Open Virtual Mobility

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Open Virtual Mobility

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Executive summary

To establish the conceptual framework on Open Virtual Mobility learner skills and competences and get insights in the contextual factors that determine Open Virtual Mobility activities, a group concept mapping (GCM) study was conducted with experts on both Virtual Mobility and Open Education.
The aim of this paper is to present in detail the outcomes of this study, which resulted in the construction of the competence framework in the OpenVM project. Both the process and the results will be presented and elaborated on to facilitate and encourage further work with the outcomes of this study.
The paper is directed at project members who participated in this study, researchers interested in Open Education and Virtual Mobility themes and the broader HE community with interest in Virtual Mobility.
The paper elaborates on the organization, participants and procedures of the GCM study, presents the study results in detail and discusses them.

Contributors

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All participants of the GCM study

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1. Background and rationale

In the frame of the Erasmus+ strategic partnership Open Virtual Mobility (OpenVM), 9 European partner organisations from higher education set the goal of developing a shared understanding of the concept of OpenVM and its core characteristics. To establish the conceptual framework on Open Virtual Mobility learner skills and competences and get insights in the contextual factors that determine Open Virtual Mobility activities, a group concept mapping (GCM) study was conducted with experts on both Virtual Mobility and Open Education.

This paper first focusses on the methodology. Further on, it elaborates on the outcomes of each phase of the group concept mapping study in detail.

2. Methodology

Group Concept mapping

To answer the research questions the Group Concept Mapping (GCM) methodology was applied (Kane & Trochim, 2007).

GCM supports knowledge construction through collecting and organizing ideas of individuals so that a collective visual geography of a concept can be created to be further analysed, interpreted and used to feed understanding, design and /or decision or policymaking. Data generation and analysis in GCM is a structured multi-step approach, which follows a number of well-defined steps building upon each other and using the output of the previous step as data source.

- **Step 1** -The first step involves determining the target group and selecting participants so that different stakeholder groups are represented sufficiently. The GCM methodology does not require representative sampling but lays the focus on defining and attracting those who have the necessary knowledge, background or interest (Kane & Rosas, 2018). According to Trochim (Kane & Trochim, 2007), 10 participants are sufficient for getting results that are valid in the particular context of the study.
- **Step 2 -** Participants generate ideas on the topic of the study individually supported by a prompt. This can be done with an online tool or during a live session (processing the results afterwards manually).
- **Step 3 -** Collected ideas are screened and cleaned up so that the resulting set contained unique unequivocal statements. According to Kane and Trochim (2007), the number of statements for the analysis should not exceed 100 although there are examples of larger samples being used in further steps.
- **Step 4** - Thereafter, participants group and rate the collected unique ideas on two relevant dimensions (i.e., importance and feasibility). Trochim (1989) suggests using a five-point scale, although different scales can also be used (Kane & Rosas, 2018). The grouping or clustering activity consists of assigning each statement to only one unique cluster and suggesting a suitable label for each cluster.

- **Step 5** - The resulting data are analysed with multidimensional scaling (MDS) and hierarchical cluster analysis (HCA) to identify patterns in the data. The output of this analysis are maps representing individual standpoints on an issue in relation to other statements. Taken together, they represent a collective standpoint of all participants. The GCM tool suggests a number of options for a possible clustering with possible labels based on the input of participants. The choice for an optimal cluster as a data representation is determined by the researchers and (a part of) the participants together based on theoretical considerations and plausibility. The choice for a cluster label that forms an optimal representation of this cluster is also result of discussion and joint decision-making (Kane & Rosas, 2018).
  The following test statistics are used for the purpose:
  - **Kruskal's stress value statistic** indicates the goodness of fit of the data, the extent to which the data point map represents the way individuals sorted the data. Less stress value is an indication of a better fit, which should be in the range between 0.205 and 0.365 (Kane & Trochim, 2007; Petrucci & Quinlan, 2007). In our study, the stress value constituted a goodness of fit of acceptable level of 0.2531.
  - **Bridging value statistic**. GCM makes use of the bridging value statistic which is based on the calculation of how often (i.e. by how many participants) a particular statement has been grouped together with other statements that are more or less close to it. A low bridging value indicates that an item is sorted with nearby statements on the map while high bridging values (nearing 1) imply that participants sorted a particular statement with statements far on the map and that there is less consistency in how participants view a particular statement in relation to other statements. A **cluster bridging index** is an average of the values within the cluster. The cluster bridging value index indicates to what extent a cluster is a consistent and coherent entity, separate from other clusters. The higher the bridging value, the more the cluster and its constituent elements (statements) are connected to other clusters and statements in other clusters. In the 10-cluster model of Open VM, the average bridging values vary from 0.12 to 0.54 as presented in Table 3.
  - **Spanning analysis**. Spanning analysis in GCM helps to understand the relationship of items to other items situated close and further away. Using the spanning function, researchers make informed decisions on what statements might eventually need to be moved to different clusters (Kane & Rosas, 2018).
- **Step 6** - Visual representations of different cluster options are used to validate the shared understanding with study participants during interpretation workshops. Resultingly, adjustments in clustering and labelling may occur. The GCM online tool generates a variety of visual representations of the data that are used in the analysis at conceptual level and in presenting the results to the participants: a point map, cluster maps, spanning analysis representations on cluster map, cluster- rating maps, pattern match and "go-zone" representations, which allow additional visual comparison of data (Kane & Rosas, 2018).

- **Step 7** - Based on the outcomes, further actions or strategies can be formulated (Kane & Trochim, 2007, Kane & Rosas, 2018).

Participants

For the GCM study in the framework of the OpenVM Project, expertise on and affinity with Virtual Mobility and Open Education on the conceptual level or in the educational practice formed the prerequisite for selecting participants. As such experts are scarce, for each phase in the study, additional recruitment was undertaken to complement the expertise within the OpenVM project. Each project partner was requested to invite experts from their respective (inter)national networks for brainstorming, sorting and rating. Table 1 presents an overview of the activities partners were involved in, table 2 describes the particpants per phase in GCM, table 3 and figure 1 give their background characteristics.

