Open Virtual Mobility

O5 Open Credentials and Gamification:

Activity 1: Open Credentials Concept

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

Outcome 5 Activity 1 : Conceptual and Visual Design of Open Credentials to Recognise Virtual Mobility Skills	
Document submission and review information	
Declared due date of deliverable	01.11.2019
Reviewed due date of deliverable	11.11.2019
Actual submission date	11.11.2019
Organisation name of lead contractor	Beuth University of Applied Sciences
Revision	QG3 Final (update of milestone 4)
Author and reviewer information	
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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: 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-A1 “Conceptual and Visual Design of Open Credentials ” and describes milestone 4 in O5-A1 (O5-A1.4), i. e. Implementation and User-Testing of Open Credentials in the Open Virtual Mobility Learning Hub: https://hub.openvirtualmobility.eu

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Suggested citation

Buchem, I. & Carlino, Ch. (2018). Update of Milestone 4: Implementation and User-Testing of Open Credentials to Recognise Virtual Mobility Skills in the OpenVM 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 the update of milestone 4 related to the methodology and results of the implementation and user-testing of Open Credentials in the OpenVM Learning Hub. This publication presents the update of the results from the MOOC evaluation related to the use of Open Credentials in the OpenVM Learning Hub following the workflow in O5-A1:

Milestone 1: O5-A1.1: Definition of the design process and tools (February 2018)
Milestone 2: O5-A1.2: Design workshops with VM experts (May 2018)
Milestone 3: O5-A1.3: Set of open credentials to recognise VM skills (September 2018)
Milestone 4: O5-A1.4: Implementation in the VM Learning Hub and User-Testing (January 2019)
Milestone 4: O5-A1.5: Final concept and report (August 2020)

What are the objectives of this paper?

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

The results related to the implementation and user-testing of Open Credentials presented in this report span the time period from March to November 2019 andare related to the two categories of OpenVM credentials:

1. **Competence Credentials** used in OpenVM MOOCs
2. **Contributor Credentials** used to recognise contributions to the project

Both kinds of credentials are issued as Open Badges, while Blockcerts are going to be additionally issued only for the highest level competency credentials.

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 Open Credentials 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 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 the implementation and user-testing of Open Credentials in the Open Virtual Mobility (OpenVM) project: (1) Implementation process, methods and technologies, and (2) User-Testing of OpenVM Credentials.

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 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.

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 the 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 works 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 and is contact person in Cineca for EU funded projects concerning Open Badges.

Acknowledgements

The authors would like to acknowledge with gratitude all those who have made a significant contribution to the Outcome O5-A1.4 “Implementation and User-Testing of Open Credentials”. Our special thanks go to the learners participating in OpenVM MOOC pilots and to all contributors to the Open Virtual Mobility Learning Hub who claimed OpenVM Credentials and participated in the survey evaluating the design and the implementation of Open Credentials in the OpenVM Learning Hub. These early contributors include educators and students from project partner organisations.

1. Aims and scope

Aims: This publication aims at presenting the implementation and user-testing of open credentials 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-A1: 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-A1 in March 2019 (Quality Gate 3):

Buchem, I. & Carlino, Ch. (2018). Implementation and User-Testing of Open Credentials to Recognise Virtual Mobility Skills in the OpenVM 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 Credentials can be summarised as follows:

2.1 Design of OpenVM Credentials

OpenVM Credential prototypes were created using a number of templates, especially: (a) Bestr template for creating a badge in Bestr, (b) Badging Toolkit[5] and (c) Badge Design Canvas.[6] First prototypes were built during the expert/stakeholder workshop im May 2018 (early-stage,

[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/
[5] https://canvas.instructure.com/courses/826612/files/26095979?module_item_id=5382496
[6] https://drive.google.com/file/d/0By9JfART0xQ8dVdXT3VxY2NnRFE/view

low-fidelity prototypes) and refined as follow-up to the workshop from June until July 2018 (later-stage, high-fidelity prototypes). In the next stage, the prototypes were abstracted into design patterns, which served as a generic template for the design of a set of Open Credentials to recognise Open Virtual Mobility Skills. The generative design pattern for Open Credentials in the OpenVM project was described in the DeLFI 2018 research paper by Buchem (2018). The design of Open Credentials in the OpenVM project expresses the extended OpenVM skill framework with eight skill types developed in Output 1. The visual design of Open Credentials applies the four OpenVM visual identity colors. Altogether 24 Competence Credentials, i. e. 8 competence types times 3 levels each, were developed as an outcome of milestones 1 to 4 in Output O5. In addition to the Competence Credentials, the Contributor Badge was developed in order to recognise and award the contributions of users to the OpenVM Learning Hub. All OpenVM Credentials related to open credentials category called "Competence Badges" used in OpenVM MOOCs and to the open credentials category called "Contributor Badge" used to recognise contributions to the project are listed at the Bestr OpenVM project page https://bestr.it/organization/show/99

