Open Virtual Mobility

O5 Open Credentials and Gamification:

Activity 2: Gamification Concept

Update of Milestone 4: Implementation in the OpenVM Learning Hub and User-Testing

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This paper is a public document produced as part of Outcome O5-A2 “Conceptual and visual design of Gamification for Learning ” and describes the methodology and results of implementation and user testing in the Open Virtual Mobility Learning Hub: https://hub.openvirtualmobility.eu

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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 methodology and results implementation and user testing in the Open Virtual Mobility Learning Hub: https://hub.openvirtualmobility.eu

This publication This publication presents the update of the results from milestone 4, following this workflow in O5-A1:

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)
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 current outcomes of joint work on the implementation and user-testing of Gamification in the Open Virtual Mobility Learning Hub: https://hub.openvirtualmobility.eu

The current results in implementation and user-testing of Gamification up until November 2019 are related to the implementation of the gamification concept in OpenVM mini-MOOCs in the first pilot phase.

This report is a follow-up to milestone 4 which was published in March 2019 (Quality Gate 2) and includes more comprehensive results of implementation and user-testing of the gamification concept in the Open Virtual Mobility Learning Hub.

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 two topics related to the implementation and user-testing of the Gamification Concept in the OpenVM project: (1) Implementation process, methods and technologies; (2) User-Testing of gamification design elements.

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 Credit Points (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-A2.4 “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. Aims and scope

Aims: This publication aims at presenting the update of the results of the implementation and user-testing of the gamification concept for virtual mobility skills in the Open Virtual Mobility Learning Hub: https://hub.openvirtualmobility.eu

Scope: This publication presents the update of results related to Milestone 4 in O5-A2:
Milestone 4: O5-A1.4: Implementation in the VM Learning Hub and User-Testing

2. Background / State of the Art

The current state of the art related to implementation and user-testing of Open Credentials was summarised in the publication related to Milestone 2 O5-A2 in March 2019 (Quality Gate 3):

Buchem, Ilona & Carlino, Chiara (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/topics/outputs

Milestone 4 publication was published on the OpenVM project website under "Outputs > O5"[1]. Further information about the background and state of the art are included 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[2] and published by Springer in the HCII 2018 conference proceedings. The HCI 2018 paper is accessible online[3] and has been presented on the OpenVM project website[4].

The current State of the Art on OpenVM Gamification Concept can be summarised as follows:

2.1 Meaningful Gamification Approach

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 by enabling learner control and ownership as postulated by the Personal Learning Environment design approach. The gamification design in the OpenVM project builds on *meaningful*

[1] https://www.openvirtualmobility.eu/wp-content/uploads/2018/11/OpenVM_O5-A1-publication2018.pdf
[2] http://2018.hci.international
[3] https://link.springer.com/chapter/10.1007/978-3-319-91743-6_27
[4] https://www.openvirtualmobility.eu/learning-hub/1068-openvm-at-hci-international-2018/

gamification by Nicholson (2012a, 2012b) and *Personal Learning Environments* 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.

Meaningful gamification 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).

Specifically, the meaningful gamification concept in the OpenVM project focuses on enhancing *self-regulated learning* through 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 appropriate learning tools a to support one's own learning, co-creation of learning content) in a *personal learning environment*.

2.2 Self Regulated Learning (SRL)

Self-regulated learning (SRL) is a key concept underpinning meaningful gamification approach in the OpenVM Learning Hub. 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 external rewards, such as scoring-based gamification called BLAP (Badges, Leaderboards, Achievements, Points), enhance only short-term motivation and may even have negative effects on *self-regulation* (Nicholson, 2012b).

Active, *self-regulated learner skills* is one of the key skills identified by Firssova & Rajagopal (2018) in Output 1 of the OpenVM project[5]. 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.

5 https://www.openvirtualmobility.eu/outputs/1091-o1-conceptual-framework-and-guidelines-for-achievement-assessment-and-recognition-of-vm-skills-in-he/

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).

2.3 Meaningful Gamification Design

In order to design the meaningful gamification concept for learning, a number of research methods have been applied including the first online-survey about personalisation/customization options including prioritization of requirements based on the MoSCoW method in March 2018, and the second online-survey with the list of key design features for meaningful gamification clustered into the *why, what and how of learning* based on Universal Design for Learning principles in June 2018. The results from both surveys were described in the O5-A1.3 publication which was published on the project website[6]. User-centered design of the meaningful gamification concept has included UML diagrams and mock-ups of the user interface of the OpenVM Learning Hub (November 2018).

Meaningful gamification design follows a non-reward approach and focuses on the enhancement of self-regulated learning and learner control. Meaningful gamification design in the OpenVM Learning Hub is related to the following five dimensions:

- **Meaningful learning** includes possibilities to follow own learning objectives and make personally meaningful choices (i. e. supporting the concepts of learner control and self-regulation). Examples of gamification elements which support meaningful learning include (a) the design of each sub-MOOC with three *levels,* and (b) the *pre-assessment* for each skill type and level. Both elements allow learners to assess own of skills and choose individual pathways to achieve personally meaningful learning outcomes.