Table 1. Participation of OpVM patners in the activities of the GCM study

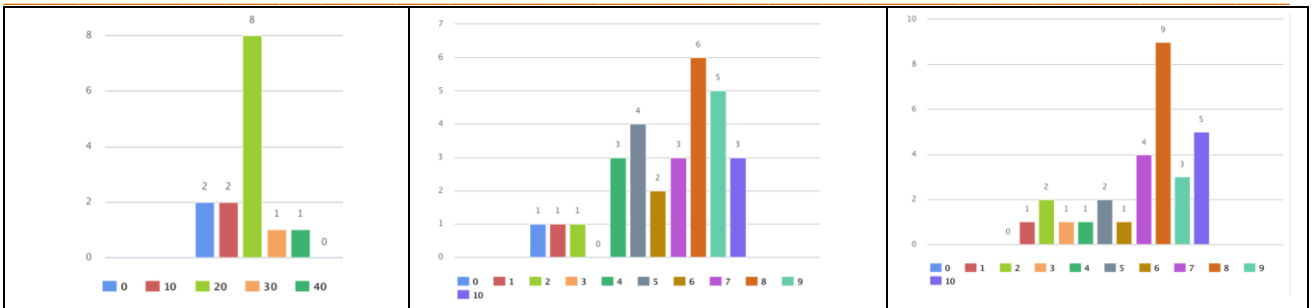
Partner in Open VM	Actions related to GCM study
BEUTH UNIVERSITY OF APPLIED SCIENCE, Germany	Participation in brainstorm, sorting and rating, live session & online. Project members and networks.
UNIT/AUNEGE, France	Participation in brainstorm, sorting and rating, online. Participation in the interpretation activity. Project members and networks.
KATHOLIEKE UNIVERSITEIT LEUVEN, Belgium	Participation in brainstorm, sorting and rating, online. Participation in the interpretation and consolidation activities. Project members and networks
UNIVERSITA DEGLI STUDI ROMA TRE, Italy	Participation in brainstorm, sorting and rating online. Project members
UNIVERSIDAD DE LAS ISLAS BALEARES, Spain	Participation in brainstorm, sorting and rating online. Project members and networks
VERENIGING VAN EUROPEAN DISTANCE TEACHING UNIVERSITIES, EADTU, the Netherlands	Participation in brainstorm, sorting and rating online. Participation in the consolidation activity. Project members
CINECA CONSORZIO INTERUNIVERSITARIO, Italy	Participation in brainstorm, sorting and rating online. Project members
UNIVERSITATEA POLITEHNICA TIMISOARA, Romania	Participation in meaning making activities. Project members
OPEN UNIVERSITEIT NEDERLAND, the Netherlands	Researchers. Designed the GCM environment, instruction and design of the online environment. Participation in brainstorm, sorting and rating online, interpretation and consolidation session.

Table 1. Participation in different phases of the GCM on Open Virtual Mobility

Participants	Brainstorm in GCM	Sorting in GCM	Rating in GCM	Validation activity (ActionLab@ OEGlobal18 conference	Consolidation activity (Finalizing outcomes)
OpenVM project members	11	12	12	6	5
Non-members (networks)	8	15	12	3	
Total	19	27	24	9	5

Table 3 Background characteristics of GCM participants per phase

Background characteristics	Responded to the invitation	Completed sorting activity	Completed rating on at least one dimensión	Completed all online activities in GCM	OEGlobal validation workshop	final consolidation workshop
Student in HE	3	0	0	0	0	0
University professor (teaching in HE)	19	14	14	15	6	2
Researcher	7	5	5	5	2	1
International Office staff in HE	6	2	0	2	0	0
University board member	1	0	1	1	0	0
Policy maker	1	1	1	1	0	0
Educational development support staff	4	3	2	2	1	2
ICT support staff	4	3	2	3	0	0
Other	4	4	4	4	0	0
Total (100%)	49	32	30	34	9	5



1.1. Experience in Education on a scale from 0 to 40	1.2 Affinity with Virtual Mobility on a scale from 0 to 10	1.3 Affinity with Open Education on a scale from 0 to 10

Figure 1 Background characteristics of the participants of the GCM (brainstorming, sorting and rating)

Instruments

The GCM online environment (https://conceptsystemsglobal.com/) was used for data generation and analysis. Printouts of the generated visual representations of the results (various maps) were used at the validation and interpretation workshop.

Procedure

(1) **Recruiting participants**. All OpenVM project members were invited to participate in the study and were requested to share the invitation with their respective networks including representatives of the research community, educators, internationalization officers at Higher Education Institutions, HE boards representatives and policy makers. Project members approached their contacts through e-mail with a reminder in case of non-response and invited them to participate in the sorting and rating activities through the online tool. Informed consent request was requested through the GCM tool.
(2) **Idea generation.** Idea generation was steered by the focus prompt. "Please, complete the statement "**In the context of Open Education, Virtual Mobility implies that students ….** ". Participants were invited to give as many answers as they wished in the form of short direct statements. In total 101 statements were generated in the idea generation phase of the study that was conducted both online and during live sessions (Buchem, e.a., 2018).
(3) **Data cleaning and removal duplicates.** All duplicate statements were removed. Two project members separately checked the statements for repetition or ambiguity issues. Results were compared and full agreement was reached on statements to be removed. The final set included 90 unique statements.
(4) **Sorting and rating.** Participants were invited to group statements based on their similarity in meaning in meaningful clusters, provide the clusters with meaningful labels and to evaluate each statement on dimensions of importance and feasibility on a scale from 1 to 5.
(5) **Analysis.** MDS and HCI analyses were performed with the GCM tool, and visuals were generated for conceptual analysis, interpretation and validation with the stakeholders. The two lead authors performed preliminary data interpretation in preparation for the validation and consolidation phase on conceptual level and using the GCM statistics.
(6) **Interpretation, validation and consolidation.** Two live sessions were held to interpret, validate and consolidate the outcomes of the analysis.

(6a.) Interpretation and validation: Action Lab at OE Global 2018

During the OE Global conference 2018 (oeglobal.org), an Action Lab (workshop) activity was used as the venue for the interpretation and validation of the outcomes. 6 project members from 3 partner institutions and 3 external conference participants took part in this activity During the workshop visual representations of the preliminary clusters as defined by the two authors, the respective statements and key statistics were presented to the workshop participants who discussed the presented data according to the suggested instructional prompt and provided feedback. The lead authors wrote down and analysed the contributions of the participants.