2.2 Implementation of OpenVM Credentials

OpenVM project uses the Bestr[7] digital platform of the project partner Cineca[8] to value skills through Open Badges. The Bestr platform is used to store, issue and display Open Badges. Bestr has its own Learning Record Store and is capable of collecting xAPI statements from any platform integrated with it. When the Bestr platform identifies that in its Learning Record Store a set of statements for a given subject (the learner) is matching the criteria required for issuing/earning an Open Badge, this badge is issued to the learner (earner). Having obtained an Open Badge is a new learning statement (a new learning achievement), which can be tracked by the Learning Record Store and used as a starting point for issuing a new Open Badge. Leveraging this system based on open standards, the OpenVM Learning Hub is able not only to express its own learning statements connected to learning activities provided by the OpenVM project, such as OpenVM MOOC and OER, but also to capture learning statements from any other compliant and authorised platform towards the LRS, and use any set of such information to activate the automatic issuing of Open Badges. Currently, the completion of each of the mini-MOOCs in the OpenVM Learning Hub generates a "completed" statement that triggers the issuing of the corresponding Open Badge. The OpenVM project has also evaluated the opportunity to introduce, besides Open Badges, the Blockcerts as a blockchain-based technology for digital certifications of skills. Valuable insights has been gained from expert consultations on Blockchain Credentials as described in the previous report. The Bestr platform provided by project partner Cineca has implemented a Blockcerts feature in 2019, allowing the project to experiment with this new technology, e. g. to permanently register selected digital credentials on the public Ethereum blockchain following the Blockcerts standard, so that learners will have a second more secure and permanently verifiable - digital expression of their credential /

[7] https://bestr.it
[8] https://www.cineca.it/en

achievement. As an adequate use case for the use of Blockcerts in the OpenVM project we identified the use of Blockcerts for high-level Competence Credentials, i. e. credentials certifying competencies at the highest level in OpenVM MOOCs (level 3 advanced).

2.3 User-Testing of OpenVM Credentials

To test the design and the implementation of OpenVM Credentials with OpenVM MOOC users, an aggregated online evaluation survey has been used to evaluate various aspects of OpenVM MOOC. The aggregated online evaluation has included items specifically related to OpenVM Credentials. Additionalitems have been planned for more in-depth surveys and will be implemented in 2020. In November 2019, at the time of writing this report, a sample of n = 334 learners has participated in the online evaluation and provided the evaluation of the design and implementation of OpenVM Credentials.

Table 1 below shows the design of the set of altogether 24 OpenVM Competence Credentials recognising OpenVM Competencies in the OpenVM project.

Table 1: Designs of the set of 24 OpenVM Competence Credentials (8 competence types x 3 levels)

LEVEL 1 FOUNDATION	LEVEL 2 INTERMEDIATE	LEVEL 3 ADVANCED
		
		

 Open Virtual Mobility Self-Regulated Learning Foundation Level	 Open Virtual Mobility Self-Regulated Learning Intermediate Level	 Open Virtual Mobility Self-Regulated Learning Advanced Level
 Open Virtual Mobility Networked Learning Foundation Level	 Open Virtual Mobility Networked Learning Intermediate Level	 Open Virtual Mobility Networked Learning Advanced Level
 Open Virtual Mobility Open Mindedness Foundation Level	 Open Virtual Mobility Open Mindedness Intermediate Level	 Open Virtual Mobility Open Mindedness Advanced Level
 Open Virtual Mobility Virtual Mobility Knowledge Foundation Level	 Open Virtual Mobility Virtual Mobility Knowledge Intermediate Level	 Open Virtual Mobility Virtual Mobility Knowledge Advanced Level

Figure 1 shows the design of the Contributor Badges as a category of the OpenVM Credentials in the OpenVM project.

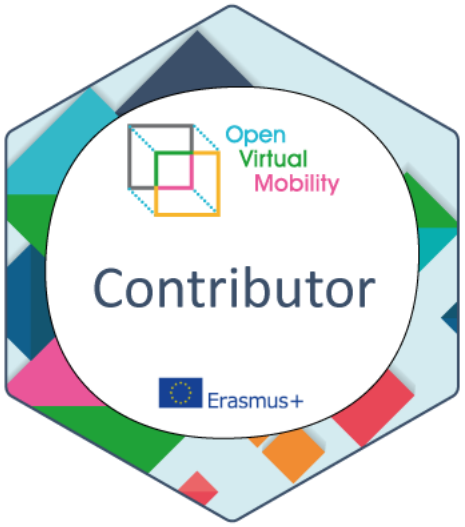

Figure 1: Design of the OpenVM Contributor Badge

It is possible to embed OpenVM Credentials in web-based systems like Content Management Systems (e. g. Wordpress) and E-Portfolio systems (e. g. Mahara). It has been verified that OpenVM Credentials can be displayed in such systems or platforms through basic HTML embedding[9], without the need of specific modules or plugins. The figure below shows an OpenVm Badge embedded in Mahara. Figure 2 below shows an example of an embedded OpenVM Credential.