- **Meaningful content** includes possibilities to choose from and develop own ways of engaging with the learning content. Examples of gamification elements which support meaningful content include (a) *content design tools* such as H5P[7] and *e-portfolio creation tools* such as Mahara[8] integrated in the OpenVM Learning Hub. These tools allow learners to create own interactive content and put together representations of learning outcomes into meaningful digital collections.

- **Meaningful connections** includes possibilities to provide evidence to demonstrate how learning goals/outcomes have been achieved and in this way establish meaningful connections between learning activities and learning outcomes. Examples of gamification elements which support meaningful connections include (a) *evidence-based assessment*

[6] https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM_O5-A2-publication2018.pdf
[7] https://h5p.org/
[8] https://mahara.org/

based on e-portfolio activities, and (b) earning of *Open Credentials* with evidence of learning which can be also used outside the OpenVM Learning Hub to allow for meaningful connections to other contexts.

- **Meaningful feedback** includes possibilities to receive and to give meaningful feedback about learning. Examples of gamification elements which support meaningful feedback include (a) different forms of *e-assessment* including peer-assessment, and (b) tools to support *self-monitoring* of own learning progress, e. g. Moodle Plugins such as completion progress.

- **Meaningful engagement** includes possibilities to communicate and collaborate in groups. Examples of gamification elements which support meaningful engagement include: (a) *group formation tool* developed in Output 3 which uses a set of specific group formation criteria, and (b) *peer-assessment* activities allowing for in-depth peer-communication.

2.3 User Experience Design

The User Experience (UX) design in the OpenVM Learning Hub focuses on the design of enjoyable learning experience and results from the analysis presented in the publication on O5-A2.3 (Milestone 3)[9]. The key design elements are (a) *narratives,* (b) *challenges* and (c) *recognition*:

- **Narrative:** Learning in OpenVM MOOC is embedded in authentic narratives, which are enhanced by visuals (pictures, films and pictograms), e. g. *"Learning in the digital era can be very challenging. You have probably come across the challenge of filtering huge masses of information on the Web. Do you know that filtering algorithms are biased and show you the results that agree with your previous searchers? This phenomenon is called the filter bubble. What can we do to break free from filer bubbles? How can we safely collaborate and communicate with digital media? In the intermediate level of the Media & Digital Literacy Course you will learn about the skills users need today to face learning challenges in the digital era."* (Media & Digital Literacy MOOC, Intermediate Level)*;*

- **Challenges**: Each learning sequence (e. g. level in each sub-MOOC) is initiated by a learning challenge derived from real-life situations. Learning tasks are formulated in forms of challenges, e. g. *"How well is your personal information protected? Discuss how well your own personal information is protected and what options can be taken to better protect it. Create a checklist that can be used to protect personal information"* (Media & Digital Literacy MOOC, Intermediate Level)*;*

- **Recognition:** Learner competencies (in the eight competency areas) are recognised with OpenVM Competence Credentials. User contributions (e. g. peer-assessment, creation of

[9] https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM_O5-A2-publication2018.pdf

OER) are recognised with OpenVM Contributor Credentials (see the current report on O5-A1.4 for details about OpenVM credentials[10]).

This basic gamification concept does not apply BLAP gamification elements in the traditional sense but redefines the BLAP model in view of meaningful gamification as summarised in Table 1:

3. Implementation

The key recommendations for the implementation of the basic meaningful gamification concept on the level of the OpenVM Learning Hub have been described in the previous publication on O5-A2.3 (Milestone 3) and included:

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.

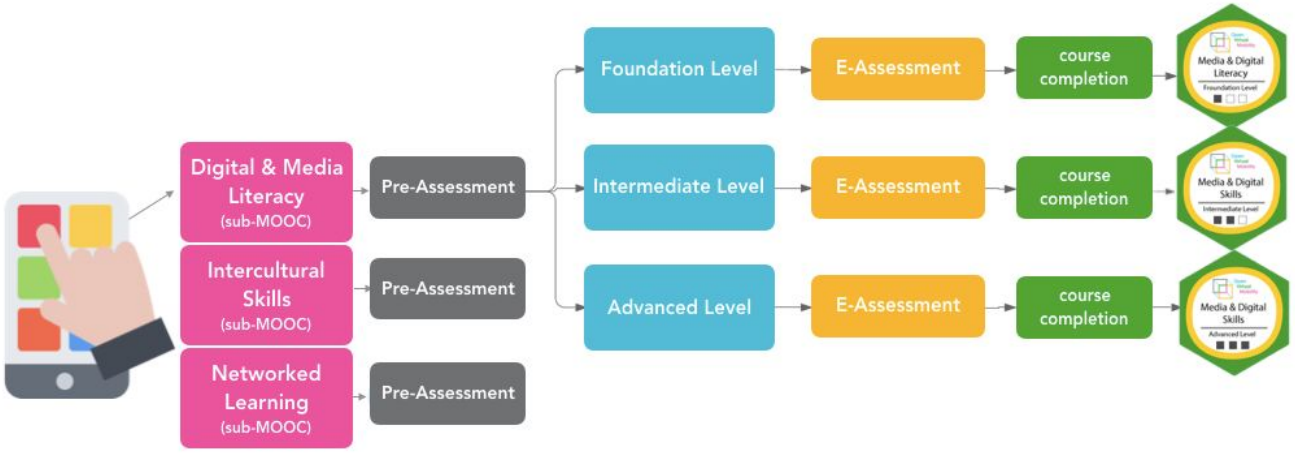


Figure 1: Schematic design of learning pathways in the OpenVM MOOCs

Figure 1 presents a Schematic design of learning pathways in OpenVM MOOCs. Learners are given recommendations for a certain level based on the results of the pre-test. However, each learner is free to choose to follow this recommendation or learn in a MOOC on another level.