(6b) Consolidation: expert meeting at KU Leuven

At the expert meeting, 5 project members discussed each of the 10 clusters and the constituent statements in detail at a conceptual level using the visual representations and the generated statistics (bridging value statistic and spanning analysis) in detail. For each cluster, a new label was chosen unanimously, after a discussion of a range of options including the options generated by the GCM tool. Results of the session were processed by the two lead authors who designed uniform descriptions from each cluster representing a separate competence area.

3. Results

Point map of the GCM outcomes

The first outcome of the GCM analysis is a point map, a visual representation of the outcomes of MDS analysis of all statements. Complete the statement: "**In the context of Open Education, Virtual Mobility implies that students ….** ". 90 statements generated in GCM are presented in a detailed point map at figure 2. On this point map, each point stands for one unique statement of the final set of 90 statements. Statements that are sorted together by more participants are located closer to each other. Statements that are not sorted together or sorted together less frequently are located further from each other.

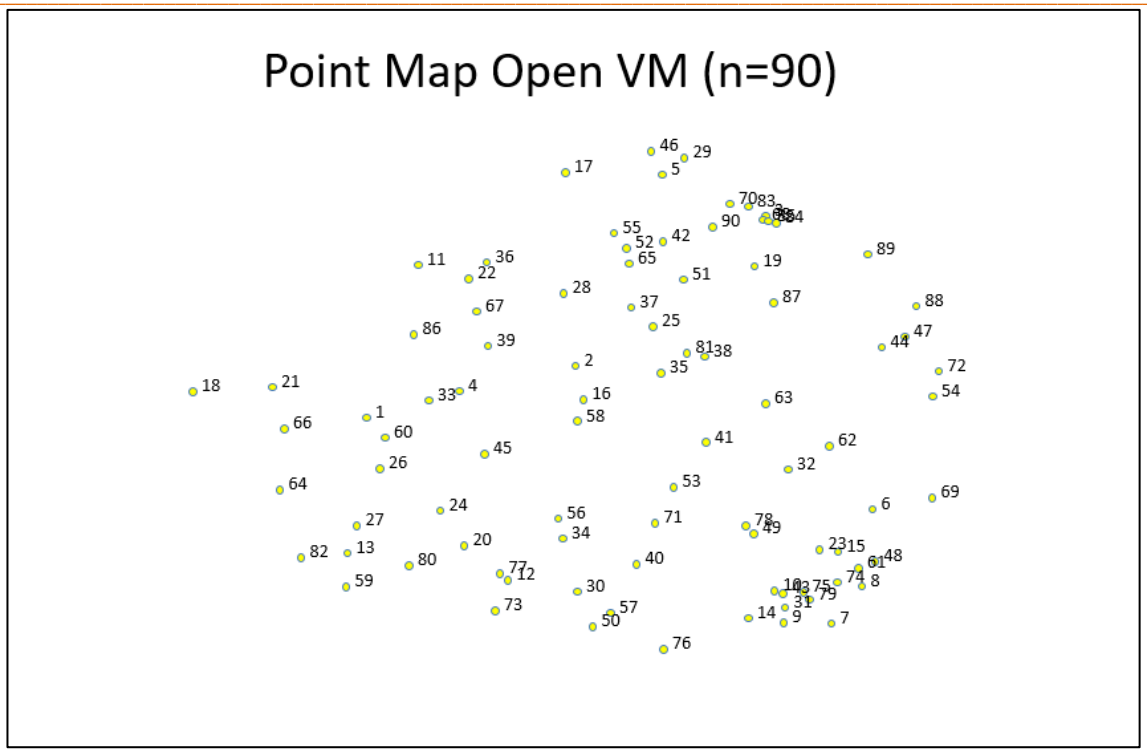


Figure 2 The outcomes of the Group Concept Mapping study on OpenVM: the point map of 90 statements.

Cluster maps

Figure 3 presents an overview of cluster solutions that the GCM tool generated in the Open VM study at different levels of granularity. The choice for the optimal number of clusters results from the conceptual analysis and discussions between experts.

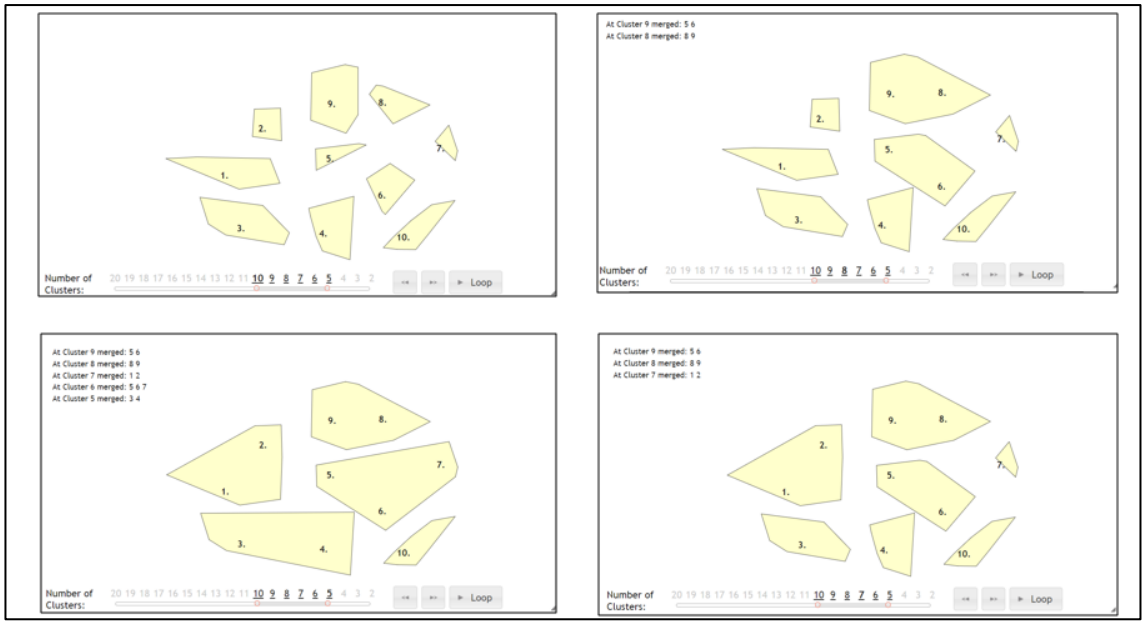


Figure 3. A 10, 8, 6 and 5 cluster solutions suggested by GCM.

