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O4.1 - Digital Skills E-Assessment Tool - FINAL

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Table of Contents

Executive Summary

This report shows the work done for the O4.1 Digital Skills E-Assessment Tool. It covers work from May 2019 to August 2021 on e-validation of digital skills for the DigiCulture MOOC (Massive Open Online Courses). During this period, the DigiCulture project has designed the e-assessment tool, performed user testing with cultural stakeholders and produced content for the e-assessment tool. The e-assessment tool was then developed and integrated into the DigiCulture VLH platform.

The e-assessment tool aimed to work as an assessment method, which could automate assessment of whether learners had achieved new competencies and knowledge, to the extent possible within an automated paradigm. It was developed as a Quiz module in Moodle and guidelines were created to make sure questions from all partners adhered to the type of exam needed. Upon completion of the exam the e-assessment tool provided a certificate if users passed. The certificates were translated into all 7 languages for all 13 courses.

Objectives of this document

This document is divided into three sections. First, it defines what goal the e-assessment tool serves (*Background and Rationale*). Second, the method by which the e-assessment tool is going to be worked is described (*Methodology)*. Finally, the current e-assessment tool guidelines and design is described *(Preliminary Results*), and its implementation and integration is covered.

Who is this document for?

This document is for the DigiCulture partners who will have to implement and integrate the e-assessment tool into their own courses in the DigiCulture VLH. Secondly, researchers who work in the field of education, can make use of this document to understand how examination in an online context can be utilized for assessment of digital skill. Finally, the creative industry sector who wish to create online training platforms can benefit from this document through an understanding of how to validate learning amongst trainees and online course participants.

What topics are addressed in this document

The document addresses the following topics:

- E-assessment tool goals and scope.
- Method for designing the e-assessment tool.
- The current e-assessment guidelines include Preliminary Survey, Peer Assessment and Examination.
- Integration and development of e-assessment in partner courses.

Acknowledgements

Aalborg University is the author of this document. The DigiCulture project partners provided valuable feedback to the process through the transnational meetings, and have carried out interviews with learners across the country.

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1   Aims and Scope

The aim of this report is to describe the design of an E-Assessment Tool O4.1, for the DigiCulture MOOC. A mock-up of the tool has been produced - the mockup consists of a document which provides partners with guidelines for how they should examine adult learners in their online courses.

2   Background and rationale

The e-assessment tools serves the following goals:

1. To prove that our adult learners have "low digital skills" - or at least have interest in acquiring more digital skills.
2. To prove that the adult learners have obtained new skills, on completion of one/more courses.
3. Provide feedback to content by adult learners through peer assessment.

To accommodate those goals, the e-assessment tool will consist of two parts: a Preliminary survey which addresses Goal 1, and a Course Examination which addresses Goal 2.

The e-assessment tool was produced using agile development methods and user centred- design, by the direct involvement of end-users represented in the project by the cultural associations. Based on the design brief, from O1, a mock-up of the e-assessment tool was produced and tested with cultural stakeholders. The tool was peer reviewed within the partnership before final adaptations and validation, and then integration in O2 VLH.

3   Methodology, tools and research

O4.1 E-Assessment Tool

The E-assessment tool was produced as an initial draft which was then reviewed via semi-structured interviews with 3 cultural stakeholders. The feedback from the cultural stakeholders were then integrated back into the tool.

As part of the sign up process for the DigiCulture MOOC, each adult learner will answer a few questions which indicates what skills they are interested in acquiring. Their indications mark what kind of new digital skills the learners need. The examination part of the E-Assessment Tool uses the Moodle Quiz Tool to provide automated assessments of adult learners. In each course, partners should design 10-12 questions to be included in a summative test which should be indicative of the adult learners' abilities. After the Course Examination Part, finally a single self-assessment question is included to let participants subjectively indicate whether they believe they have acquired new knowledge, along with a feedback field which lets them write a subjective message.

For consistency in our e-assessment tool, we recommend using only Multiple Choice and Description types, to keep the bar for interaction as low as possible for adult learners. The other question types can require non-trivial interaction which block adult learners' submission and they are generally less useful when compared to Multiple Choice questions (especially in terms of feedback possibilities).