The publication on O5-A2.3 (Milestone 3) published on the project website[11] established a list of requirements for implementation of meaningful gamification in the OpenVM Learning Hub. The

[10] https://www.openvirtualmobility.eu/wp-content/uploads/2019/11/openVM_O5-A1-QG3_2019_CURRENT.docx.pdf
[11] https://www.openvirtualmobility.eu/wp-content/uploads/2018/12/OpenVM_O5-A2-publication2018.pdf

current implementation status of these requirements as of November 2019 is summarised in Table 1 below. Improvements and changes in comparison to the previous report in March 2019 (Quality Gate 3) are marked with an asterisk*.

Table 1: Implementation status of meaningful gamification requirements (November 2019).

ID	Category	Description	Implementation status
FR01	Goals	Start menu in which the user can choose the persona (teacher, student, international officer)	*This requirement was implemented through group choice functionality in Moodle in the pre-pilot[12]. 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.
FR02	Goals	Options menu in which the user can choose options for learning (skill goals, sub-MOOCs, levels, e-assessment, digital credentials)	Implemented through the design of the dashboard, see Output 2 for details[13]
FR03	Assessment	Pre-assessment of skills and recommendation for sub-MOOC and/or level in the sub-MOOC	Implemented through integration of pre-assessment in each level of each sub-MOOC, see Output 4 for details[14]
FR04	Assessment	Different types of assessment for different skills at 3 levels, e. g. automated test, evidence-based and peer-assessment	Implemented through integration of different forms of e-assessment in each level of each sub-MOOC, see Output 4 for details[15]
FR05	Content	Skill appropriate MOOC content based on pre-assessment	Implemented through integration of different forms of content based on the description of OpenVM skills, see Output 6 for details[16]
FR06	Content	Multiple examples of solutions to authentic problems	Implemented through integration of different authentic examples integrated into the sub-MOOC contents, see Output 6 for details[17]
FR07	Activity	Challenges at each level in the sub-MOOC	*Partially implemented in selected miniMOOCs. Full implementation in all miniMOOCs will follow in the second phase of OpenVM MOOC pilots.
FR08	Activity	Activities aimed for and recognising content co-creation (e. g. producing and/or submitting OER)	*Implemented in the separate course ”OpenVM Contributions[18]” in which users can earn a

[12] https://www.openvirtualmobility.eu/outputs/1095-o2-learning-hub/
[13] https://www.openvirtualmobility.eu/outputs/1095-o2-learning-hub/
[14] https://www.openvirtualmobility.eu/outputs/1288-o4-a1-3-e-assessment-concept/
[15] https://www.openvirtualmobility.eu/outputs/1288-o4-a1-3-e-assessment-concept/
[16] https://www.openvirtualmobility.eu/outputs/1726-o6-virtual-mobility-oers-mooc/
[17] https://www.openvirtualmobility.eu/outputs/1726-o6-virtual-mobility-oers-mooc/
[18] https://hub.openvirtualmobility.eu/course/view.php?id=58

			Contributor Credentials for one or more activities including OER creation.
FR09	Progress	Visualisation of progress and levels	*Implemented in form Mycourse status plugin 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	*Partially implemented in form of OpenVM Competence Credentials 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 profile has not been implemented yet.
FR11	Personalisation	Profile in which the user can specify own attributes (e. g. experience, language, academic field, earned credentials)[19]	Implemented, see Output 2 for details[20]
FR12	Engagement	Narratives for each MOOC level	*Partially implemented in selected mini-MOOOCs. Full implementation and refinement will follow in the second phase of OpenVM MOOC pilots.
FR13	Feedback	Different types of human and computer support/feedback	Implemented, see Output 6 for details[21]
FR14	Collaboration	Group formation and collaborative activities/challenges	Implemented, see Output 3 for details[22]
FR15	Support	Mechanisms to protect personal data for public display	Implemented, see Output 2 for details[23]
NR01	Content	Visualisation of connections and structures (e. g. concept maps)	*Implemented in form of visualisations of learning pathways and the development and implementation of the “Course Overview” in each “Welcome” course, which introduces the each MOOC.
NR02	Feedback	Opportunities to express emotions (e. g. emojis, audio hand clapping)	Not implemented yet
NR03	Personalisation	Culturally relevant content (e. g. national examples)	Implemented through the design of MOOCs in partner languages, e. g. MOOCs in German,, and OERs with national examples.
NR04	Personalisation	Content in different languages	Implemented through the design of MOOCs in partner languages, e. g. MOOCs in German