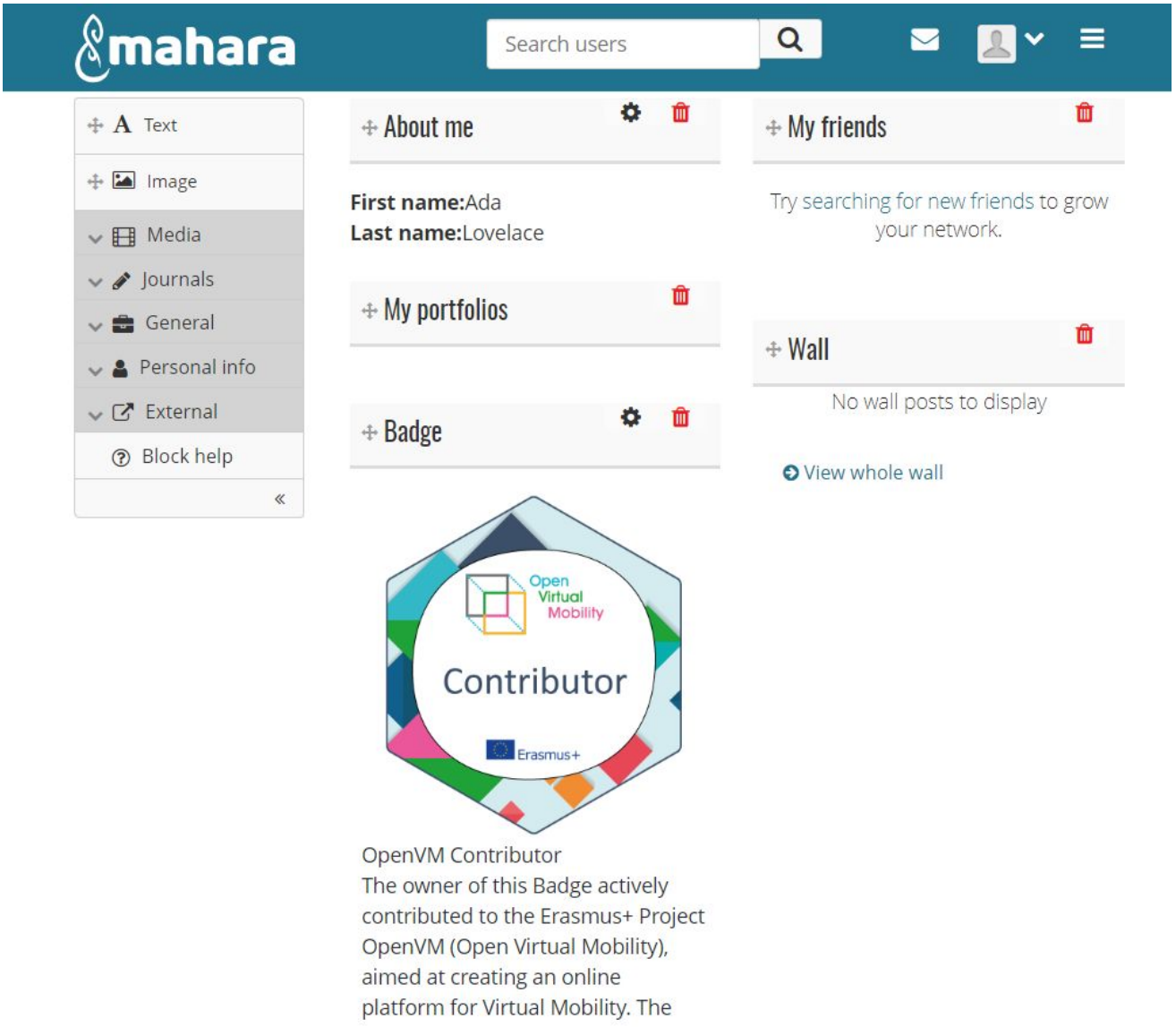

Figure 2: OpenVM Contributor Badge embedded in the E-Portfolio system Mahara

[9] https://blog.bestr.it/en/2017/07/31/add-your-badge-your-website

3. Implementation of OpenVM Credentials

The full set of OpenVM Credentials has been implemented in the eight MOOCs in the OpenVM Learning Hub via the badging platform Bestr. Bestr has provided:

- a dedicated webpage for the issuer[10]
- a dedicated webpage for the project[11]

The issuer of all OpenVM Credentials is the OpenVM project. All OpenVM Credentials on the Bestr platform are available in English and Italian.

3.1 OpenVM Competence Credentials

All 24 OpenVM Competence Credentials have been implemented in respective MOOCs in the OpenVM Learning Hub. Each Competence Credential is issued at three levels corresponding to the levels of the MOOCs, i. e. Foundations, Intermediate and Advanced.

Figure 3 below shows how OpenVM Competence Credentials are integrated into the MOOC design and implemented in the OpenVM Learning Hub. OpenVM Competence Credentials are issued upon the completion of each level course, without the need to issue Competence Credentials after the completion of multiple learning statements. This implementation procedure simplifies both the design and the understanding of the connection between courses and credentials, according to a gamification logic.