The choice for the 10-cluster solution as a final outcome was supported by analysis of the bridging value statistic and the outcomes of the validation workshop. The final labels resulted from the expert consolidation session based on unanimous agreement of all 5 participating experts. Figure 4 presents the outcomes – the 10-cluster solution of GCM with the definitive cluster labels.
Table 4 shows the clusters with their labels and exemplary statements per cluster.

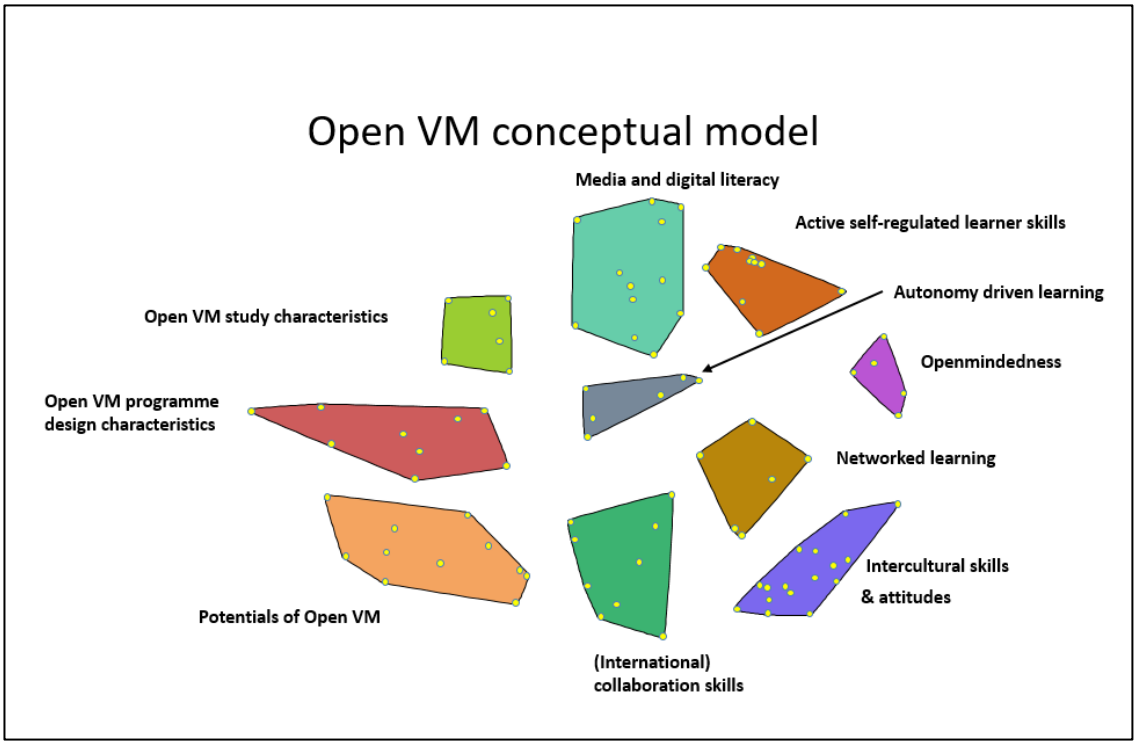


Figure 4. The 10-cluster solution with definite labels as an Open VM conceptual model

Open VM skills,competences and external factors

As figure 5 illustrates, the 10-cluster solution of the GCM includes both learner characteristics (skills and competences) and external factors as an answer to what Open VM means for learners.