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4   Results

Preliminary Survey Guidelines

The guidelines described that preliminary surveys follow this question template:

Which of the following skills would you like to learn?

❏   How to Design Virtual Reality and Augmented Reality Experiences
❏   Creating and Publishing Digital Content
❏   Protecting and Licensing Data
❏   (list of courses continues) ...

Table 1. Preliminary survey as designed by the e-assessment guidelines.

Afterwards, the preliminary survey shows recommendations to the learner for courses.

Peer Assessment of Creative Content

During the DigiCulture transnational meeting in Graz it was discussed how creative content could be evaluated. It was agreed to propose a method of *peer assessment*, in which learners can review each other's work and thereby provide valuable feedback to each other. The courses should provide tools which make learners capable of evaluating others' material, as part of the learning activities within the DigiCulture MOOC. The peer assessment will not play any direct role for whether the adult learners pass or fail courses. This is because the evaluation of creative content can be subjective, even if it involves feedback. Later, a concrete implementation plan was released to show how partners can integrate peer assessment into their courses.

Examination

The e-assessment is designed to pass adult learners who can demonstrate lower level learning and apply their knowledge in real case scenarios (5 questions each). The resulting grade is Pass/Fail. Passing requires answering at least all lower level learning questions correctly. Passing allows users to earn a course badge. Underneath are recommendations for the question types which count towards passing.

✓ **Recommended Question Types**

●   Questions which test lower level learning. (2-4 questions)
     Fx. "What is Virtual Reality?

●   Questions which test distinguishing between concepts. (1-2 questions)
   Fx. "Pick the image which shows a Virtual Reality system."

- Questions for identifying the meaning of terms. (1-2 questions)
  Fx "Augmented Reality means creating an experience which takes place in.."

- Applying knowledge in real case scenarios. (3-5 questions)
  "A colleague wants to try Virtual Reality. What should you warn her about?"

 Question Types to Avoid

- Highly complex questions which test higher levels of learning.
  Fx. "Please analyze the following three scenarios and choose the correct assertion."

- Self-assessment questions in context of the course material.
  Fx. "Do you understand the term "Virtual Reality"? (Yes/No)

- Questions which require parsing graphs that can be inhibited by graph illiteracy.
  Fx. "In the graph below, what sort of relationship is found between VR Sickness and Time?"

- Questions which assume knowledge outside course boundaries (fx math).
  Fx. "Using the formula below, how do you derive the virtual object's location in Augmented Reality?"

E-assessment Feedback

The Moodle Quiz Tool is capable of providing immediate feedback. For the final assessment, we instead recommend online courses to provide deferred feedback, but not reveal the right answer. In addition, we recommend that individual feedback is given based on the chosen answers to each question. The quiz should be designed with types of feedback which trigger based on how many previous questions were answered correctly (we recommend 50% as the pass mark).

PASS FEEDBACK   FAIL FEEDBACK
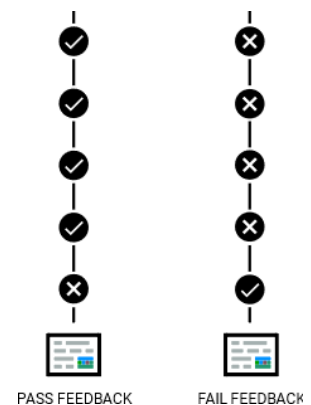
User-testing results

We conducted user-testing to evaluate what kind of exams these types of creative skills should be paired with and whether our question scheme made sense. Three participants from three countries tried a short version of an example of a quiz to earn a badge. After completion, they provided feedback on which types of questions they liked and what they expected would be necessary to receive such a certification.

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The individual results can be seen in Table 2. All participants found 'case scenario'-type questions that required applying knowledge in a concrete context to be most interesting and useful, as they required more critical thinking and were representative of a real-life situation. The type of questions most suitable would depend on whether the course conferred theoretical or practical skills. Another participant expressed a desire for feedback after submitting exam responses.