[19] https://de.slideshare.net/DCU_MPIUA/user-profiles-personas-39303051
[20] https://www.openvirtualmobility.eu/outputs/1095-o2-learning-hub/
[21] https://www.openvirtualmobility.eu/outputs/1726-o6-virtual-mobility-oers-mooc/
[22] https://www.openvirtualmobility.eu/outputs/1093-o3-competency-directory-and-learning-group-formation-tool/
[23] https://www.openvirtualmobility.eu/outputs/1095-o2-learning-hub/

NR05	Personalisation	Video subtitles	This requirement is fulfilled by using YouTube videos which automatically provide subtitles.
NR06	Support	Visual, non-linguistic support (e. g. icons)	*Icons 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)	Not implemented yet but planned in O2

Selected new featured/requirements which have been implemented as a follow-up to the previous report (O5-A2.4) are displayed in the figures 2-5 below.

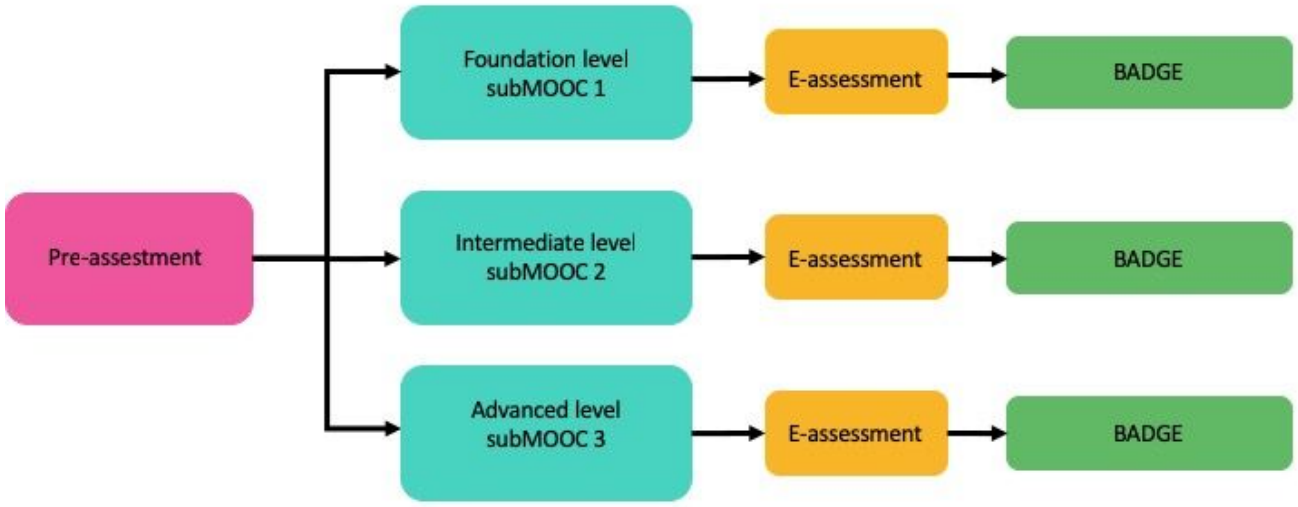
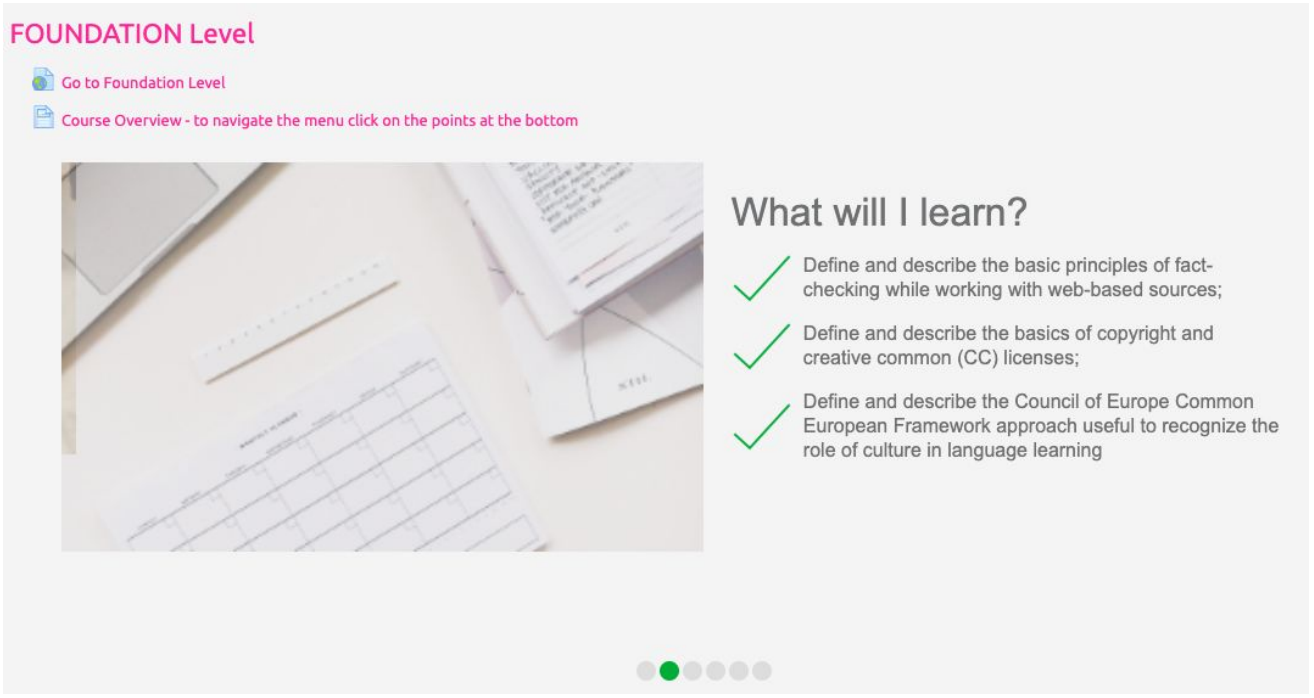