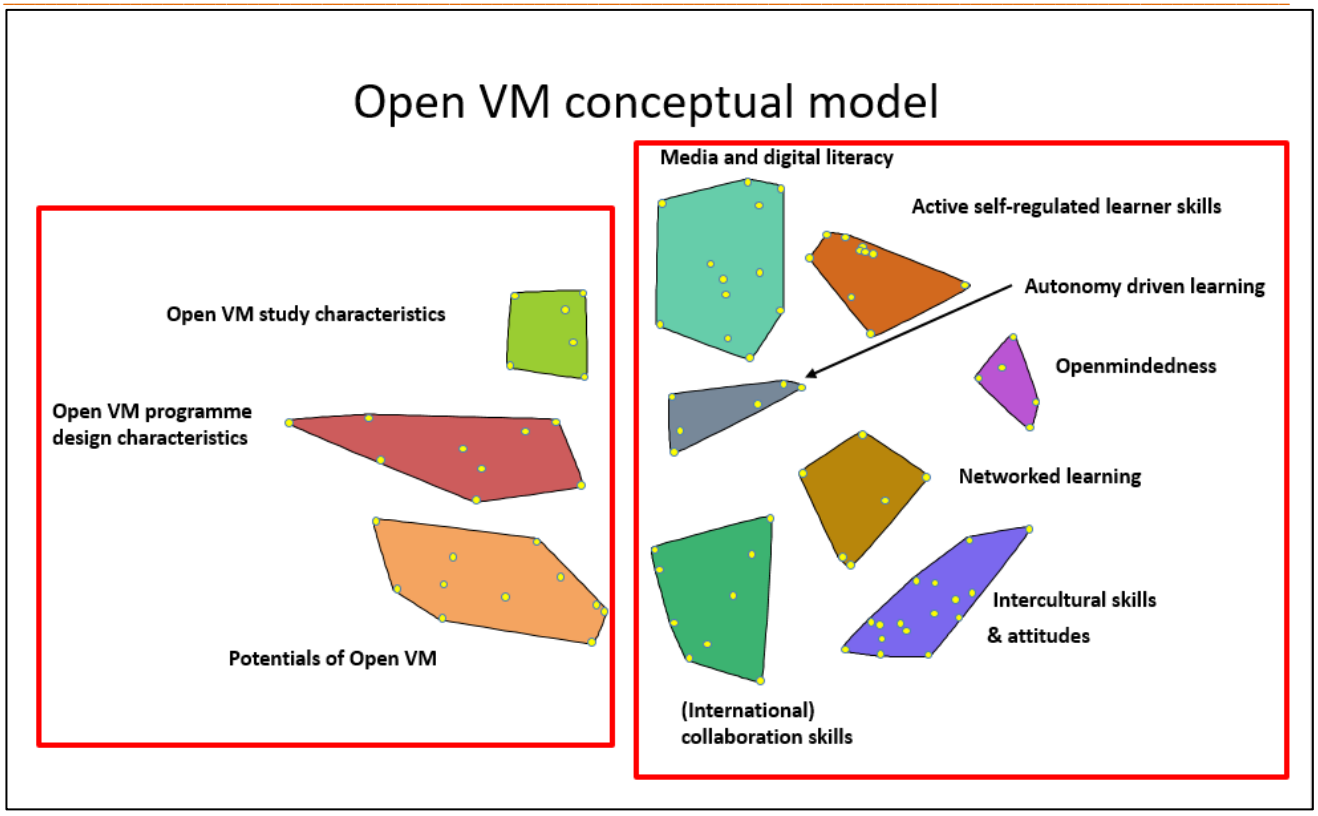


Figure 5 Open VM conceptual framework and its constituent parts.

To sum up, according to the conducted GCM study, Open Virtual Mobility activities encourage the development of 7 learner skills and competence areas. These are:

- Intercultural skills & attitudes
- Networked learning
- Active self-regulated learner skills
- Media and digital literacy
- Autonomy-driven learning
- (International) collaboration skills
- Open-mindedness

The statements in three clusters point towards both personal (individual) and institutional micro and meso-level perspectives (design, support and access).

- individual characteristics and learning/study behaviour of the student
- institutional support in providing information and access to the student
- design of OpenVM activities

Table 4. Open VM clusters with exemplary statements per cluster with their respective bridging values

Cluster with per cluster exemplary statements with their respective bridging values as an answer to the prompt **In the context of Open Education, Virtual Mobility implies that students [develop]…**	M bridging values (SD)	N statements per cluster
1. Intercultural skills & attitudes • gain knowledge about the culture they "visit" • feel confident in interacting with people from other cultures after a VM experience • want to be in touch, not only with the exchanging institution, but with the whole world	0.12 (0.13)	16
2. Networked learning • learn to work and cooperate in an international setting with the use of ICT and social platforms • learn about dealing with complex situations through the VM activity • learn about dealing with ambiguity through the VM activity	0.25 (0.05)	6
3. Active self-regulated learner skills • should be able to plan and organize their own learning process • are able to self-reflect • aims of VM in student development -self-discipline in learning	0.16 (0.13)	10
4. Media and digital literacy • are proficient in searching for good quality courses and resources • are digitally literate • are proficient in using digital platforms	0.22 (0.08)	12
5. Autonomy-driven learning • develop persistence and creativity in organizing their own study. i.e. they might need to find suitable and feasible courses on their own and convince curriculum boards of the quality of learning in OE contexts • can enhance their lifelong learning skills • can learn in an open digital context	0.21 (0.07)	6
6. Interactive and collaborative learning in an authentic international environment • exchange knowledge with peers from different disciplines • collaborate with peers from different disciplines • the open digital context facilitates collaboration about international students	0.31 (0.07)	9
7. Open-mindedness • are open minded • are not afraid of interacting with peers and teaching staff at other institutions • are willing to improve their proficiency in foreign languages	0.53 (0.07)	5

8. Potentials of Open VM • have access to high quality learning processes that otherwise would not be possible for them • have a lot of resources to choose what they want to learn • receive academic recognition for participating in virtual mobility	0.39 (0.11)	9
9. Open VM study characteristics • carry out the learning process under the characteristics of open education • students create their digital identity through the open context • using IT tools in a transparent and efficient way to interact with other participants and the learning material	0.53 (0.11)	6
10. Open VM programme design characteristics • are involved in predetermined learning activities, open and collaborative, through which they can acquired knowledge thanks to innovative learning methods • the construction of a well-defined learning path in which collaborative and international activities are pivotal • needs guidance and support to make the right choices and to stay motivated	0.54 (0.20)	8

As the labels of clusters 1, 2, 3, 4, 5 and 6 indicate, these clusters describe the skills that learners develop in Open VM and the skills that they need to succeed in Open VM. Cluster 7 (open-mindedness) which has a higher bridging value describes an attitude. The three remaining clusters, also with higher bridging values are more related to external aspects of Open VM such as Open VM programme pre-requisites and characteristics.

Cluster bridging map

Cluster consistency is analysed with the help of bridging value statistics and is visualized with the help of a cluster bridging map. Figure 5 presents the cluster bridging map for the 10-cluster solution with indications of cluster bridging value statistics. The more layers the cluster has, the higher the bridging value statistic is. This can be also seen in Table 3 which presents the cluster and exemplary statements with the cluster bridging value.

Open VM: a cluster bridging map

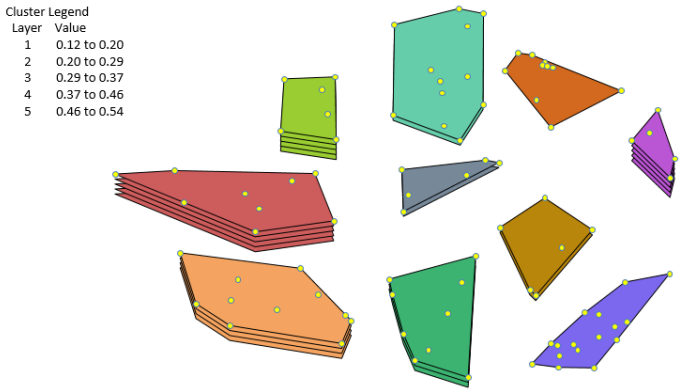
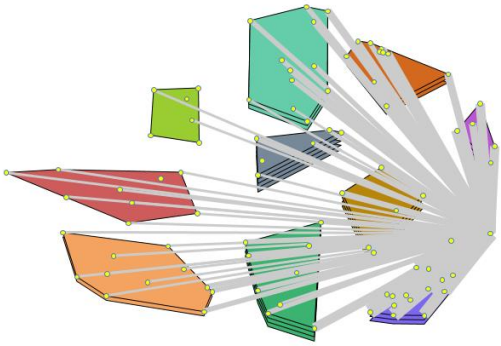


