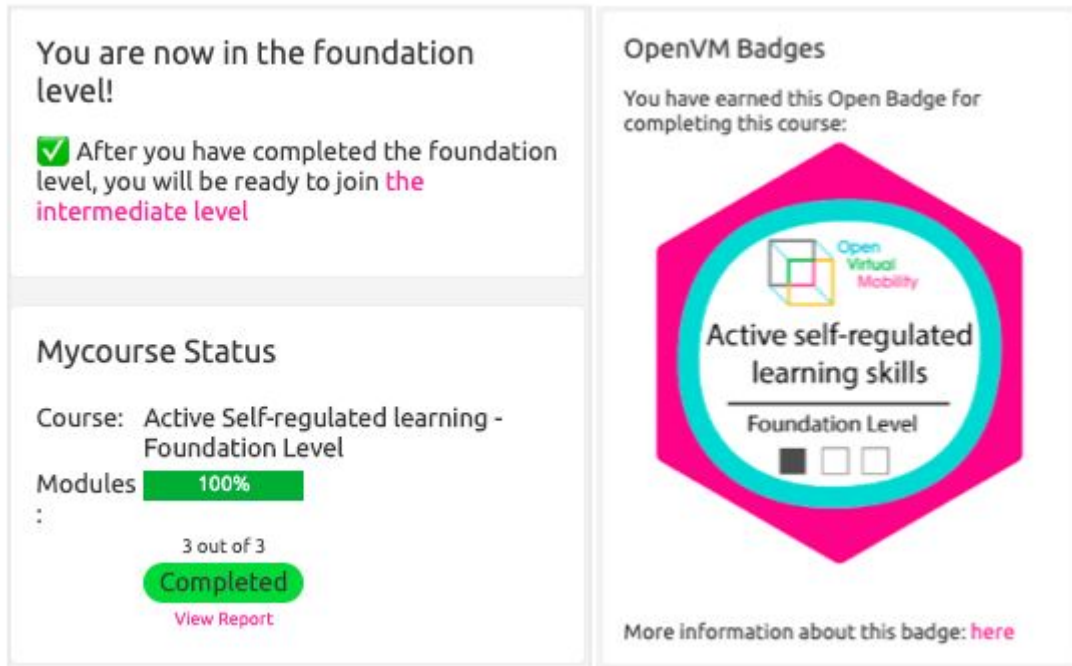


FR02	Goals	Options menu in which the user can choose options for learning (skill goals, sub-MOOCs, levels, e-assessment, digital credentials)	IMPLEMENTED: Implemented through the design of the <b>dashboard</b> , see Output 2 for details.
FR03	Assessment	Pre-assessment of skills and recommendation for sub-MOOC and/or level in the sub-MOOC	IMPLEMENTED: Implemented through integration of <b>pre-assessment</b> in each level of each sub-MOOC, see Output 4 for details.
FR04	Assessment	Different types of assessment for different skills at 3 levels, e. g. automated test, evidence-based and peer-assessment	IMPLEMENTED: Implemented through integration of different forms of <b>e-assessment</b> in each level of each sub-MOOC, see Output 4 for details.
FR05	Content	Skill appropriate MOOC content based on pre-assessment	IMPLEMENTED: Implemented through integration of different forms of <b>content</b> based on the description of OpenVM skills, see Output 6 for details.
FR06	Content	Multiple examples of solutions to authentic problems	IMPLEMENTED: Implemented through integration of different authentic <b>examples</b> integrated into the sub-MOOC contents, see Output 6 for details.
FR07	Activity	Challenges at each level in the sub-MOOC	IMPLEMENTED: Partially implemented in selected levels of mini-MOOCs where pedagogically appropriate.
FR08	Activity	Activities aimed for and recognising content co-creation (e. g. producing and/or submitting OER)	IMPLEMENTED: Implemented in the separate course <b>OpenVM Contributor Badge</b> <sup>4</sup> in which users can earn a Contributor Credentials for one or more activities (see O5-A1 for more details).
FR09	Progress	Visualisation of progress and levels	IMPLEMENTED: Implemented in form <b>Mycourse status plugin</b> which was customized for the OpenVM Learning Hub and which provides an overview of progress.*
FR10	Progress	Display of earned digital credentials in the profile	IMPLEMENTED: Implemented in form of <b>Competence Credentials</b> appearing in each mini-MOOC level course in the top right corner differentiating the case where the user earned it or not. Display of credentials in the user profile was not implemented due to high workload.
FR11	Personalisation	Profile in which the user can specify own attributes	IMPLEMENTED: see Output 2 for details.
FR12	Engagement	Narratives for each MOOC level	NOT IMPLEMENTED: Full implementation was not possible due to high workload.
FR13	Feedback	Different types of human and computer support/feedback	IMPLEMENTED: see Output 6 for details.

