



MAS

Museum Affinity Spaces

www.masproject.eu

Collaborate. Learn. Include



Deliverable D18

Preliminary MAS Requirements specifications

Authors: Stefania Savva & Nicos Souleles

DIDAKTOR (POST DOCTORAL RESEARCHERS) - POST-DOC/0916/0248

Partnerships for the 21st century through a Multiliteracies Lens



Executive summary

This deliverable D18 reports on the design, implementation and findings of Phase 1 “Preliminary Analysis” of the Design-Based Research for the MAS project, including observations, interviews and surveys with practitioners and students to elicit information on the current virtual museum usage habit of these professionals in their respective institutions, as well as their overall experiences with museums as physical sites for collaboration and learning. The result from this preliminary context analysis, was 97 responses from practitioners in the web-based surveys, semi-structured interviews with 7 educators and focus group interviews with 70 students. Overall, the participating museum educators, school teachers and students, had positive attitudes towards online museums and museums at large. However, it was evident that the appeal of museums was restricted to recreational or educational, one-off visits, with little collaboration or potential for synergies on a long-term scale. Another interesting finding was with regards to availability and accessibility of online museums, while also lacking confidence to teach in respect to the curriculum through these digital tools.

Table of Contents

LIST OF ABBREVIATIONS	3
1. INTRODUCTION	5
2. Baseline data: Museum educators and school-teachers' surveys	6
2.1 Survey Design and Implementation.....	6
2.2 Results and Discussion	7
2.2.1 Museum Staff Survey	7
2.2.2 School Teacher Survey.....	12
2.3 Conclusion on Museum Educators and Teacher Surveys	16
3. DATA COLLECTION FROM INTERVIEWS.....	17
3.1 Pre-pilot student museum attitudes	18
3.1 Semi structured interviews with museum educators and school-teachers.....	25
3.1.1 Brief Description of Goals and Objectives.....	25
3.1.2 Methodology and Organisation of Interviews.....	25
4. RESULTS FROM INTERVIEWS	26
4.1. Discussions	26
4.2 Organisational and Technical Barriers to Museum-School Partnerships and Virtual Museum Use.....	27
4.2.1 Usability problems	28
4.2.2 Content issues.....	28
4.2.3 Lack of training and experience with virtual museums.....	29
4.2.3 Lack of time and curriculum match.....	29
4.2.4 Limited access to the Internet and ICT	30
4.2.5 Ready-made solutions with low modifiability.....	30
4.2.6 Insufficient funding	30
4.2.7 Student management support issue.....	31
4.2.8 Inadequate school support.....	31
4.3 Reflection on interviews	31
5. Conclusion	32
6. References	34

LIST OF ABBREVIATIONS

MAS	<p><i>"Museum Affinity Spaces (MAS): Re-imagining Museum-School Partnerships for the 21st century through a Multiliteracies Lens"</i></p> <p><i>DIDAKTOR (POST DOCTORAL RESEARCHERS) –</i></p> <p><i>POST-DOC/0916/0248</i></p>
EU	<i>European Union</i>
EACEA	<p><i>The Education, Audiovisual and Culture Executive Agency</i></p> <p><i>Key Action</i></p>
WP	<i>Work Package</i>
MAS Portal	<i>Strategic partnership finder tool for museums and schools</i>
MAS Cabinet	<i>Virtual Museum Creator: a software developed for use</i>
MAS Hub	<i>Support Mechanism for MAS Virtual Community</i>
MAS Archive	<i>Open Access Educational Resources provided by the research team</i>
CLD students	<i>Culturally and Linguistically diverse students</i>
Social media	<i>The collection of software that enables individuals and communities to gather, communicate, share and in some cases collaborate or play¹.</i>

¹ Boyd, D. (2009). 'Social media is here to stay... now what?' Available at: <http://www.danah.org/papers/talks/MSRTechFest2009.html> (accessed 24 September 2018).

1. INTRODUCTION

The main objective of the Preliminary analysis in Phase 1 of this project, as described in D19 for the Phases of the MAS project, is to identify, update and integrate, on an ongoing bases, requirements for developing the MAS Infrastructure to ensure that it will be highly useful, usable, desirable and pleasurable. The preliminary needs analysis was necessary to understand the museums' usage of three major user groups of MAS platform -museum educators, school-teachers and students- in general, and their experiences with virtual museums in particular. To meet this goal, we have designed and conducted two web-based surveys: one targeted on museum educators and the other on school-teachers. We have also engaged in semi-structured interviews with four museum educators in Cyprus and three school-teachers, as well as carried out focus group interviews with 70 students from across Europe.

MAS aims to implement the project's goals at a large scale in Europe, while catering for local needs in Cyprus. Nine countries in total, including Cyprus, Estonia, France, Germany, Greece, the Denmark, Portugal, Italy and the UK, have contributed for the first phase of the project. Stakeholders from these countries are involved in the surveys, focus group interviews and relevant activities. The results from this preliminary fieldwork are presented and discussed below.

2. Baseline data: Museum educators and school-teachers' surveys

Two web-based surveys entitled "Sharing Practical Experiences about Online Virtual Museums" have been designed and launched since end-November 2018. The original Greek version has been translated into English, to facilitate the participation of the largest possible communities across Europe. The main target groups are museum staff, and primary and secondary school teachers.

2.1 Survey Design and Implementation

The surveys consist of several parts: Demographic data, IT infrastructure, Tools for learning, and Experience with an online museum. It takes on average 20 and 30 minutes to complete maximum 20 questions and 40 questions² in the student and teacher survey, respectively. From end-November 2018 to end-April 2019, responses from 70 students and 97 museum educators and teachers have been collected. As the surveys aim to capture data to address different needs of WP1, WP3, WP5, and WP6, they become inevitably long and some questions are thus made optional. Also, not all the teachers and students invited to take part in the surveys have had experience of using virtual museums.

There exists an uneven distribution of responses over the European countries, which can be explained by the fact that the surveys have been circulated by the MAS team to their networks who are more likely to have some experience with museums and/or education, whereas in other countries with not substantial network, the response rate was lower or missing.

The data were collected from random samples, avoiding skewing bias. Given the difficulty of involving the broader European school populations in this survey study, the

² As there are conditional questions in both surveys, the number of questions answered can vary with individual respondents.

representativeness of the current sample and the validity of the results could be compromised.

2.2 Results and Discussion

2.2.1 Museum Staff Survey

2.2.1.1 Demographic data

The majority of the respondents were museum educators from small to medium scale museums (62.4%), followed by museum educators from medium to large scale museums (30.6%) (Figure 1). The gender distribution was almost equal: male (52%) vs. female (48%). The respondents originated from 9 European countries with most of them coming from Cyprus (28%), followed by Estonia (17%), Italy (15%), Greece (12%) and Portugal (9%), etc.