Participant 1 Italy	- The participant thought that the case scenario question was most effective as it was testing understanding in context. It represented a challenge you would likely face in real-life. - The participant raised an issue with the wording of the questions. He said they were very broad. - He also said it would be nice to get some feedback after submitting a response, which explains why the answer was correct or incorrect
Participant 2 Ireland	- The participant stated that the quiz is extremely simple, maybe a fourth option could be added. She especially liked question number 3: "A colleague has designed a Virtual Reality system for a natural science museum. Visitors to the museum will wear a wireless VR HMD and walk in a 100 meter virtual tunnel. What limit of Virtual Reality should you make her aware of?". She thought this question requires a bit of critical thinking, while the others don't. - The participant suggested implementing the text of question number 3 as follows: "What limit of Virtual Reality should you make him/her aware of?". - She thought it would be better to create more questions like the number 3: for her, this kind of questions can test and show a deeper understanding of the subject. - She found it easy to navigate through the quiz: its organisation is good and clear.
Participant 3 Denmark	- When asked about preferences on the different questions, the participant commented that it depends whether the course represents theory or practical skill. The participant thought practical skill would be most useful - for instance, the Adobe courses which he had attended examined him in his technical understanding, ie. which menu item to use and where it was located in the Adobe Photoshop software suite. - Of the different question types, the participant thought the case studies sounded like the most useful.

Table 2. Participant answers regarding e-assessment in the DigiCulture MOOC.

Development and Integration into VLH

Through peer review, each partner had to fill in a spreadsheet detailing how and what completed course content should trigger course completion and allow the adult learner to go through e-assessment, taking the exam. Table 3 and 4 below, illustrates how these requirements were specified.

course Section	assessment	activity	activity name	completion criterion of activity	how many? If completion requires n
0	preassessment	quiz		received grade	
1	formative	book	what is Virtual Reality	viewed	
1	formative	book	Case studies of Virtual Reality	viewed	
2	formative	book	Augmented Reality	viewed	
3	formative	book	360 experiences	viewed	
4	formative	forum	VR! Create your own!	created posts	1
5	formative	forum	AR! Create your own!	created posts	1
6	summative - final exam (for badge)	quiz	Examination	received passing grade	-

Table 3. Requirements for passing the course and going to the final exam for the Augmented Reality and Virtual Reality course.

courseSection	assessment	activity	activity name	completion criterion of activity	how many? If completion requires n
0	preassessment	quiz		received grade	
	formative	book	Defining digitisation	viewed	
	formative	book	Examples: Transkribus and Photogrammetry	viewed	
	formative	book	Task: Create a 3D model with QLONE	viewed	
	formative	forum	QLONE	created posts	
	formative	book	Defining data models, metadata standards, vocabularies	viewed	
	formative	book	Examples: Getty Vocabularies and Wikidata	viewed	
	formative	book	Task: Create your own data model	viewed	
	formative	forum	Data Model	created posts	
	formative	book	Defining Collection Management Systems and Repositories	viewed	
	formative	book	Examples: Europeana and Omeka	viewed	
	formative	book	Task: Create an online collection	viewed	
	formative	forum	Omeka	created posts	
	formative	book	Definitions and contexts	viewed	

	formative	book	Examples: Europeana, Google Arts & Culture, StorymapJS	viewed	
	formative	book	Task: Online collections and virtual exhibitions; StorymapJS	viewed	
	formative	forum	Online collections and virtual exhibitions	created posts	
	formative	forum	StoryMap	created posts	
	formative	book	Defining Folksonomies and Crowdsourcing	viewed	
	formative	book	Examples: 'What's on the menu?' and Artigo	viewed	
	formative	book	Task: Emigrant City	viewed	
5	summative - final exam (for badge)	quiz	Examination	received passing grade	

Table 4. Requirements for passing the course and going to the final exam for Digital Curation - Digital Libraries and Museums.

AAU and UPT were in charge of taking these changes and performing technical implementation, such that e-assessment and badges would trigger based on the requirements from the partners.