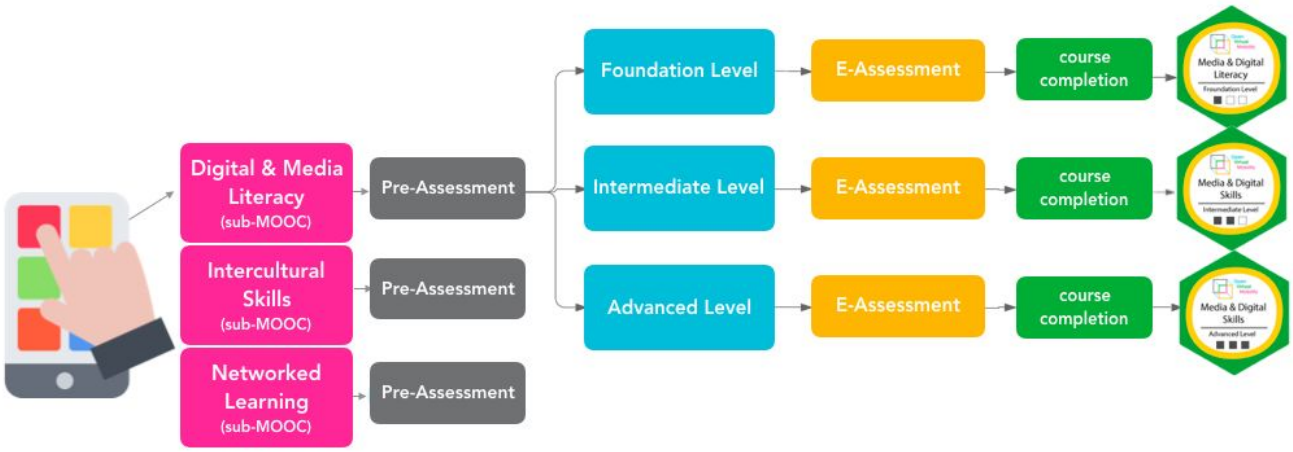

Figure 3: Implementation of Open Credentials in the MOOC

Figure 4 below shows an example of how OpenVM Competence Credentials have been integrated into MOOCs in the OpenVM Learning Hub. The example in figure 2 is related to the Media & Digital Literacy, Foundation Level. The description below the badge-image shows that 95 users already completed this course and received this badge.

[10] https://bestr.it/organization/show/99
[11] https://bestr.it/project/show/107

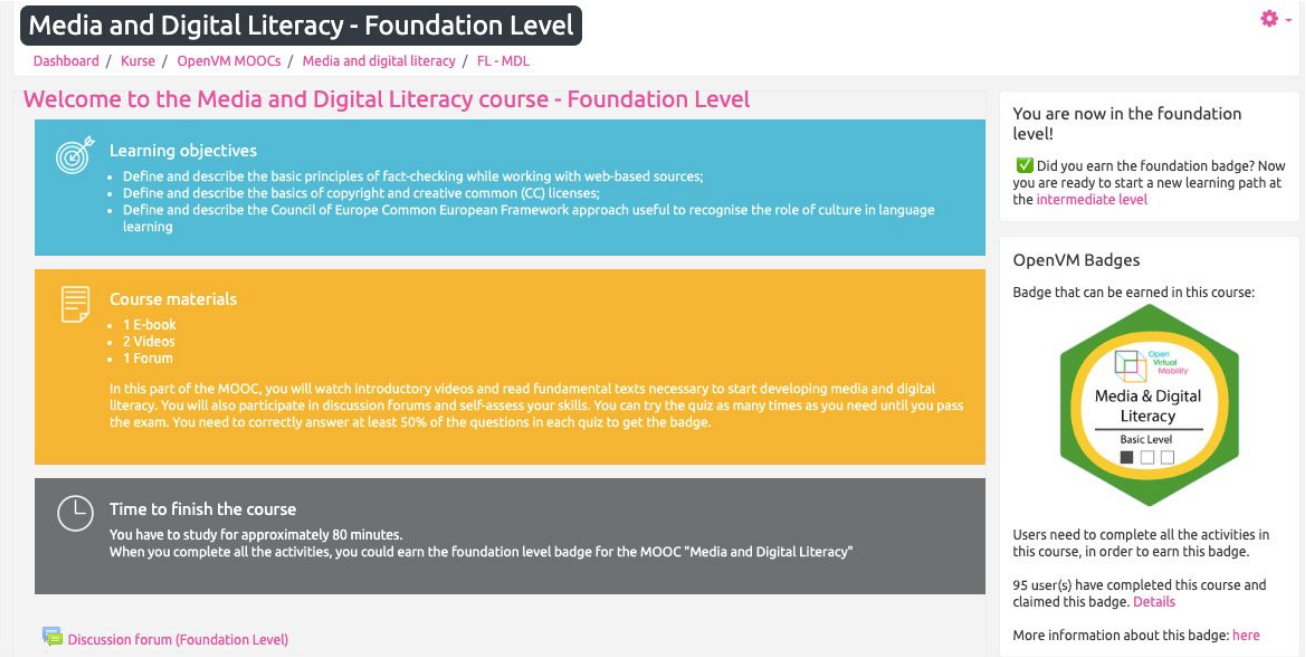

Figure 4: Implementation of OpenVM Competence Credentials in MOOCs

OpenVM Competence Credentials description is coherent with the OpenVM Competency Framework as defined by O1 output and their criteria reflect the specific activities required in the MOOC awarding the Badge, to ensure maximum transparency. The Badge is also connected to the Competency Directory (output of O3) both at the competency level and at the sub-competency level, meaning it connects the Badge of a specific level both to the general competency definition and to the sub-competencies that have been identified as pertaining to that level. As further development this will be inserted in the alignment field as Bestr transitions to Badgr and to OBI 2.0 support.