Figure 2: Diagram showing possible learning pathways in the OpenVM MOOCs implemented in each opening part of the course



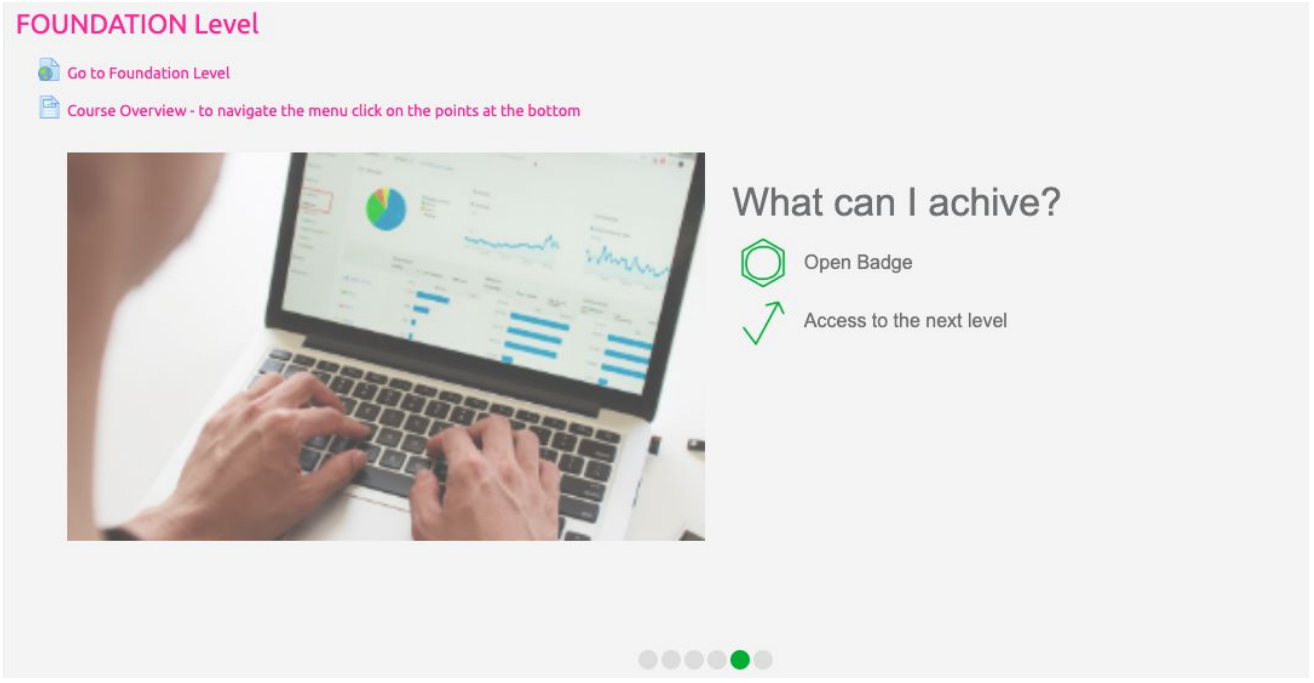


Figure 3: Interactive "Course Overview" implemented in each Welcome part of the course. There are "Course Overview" modules for each MOOC level course.

Figure 4: Information blocks with icons implemented in each level course.