<sup>4</sup> <https://hub.openvirtualmobility.eu/course/view.php?id=58>

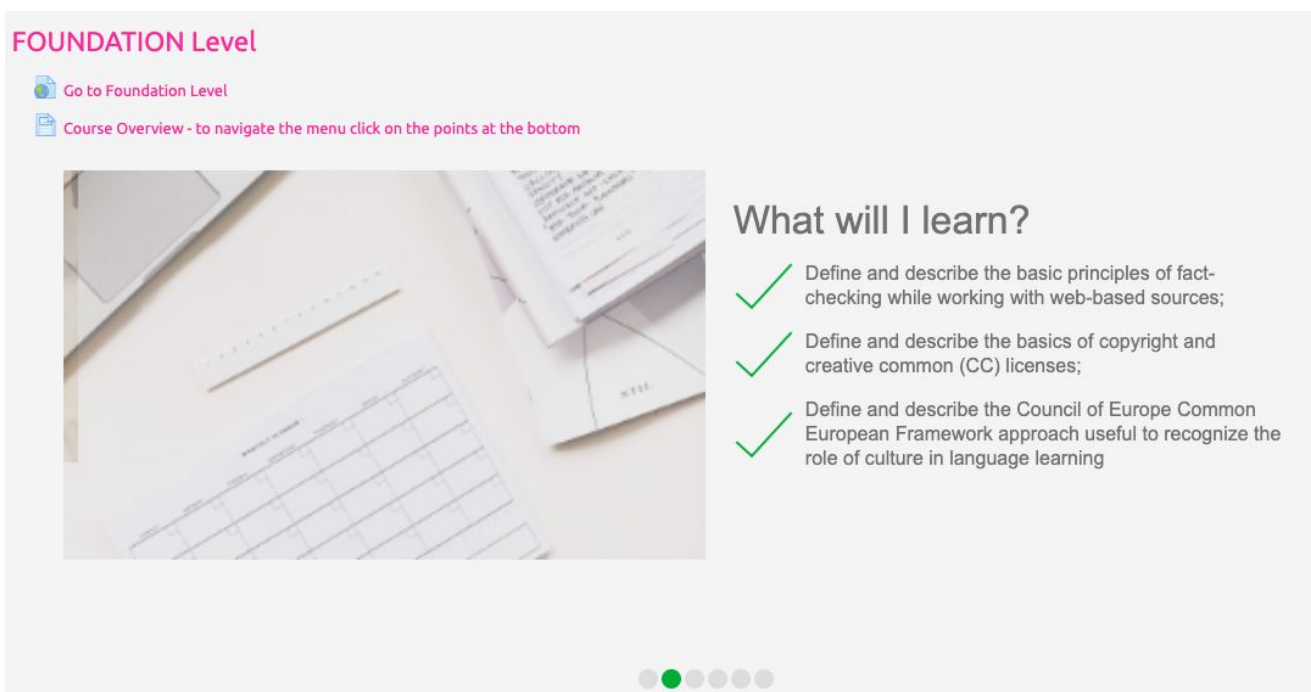
FR14	Collaboration	Group formation and collaborative activities/challenges	IMPLEMENTED: see Output 3 for details.
FR15	Support	Mechanisms to protect personal data for public display	IMPLEMENTED: see Output 2 for details.
NR01	Content	Visualisation of connections and structures (e. g. concept maps)	IMPLEMENTED: Implemented in the form of <b>visualisations of learning pathways</b> and the development and implementation of the <b>Course Overview</b> in each <b>Welcome</b> course, which introduces each MOOC.**
NR02	Feedback	Opportunities to express emotions (e. g. emojis, audio hand clapping)	IMPLEMENTED: This requirement is fulfilled by using editing options in the <b>forums</b> .
NR03	Personalisation	Culturally relevant content (e. g. national examples)	IMPLEMENTED: Implemented through the design of MOOCs in <b>partner languages</b> , e. g. MOOCs in German and OERs with national examples.
NR04	Personalisation	Content in different languages	IMPLEMENTED: Implemented through the design of MOOCs in <b>partner languages</b> , e. g. MOOCs in German
NR05	Personalisation	Video subtitles	IMPLEMENTED: This requirement is fulfilled by using YouTube videos which automatically provide <b>subtitles</b> .
NR06	Support	Visual, non-linguistic support (e. g. icons)	IMPLEMENTED: <b>Icons</b> implemented in each information block at the beginning of each mini-MOOC level. Icons are related to learning objectives, course materials and time to finish the course.
NR07	Support	Mobile version (mobile app)	IMPLEMENTED: Implemented in O2.