3.2 OpenVM Contributor Credential

The first Contributor Badge has been published in February 2019. The concept behind the Contributor Badge is that of recognizing not only the competencies developed by learners following the MOOCs offered by the project, but also active contribution to the project's content, as shown both by students, teachers and other peers as project members engaged them to provide feedback or other contributions in different moments of the project, such as the Group Concept Mapping, sharing Virtual Mobility experiences and best practices, highlighting or producing OERs to be used in the project MOOCs, follow the project MOOCs, provide feedback and participate in evaluation.

The process for issuing Contributor Credential has been modified (compare the first procedure described in the previous report) to make the process more straightforward and to better comply

with data protection regulations. We have created a separate course in the OpenVM Learning Hub and specified a number of ways to contribute to the OpenVM project. These options include:

1. I have created content for the OpenVM Learning Hub, available in the OpenVM OER Repository: https://hub.openvirtualmobility.eu/course/index.php?categoryid=5
2. I have contributed to the OpenVM Market: https://hub.openvirtualmobility.eu/course/view.php?id=52
3. I have participated in an OpenVM survey, e. g. MOOC evaluation survey
4. I have created a MOOC related to virtual mobility in my own language
5. I have participated in an OpenVM event

Figure 5 below shows how OpenVM Contributor Credential has been implemented in in the OpenVM Learning Hub.The description below the badge-image shows that 67 users already claimed the Contributor Credential.

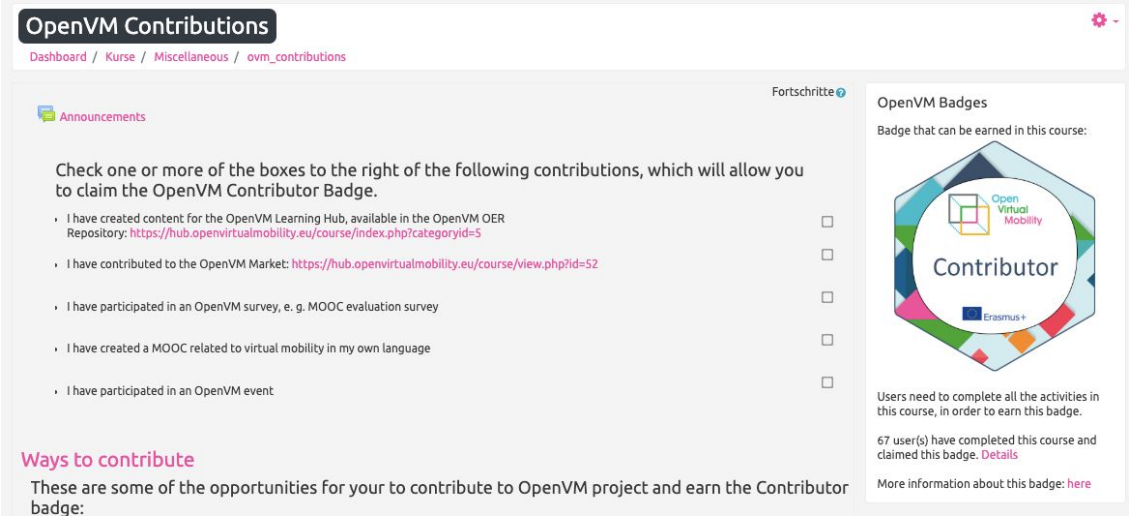

Figure 5: Implementation of the OpenVM Contributor Credential in the OpenVM Hub

3.3 Implementation of OpenVM Blockcerts

The implementation of Blockcerts in the OpenVM project is planned for early 2020. The implementation of Blockcerts will leverage Bestr's expertise in using Blockcerts, which have been implemented by Bestr in 2019 and are used by two Italian universities (University of Milan-Bicocca, University of Padua) to issue digital credentials in form of Blockcerts for bachelor and master degrees. Blockcerts are issued as a separate digital credential, independent from the Open Badge and usually containing a subset of the information present in the Open Badge. The learner is thus granted the possibility to choose which credentialing format to use according to the different use cases: while the Open Badge supports a more visual communication, Blockcerts allows for secure and permanent verifiability, without the need to rely on the issuing platform. The OpenVM implementation of Blockcerts will be the first case on Bestr to issue Blockcerts starting from learning statements sent from Moodle. Bestr's Blockcerts are recorded as merkle-tree on the public Ethereum Blockchain at pre-fixed intervals, in order to minimise the monetary cost of the operation.

Data protection: Users receiving a Blockcerts will need to claim it following a specific process: no data about any user is written on the Blockchain without the user's consent and specific action; moreover it is relevant to note that no complete document is notarized on the Blockchain but only hashes combined in merkle trees, meaning that a user with access to the Blockcert document (because its owner - the learner - has provided it) can verify its integrity on the Blockchain, but no information is extractable from the Blockchain alone.

User experience: Since claiming a Blockcerts is a different and longer process than claiming a Badge, it will be relevant to have user feedback in this low-risk case and verify if a stronger engagement is needed for users to claim the blockcerts, or if the awareness of getting a superior (as of competence level recognized) credential in a future-proof format is a sufficient motivation.

4. User-Testing of OpenVM Credentials

The user-testing phase focuses on gathering feedback about created prototypes. User-Testing is seen as an opportunity to understand the users even better that it was possible in the initial empathy mode. Design Thinking recommends to approach testing with the "Why?" question in mind, i. e. focusing on what can be learned about the users, the problem and about the potential solution. The results are summarised below.