Each partner was responsible for developing examination content for the DigiCulture courses and did so using the developed E-assessment tool guidelines. The guidelines ensured a certain base level of consistency, while still giving the partners individual freedom to create their examination as they wanted. Figure 1-3 below are screenshots from the examinations in the different courses.
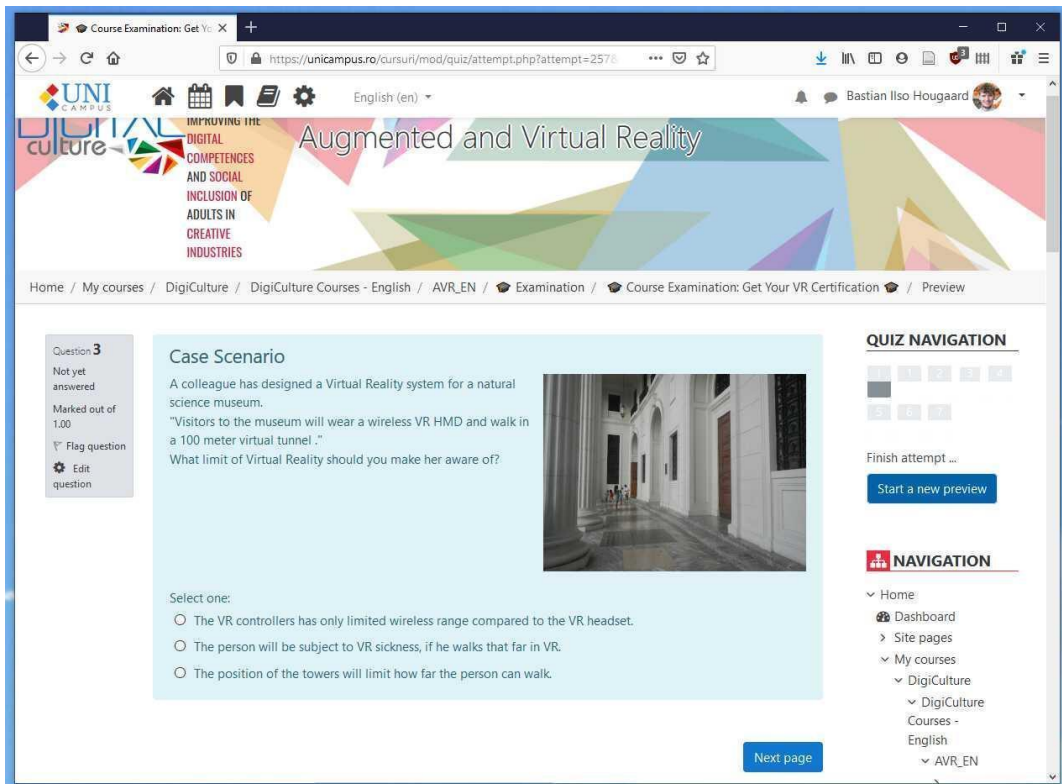
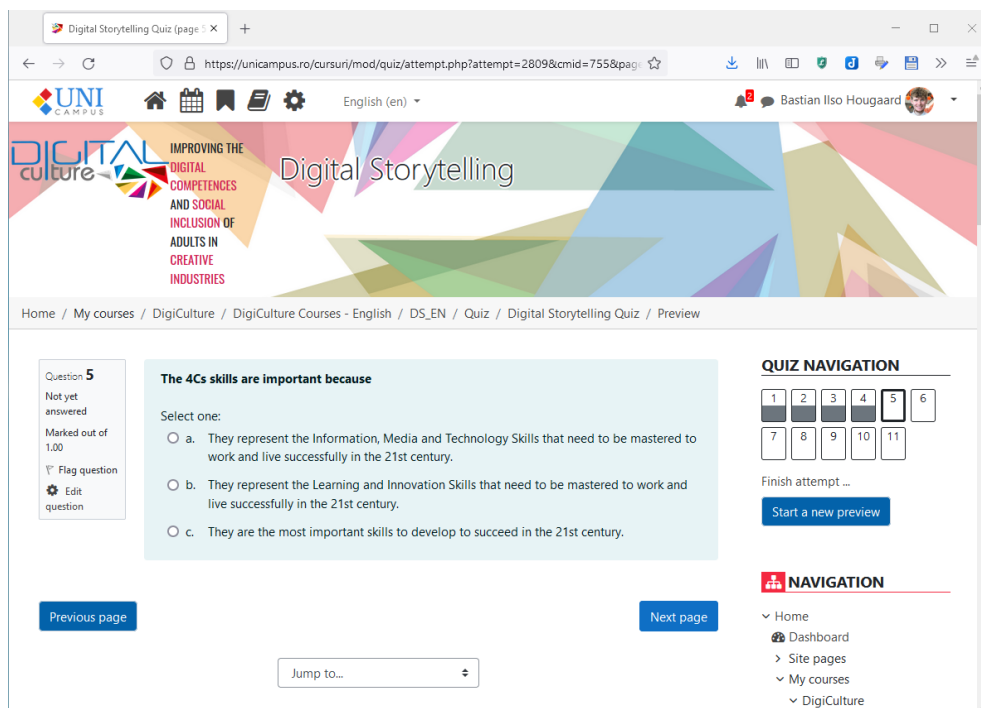*Figure 1. Screenshot from the Virtual Reality & Augmented Reality examination*