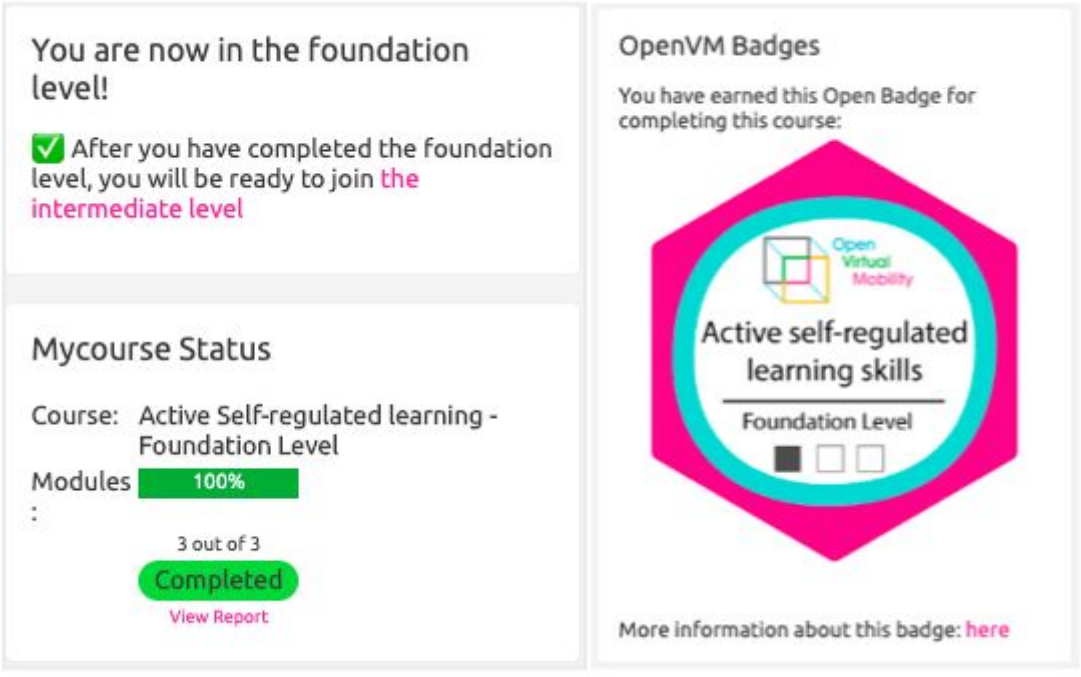


Figure 5: ”Mycourse Status” customized and implemented in each course level (left) and OpenVM Credentials implemented in each level (right) to visual progress.

4. User-Testing

The user-testing of meaningful gamification design was outlined in O5-A2.3 (milestone 3). In O5-A2.4 (milestone 4) we presented the results of user-testing from the pre-pilot based on the example of the Media and Digital Literacy MOOC. In this report (update of milestone 4) we present preliminary results related to user-testing of gamification design from the OpenVM MOOC Evaluation Questionnaire with a sample of n = 359 learners (status: November 2019).

The learners participated in all eight mini-MOOCs offered in the OpenVM Learning Hub. The results are summarized below.

Figure 6 below summarises the participation in OpenVM MOOCs as of 11 November 2019.

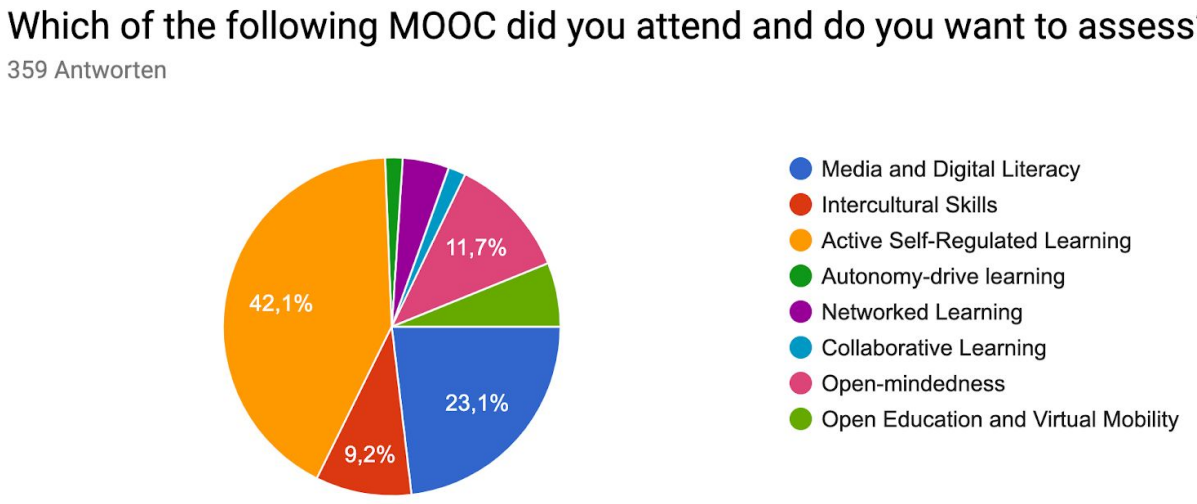


Figure 6. MOOC participation in the OpenVM Learning Hub, n = 359

The participants evaluated a set of statements on the scale from 1 (totally disagree) to 5 (totally agree). The statements included ten statements related to user preferences and user experience; and one statement with six sub-statements related to the impact of Meaningful Gamification on Self Regulated Learning (SRL). The statements used in the evaluation survey are listed below.

10 statements related to user preferences and user experience:

1. I like the visual design of MOOCs in the OpenVM Learning Hub
2. Mycourse status was useful for orientation about my progress
3. "Course Overview" in the "Welcome" part of the course was useful for orientation in the MOOCs

4. Information about learning objectives, course materials and time to finish at the beginning of each level were helpful for me
5. Visuals about the MOOC structure and levels were helpful for me
6. OpenVM MOOCs have a playful design
7. OpenVM MOOCs are interactive and engaging
8. I could choose different elements to learn.
9. I could choose my own learning pathway
10. Learning in OpenVM MOOC was meaningful to me.