4.1 Evaluation survey results

To test the design and the implementation of OpenVM Credentials with OpenVM MOOC users, an aggregated online evaluation survey has been used to evaluate various aspects of OpenVM MOOC. The aggregated online evaluation has included items specifically related to OpenVM Credentials. Additional items have been planned for in-depth surveys and will be implemented in 2020.

In November 2019, at the time of writing this report, a sample of n = 334 learners have participated in the online evaluation and provided the evaluation of the design and implementation of OpenVM Credentials. The learners participated in all eight mini-MOOCs offered in the OpenVM Learning Hub.

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

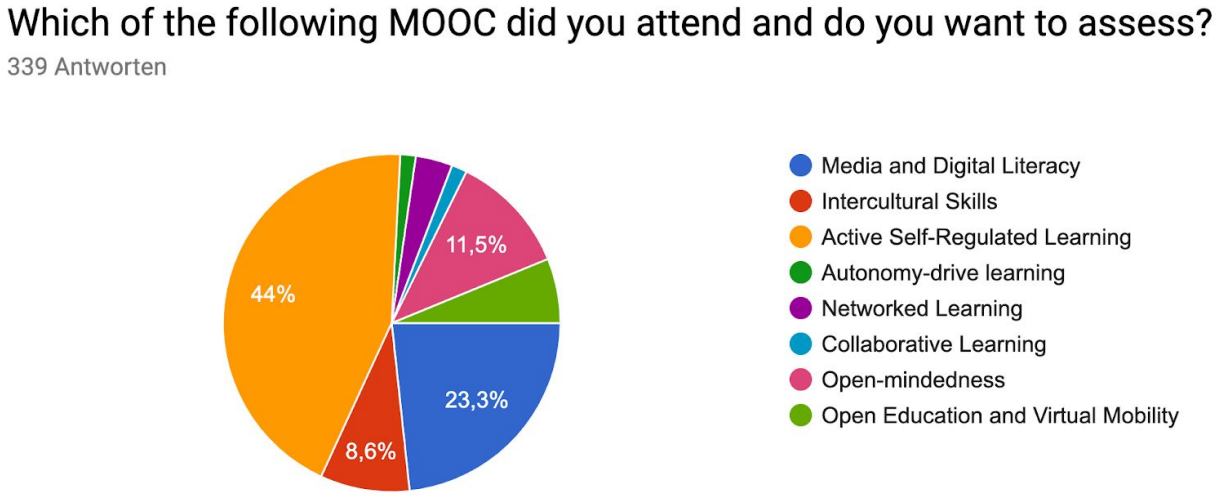

Figure 6. MOOC participation in the OpenVM Learning Hub, n = 339

The participants evaluated a set of statements on the scale from 1 (totally disagree) to 5 (totally agree). The statements included five statements related to user preferences, motivation and use of Competence Credentials and one statement with six sub-statements related to the impact of Competence Credentials on Self Regulated Learning (SRL). The statements used in the evaluation survey are listed below.

1. I like the design of OpenVM Badges
2. OpenVM Badges motivated me to learn in the MOOC
3. OpenVM Badges motivated me to complete a MOOC level
4. OpenVM Badges describe the skills I developed in a suitable way
5. I will use OpenVM Badges outside of the OpenVM Learning Hub
6. To what extent the OPEN BADGES have helped me in the following SRL (self-regulated learning) skills (the information on how to achieve them):
    - Task analysis
    - Self-motivation
    - Self-control
    - Self-observation
    - Self-judgement (self-evaluation)
    - Self-reaction

The results are summarized in the figures 7 and 8 below.

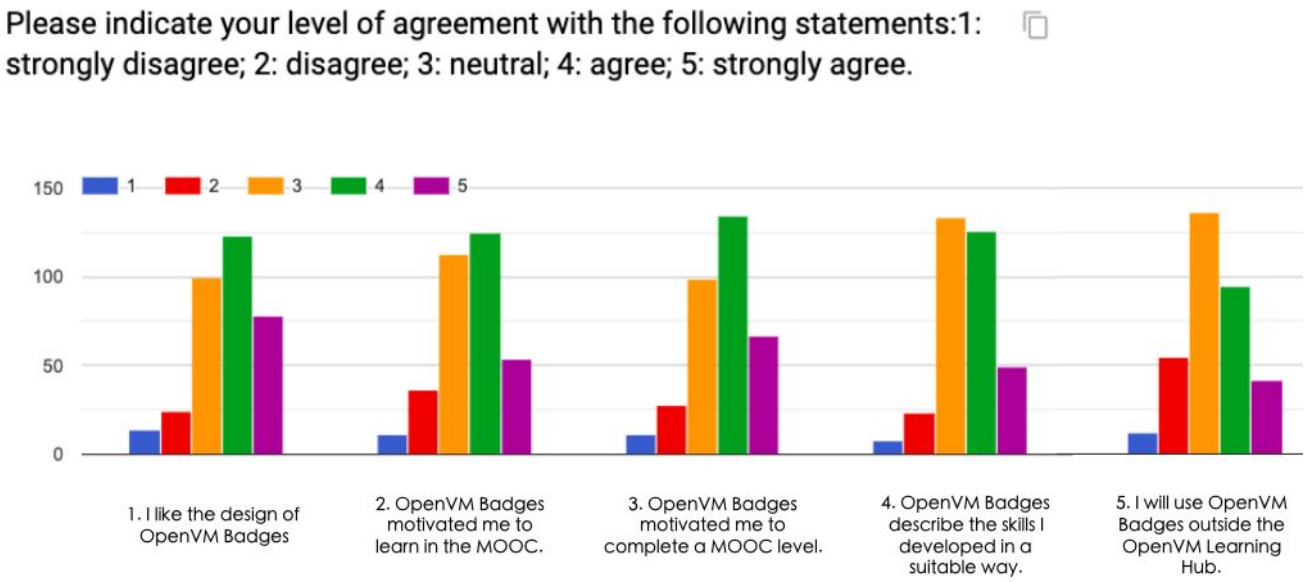

Figure 7. Evaluation of OpenVM Competence Credentials related to preferences and motivation

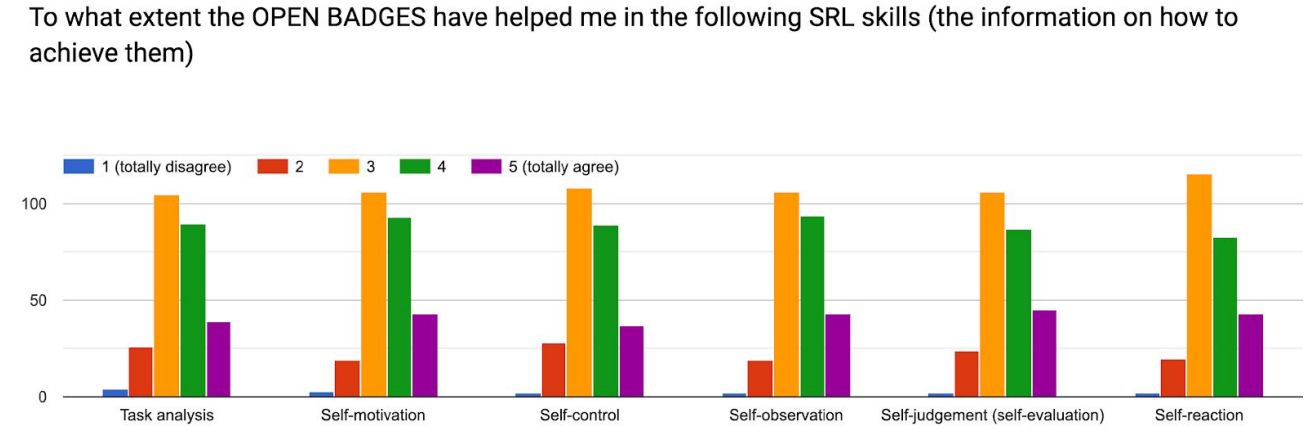

Figure 8. Evaluation of OpenVM Competence Credentials related to SRL

The results show that Competence Credentials motivated learners to complete a MOOC level and learn in the MOOC in general. Most learners also liked the design of Competence Credentials. Results related to the question of whether Competence Credentials describe developed skills in a suitable way and whether learners will use Competence Credentials outside the OpenVM Learning hub are somewhat inconclusive and will be looked into in more detail in the follow-up in-depth surveys related to OpenVM Credentials. As far as the assessment of learners related to the effects of Competence Credentials on Self Regulated Learning (SRL) are concerned, the results are somewhat inconclusive and will be also looked into in more detail. It seems that Competence Credentials may have especially positive effects on learners' self-motivation and self-observation.

4.2 Statistical data

We have gathered some data useful to understand how OpenVM Credentials have been received and used so far. The data comes partly from the OpenVM Learning Hub (badge issuing and claiming) and partly from Google Analytics monitoring the Bestr platform. Since badge issuing and MOOCs have only been available for less than three months, data is numerically quite scarce and will be supplemented with new data during the next iterations and user-testing in upcoming pilots. However, the existing data is useful to point out potential weaknesses and prompt the OpenVM partnership to take early actions.

As of november 8th 2019 altogether 534 Competence Credentials have been issued and 65% of them have been claimed, with the detail expressed in the figure 9 below.