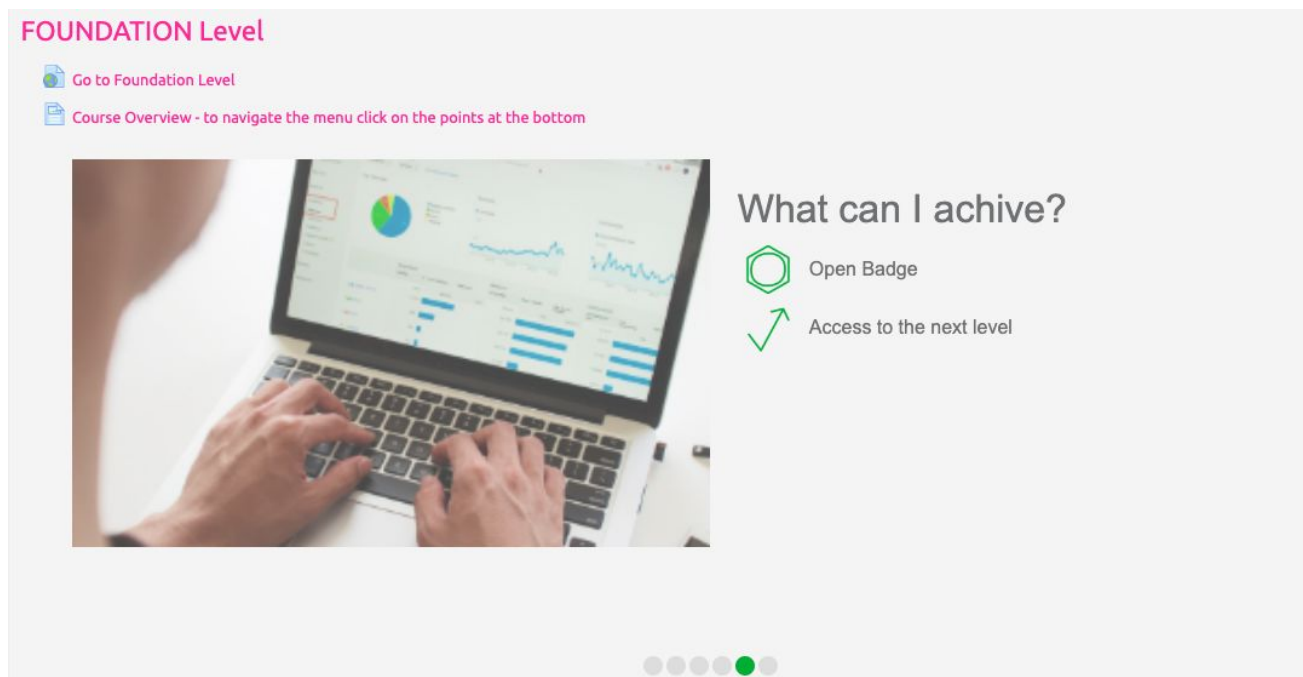
\*Figure 8 below shows "Mycourse Status" customized and implemented in each course level (left) and OpenVM Credentials implemented in each level (right) to visual progress.