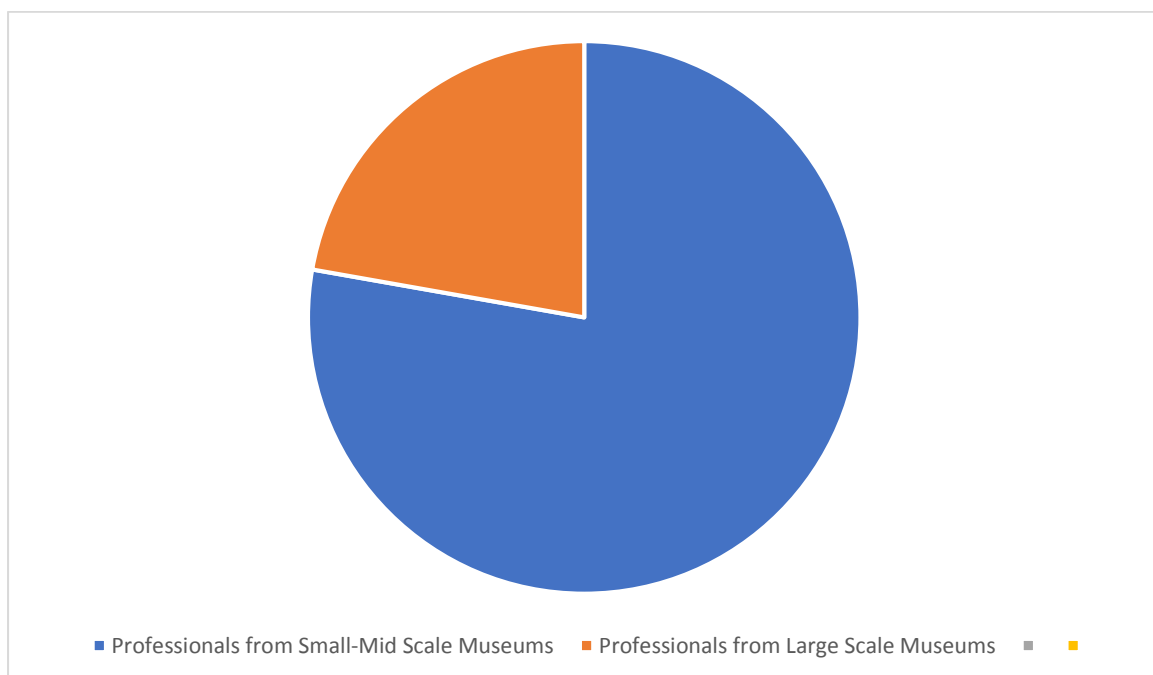


Figure 1. Workplace of museum professionals

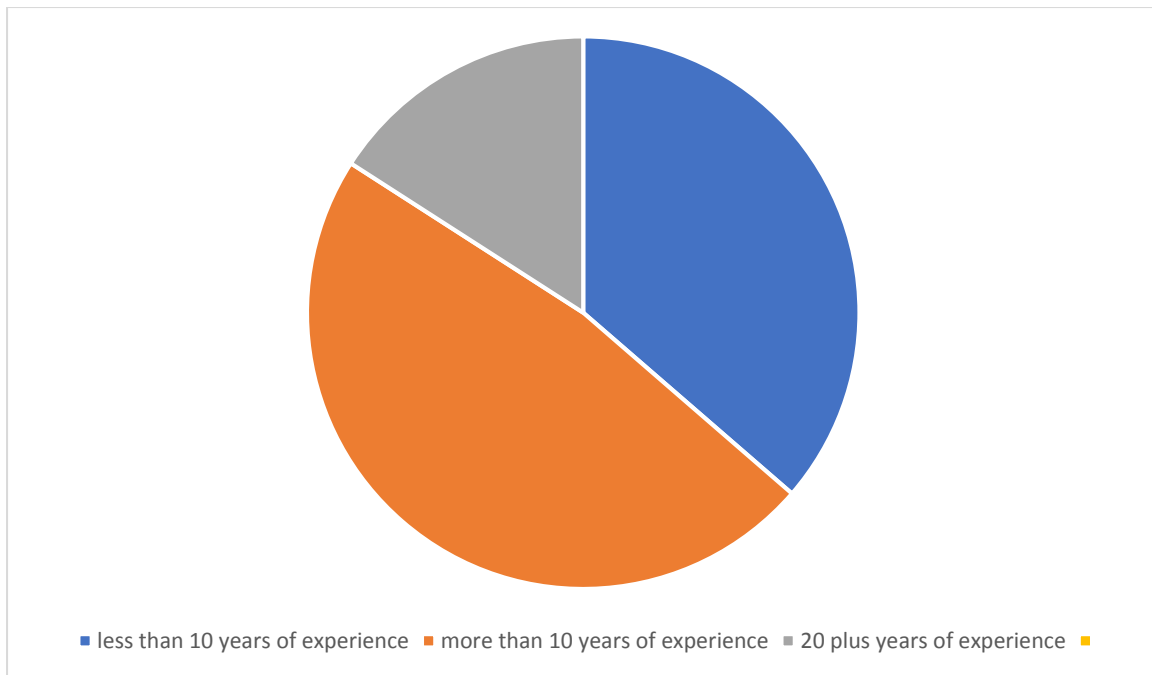


Figure 2. Years of experience of museum staff survey

2.2.1.2 Virtual museums Infrastructure

The survey results show that a typical user of virtual museums would use a desktop or laptop computer running Microsoft Windows operating system and Chrome web browser. Interestingly, only 17% of the student respondents had tablets as their primary IT device, whereas mobile phones were much less popular (4%). Chrome was the most popular web browser for the museum staff (60%), followed by Firefox (21%), Safari (12%), and a small percentage for Internet Explorer (Figure 2).

2.2.1.3 Tools for teaching and learning

The museum staff' responses indicate the frequency of the use of different software tools to support their learning. The frequency was divided into five ranges: never, infrequent (less than 2 hours per week), moderate (between 2 and 5 hours per week), frequent (between 5 and 10 hours per week) and very frequent (more than 10 hours per week). The tools were organized in five categories: search engines (e.g., Google, Bing), email (e.g., Gmail, Yahoo), social media (e.g., Wikipedia, blog, Facebook, YouTube), Microsoft Office software (e.g., Power point, Word, Excel)

and Educational software (e.g., games, computer-aided design). As shown in Figure 3, the museum educators used search engine and social media the most, followed by the moderate use of Educational Software, Microsoft Office and email.

2.2.1.4 Experience with virtual museums

The Student Survey was aimed to be distributed to respondents with the experience of using virtual museums for teaching and learning. Virtual museums can be classified into different types based on a number of specific elements, such as content, scope, communication, level of immersion, interaction technology etc., we decided to focus on content and interaction technology.