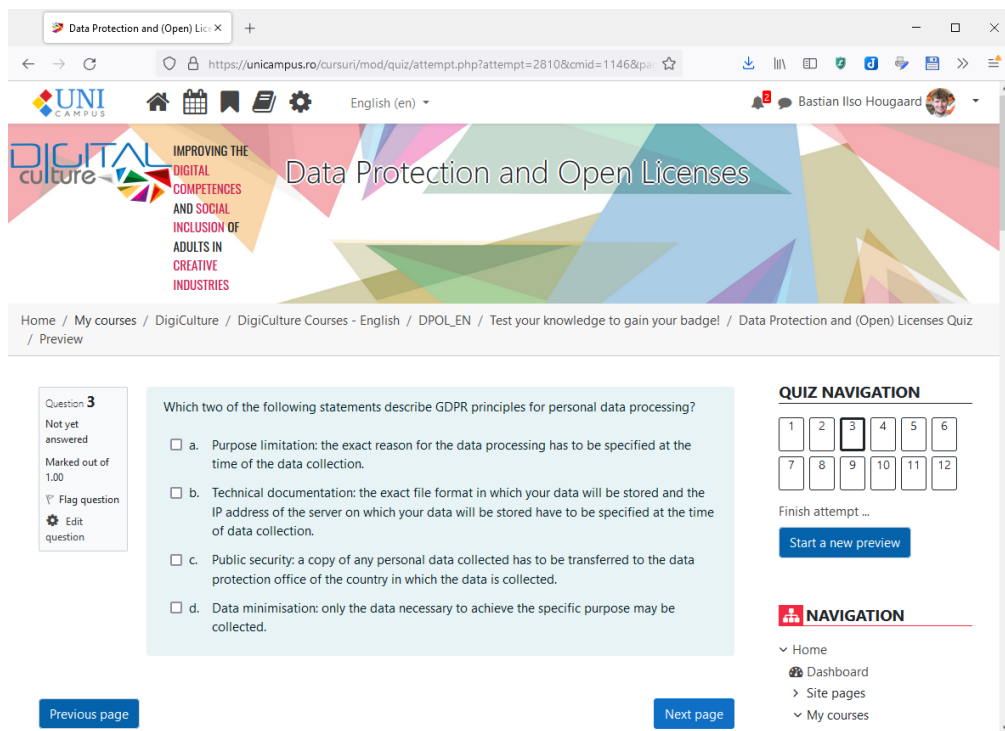*Figure 2. Screenshot from the Digital Storytelling examination.*

Figure 3. Screenshot from the Data Protection and Open Licenses examination.

To aid development and implementation of e-assessment and badges into Moodle (the VLH used by the DigiCulture MOOC), AAU developed a slideshow for partners to provide an overview of Moodle functionality. Figure 4 below, provides an overview of what these slideshows covered, divided into two perspectives: 1) What can the teachers do to create badges and define competencies in Moodle? 2) How can the students earn badges, share badges and complete competencies in Moodle?