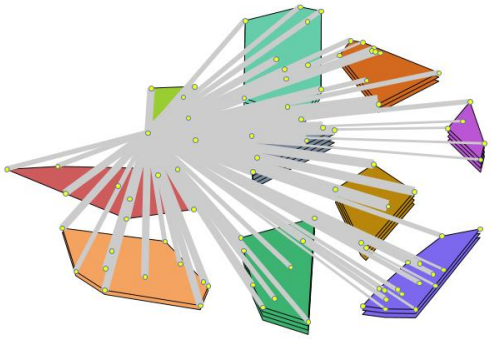
Figure 6. Cluster bridging map with the cluster bridging values indicated with the help of layers.

As both the graphical representation on figure 6 and table 4 demonstrate, the 10 cluster solution includes clusters with low bridging values (the so-called anchor clusters) and clusters with higher bridging values (the so-called bridges). Clusters 1 until 6 can be described as highly consistent independent "anchor" clusters. Statements in these clusters are grouped together with statements that are situated near them on the point map more often than with statement further away.

Three clusters (clusters 8, 9 and 10) have a higher bridging value (medium level), indicating that statements from these clusters are grouped together with statements situated further away from their own clusters, thus these statements may be forming a bridge to these other clusters. This is demonstrated by figure 7 with the help of the spanning analysis technique. This figure presents two instances of spanning analysis – for a statement in an anchor cluster and for a statement in a bridge cluster. Statement 69 (the right part of the figure) is visibly more anchored in the area of its own cluster and has les ties with other clusters. Statement 86 (the left part of the figure) has more connections with the clusters further on and relatively less ties with the nearest clusters.



Statement 69: “can deal with intercultural issues” (anchor cluster)

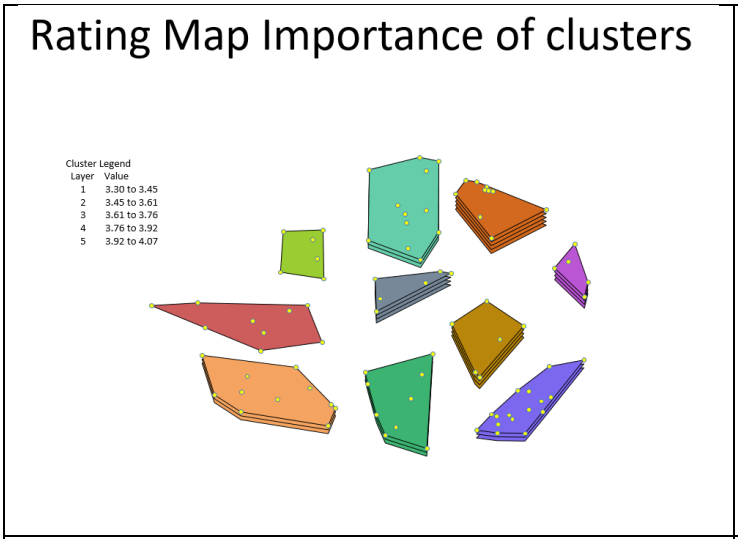


Statement 86: “Aims of VM in student development - proficiency in assessing quality of programs/resources” (bridge cluster)

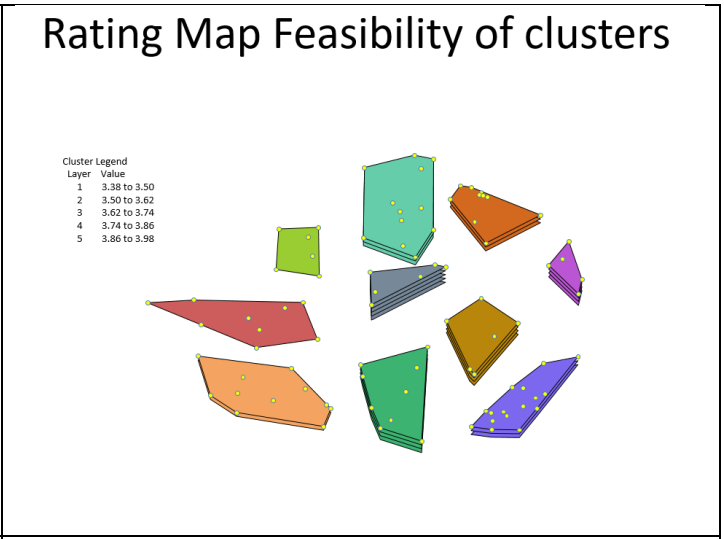
Figure 7. Two instances of spanning analysis to demonstrate relations between statements close and far from each other

Cluster rating maps: importance and feasibility rating analysis

Figure 8 presents the cluster rating maps on dimensions of importance and feasibility. We can see that the general evaluation of the two categories of clusters (competences and external pre-requisites) is different. The competences related clusters are rated as more important and more feasible than program or study characteristics



Open VM rating map on dimension of Importance. Participants (n=24) rated each statement on a scale from 1 to 5.



Open CM rating map on dimension of Feasibility. Participants (n=24) rated each statement on a scale from 1 to 5.

Figure 8. Rating maps in the 10-cluster solution of the open VM cluster map

While visualizing the rating results with concept maps helps to get a general idea in the way participants evaluate different facets of the concept, a pattern match visualizes a direct comparison

between the two dimensions of each constituent cluster on average ratings, as demonstrated in figure 9.