**Figure 8:** "Mycourse Status" customized and implemented in each course level (left) and OpenVM Credentials implemented in each level (right) to visual progress.

\*\*Figure 9 below shows the interactive "Course Overview" implemented in each Welcome part of the mini-MOOC. There are "Course Overview" modules for each MOOC level course. The goal is the visualisation of connections and structures in the mini-MOOCs.





**Figure 9:** Interactive “Course Overview” implemented in each Welcome part of the course.

### 3. Evaluation report

To test the design and the implementation of the meaningful gamification design in OpenVM MOOC, an aggregated online evaluation survey has been used in the project to evaluate various aspects of OpenVM MOOC. The aggregated online evaluation has included items specifically related to the meaningful gamification design. In August 2020, at the time of writing this report, a sample of  $n = 1412$  learners participated in the online evaluation survey and submitted their evaluation of the design and implementation of meaningful gamification.

**Procedure:** Participants in all MOOCs were invited to participate in the online evaluation survey (in the English language), which was linked at the end of each level-course. The OpenVM online evaluation survey is organised in eight sections and participants are required to express their level of agreement with a set of statements on a Likert scale from 1 (strongly disagree) to 5 (totally agree). The survey encompasses a set of statements related to meaningful gamification. The evaluation took place on an ongoing basis within two waves of pilots in 2019 and 2020. This allowed for an iterative design and improvement of designs based on the evaluation results. The results presented in this report are aggregated results from 2019 and 2020.

**Sample:** The study sample was composed of the total of 1412 participants. The profile of participants was very diverse as shown in Table 3 below.

**Table 3.** Study sample

Characteristics	OpenVM MOOC evaluation survey participants
<b>Gender</b>	69% female 30% male
<b>Age</b>	61% 19-24 years old
<b>Role</b>	96% university students 3% teachers/educators
<b>Country</b>	44% Romania 20% Italy 20% Germany 7% Spain

The largest group of OpenVM participants were students from 88 different higher education institutions in Europe and beyond, predominantly from the countries represented by project partners (Romania, Italy, Germany, Spain, Netherlands) and other European countries (UK, Lithuania, Sweden, Norway, Slovakia, Bulgaria, France, Switzerland). Enrolled participants also included students and teachers from outside of Europe, including the USA, Colombia, Ecuador, Chile, Mexico, Argentina, Turkey, Burkina Faso and New Zealand.

**Enrollment:** Approx. 1500 participants were enrolled in all eight OpenVM MOOCs at the beginning of 2020. Out of all 1412 MOOC participants, who filled in the survey, 20% participated in the Active Self-Regulated Learning, 17% Media and Digital Literacy, 15% Collaborative Learning, 14% Open-mindedness, 12% Intercultural Skills MOOCs.

**Survey items:** The participants evaluated a set of statements related to the meaningful gamification design on the scale from 1 (totally disagree) to 5 (totally agree). The statements used in the online evaluation survey are listed in Table 4 below.