Teachers	Students
Create Course Badges/activity completion	Earn badges through activity completion
Add Competency Framework	Download badges/ connect to backpack
Import competency frameworks	Share badges
Create Scale	Complete competencies
Add /link Competencies to courses	Earn badges through competencies
Add/link Competencies to activities	Attach evidence /students
Linking Competencies with Badges	Review manual evidence/teachers
Create learning plans	Review automated evidence/teachers

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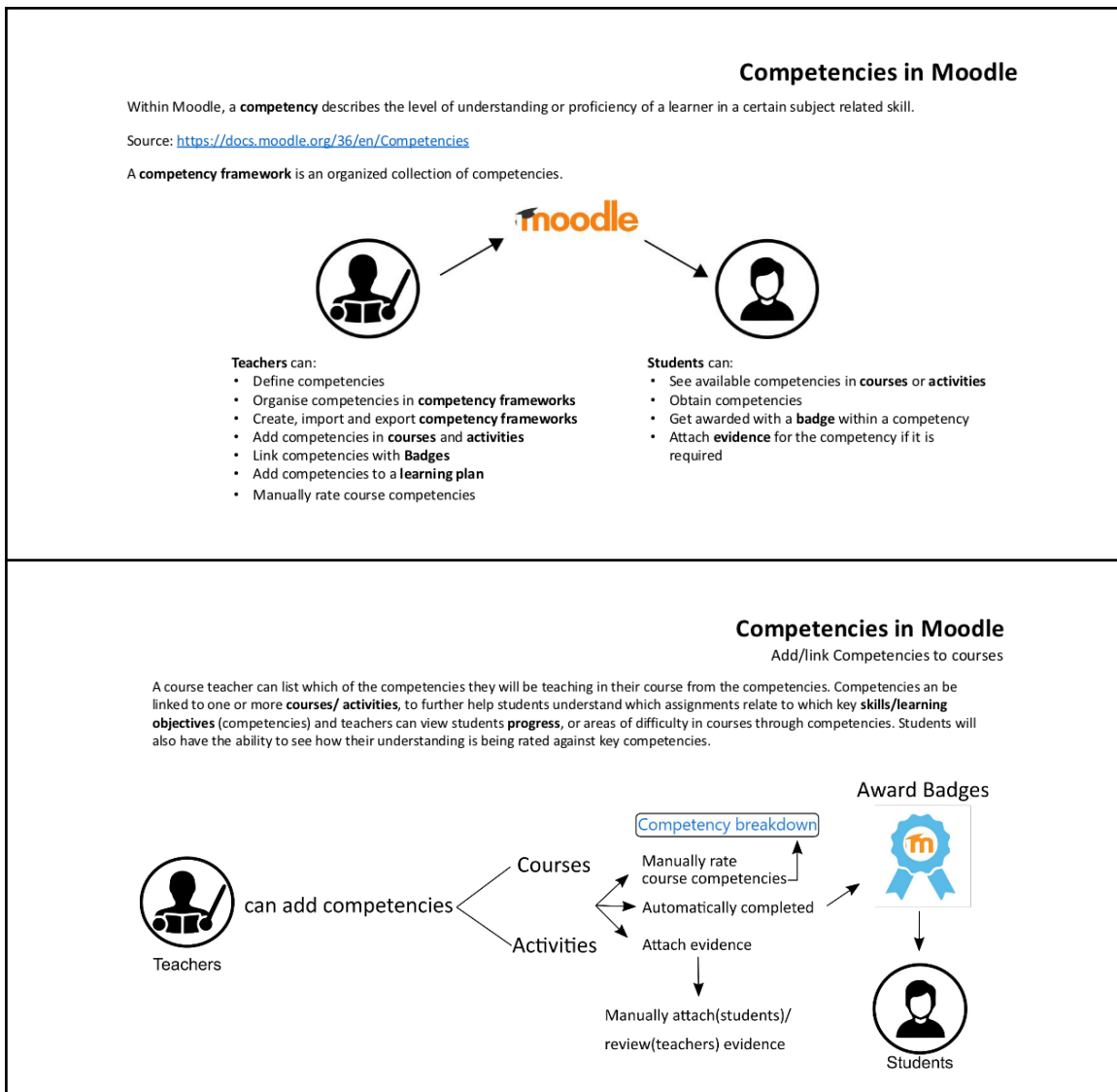Erasmus+ Programme
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Figure 4. Excerpts from overview slideshow providing assistance for developing the e-assessment and badges into the DigiCulture VLH (129 slides total).