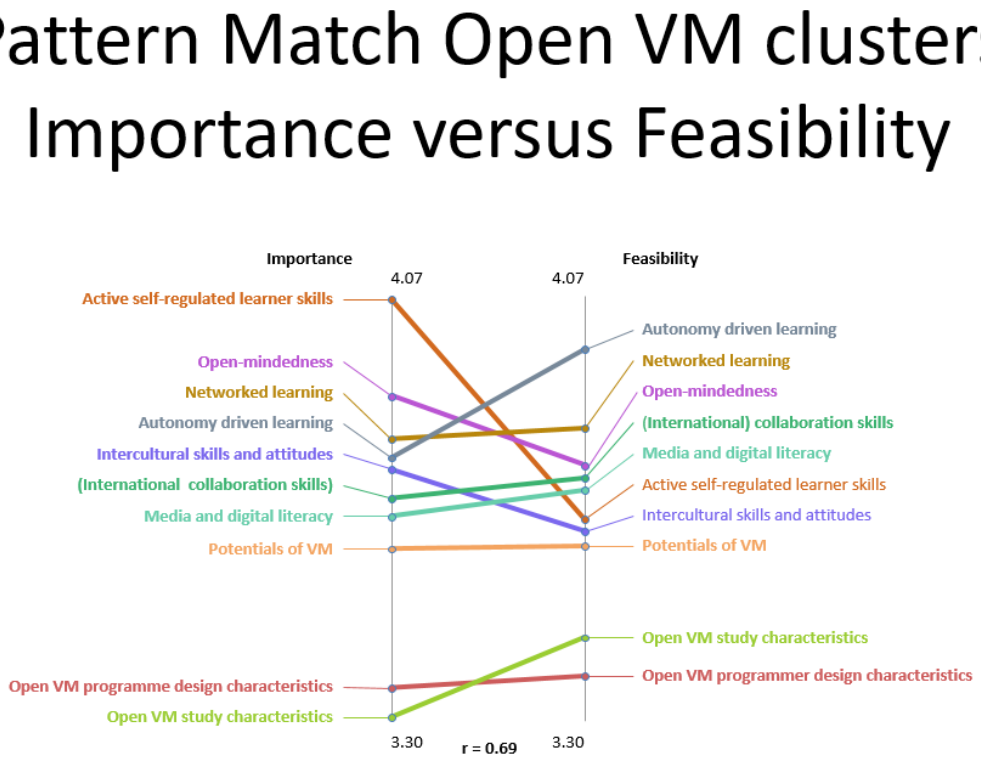


Figure 9. A pattern match of the average ratings of open VM clusters on dimensions of importance and feasibility, as rated by 24 participants. Correlation index of r=0.69 indicates that there is a (medium-level) relationship between these dimensions.

The pattern match visualization suggests issues for further analysis, namely on the relations between variables which is pursued via t-test of values assigned to different clusters on the importance dimension and via Go-Zone visual presentations of the rating results.

T-tests of differences on importance ratings between clusters

Table 5a presents an overview of significant results based on the t-test of difference between two clusters generated by the GCM tool. As presented in table 5a, cluster “Active self-regulated learning” is considered as significantly more important than any other cluster. Cluster “Study characteristics” is considered significantly less important than most of the “competences” clusters. Table 5b includes results of ratings on the importance dimension that are significant.

There are no statistically significant differences in the way participants estimate feasibility of the clusters.

Table 5a. Significance levels of T-tests of difference between pairs of clusters on importance dimension

	Curriculum characteristics	Study characteristics	VM potential	Networked learning	Intercultural skills & attitudes	Active self-regulated learner skills	Media and digital literacy	Autonomy-driven learning	(International) collaboration skills	Open-mindedness
Curriculum characteristics	xxxxxx	not sig	not sig	not sig	not sig	*p*<0.002	not sig	not sig	not sig	*p* <0.02
Study characteristics	not sig	xxxxxx	not sig	*p* <0.05	*p* <0.02	*p* <0001	*p* <0.05	*p* <0.05	*p* <0.05	*p* <0.01
VM potential	not sig	not sig	xxxx	not sig	not sig	*p* <0.01	not sig	not sig	not sig	not sig
Networked learning	not sig	*p* <0.05	Not sig	xxxxx	not sig	*p* =.05	not sig	not sig	not sig	not sig
Intercultural skills & attitudes	not sig	*p* <0.02	not sig	not sig	xxxxx	*p* <.005	not sig	not sig	not sig	not sig
Active self-regulated learner skills	*p* <0.002	*p* <0.001	*p* <0.01	*p* <.05	*p* <.005	xxxxx	*p* < .001	*P* < .05	*p* <.001	*p* <.05
Media and digital literacy	not sig	*p* <0.05	not sig	not sig	not sig	*p* < .001	xxxx	not sig	not sig	*p* <.05
Autonomy-driven learning	not sig	*p* <0.05	not sig	not sig	not sig	*p* < .05	not sig	xxxxx	not sig	not sig
(International) collaboration skills	not sig	*p* <0.05	not sig	not sig	not sig	*p* <.001	not sig	not sig	xxxxxxx	not sig
Open-mindedness	not sig	*p* <0.01	Not sig	not sig	not sig	*p* <.05	*p* <.05	not sig	not sig	xxxxxx

Table 5b. Average ratings on importance dimension and significant differences between clusters

	Average score on importance dimension	Difference with Study characteristics cluster	Difference with Active self-regulated learner skills cluster
Curriculum characteristics	3.3535	not sig	t(12) = - 3.6652 *p*<0.002
Study characteristics	3.2986	xxxxxx	t(14)= - 4.6610 *p*<0.001
VM potential	3.6098	not sig	t(14)= - 2.9495 *p*<0.01
Networked learning	3.8125	t(10) = - 2.7162 *p*<0.05	t(14)= - 2.1848 *p*<.05
Intercultural skills & attitudes	3.7565	t(20)=2.6057 *p*<0.02	t(14)= - 3.3020 *p*=<.005
Active self-regulated learner skills	4.0708	t(14)=4.6610 *p*<0.001	xxxxx
Media and digital literacy	3.6701	t(16)=2.1830 *p*<0.05	t(14)= -2.1825 *p* < .001
Autonomy-driven learning	3.7778	t(10) = 2.4007 *p*<0.05	t(14)= - 3.7778 *p* < .05
(International) collaboration skills	3.7037	t(13) = 2.3778 *p*<0.05	t(14)= - 3.7037 *p* <.001
Open-mindedness	3.8917	t(9)=-3.5068 *p*<0.01	t(14)= - 4.6610 *p*<.05