Types of Virtual Museums defined by their content are:

- [Archaeology Virtual Museum]
- [Arts Virtual Museum]
- [Ethnographic Virtual Museum]: A virtual museum concerned with Ethnography and having major collections in Ethnology or Anthropology. More in depth, Ethnography may be defined as both a qualitative research process or method (one conducts an ethnography) and product (the outcome of this process is an ethnography) whose aim is cultural interpretation.
- [Historical Virtual Museum]
- [Natural History Virtual Museum]
- [Technology Virtual Museum]
- [Design Virtual Museum]
- [Music Virtual Museum]
- [Fashion Virtual Museum]
- etc.

Classification by interaction with technology

This category includes all Virtual Museums defined in accordance with the type of

interaction. Interaction is related to the user capability of modifying the environment and receiving a feedback to his/her actions (V-Must, 2013).

[Interactive Virtual Museum] [LINK]: An Interactive Virtual Museum is a Virtual Museum responding to a user's input [ref. Oxford Dictionary]. It includes [device-based interaction] and [gesture-based interaction].

[Non-Interactive Virtual Museum] [LINK]: Assemblage of digital media providing the user passive (including emotional, intellectual and imaginative) engagement.

The respondents in this survey, both museum educators and school teachers, were provided explanations on each of the types of museums and terms used, for instance gesture, interaction design, multimodal interaction, tangible interaction, user experience, user interface. These are provided at the beginning of this deliverable as abbreviations.

According to the findings of this section of the survey, 48 out of the total 330 respondents reported that they had so: 43% have used virtual museums, 38% virtual learning environments, and 19% both. The level of experience with the virtual learning environments, tended to be low (Figure 4). The students were asked to name virtual learning environments they had used.

76% of the museum educators have learned from their professional development training/seminars about the virtual museum sites, which were predominantly in the domain of history and art (60%). The proportion of the virtual museums for chemistry, mathematics and biology was rather low (13%, 7% and 2%, respectively) and the other virtual museums were categorized as cultural heritage in general.

It was evident that around 40% of the museum staff experienced a virtual museum environment during their personal time, whereas a 36% have been exposed to it as part of a seminar without any interaction. The remaining 24% had the possibility to use a virtual museum environment during a museum programme, visit or exhibit. The majority (87%) engaged in such virtual learning experiences on an individual basis, which was complemented by some sort of professional development.

The museum educators were asked to report the source and type of help for deploying the virtual museum environment/s. Based on the responses, the most frequent source for support came from the instructions provided on using the virtual environments. Common setbacks included setting up, organising the lesson/guide, language barriers as not all users could understand the English interface, especially in the case of children. Other barriers included the access procedure (e.g., login) and navigation instructions (e.g. commands use), theoretical

knowledge required, and interpretation of results. The mostly sought help, not surprisingly, was from colleagues (76%) (n=212), followed by helpful resources of the virtual museum environments (7%), and others (2%) (e.g., Google).

The museum educators were asked to evaluate the virtual museum they had experience (Section 2.2.1.4) with nine given statements on the ease of use, usefulness, and intention to use (Figure 6) (cf. Technology Acceptance Model [TAM], Davis, 1989). In summary, most of the museum staff found the virtual museum with which they felt familiar, easy to use, helpful and inspirational, however were not convinced that the virtual museum environment was more effective than a real museum. The overall user experience with the existing virtual museums was positive (N = 249, $M = 3.44$ out of a 5-point Likert scale, 1: very negative, 5: very positive).

There were many desirable features of virtual museums described by the museum educators, with the most desirable one being ease of use. The museum staff in general enjoyed the interactivity features of the given environment, the realistic representation of objects and feasibility to use within the context of their professional activities, clarity and simplicity even among others. On the other hand, what emerged as well from the survey questionnaires are certain undesirable features of virtual museums used/visited. In particular, it was considered critical to access the museum labels and overall surface environment in the local language of the user. In addition, due to the capacity and technical infrastructure required (including Internet access and local servers) to run a programme/load a virtual environment, sometimes users left the page before it even loads. Other obstacles related to the lack of confidence in pre-requisite knowledge to use the virtual environment, unclear instructions, complicated interface or limited time to plan and/or conduct an activity. Most frequently, these museum educators would seek for support online, whether it was through tutorials (video, examples, FAQ) or translation, to overcome obstacles to do with the use of the virtual environment.

Overall, museum educators in this survey proposed solutions such as webinars to support use, lesson plans, developing simpler environments, enhance interactivity features and making them more user friendly in general. Regardless of their experiences, they appeared to have a generally positive stance towards the use of virtual museums in their regular educational programme or outreach activities at their respective institutions. Approximately 60% (N=22) of museum educators responded "Yes" to the question whether they would recommend the use of a virtual museum to their colleagues (cf. 18% "no"; 22% "don't know"), because it is enjoyable, appealing, useful, creative, helps to learn the topic, and provides access to new experiences.

2.2.2 School Teacher Survey

2.2.2.1 Demographic Data

About 60% (N=36) of the respondents to the Teacher Survey were primary school teachers. This group was followed by smaller clusters of secondary school teachers (25%), university teaching staff (8%), researchers (5%), and teacher trainees (2%). The average teaching experience was 14.7 years (N=60).