One statement with six sub-statements related to the impact of Meaningful Gamification on Self Regulated Learning (SRL)

1. To what extent the MOOC HINTS have helped me in the following SRL skills (information about the content, the tasks)

- Task analysis
- Self-motivation
- Self-control
- Self-observation
- Self-judgement (self-evaluation)
- Self-reaction

The results are summarized in the figures 7 and 9 below.

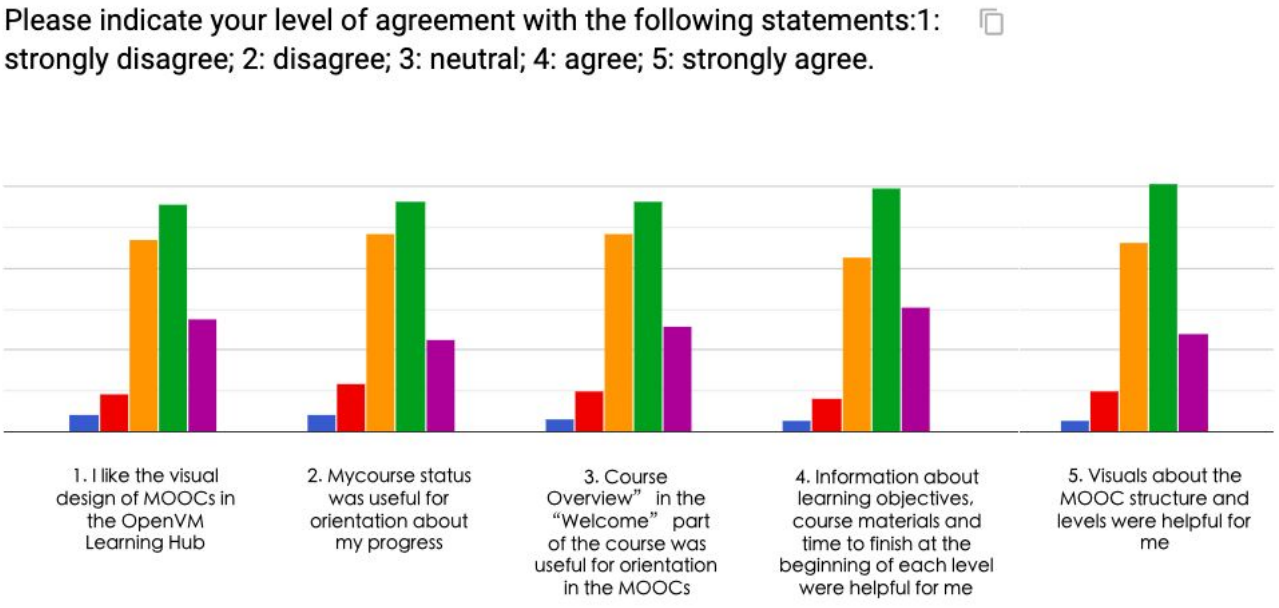


Figure 7. Evaluation of user preferences and user experience, first five out of ten items, n = 359

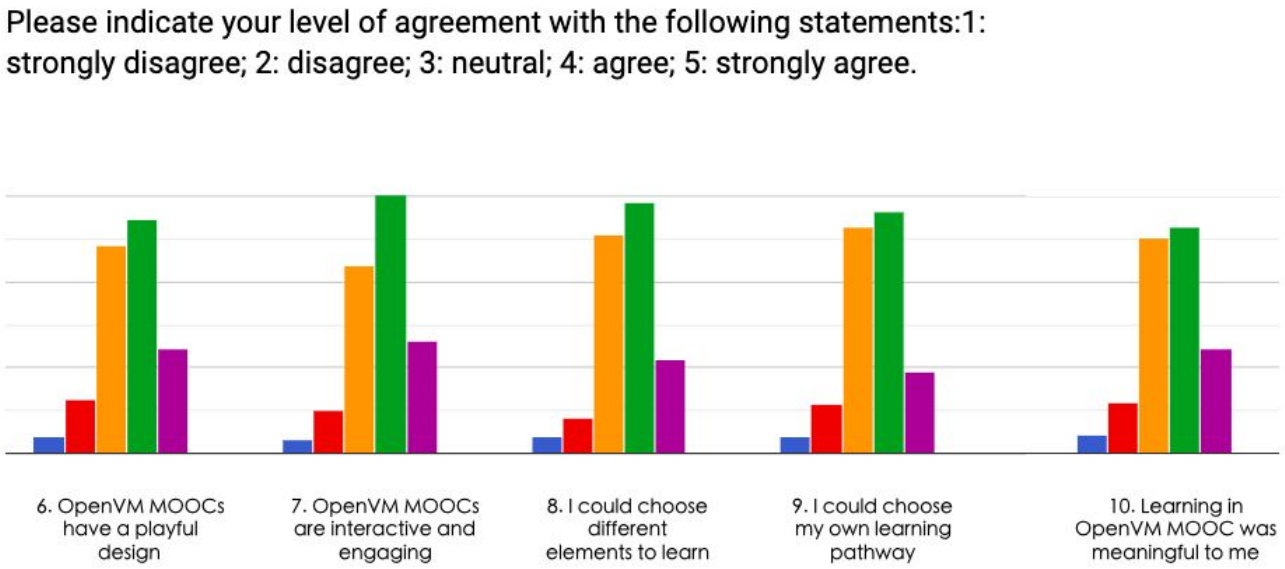


Figure 8. Evaluation of user preferences and user experience, last five out of ten items, n = 359

The results related to user preferences and user experience show that all elements of the meaningful gamification design were positively evaluated by MOOC participants across all 24 mini-MOOCs (4: agree, green color). High scores were specifically reached for the elements "Information about learning objectives, course materials and time to finish at the beginning of each level" and "Visuals about the MOOC structure and levels".