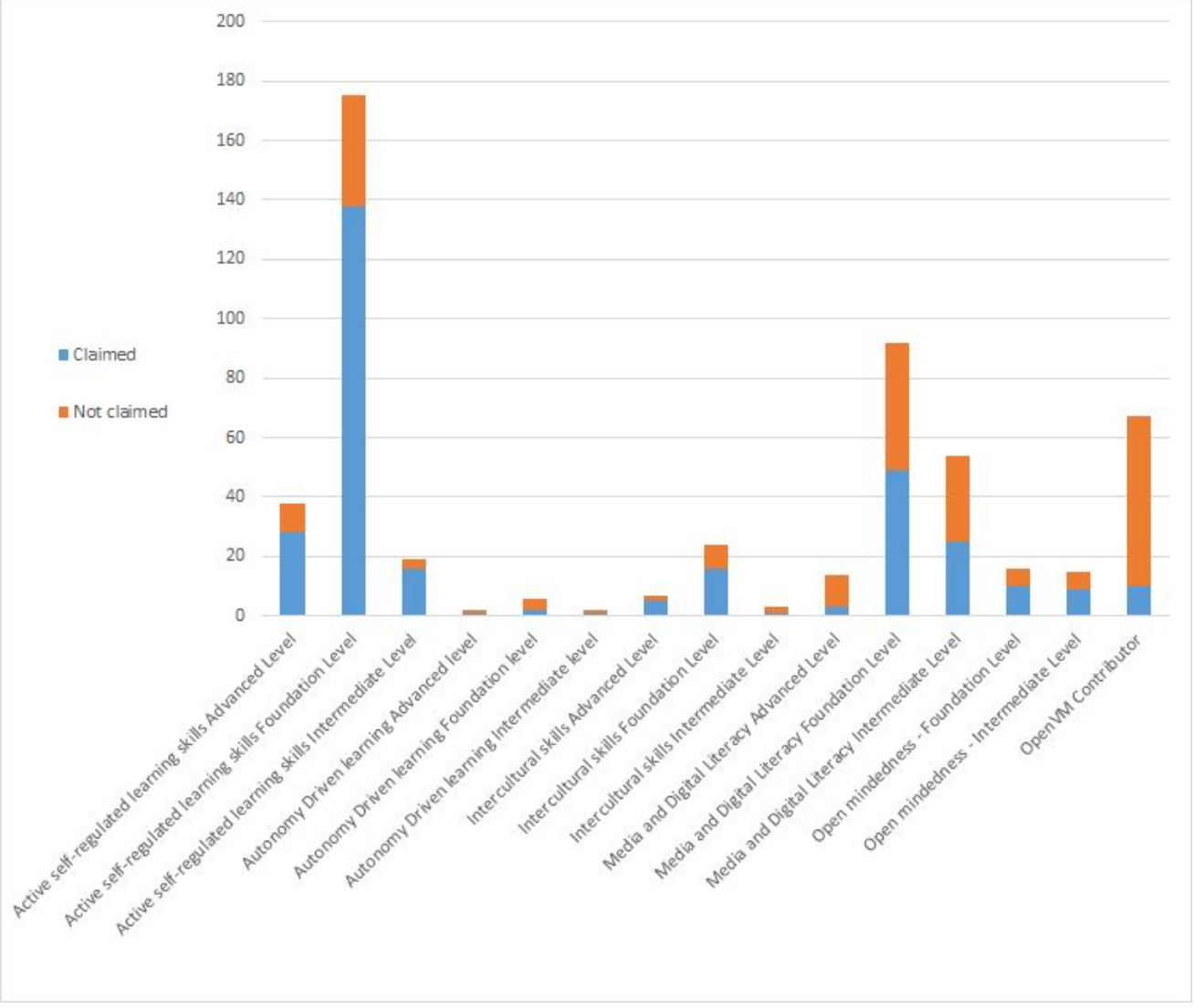

Figure 9. Number of issued and claimed Competence Credentials

The results how that the Contributor Credential has been issued to 67 users, but has a very low claim rate (15%) especially compared to the good performances of the Competence Credentials. This might be connected to a perceive lower value from the user, since it recognizes engagement but not a specific achievement.

The open question about why some of the OpenVM Credentials, especially the Contributor Badge and badges in the Media & Digital Literacy MOOC have not been claimed by a number of learners, will be looked into in more detail in the follow-up, in-depth survey.

5. Conclusions and next steps

The key conclusion from the iterative process of implementation and user-testing of OpenVM Credentials has proved to be the right approach as it allows to cater to user needs and adjust the design and implementation of OpenVM Credentials continuously according to user feedback and new insights in the development team. The iterative approach allows 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 design.

The evaluation results with a sample of n = 339 OpenVM Learning Hub users/learners and user/learner statistics presented in the report indicate positive user experience related to OpenVM Credentials as well as positive impact of OpenVM Credentials on motivation to learn and to complete a MOOC level as well as positive effects on various aspects self-regulated learning (SRL) including self-motivation and self-observation.

Based on the update of results in O5-A2 of presented in this report, the following steps are planned by the next milestone (Milestone 5) which is due in August 2020:

1. **In-depth surveys:** Beside the aggregated online evaluation survey with the items related to the evaluation of OpenVM Credentials, we plan an in-depth survey which will allow us to better understand the use, the value-added and the effects of OpenVM Credentials on users and their learning. The results will be published in form of a research publication in 2020.

2. **Semantic links to competency frameworks:** OpenVM Credentials semantically link to the European Skills Competency and Occupation framework (ESCO)[12], which has been considered as a valuable reference for OpenVM skills and reflected in the design of the Competency Directory in Output 3. Unique URLs allow referencing from the Open Badges and a a web-based search interface will be available. In the next step we plan to explore this aspect from user perspective in more depth.

[12] https://ec.europa.eu/esco/portal/home

3. **Endorsement:** The official issuing organization of OpenVM Credentials is the OpenVM partnership. Endorsements by higher education networks such as the Associated Partner EDEN have being discussed inside the partnership. In the next step we plan to implement the endorsement feature and test it with users.

4. **Blockcerts**: The Bestr platform is expected to implement the Blockcert functionality for OpenVM Credentials and to upgrade its issued Badges to the OBI 2.0 specification. The results of the implementation of both Blockcerts and OBI 2.0 specification will be described in the next report.

6. References

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