Go-Zones: Visual representations of ratings on importance and feasibility dimensions

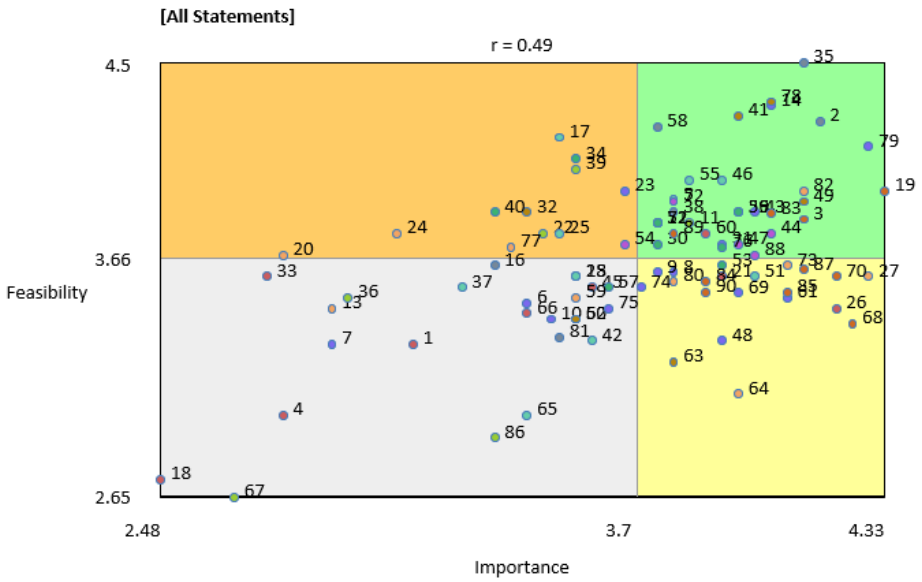


Figure 10. Visual representation of the Go-Zone on dimensions of importance and feasibility. The green quadrant includes statements in the Go Zone.

Based on the Go-Zone results a new, further specified learner profile and an overview of competences can be constructed as represented in Figure 11.

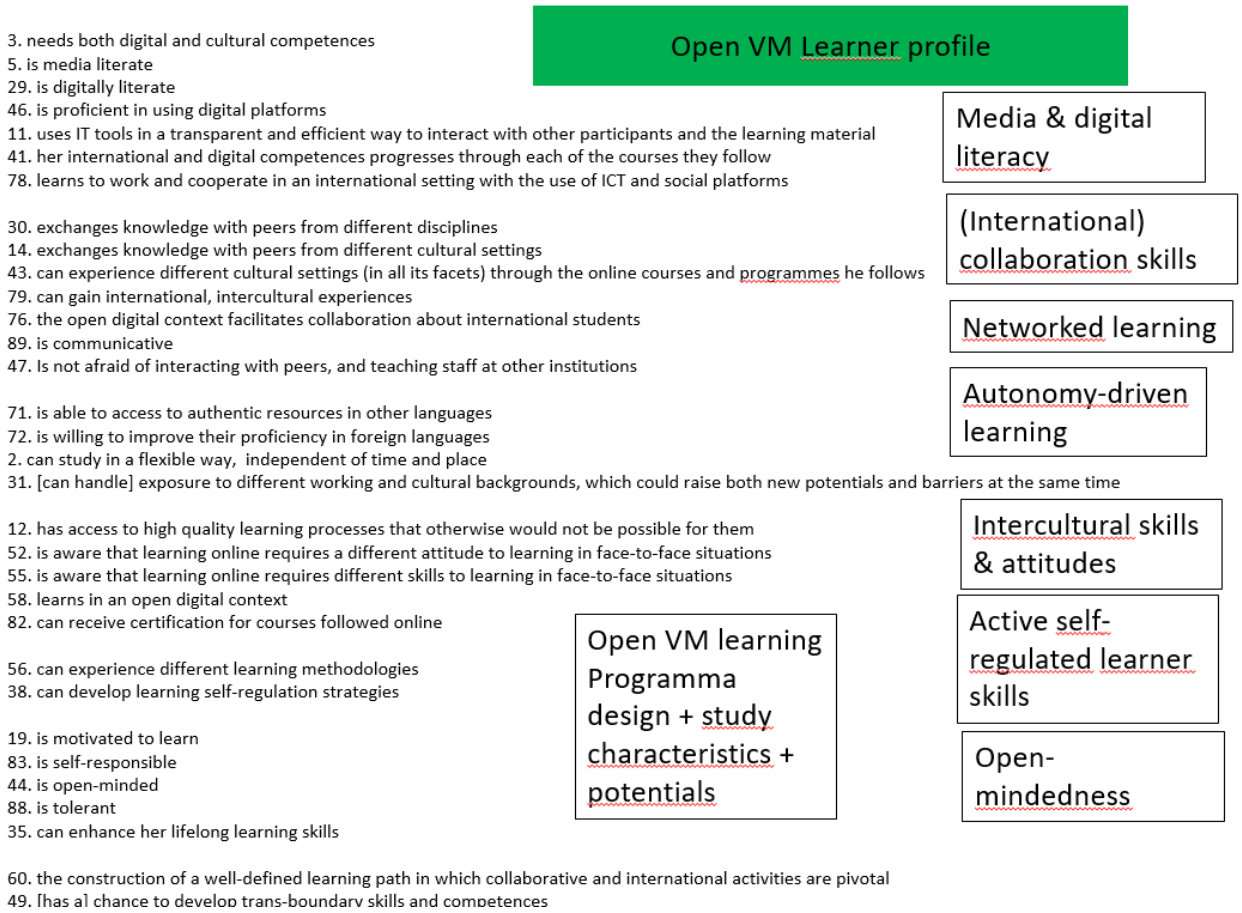


Figure 11. Open VM learner profile based on the Go-Zone GCM analysis

4. Next steps

In this paper, we have psresented the results of the Group Concept Mapping study in detail. The primary results have been described and interpreted in full in O1-A1 Competence Framework. The next steps for this output is the interpretation of the secondary results in terms of determination of the Go Zones (based on the ratings of importance and feasibility). The differences in significance in the cluster ratings also require interpretation.

5. References

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