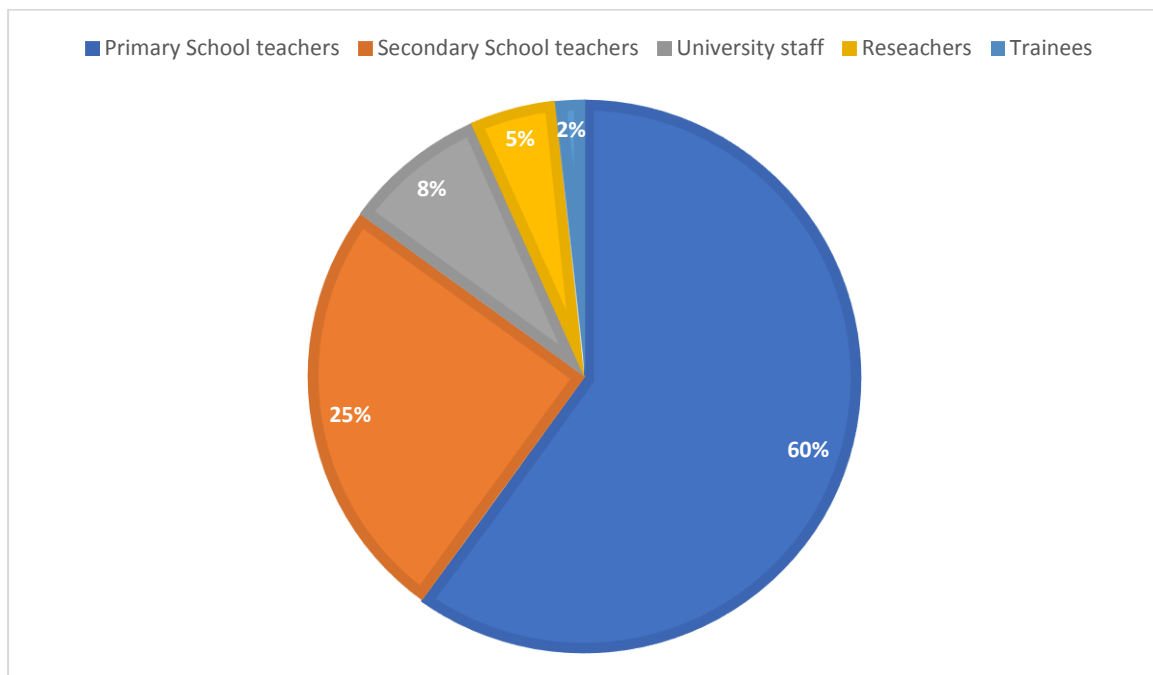


Figure 3. Workplace of museum professionals

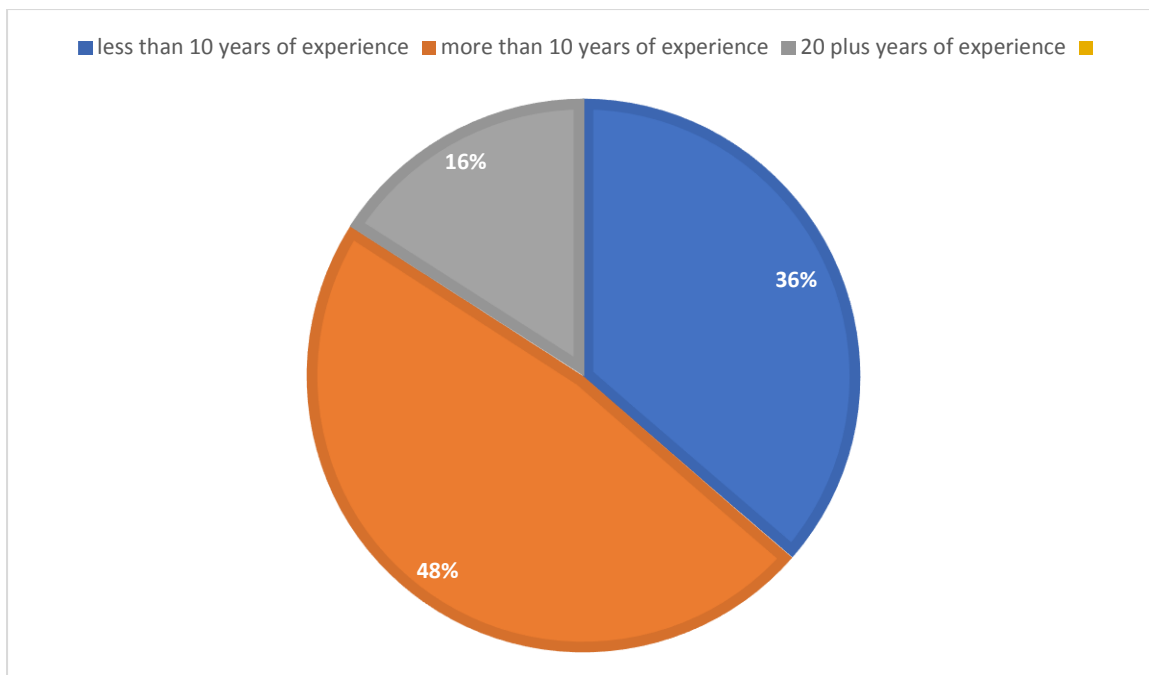


Figure 4. Years of experience of museum staff survey

The gender distribution of the respondents was close to even: 56% female and 44% male. The largest age group was 36-45 (Figure 8). Most of them resided in Europe and a smaller number in non-European countries (Table 1). The gender distribution was almost equal: male (49%) vs. female (51%). The respondents originated from 7 European countries with most of them coming from Cyprus (22%), followed by Portugal (17%), France (16%), Greece (15%), UK (14%) and Estonia (12%).

2.2.2.2 IT Infrastructure

Based on the survey findings, typically a teacher uses a school PC and laptop running the Microsoft Windows operating system with the Chrome web browser.

2.2.2.3 Tools for teaching

The school teachers' data report on the frequency of the use of software tools supporting teaching include a number of Course management systems (e.g., Moodle, Blackboard), Social

networking platforms (e.g., Twitter, Facebook), Web search/research (e.g., Wikipedia, Google search), Educational tools (e.g., Khan Academy, iTunesU, eTwinning), Video tools for sharing (e.g., YouTube, TED Talks) and File synchronization / cloud storage (e.g., Dropbox, Windows Skydrive). A Likert Scale was used to elicit details on the frequency, divided into five ranges: never, infrequent (less than 2 hours per week), moderate (between 2 and 5 hours per week), frequent (between 5 and 10 hours per week) and very frequent (more than 10 hours per week).

Evidently, almost all teachers reported using a web search, to support their teaching. In some instances, teachers reported use of video tools, in particular to enrich lesson planning. Social networking software was used in a moderate rate to share educational content and ask for advice (Section 2.2.1.3). Interestingly however, the educational tools were used only occasionally by the teachers (Figure 10).

2.2.2.4 Experience with virtual museums

Of the 60 teacher respondents who reported having experience with virtual museums, 44% had it with only virtual collection with no interaction, 30% only with virtual museums with little interaction and 26% had both. The level of experience with the different types of the virtual museums tended to be medium.

In addition to the list of the virtual museums given museum educators, the teachers provided some others. The virtual museums identified, were reported to be more commonly belonging in the non-interactive type, followed by device-based interaction and natural-based interaction and gesture-based interaction. In regards to the type of content most commonly engaging with, this was mostly natural history, archaeology and history or visual arts. The teachers' responses corroborated the museum educators' opinion (Section 2.2.1.4) that most of the virtual museums (68%) were designed for the age group of 13-18 years old.

The teachers have learned about the virtual museums from several sources: formal recommendations by an educational authority (e.g., part of a syllabus, an expert in a training course), web-based research on their own, informal recommendations by peers, and publications (e.g., science book, academic journal, magazine, newspaper). In addition, they have identified other sources of new knowledge about virtual museums, including training

activities (e.g., NEMO, European Schoolnet), conferences, workshops, university courses, and even from their students. The perceived difficulty of finding such virtual museums was considered average to substantially high.

43 teachers (out of the 60 responses) reported that they used the virtual museums mostly for recreational purposes as a demonstration tool that is not interactive for the students, while 26 used them as part of the lesson and curriculum deliver. Only 12 teachers used the virtual museums for homework assignments. There were cases reported when teachers used a combination of some or all of the aforementioned options. Furthermore, some teachers reported personal uses of virtual museums for training and self-study. According to the teachers, the students' interactions with the virtual museums were mostly implemented as end of lesson activities in a group (co-located).

While most teachers expressed that they did not need help in using virtual museums, when needed, looking up an instruction manual/online help text appeared to be a popular approach; the other options were asking a colleague and consulting(or receiving training from) the creator of the virtual museum. The amount of help needed by the students was estimated by the teachers to be rather low (for the scale of 0-100, $M=38$, $SD=29$). In case help was needed, the teachers supported their students with the lab access, text translation, theory understanding, lab navigation, experiment setup, tools demonstration, and results interpretation. These issues also correspond well to the lab features that were found difficult by the teachers.

The teachers were asked to indicate the extent to which they monitored the progress of their students when using a virtual museum with a scale of 0 (not at all) to 100 (all the time), and the relative importance of such monitoring to them again with a scale of 0 (not important at all) to 100 (very important). Around 67% of respondents stated that they monitored students' activity below average 34%.

The teachers were asked to evaluate the virtual museums they had experience with, drawing on nine given statements on the ease of use, usefulness, and intention to use. The general consensus is that most of the teachers found the virtual museums useful, easy to use, clear and motivating, and the perceived frustration level was low. The overall user experience was positive.

The most desirable features of the virtual museums contributing to the positive user experience included collaborative work, access to otherwise exhibits and content which would not be feasible physically, appealing visual layout/interface, exact representation of objects, and ease of use. The teachers also listed some undesirable features including limited availability for

booking, language constraints, technical problems, and not exact representation of the real system.

Most of the teachers were positive about the use of virtual museums. About 90% (51 out of 60 responses) of them chose "Yes" to the question whether they would recommend the use of a virtual museum to their peers (cf. 2 chose "no"; 14 chose "don't know").

2.2.2.5 Museum-based learning knowledge

The teachers were asked to indicate their own level of knowledge of the museum-based learning method and multiliteracies pedagogy with a scale of 0 (not at all) to 100 (very high), and the results show that on average they had a medium level ($N=181$, $M=52.1$, $SD=29.6$). Further investigation of the teachers' experiences with museum-based learning focused on *scaffolding* through using virtual tours or virtual museums as supplementary to teaching a lesson in the classroom. Results showed that the experiences tended to be positive. Particularly favourable to the teachers were the scaffolds for Data collection and Observation.

As a follow-up question, the teachers were asked to evaluate the necessity of such scaffolds. Two prominent ones in the "must have" category are "Making observations" and "Using lab tools and procedures" (Figure 16). This question was answered by a batch of 110 teacher respondents.

2.3 Conclusion on Museum Educators and Teacher Surveys

The two surveys, despite their limitations, provided a more up-to-date picture of the usage of virtual museums in some European countries. It was evident that both museum educators and school teachers, were positive towards the use of virtual museums, appreciating their potential

educational values. Nevertheless, the actual experience and usage of virtual museums was relatively minimum across these practitioners, with around one third of them who completed the survey, not able to respond to the question on virtual museums because of their lack of exposure to any of such virtual museums³.

Upon designing the survey questionnaire, certain challenges included succeeding to address the different research questions, which resulted to a rather long questionnaire, affecting the response rate to a degree. These results can inform though the members of the MAS team to make informed decisions of their respective work. For instance, knowing which IT devices are commonly used by teachers and students, would influence the technical team's decision on the main display resolution of the MAS Cabinet, system configuration, etc. Similarly, understanding which scaffolds are valued by museum educators and teachers, can help the pedagogical team design learning scenarios for the effective use of the MAS Cabinet and other tools developed.

3. DATA COLLECTION FROM INTERVIEWS

An important element of the research was to enquire into students' beliefs and attitudes towards virtual museums and museum learning in general. Therefore, it was decided to conduct semi-structured focus groups (Patton, 2002). For the focus group interviews, three groups of 3-4 mixed-sex students formed the population. This group size is considered manageable and is productive in revealing intra-group dynamics (Cohen et al., 2007; Krueger, 1994; Lewis, 1992). The decision to employ a focused type of interview with students instead of semi-structured interviews aimed to allow discussion in a non-directive way and delve into the evaluation of an emerging framework.

The philosophical and theoretical groundings of the MMP and the notion of multiliteracies informed the design of the focus group interviews, in that it was considered more appropriate to adopt an alternative approach that would suit the participants' needs and interests. The method was unique in that an online software which allows for the creation of audiovisual comics – considered as a multimodal text – was employed for the design of the focused

³ Note: These respondents completed the other parts of the survey, which provided us some useful information about their IT usage.

groups prior the intervention (Appendix 2Ia and 2Ib) and post-intervention (Appendix 2Ic). We hypothesized that the nature of group interviews using the audiovisual tool would motivate participants, in this case minors, to feel relaxed talking to each other and overcome anxiety or hesitation about offering views, opinions, or thoughts. It was anticipated that interaction in the group discussion - a basic characteristic of focus group interviews - would provide valuable information or insights, as the memories, ideas and experiences of individual members are stimulated when listening to others verbalizing their experiences.

3.1 Pre-pilot student museum attitudes

The following activities were implemented across 13 countries and all data from students were collected via the participating school-teachers and museum educators. Pre-pilot attitudes focus group interviews were conducted among 70 students prior to the prototyping phase of the MAS project, in order to determine their behaviour, interests, and perceptions towards museums. Instead of the traditional questionnaire, we were looking for a playful activity that would engage all learners into talking and participate in the session, even the timidest ones. For this purpose and to invite dialogue, we incorporated a scenario where the students read an online announcement, saying that a local newly established museum was looking for volunteers to contribute to its work. Two activities were undertaken to elicit data: filling in a 'Resume form' and a 'Museum Box' activity, the findings of which are described below.

First, the students were asked to fill in the resume including questions about themselves and their knowledge of museums to see if they are qualified to become volunteers at the museum (Figure 5).

Contact details
 Name:
 Age:
 School:

1. INTERESTS: Name 3 things:
You enjoy doing when you have spare time:

You do apart from reading homework:

2. SKILLS: Name 3 things you are good at:
 1
 2
 3

3. EXPERIENCE
Have you ever visited a museum; If so, do you remember which, when and with whom did you go?
 Yes
 No

If you answered YES to the previous question move on to 2A and 2B. If you answered NO move on to Question 4.

5. Circle all the words you feel relate to what a museum can offer to the visitor:

Work of art	fun
monument	curiosity
game	Heritage site
anxiety	culture
pride	interesting
adventure	discovery
civilization	knowledge
drama	education
fascinating	art
creativity	Critical thinking

4. Web of thought! A museum is ...

Figure 5. Short resume for student participants (Pre-pilot)

Following the 'Resume form', instead of directly questioning students' about their perceptions and attitudes towards the museum, teachers engaged students in an activity entitled 'Museum Box'. This activity is inspired by an activity called Mystery Box or 20 Questions in the activities proposed for the knowledge processes by Cope and Kalantzis (2000a). As a continuation of the scenario asking from the students to

become volunteers for our museum, teachers presented a wooden box to students to launch the activity and spark their interest. They then asked them to imagine what could

be inside the Museum Box. Students were intrigued by that and thought that there could be some objects inside. Teachers then opened the box and revealed folded papers with questions (Table 2). The questions were carefully designed to encourage students to think about the multiple ways and means of communication in a museum, how it differs from a school and their home, as well as derive core knowledge about these students' museum experiences. Initially students were reluctant to discuss about their experiences, but gradually they engaged in lively conversation, despite the language barriers, and seemed genuinely interested in the discussion. Providing the questions in English, Greek and Russian enabled participation in this activity.

Table 1: The questions asked for the Museum Box Activity in English

What does a museum look like?
What does a museum sound like?
What does a museum feel like?
Have you ever been to a museum?
Do you know any famous museums?
What was the most impressive thing that you found in a museum?
What did you like the most?
What would you like to see in a museum?
What kind of museums are there?
Why do museums exist?
Who runs a museum?
Who determines the content of a museum?
What do museums do?
What are they for?
What is a collection?
Why do people collect?
What is the role of objects?
How do we value objects?
How and why do they collect?

How are their objects catalogued and stored?
When and where are their objects displayed?
How are museum objects experienced?
What is a museum object?

Findings of the students' pre-visit attitude survey are summarised in Table 2.

Table 2: The modes and percentages of students' pre-visit attitudes towards museums (N = 70)

Attitude statements	Mode	Percentages
<i>i) Museums sound very interesting to me</i>	2	66
<i>ii) Museums are fascinating and fun</i>	3	39
<i>iii) I enjoy visiting museums</i>	2	52
<i>iv) I have good feelings towards museums</i>	2	38
<i>v) I would have liked to visit museums more often</i>	2	44
<i>vi) I feel more relaxed in a museum environment than in a school</i>	3	57
<i>vii) Museums are places worth visiting as they are stimulating for knowledge</i>	3	49
<i>viii) I am very interested in doing practical work about virtual museums</i>	4	73

Note: 5 = strongly agree; 1 = strongly disagree

Findings in Table 2 show that 66% of the students were undecided whether they disliked museums or not. With respect to the teaching and learning methods, 68% of the students indicated that they are interested in doing practical work involving virtual museums. On the other hand, the activities revealed that this group of students had limited or none experience of visits to museums in their local town, or abroad. Only twenty six students out of the seventy mentioned having visited a museum more than three times in their life. However, it was apparent from the discussion that the majority of students were keen to explore virtual museums and seemed mostly interested in topics related to nature, animals and technology and mentioned films, games and online sources related to these topics. In discussing what sort of museum they would be interested in visiting they mentioned a natural history museum, while they did not seem familiar with certain terminology used at the museum such as collections, exhibits, diagrams etc.

To supplement the interviews, a further writing assignment with students was pursued. In particular, after reading an audiovisual comic strip students were asked to fill in "Diary notes", a short diary of their daily activities in and out of school (Figure 6). The intention was to compare how much students learn through attending to still and moving images in their home context and how often these still and moving images are used for learning in classroom and elsewhere; thus revealing their frequency of engagement in literacy practices and the kind of literacies employed. Therefore the students were asked:

- To name a daily activity
- To name the means used to perform an activity (semiotic systems)
- To explain the reason for using/doing this activity

Aiming to retrieve insights on the level of understanding of these students regarding their literacy experiences the following questions typical in a literacy activity were implemented in the retrieval chart:

- To describe something they know from before that helps them complete this activity

- To mention what this activity/task reminded them of
- To describe what needs to be done to complete this activity/task

The important starting point is what students already know, asking them to use prior knowledge and connect this with new knowledge. This is referred to by Cope and Kalantzis (2005, p.45) as a "knowledge journey" which is a common activity in a Pedagogy of Multiliteracies. The former is of particular importance according to Cope and Kalantzis (2005, p.47) as it can provide unique insight understanding of the person's thoughts and ideas when experiencing the known and how this links to new knowledge.


Activity 	Symbol- means	Reason for using it	Something that I know and helps me complete the activity	This activity reminds me of...	To complete this activity I must...
<i>Finding pages on the web that have information on animals in extinction</i>	<i>Visual, linguistic, auditory</i>	<i>To find information for my assignment in Science lesson.</i>	<i>How to use search machines and how to save a file/image.</i>	<i>The last time I had to look up for something on the web for Science lesson.</i>	<i>Choose among animals in extinction only those found in your country</i>

Figure 6. Diary Notes Worksheet with examples for each category (Pre-pilot)

Based on the students' answers in relation to their literacy practices in the 'Diary Notes' Worksheet, there was an indication that most of these students were becoming multimodally literate; it was derived from their answers that they engaged in digitally mediated practices on a daily basis. Despite this, it was noteworthy that they had difficulty analysing their literacy practices and be critical on their decisions which suggested a low level of higher order thinking. Importantly, the discussion with these students indicated that those coming from different cultural and linguistic background appeared to have more difficulty than others finding examples to justify their responses and express their ideas, probably because they lacked the necessary vocabulary. Considerably, these students' family backgrounds and the support their families provided them were also significant frameworks to consider in regards to their lack of engagement and achievement in conventional literacy work (Alloway et al., 2002).

The findings from the interviews prompted the idea that teaching explicitly based on the content and form of multiliteracies pedagogy might be challenging for students who have limited experience in developing a metalanguage – to describe and evaluate meanings created by the relationships between image and word, or between images themselves (Kress & van Leeuwen, 1996). A review of provincial documents for the introduction chapter had confirmed that the Cypriot school curriculum had only started to include lessons targeted at multiliteracies in 2011. Therefore, ways to develop a learning design that would accommodate the age and cognitive development of the primary students in the sample while serving the purposes of the learning framework and the research overall were explored.

In addition, ability levels, and the interaction of ability and home environment, constituted the most important reasons why they lacked confidence in their literacy practices. All these parameters together with discussions with the school principal, teachers and parents as to gain more in depth information on the students' background informed the design of the project. The support from the school and their openness to

allow to the research were critical to the success of the MAS project. It was the data about students' classroom behaviours and low achievement, which informed the design of the MAS infrastructure in Phase II of the research to construct appropriate pedagogical scenarios.

3.1 Semi structured interviews with museum educators and school-teachers

3.1.1 Brief Description of Goals and Objectives

The main purposes of semi-structured interviews are to collect different stakeholders' views on the future of museum and literacy education where virtual museums can play a significant role, and to build a community to sustain communication and collaboration. The views shared were addressed in the pedagogical, organisational and technological aspects of MAS Infrastructure and can also be used for its future development.

3.1.2 Methodology and Organisation of Interviews

There were two major types of semi-structured interviews, face-to-face and online, which had a similar structure and organisation (details see D6.1). The in-depth interview is a technique particularly favourable as it is considered capable of providing a vivid picture of the participant's perspective on the research topic (Mack et. al., 2005, p.29). Semi-structured interviews were thought to be more appropriate to investigate museum educators' and teachers' perceptions regarding their experiences and practices in relation to multiliteracies pedagogy, culturally responsive teaching, and museum learning, prior the design of the MAS Infrastructure.

The reflective interviews took place during November-December 2018. Each interview lasted between 25 and 45 minutes, depending on the person's willingness and availability. The educators were approached as experts in their field, the goal being to "establish the subject as the one who knows and the researcher as the one who has come to learn" (Bogdan & Biklen, 1998, p.97). Also, care was taken to make participants feel welcome to share their experiences and be confident that their voices were heard and that their responses were not influenced by feedback from the researcher, acting to achieve a "balanced rapport" (Denzin & Lincoln, 2000, p.650).

An interview guide provided a means to systematically gain information about predetermined areas (Denzin & Lincoln, 2000). However, one of the strengths of the semi-structured interview type is that it can allow for the flexibility to use probing questions to illuminate particular pieces of information (Patton, 2002, p.343). The aim was to address all questions or topics listed in the interview guide, ask follow-up questions (some of which may be scripted in the interview guide) and/or probe participants for an elaboration of their responses in order to elicit participants' complete knowledge and experience related to the research topic.

4. RESULTS FROM INTERVIEWS

This section provides an overview of the emerging themes across the interviews with 7 educators (4 school teachers and 3 museum educators) in the MAS project.

4.1. Discussions

General: Both the school teachers and museum educators appreciated the idea of using virtual museums for teaching, as well as expressed the view that potentially such interactive learning is meaningful and appealing to students. A perceived understanding is that virtual museums could enhance learning opportunities for culturally and linguistically diverse students.

There was some level of uncertainty on how to use the technology, and if it is feasible to implement it in actual classrooms, with the limited time available. This opinion was prevalent among teachers, especially those who are not familiar with virtual museums or museum pedagogies at large. It was also mentioned that perhaps it is difficult to match the content of the virtual museums with all subjects. The more experienced teachers and museum educators, seemed eager to know more about the MAS Platform.

Scenarios: For the participants, a virtual museum environment, when designed with specific Pedagogical Framework in mind (such as the MMAF), is a motivating apparatus for engaging students to cultural heritage and participation, as well as interdisciplinary learning. They recognized the potential of the virtual museums to enable students to discover phenomena

and knowledge about topics in different ways, promoting critical thinking, more profound understanding and multimodal meaning making and awareness, while also encourage acquisition of key ICT skills. Most of the participants expressed willingness to try out the MAS Cabinet (Virtual Museum environment) and other features of the MAS Platform. Some participants even spoke about the potential to teach using the Infrastructure provided, via videoconferencing, when students work remotely at home.

Training and pedagogical scenarios requirements: It was unanimously considered good practice to have some form of training before using the MAS Platform for the first time. This could be a workshop or webinar, even a test drive in a way of the tools to familiarise with the interface. Other useful prompts would be small helpful tips, short screen casts and online user guides on performing various tasks in the environment. Some sort of forum for communication of ideas and sharing of learning plans and successful scenarios were thought to be imperative.

4.2 Organisational and Technical Barriers to Museum-School Partnerships and Virtual Museum Use

In discussing potential barriers to develop museum-school partnerships and use the MAS Cabinet (virtual museum environment) created, certain challenges were identified, categorised and sorted in terms of frequency (Table 3). Individual barriers and their possible solutions proposed by the participants are discussed subsequently.

Table 3. The categories of organisational and technical barriers derived from Phase 1 data.

Type of Barrier Organisational	Freq	Type of Barrier Technical	Freq.
Usability problems and content issues	28	Lack of experience with ICT	8
Limited access to the Internet and ICT	28	Ready-made solutions with low modifiability	6
Lack of time and curriculum match	17	Insufficient funding	3
Lack of training	14	Inadequate school support	2

Student management issue	9		
--------------------------	---	--	--

4.2.1 Usability problems

What is often the case with technologies implemented in the classroom, is a greater level of complexity than desired, which could inhibit a smooth use of the interface. The need to support students with variant ICT expertise and knowledge of the topic of interest in general, was a frequent concern. Another emerging issue is language, which it was considered best to be in the students' native language to avoid misconceptions. A multilingual interface and materials or localised guidelines with some examples on the use of the MAS Infrastructure should be provided.

Overall, the educators highlighted the need to have a simple interface with simple graphics, avoid long text, and complex instructions. Although a premise of the MAS project itself, it was stressed that differences in background, skills and capabilities of students should be addressed when designing the virtual museum environment.

4.2.2 Content issues

The conceptualisation behind the development of the MAS Cabinet, allows for a rather big level of flexibility on behalf of the teacher/museum educator and students, to upload content and arrange it accordingly. For instance, one group of students can work on a specific topic for a period in time, and then upload the content and present it to their peers. These explanations were provided to the interviewees who pointed out the need to introduce some sort of terminology behind the use of the virtual museums to students (and teachers). This could be in the form of an introductory workshop or landing page before entering the environment, to familiarise with the use of the environment. To make the most of the virtual museums, the developers should focus on content that is otherwise not accessible physically, and obviously content that is relevant and appropriate for the students' age/grade and curriculum. In regards to the Pedagogical Framework proposed, it would be essential to go over every knowledge process described and the affinity literacy zones, through some training, before being able to transfer this into the design of a lesson using the MAS Cabinet.

4.2.3 Lack of training and experience with virtual museums

Another important concern and suggestion at the same time, related to the lack of training in relation to the Pedagogical Framework of the MAS project. The idea would be to have training (whether online or physical), before being able to use the virtual museum for teaching or follow the instructions/guidelines during the virtual museum use. The need for training results from lack of confidence to use ICT in general, and insufficient experience with virtual museums in particular. There were also some further concerns from individuals with a rather negative stance towards the use of ICT for teaching. In this sense, it is important to establish systematic training on the MAS Infrastructure as part of their professional development. An important aspect, involves according to the educators to get familiar with the platform for performing various tasks.

Similar to educators, students should be given with opportunities to familiarise with the MAS Platform and in particular the virtual museum environment, to make engagement more efficient. Small bits of information in every page/step of the way, could be useful for users. Some teachers mentioned they would appreciate printed guidelines as well. Finally, the language where possible, should be native to the users. In terms of the virtual museum environment, this could be arranged if users picked their language of preference and downloaded that version of the MAS Cabinet.

4.2.3 Lack of time and curriculum match

One of the most frequently cited issues of concern amongst educators, especially school teachers, was time management and restrictions. Though using virtual museums in education could be beneficial for students, it would most likely require extra time and dedication to prepare a lesson plan to include the use of the virtual museum, and also to learn about the virtual museum environment. The issue of time is closely linked to the curriculum, and creates tension as to whether it is feasible to incorporate virtual museums and develop museum-school partnerships, given the pressure from curricula and tests. Moreover, curricula vary across the European countries, calling for virtual museums that could fit all the educational systems. Students near their final exams or their parents may be less motivated to use virtual museums, because they would prefer preparation for the exams, which employs a different methodology than the virtual museums and the Pedagogical Framework in MAS. To mitigate the issue of

curriculum mismatch, the content design of a virtual museum, should be based on the curriculum but not as detailed as per book chapter, because books change quite often and so is student assessment.

4.2.4 Limited access to the Internet and ICT

One technical challenge mostly reported by school-teachers rather than the museum educators in this research, was Internet access, reliability and connectivity, slow upload/download speed (bandwidth), etc. It was frequently mentioned that one of the biggest obstacles to systematic incorporation of digital devices in lessons, is the lack of access to ICT. There exists a limited number of computers in a class, if not only one for the teacher, or the Computer Room is not available when needed. Usually, these computers have low processing power (dated models) or lack of permissions for software installation. Thus, students are disappointed and do not feel motivated to use them, while they cannot often access them simultaneously. An alternative suggestion was to have an offline version of the virtual museums.

4.2.5 Ready-made solutions with low modifiability

The educators acknowledged the help of virtual museums for teaching complex phenomena and promoting cultural engagement of diverse students. They appreciated the ready-made pedagogical scenarios to be proposed, because of potential lack of time or expertise to prepare their one at first. What they suggested is having predetermined activities to modify based on their needs, like design educational activities with support from mentors (experts, peers, etc.) and also have access to pedagogical scenarios and resources proposed by others.

4.2.6 Insufficient funding

This challenge relates to the aforementioned barrier of ICT and Internet access. Obviously, the primary solution would be increasing the funding for technological infrastructure by some means.

4.2.7 Student management support issue

Virtual learning environments should provide appropriate monitoring of students' progress (real-time or post-exercise) and support the organization of the student work in the classroom (i.e. students involved in individual or group work). The number of students per class can play a role in the way virtual museums are integrated in instruction. Some teachers complained that the number of students in the class would be too large for managing this activity and that the simultaneous use of virtual museums by several students might not always be possible.

4.2.8 Inadequate school support

What is crucial is institutional support, whether it is the school or the museum where the professionals work. Despite general promotion of the use of digital devices and progressive instructional approaches, the actual situation is one where there is not sufficient support and encouragement for this activity and such initiatives are isolated.

4.3 Reflection on interviews

The findings from the interviews conducted with museum educators and school-teachers. There was a generally positive stance toward the implementation of virtual museums in their everyday professional routine. However, participants raised a number of important requirements, and expressed concerns over identified obstacles to meaningful implementation. Participants were given opportunities to reflect on their current teaching approaches and propose improvements or recommendations for the development of the MAS Infrastructure. These interviews complemented the findings from the surveys with a larger number of museum educators and school-teachers from across Europe. Significantly, these findings laid the important groundwork for the participants to build the community that could

support the continuous professional development of the teachers and the sustainability of the work of MAS project.

Clearly, there are still a range of personal, social, technical and organisational issues to be addressed for the mass uptake of virtual museums and establishment of sustainable museum-school partnerships. To gain more insights into the facilitating and hindering factors for the integration of virtual museums into the existing curricula and real practices, museum educators and teachers were invited to develop scenarios on deploying virtual museums in their everyday teaching. This objective is to be realised in Phase Two of the MAS project, the Prototyping.

5. Conclusion

The preliminary analysis phase in the MAS project is indispensable for understanding different stakeholders' needs, as well as goals and for evaluating how well the ongoing pedagogical and technical work of MAS could actually or will potentially meet them. Specifically, requirements have been extracted from the empirical data and prioritised in terms of necessity and impact. Amongst others, the main requirement is to render the MAS Portal more child-friendly for young students, who can vary widely in terms of language and other cognitive abilities as well as social skills. This high-level requirement is supported by several other more specific ones (e.g., making the language more age-appropriate and consistent with those used in curricula). In addition, the quantitative and qualitative results also support us to address the research questions relevant to the pedagogical team and participatory design team.

Above all, based on the participants' feedback, it is very encouraging to observe that the general acceptance of MAS is high. Specifically, the participants appreciated the key objectives of MAS project, including the ideas of integration of virtual museums in their everyday curriculum and employing learning scenarios and lesson plans, specific to the purpose of interdisciplinary teaching and learning. The participants were also optimistic about the direction the project has been taking, and were interested in finding out more information about the platform and to discover new laboratories matching their needs.

The participatory activities in the MAS project, will continue with visionary workshops and practice reflection workshops as the project progresses to the next phase. Both VW, which are to be replaced by Practice Reflection Workshop in Year 2, and PD activities, will be refined by modifying the current methods, techniques, and tools.

6. References

- Alloway, N., Freebody, P., Gilbert, P. and Muspratt, S. (2002). 'Boys, literacy and schooling: Expanding the repertoires of practice', Melbourne: Curriculum 426 Wayne Martino and Michael Kehler Corporation. Available at:http://www.dest.gov.au/sectors/school_education/publications_resources/profiles/boys_literacy_schooling.htm (Accessed: 3 September 2012)
- Boyd, D. (2009). 'Social media is here to stay... now what?' Available at: <http://www.danah.org/papers/talks/MSRTechFest2009.html> (accessed 24 September 2015).
- Denzin, N. K. and Lincoln, Y. S. (Eds.) (2003) *Collecting and Interpreting Qualitative Materials* (2nd ed.). London: SAGE Publications.
- Denzin, N.K. and Lincoln, Y.S. (2000) *Handbook of qualitative research* (2nd ed.). Thousand Oaks, CA: Sage.
- Mack, N., Woodsong, C., Macqueen, K. M., Guest, G. and Namey, E. (2005) *Qualitative*
- Patton, M. (2002) *Qualitative research and evaluation methods*. 3rded. London: Sage.
- Research Methods: A Data Collector's Field Guide*. Family Health International, North Carolina, USA.
- V-Must (2013). *State of the art on Virtual Museums in Europe and outside Europe*. DELIVERABLE REPORT. D2.3b. Available at chrome-extension://oemmndcblldboiebfnladdacbfmadadm/https://s3.amazonaws.com/academia.edu/documents/33005006/D2.3b_StateOfArt_VirtualMuseums_final.pdf?response-content-disposition=attachment%3B%20filename%3DState_of_the_art_on_Virtual_Museums.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWOWYYGZ2Y53UL3A%2F20200110%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200110T144733Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Signature=b7c3de0c5ec3a6718c57de40d6bfd174e2b555beb31bb4a8971e1d31771