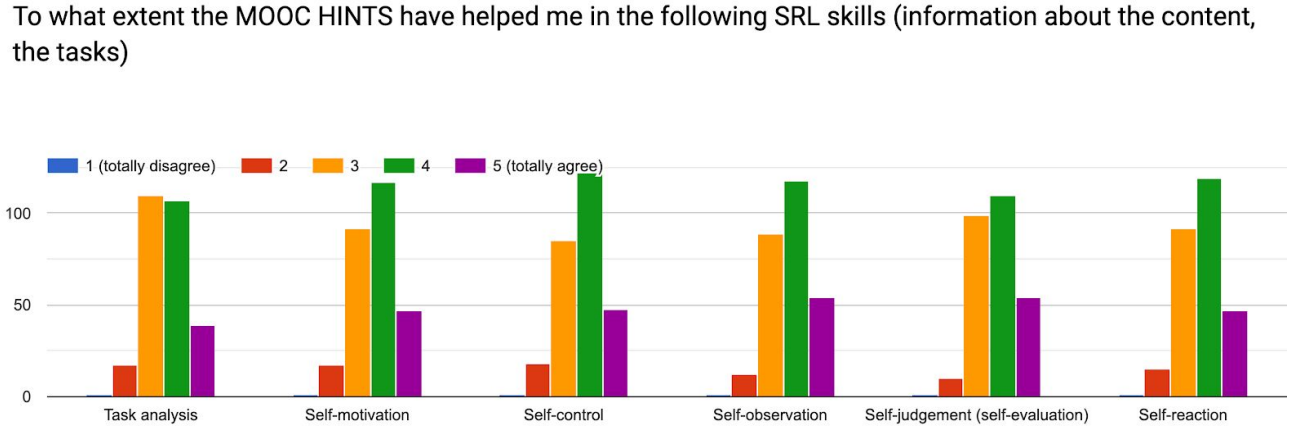


Figure 9. Evaluation of the impact of meaningful gamification on self regulated learning, n = 359

The results related to the impact of meaningful gamification on self-regulated learning show that the hints, i. e. additional information such as the one about learning objectives, course materials

and time to finish the course as well as hints related to progress (figure 9) were positively evaluated by MOOC participants across all 24 mini-MOOCs (4: agree, green color). High scores were specifically reached in relation to self-motivation, self-control, self-observation and self-reaction. The fact that no-one answered 1 (totally disagree) about MOOC HINTS compared to other questions is also relevant.

5. Conclusions and next steps

Meaningful gamification design aimst to support learners in making meaningful choices affected by decisions of learners (e. g. deciding which learning activity to engage with) and engaging in an enjoyable learning experience (e. g. fun, interesting, relevant), The results from the first wave of pilots in 2019 have provided very valuable insight into the learning experience in this initial piloting phase in the OpenVM Learning Hub. The results have shown an overall positive evaluation of the different elements of meaningful gamification design which can be interpreted as a meaningful learning experience for the sample of 359 learners as described in this report.

The key barriers to meaningful learning and engagement which were revealed in the evaluation of the pre-pilot with the Media and Digital Literacy MOOC and included (a) unclear structure and navigation, (b) lack of clear instructions and (c) language mistakes in the design of the pre-pilot, have been removed. All OpenVM mini-MOOCs have been structured in a new way and information about learning objectives, course materials and time to finish the course as well as hints related to progress were implemented and tested in the subsequent piloting phase with all mini-MOOCs.

However, not all elements of meaningful gamification design could be yet implemented and tested in the first wave of pilots and are planned for next iteration and user-testing in the second wave of pilots. These elements include narratives and challenges which will be implemented to enhance meaningful engagement in OpenVM MOOCs. To further refine and test the meaningful gamification concept a number of design elements will be implemented in further iterations as summarised in Table 2 below.

Table 2: Meaningful gamification elements to be implemented in further iterations in 2020

System-level implementation (O2)	MOOC-level implementation (O6)
1. Display of earned digital credentials and visualisation of progress in user profiles, e. g. number of sub-MOOCs taken, e-assessments completed	1. Narratives to embed learning in a authentic scenario enriched by stimulating problem descriptions from real life and reflection questions

1. Possibilities to connect, share experiences and plan collaborations with peers (i. e. OpenVM Marketplace)	2. Challenges at each course level to enhance engagement in learning, especially as entry to learning tasks

The focus in the last part of the project in relation to the meaningful gamification design will be related to the fours elements listed in table 2 and will aim at improving a positive and engaging learning experience in the OpenVM Learning Hub.

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