**Table 4.** Items used in the online evaluation survey in relation to the RECIPE model.

Focus	Statements
<b>Reflection</b>	<ul style="list-style-type: none"> <li>● ePortfolio helped me to reflect on my own skills.</li> <li>● Peer-assessment helped me in self-observation (SRL).</li> <li>● E-assessment helped me in self-observation (SRL).</li> <li>● Communication in forums helped me in self-observation (SRL).</li> <li>● OERs helped me in self-observation (SRL).</li> <li>● MOOC pathways helped me in self-observation (SRL).</li> </ul>

	<ul style="list-style-type: none"> <li>● Information hints helped me in self-observation (SRL).</li> <li>● Open Badges helped me in self-observation (SRL).</li> </ul>
<b>Exposition</b>	<ul style="list-style-type: none"> <li>● The learning tasks and outcomes are clearly and comprehensively defined at the beginning of the MOOC.</li> <li>● The MOOC layout positively affects my learning experience.</li> <li>● The MOOC provides practical examples that can be understood by all, regardless of cultural background.</li> <li>● I like the visual design of MOOCs in the OpenVM Learning Hub.</li> </ul>
<b>Choice</b>	<ul style="list-style-type: none"> <li>● I could choose different elements to learn.</li> <li>● I could choose my own learning pathway.</li> <li>● I appreciated the use of different kinds of content (text, video and pictures)</li> </ul>
<b>Information</b>	<ul style="list-style-type: none"> <li>● Information about learning objectives, course materials and time to finish at the beginning of each level were helpful for me.</li> <li>● “Course Overview” in the “Welcome” part of the course was useful for orientation in the MOOCs.</li> <li>● Mycourse status was useful for orientation about my progress.</li> <li>● Visuals about the MOOC structure and levels were helpful for me.</li> </ul>
<b>Play</b>	<ul style="list-style-type: none"> <li>● OpenVM MOOCs have a playful design.</li> <li>● I had fun learning this way.</li> </ul>
<b>Engagement</b>	<ul style="list-style-type: none"> <li>● OpenVM MOOCs are interactive and engaging.</li> <li>● I was intrigued by the MOOC and I wanted to deepen some topics.</li> </ul>

The results related to the RECIPE model of meaningful gamification are discussed in sections below. The statistical analysis was conducted using IBM SPSS Statistics version 27.

### 3.1 Reflection

The results related to the “reflection” as part of the RECIPE model for meaningful gamification of learning in OpenVM MOOCs are presented in table 5 below. Since not all questions were mandatory, the dataset included different numbers of entries (n).

**Table 5.** Reflection (RECIPE model). Scale 1 (totally disagree) to 5 (totally agree).

Survey item	n	M	SD
ePortfolio helped me to reflect on my own skills.	420	3.68	.999
Peer-assessment helped me in self-observation (SRL).	621	3.63	.934

E-assessment helped me in self-observation (SRL).	805	3.74	.873
Communication in forums helped me in self-observation (SRL).	767	3.54	.952
OERs helped me in self-observation (SRL).	805	3.79	.867
MOOC pathways helped me in self-observation (SRL).	805	3.84	.842
Information hints helped me in self-observation (SRL).	805	3.82	.851
Open Badges helped me in self-observation (SRL).	791	3.71	.887

Descriptive statistics summarised in Table 5 show that high average values, oscillating towards “strongly agree” (value 4 on the scale), were reached for all survey items related to the possibilities of reflection. The results indicate that MOOC participants especially appreciated MOOC pathways (M = 3.84) and information hints including information visualisation (M = 3.82) as well as OERs (M = 3.79). This means that the meaningful gamification design included diverse elements which supported the reflection part of the RECIPE model.

### 3.2 Exposition

The results related to the “exposition” as part of the RECIPE model for meaningful gamification of learning in OpenVM MOOCs are presented in table 6 below. Since not all questions were mandatory, the dataset included different numbers of entries (n).

**Table 6.** Exposition (RECIPE model). Scale 1 (totally disagree) to 5 (totally agree), n = 1412.

Survey item	n	M	SD
The learning tasks and outcomes are clearly and comprehensively defined at the beginning of the MOOC.	1412	3.88	.959
The MOOC layout positively affects my learning experience.	1402	3.69	.976
The MOOC provides practical examples that can be understood by all, regardless of cultural background.	1412	3.87	.921
I like the visual design of MOOCs in the OpenVM Learning Hub.	1412	3.68	.968

Descriptive statistics summarised in Table 6 show that high average values, oscillating towards “strongly agree” (value 4 on the scale), were reached for all survey items. The results indicate that MOOC participants especially appreciated the exposition of learning tasks and objectives (M = 3.88) and the exposition to the practical examples (M = 3.87). This means that the meaningful gamification design included diverse elements which supported the exposition part of the RECIPE model.

### 3.3 Choice

The results related to the “choice” as part of the RECIPE model for meaningful gamification of learning in OpenVM MOOCs are presented in table 7 below. Since not all questions were mandatory, the dataset included different numbers of entries (n).

**Table 7.** Choice (RECIPE model). Scale 1 (totally disagree) to 5 (totally agree), n = 1412.

Survey item	n	M	SD
I could choose different elements to learn.	1412	3.64	.954
I could choose my own learning pathway.	1412	3.65	.957
I appreciated the use of different kinds of content (text, video and pictures).	1412	4.04	.932

Descriptive statistics summarised in Table 7 show that high average values, oscillating towards “strongly agree” (value 4 on the scale), were reached for all survey items. The results indicate that MOOC participants especially appreciated different kinds of content such as text, videos, pictures (M = 4.04). This is an interesting example which shows that the choice of content may be even more important to learners than the choice of learning elements and learning pathways in relation to the choice part of the RECIPE model.

### 3.4 Information

The results related to the “information” as part of the RECIPE model for meaningful gamification of learning in OpenVM MOOCs are presented in table 8 below.

**Table 8.** Information (RECIPE model). Scale 1 (totally disagree) to 5 (totally agree), n = 1412.

Survey item	n	M	SD
Information about learning objectives, course materials and time to finish at the beginning of each level were helpful for me.	1412	3.83	.901
“Course Overview” in the “Welcome” part of the course was useful for orientation in the MOOCs.	1412	3.75	.924
Mycourse status was useful for orientation about my progress.	1412	3.74	.948
Visuals about the MOOC structure and levels were helpful for me.	1412	3.75	.912



Descriptive statistics summarised in Table 8 show that high average values, oscillating towards “strongly agree” (value 4 on the scale), were reached for all survey items. The results indicate that MOOC participants especially appreciated the information about learning objectives, course materials and time to finish at the beginning of each level (M = 3.83). However, all other items were rated relatively high. This means that the meaningful gamification design included diverse elements which supported the information part of the RECIPE model.

### 3.5 Play

The results related to the “play” as part of the RECIPE model for meaningful gamification of learning in OpenVM MOOCs are presented in table 9 below.

**Table 9.** Play (RECIPE model). Scale 1 (totally disagree) to 5 (totally agree), n = 1412.

Survey item	n	M	SD
OpenVM MOOCs have a playful design.	1412	3.67	.947
I had fun learning this way.	1412	3.72	.986

Descriptive statistics summarised in Table 9 show that high average values, oscillating towards “strongly agree” (value 4 on the scale), were reached for all survey items. The results indicate that MOOC participants found that OpenVM MOOCs had a playful design and that they had fun learning in OpenVM MOOCs. This means that the meaningful gamification design supported the play part of the RECIPE model.

### 3.6 Engagement

The results related to the “engagement” as part of the RECIPE model for meaningful gamification of learning in OpenVM MOOCs are presented in table 10 below.

**Table 10.** Engagement (RECIPE model). Scale 1 (totally disagree) to 5 (totally agree), n = 1412.

Survey item	n	M	SD
OpenVM MOOCs are interactive and engaging.	1412	3.76	.922
I was intrigued by the MOOC and I wanted to deepen some topics.	1412	3.50	.968

Descriptive statistics summarised in Table 10 show that high average values, oscillating towards “strongly agree” (value 4 on the scale), were reached for the survey item related to interaction and engagement. The results indicate that OpenVM MOOCs were interactive and engaging.

### 3.7 Meaningful learning

In addition to the results related directly to different parts of the RECIPE model for meaningful gamification for learning, participants in OpenVM MOOCs were also asked whether their learning experience was meaningful. The sample of 1412 participants assessed this statement with 3.71 on the scale from 1 (totally disagree) to 5 (totally agree). This means that most participants found learning in OpenVM MOOCs meaningful to them. Moreover, we asked whether OpenVM MOOCs met learners expectations. The sample of 1412 participants assessed this statement with 3.80 on the scale from 1 (totally disagree) to 5 (totally agree). This means that OpenVM MOOCs met the expectations of most participants (see Table 11).

**Table 11.** Meaningful learning and expectations. Scale 1 (totally disagree) to 5 (totally agree).

Survey item	n	M	SD
My learning experience in OpenVM MOOCs was meaningful.	1412	3.71	.943
Learning in OpenVM MOOCs met my expectations.	1412	3.80	.940

The results show that the second statement was better rated. This may indicate that for some learners learning in MOOCs was less meaningful, maybe because the MOOCs were embedded in curricula in standard courses offered by project partners and learners not always had the choice to learn with the MOOC that best matched their interests.

## 4. Microlearning design

In relation to the microlearning design two items were included in the online evaluation survey. The items and the results are presented in Table 12 below.

**Table 12.** Meaningful learning and expectations. Scale 1 (totally disagree) to 5 (totally agree).

Survey item	n	M	SD
The course duration is good for me.	737	3.75	.965
The length of the videos is good.	1400	3.99	.933

These results show that MOOC participants liked the microlearning format of OpenVM MOOCs, both in terms of the overall course duration as well as duration of videos used as OERs in each level course. It seems that the participants especially appreciated the length of the videos, which were mostly around 15 minutes long.

## 5. Conclusions

Output 5 Activity 2 focused on designing, implementation and testing of meaningful gamification for learning in OpenVM MOOCs. The design of meaningful gamification was combined with the microlearning approach to enhance motivation and engagement of MOOC participants. The results presented in the evaluation report indicate that the project succeeded in enhancing motivation and engagement of MOOC participants through the inclusion of a wide range of design elements supporting reflection, exposition, choice, information, play and engagement according to the RECIPE model. Moreover, the short and modular format of mini-MOOCs with three level courses integrated microcontent such as short videos was appreciated by MOOC participants. The majority of the 1412 respondents to the online evaluation survey agreed with the statements that learning in OpenVM MOOCs was interactive and engaging, they had fun learning in this way and that the MOOCs met their expectations.

In order to design, develop, implement and test the meaningful gamification design, the O5 team together with project partners applied an agile and iterative approach. The key conclusion from the iterative process of designing, implementation and user-testing of the meaningful gamification design has proved to be the right approach as it allowed to explore different options along learner preferences, to work in a collaborative way with different stakeholders and to adjust the prototypes to the developments in other outputs in the project. Through the evaluation of OpenVM MOOCs in the two waves of pilots in 2019 and 2020, the O5-A2 team could adjust the design and

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implementation of the meaningful gamification elements continuously according to user feedback. The iterative approach allowed to break down the design, development and deployment process into smaller chunks of activities which can be better aligned with other activities in the project, such as the MOOC implementation in O2 and O6.

The evaluation results with the large sample of  $n = 1412$  MOOC participants are significant and confirm that the meaningful gamification design was positively received by MOOC learners and that MOOC learners perceived OpenVM MOOCs as engaging and fun. The statistics presented in this report indicate positive user experience related to OpenVM MOOCs as well as positive impact of the meaningful gamification design on different aspects of self-regulated learning (SRL).

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