Developed Self-assessment content within DigiCulture courses

In addition to the e-assessment which needed to be implemented, self-assessment was also designed for adult learners to reflect on their own learning before and after completing the course. To encourage participation, the questions were turned into a self-reflective activity, seen as part of the activity in the course. All partners developed questions which were tailored to each of their courses and linked to the digital competences from the Digital Competences Framework 2.0 (EU Science Hub, 2015). Figure 2 below shows an example of such a question developed for the Augmented Reality & Virtual Reality course.

Augmented Reality & Virtual Reality course

Prior to the course:

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Linked Competency: (How well can you create and edit digital content in Augmented Reality)

How well do you think you can complete the following task?

"I can create an augmented reality application prototype which i can share with others."

☐ 1 - Not at all

☐ 2 - Poorly

☐ 3 - Adequately

☐ 4 - Well

☐ 5 - Very Well

Linked Competency: (How well can you create and edit digital content in Virtual Reality)

How well do you think you can complete the following task?

"I can create a virtual reality application prototype using images from the internet."

☐ 1 - Not at all

☐ 2 - Poorly

☐ 3 - Adequately

☐ 4 - Well

☐ 5 - Very Well

Linked Competency: (To identify needs and problems about Virtual Reality in digital environments.)

How well do you think you can complete the following task?

"I can explain the creative limitations of Virtual Reality to others."

☐ 1 - Not at all

☐ 2 - Poorly

☐ 3 - Adequately

☐ 4 - Well

☐ 5 - Very Well

Figure 2. Questions developed for the Virtual and Augmented Reality self-assessment questionnaire. Similar questions were developed for the other 12 courses in DigiCulture and translated into 7 languages.

Questions developed for acquiring learner background

In addition to the self-assessment questions in each course, the DigiCulture MOOC also included introductory courses where adult learners had to provide information about their background. This background information was used to triangulate the self-assessment questions and provide context for their answer choices. The complete questionnaire is shown in Figure 3 below.

Status in creative industries:

□ working in cultural and creative industries

□ volunteers in cultural and heritage organizations,

□ artists or volunteers to traditional fairs

□ actors in traditional skills activities (old tradition artists, dancers, wood and ceramic, etc)

□ freelance
□ artists (musicians, amateur performers, etc)
□ stakeholders (including managers) in creative industries, culture and museums, architecture, humanities
□ student
□ teacher or working in educational institutions
□ unemployed

Organization:
(Write name)

How would you describe level of Internet access:
□ Very high speed access
□ Good access
□ Average access
□ Poor or erratic access
□ No answer

How experienced are you with Digital tools?
□ Very experienced
□ Experienced
□ Somewhat experienced
□ Not at all experienced
□ No answer

Have you previously learned/educated online?
□ Yes, frequently
□ Yes, sometimes
□ I have looked at some courses
□ No, this is my first time
□ No answer

Please indicate if you fall into any of the following categories:
□ Cultural minority
□ Disability
□ Roma or traveller group
□ Other minority group
□ Economic obstacles
□ Learning difficulties
□ Geographical obstacles - remote areas
□ Health problems
□ Refugees or social barriers
□ other/none

Please select all those that apply to your current activity/profession/work environment/area of study
□ Museums, galleries and libraries
□ Music, performing and visual arts
□ Advertising and marketing

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□ Architecture
□ Crafts
□ Design (product, graphic and fashion design)
□ Film, TV, video,radio and photography
□ IT and computer services software and web/mobile development
□ Publishing
□ Tourism
□ Other (next page) …

Other current activity/profession/work environment/area of study:

(Write answer)

Figure 5. Questions from the pre-course signup questionnaire, used to triangulate self-assessment.

5   Discussion

Partners collaborated on a qualitative investigation, which required direct involvement of end-users (adult learners and potential employers). We produced 3 interviews with CI stakeholders and used the results to update the e-assessment guidelines. The team developed the e-assessment tool as described in the results.

6   Conclusions

O4.1 E-assessment has settled the design and recommendations for all partners. All project partners developed and integrated the e-assessment tool into the DigiCulture VLH for each online course, following the guidelines agreed upon.

7   References

European Commission: The Digital Competence Framework 2.0 - EU Science Hub (2015), https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework