Final Report of Intellectual output 3

HOW WE CAN HELP UNIVERSITY COMMUNITIES TO HAVE THE RIGHT DIGITAL SKILLS TO BE ABLE TO IMPLEMENT THE DIGIMATES APPROACH

Do educators have the necessary digital competencies to successfully implement the online game-based learning?
and how could our project improve the less developed digital competences of our communities?

Prepared by

Spanish DigiMates Team from Universidad de León, Spain

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CONTENT

INTRODUCTION

The European Higher Education Area (EHEA) advocates the implementation of educational methodologies complementary to the traditional ones to face the new socio-educational context. Active methodologies are one of the most interesting approaches to develop cooperative learning and student involvement in the classroom. The use of these methodologies is highly recommended in digital learning environments. Gamification is used as a motivational and student engagement technique in the learning and teaching process in digital environments. The game acts as an attention activator and in most cases as a nexus joining the academic and non-academic life of the students. Through the game, the students put into practice skills that they have learned in both formal and non-formal contexts while they receive feedback in the short, medium, or long term that translates into a reward for them.

Besides, Gamification can be deployed in different devices, ranging from smartphones, tablets, computers...Most students have some of these devices with them, so in case sudden situations occur, they can use them to continue their learning.

Moreover, current COVID-19 related situations revealed that there is a need to improve teachers' digital competences for e-learning. The AIM of this IO was to design and implement an online training program for academic staff and students. The specific objectives of this IO were the following:

- To identify teachers, students and staff needs in terms of digital competences to be able to achieve the method.
- To improve the digital readiness of the participants in general for e-learning
- To impulse the promotion of the process of integrating more playful educational resources to improve students' learning engagement.
- To provide advanced training on e-learning, focusing on the use of gamification as a teaching resource in courses under e-learning or blended learning model.

The online training program developed was based on basic digital literacy for educators. This module, was designed in the line of area 3 of the European Framework for the Digital Competence of Educators (DigCompEdu); on managing and orchestrating the use of digital tools in teaching and learning. With this module, professors acquired basic digital skills for the adaptation to technological, organizational, and social-communicative changes that are required to learn in a digital context as well to react in situations such as the Covid-19 pandemic. Other areas need that developed were the selection, creation, and sharing of digital resources for digital learning environments and learning of good practices.

The first step was the analysis of teachers' needs in terms of digital competences implemented transnationally, which means that the needs were analyzed in a variety of teaching and learning contexts at the national level of each project partner and at the international European level. Moreover, related programs focused only on the development of digital competences of teacher skills

needed to carry out a gamified learning process. Proposed online training program were innovative because it enable teachers to gain both types of relevant skills in the international environment.

Objectives of this IO 3

The steps decided to be implemented in this Intellectual output try to answer these questions:

- Do educators, have the necessary digital competencies to successfully implement the online game-based learning? For doing this, a complete analysis and identification of basic digital competences needed by teachers, and an analysis of the digital competences needed to successfully implement the DigiMates method were done. We also did an analysis of the digital competences required by others users of the method, like students and staff members.

- The second question was to design How could our project improve the less developed digital competences of our communities? To do this, we designed and developed an online training program and we implemented this on online courses for learning digital competences.

1 DO EDUCATORS HAVE THE NECESSARY DIGITAL COMPETENCIES TO SUCCESSFULLY IMPLEMENT THE ONLINE GAME-BASED LEARNING?

The DigiMates method needs the development of digital skills, not only by the students, but also from the teachers in charge of the DigiMates method development. The Covid pandemia, and also the involvement with digital native students, demands better digital competences to be able to organice digital activities.

In the last decades, the world has experienced a digital revolution that has underlined the importance of digital competences. The development of these digital skills is a key factor to meet the evolving needs in relation to employment, personal development and social inclusion. In addition, the advance in digital competences is essential for innovation in education and training practices.

Acknowledging the professional, educational and social digital transformation currently taking place, the European Commission has developed a Digital Competence Framework (DigComp) with the aim to improve citizens' digital competences, allowing self-evaluation, setting learning goals and allowing to identify learning opportunities. This framework also allows to promote the development of a high-performance digital education ecosystem, refine digital competences and capacities to support the digital transformation, and reinforce cooperation in terms of digital education at a European level. Among several examples under implementation, the Spanish Ministry of Education, Culture and Sports has adapted this framework and used it as a strategic tool to plan and design education development. In this line, the DigiMates Alliance is aware of the importance of promoting capacity building for the digital transformation of the education and learning system among all partners' participants (students, professors and staff) that allow to reinforce personal, professional and educational skills.

In order to achieve this goal, the first step aims to identify digital competences that need to be strengthened within the DigiMates project. Strategies that foster the development of these digital skills in the long-term will be designed and new methods in learning and education that will contribute to the digitalization of the higher-education system will be implemented.

Identifying gaps and proficiency levels of digital competences

The main purpose of this evaluation was:

- To gather information on the skills and digital competences of the members within the DigiMates parnership to identify the gaps that DigiMates project faces in relation to digital competences and skills.

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- To assess proficiency levels according to the level of knowledge and skills on digital competences, with the objective of defining a list of digital competences and tools that can be used as a basis to design instruments for the long-term improvement of digital competence performance, educational training, and career guidance and professional development.

Methodology of asses the degree of proficiency in digital competences

In order to assess the degree of proficiency in digital competences and skills, that allows to identify potential weaknesses that need to be dealt within the alliance, this study uses as a reference the European Digital Competence Framework for Citizens (DigComp), which includes 21 competences that are grouped in five different competence areas:

1. **Competence Area 1: Information and data literacy**
    1. Browsing, searching, filtering data, information and digital content.
    2. Evaluating data, information and digital content.
    3. Managing data, information and digital content.

2. **Competence Area 2: Communication and collaboration**
    1. Interacting through digital technologies.
    2. Sharing through digital technologies.
    3. Engaging in citizenship through digital technologies.
    4. Collaborating through digital technologies.
    5. Netiquette.
    6. Managing digital identity.

3. **Competence Area 3: Digital content creation**
    1. Developing digital content.
    2. Integrating and re-elaborating digital content.
    3. Copyright and licenses.
    4. Programming.

4. **Competence Area 4: Safety**
    1. Protecting devices.
    2. Protecting personal data and privacy.
    3. Protecting health and well-being.
    4. Protecting the environment.

5. **Competence Area 5: Problem solving**
    1. Solving technical problems.
    2. Identifying needs and technological responses.
    3. Creatively using digital technologies.
    4. Identifying digital competences gaps.

The degree of proficiency for each competence has been established by defining four proficiency levels for each competence, that are subdivided into two levels each:

1. **Foundation:** users are able to do simple tasks with a guidance and based on remembering.
2. **Intermediate:** users are able to solve well-defined and routine tasks, and straight forward problems based on their process understanding.
3. **Advanced:** users are able to solve different tasks and problems and guiding others applying their knowledge.
4. **Highly-specialised:** users are able to solve complex problems with limited solutions, integrating knowledge to contribute to the professional practice and to guide others, as well as to create content.
5.

In this study only the first domain of proficiency levels (i.e., foundation, intermediate, advanced and highly specialized) will be used.

With the aim of gathering useful information from the different partner universities in the alliance, that allows to determine gaps in the level of digital competences and skills, we conducted a survey targeted to university members (i.e., students, professors and staff), using a questionnaire generated by Ikanos enterprise, the Ikanos Digital Skills Test (https://test.ikanos.eus/index.php/566697). This test was developed by the Basque Country Government in Spain in 2014 and is based on the DigComp Framework for digital skills of the European Commission. It has been successfully completed by 70.000 citizens, professionals, teachers or students until 2020.

Additionally, in order to accomplish specific professional and educational characteristics and skills of each target group we used three versions of the test. These are, the Ikanos DigComp test for students, the Ikanos DigComp test for the teaching force and the Ikanos DigComp test for citizens (for staff). The Ikanos DigComp test for students and the Ikanos DigComp for the teaching force consisted on an adaptation of the Ikanos DigComp test for citizen to the specific characteristics of students and teachers.

The Ikanos tests were distributed between the five university members of the project: University of Dokuz Eylul (Turkey), University of Gdansk (Poland), University of Heilbronn (Germany), University of León (Spain), University of Ljubljana (Slovenia). A minimum participation of 5 % of the total amount of students, professors and staff from each university was recommended. At this point it is important to remember that all the universities except the University of León inform that they have several difficulties to get answers from students, teachers and staff from other faculties different than the Economics one. In any case, for this report we may understand that these answers recovered will represent each of the universities involved in this project.

The Ikanos test allows us to evaluate every area of the DigComp European framework, including information regarding:

- The ability of filtering, assessing and managing data, information and digital content.
- Interaction and collaboration through digital technologies.

- Citizen participation through digital technologies and netiquette.
- Digital identity and security. Protecting personal data and privacy.
- Tools for digital creation.
- Knowledge of copyrights and licenses of use.
- Problem solving abilities.
- Safeguarding health and environment through technologies.
- Identifying needs and technological responsibilities.

Finally, we estimated the percentage of participants or respondents (i.e., students, professors and staff) for the four levels of proficiency (i.e., founded, intermediate, advanced and highly-specialised) and per each assessed digital competence from DigiComp framework.

Results

The total number of respondents from the five allied universities participating in the study was 728 students, 448 professors and 313 staff (table 1).

Table 1. Number of questionnaires answered by each university of the project, divided by role in the community (student, teacher or staff member).

	Students	Teachers	Staff
University of Dokuz Eylul (Turkey),	43	42	12
University of Gdansk (Poland),	40	12	11
University of Heilbronn (Germany),	107	17	6
University of León (Spain),	454	350	271
University of Ljubljana(Slovenia).	84	27	13

Data analysis have shown some disequilibrium in the proficiency level of digital competences among the three participant groups (i.e., students, professors and staff).

Conclusions and identified less developed digital competences and tools

This study has allowed to identify a range of digital competences that need to be strengthened as well as the target groups where we must focus our efforts within the alliance onto improve skills in order to get a better level of digital performance and vocational training. These identified competences could be listed as follows:

Competence Area 1: Information and data literacy
1.1 Browsing, searching and filtering data
Competence Area 2: Communication and collaboration
2.2 Sharing through digital technologies
2.3 Engaging in citizenship through digital technologies

2.4 Collaborating through digital technologies

2.6 Managing digital competences

Competence Area 3: Digital content creation

3.1 Developing digital content

3.2 Integrating and re-elaborating digital content

3.3 Copyright and licences

3.4 Programming

Competence Area 5: Problem solving

5.2 Identifying needs and technological responses

5.3 Creatively using digital technologies

5.4 Identifying digital competence gaps

2   HOW COULD OUR PROJECT IMPROVE THE LESS DEVELOPED DIGITAL COMPETENCES OF OUR COMMUNITIES?

In order to develop these competencies in the personnel, it was decided that it would be interesting to develop a series of free training courses and make them available to the university communities. Therefore, the preparation of a series of courses (Table 2), carried out by the 5 universities of the project, has begun.

Designing of courses

The courses were proposed as asynchronous phases with (videos, digital resources, etc). The first introduction video with a presentation of the online training program and an introduction of the materials, contents, assignments, and outcomes. The participants consulted the materials, use the forums, establish collaboration and cooperation with their peers, and live the experience of a learner in a digital context, and they will have later to complete some exercises and activities to assure the participation and understanding of the courses.

It was decided to develop them in Moodle Platform, so we must explain the possibilities that this platform has and prepare some videos about how to enroll in the platform for students and teachers outside university of León, the university owner of the platform.

Table 2. Name of courses developed in DigiMates project, countries that will develop them, teachers in charge and links to the courses into the moodle platform.

Country	Course title	Name of the teacher	Link of the course
Turkey	5.2 Identifying needs and technological responses	Aysun Kapucugil Ikiz	https://ariadna.unileon.es/course/view.php?id=1364
		Banu Demirel	
Germany	2.4 Digital Collaboration & 3.1 Developing Digital Content in Global Business	Susanne Stetter	https://ariadna.unileon.es/course/view.php?id=1365
Slovenia	3.3 Copyrights and license.	Mitja Kovač	https://ariadna.unileon.es/user/index.php?id=1366
Poland	2.3. Engaging in citizenship through digital technologies	Aleksandra Aziewicz	https://ariadna.unileon.es/course/view.php?id=1370
		Przemysław Wysiński	
Spain	3.2 Integrating and re-elaborating digital content.	María Fernández Raga	https://ariadna.unileon.es/course/view.php?id=1326

These courses all had the same structure, which was decided among all of them. Each course consists of 5 videos of 10 to 15 minutes, after each of which a short activity of test questions or other short activities that can be self-corrected is required.

First, a course was made by Spain as a model, so that members of the other universities could take it and give their opinion on the structure, length of the videos and activities. Once the structure was agreed upon, all the universities began to design their courses with the help of the University of León. The translation of the videos into native languages was also discussed, but it was finally decided to leave them in English.

The courses were open to the public from November through February, with a total of between 39 and 52 students (Fig 1, 2 and 3). The numbers of men and women are quite similar, slightly higher in the case of women (Fig 1a). In terms of countries, it is Spain, Slovenia, Germany, Turkey and Poland (Fig 1.b).
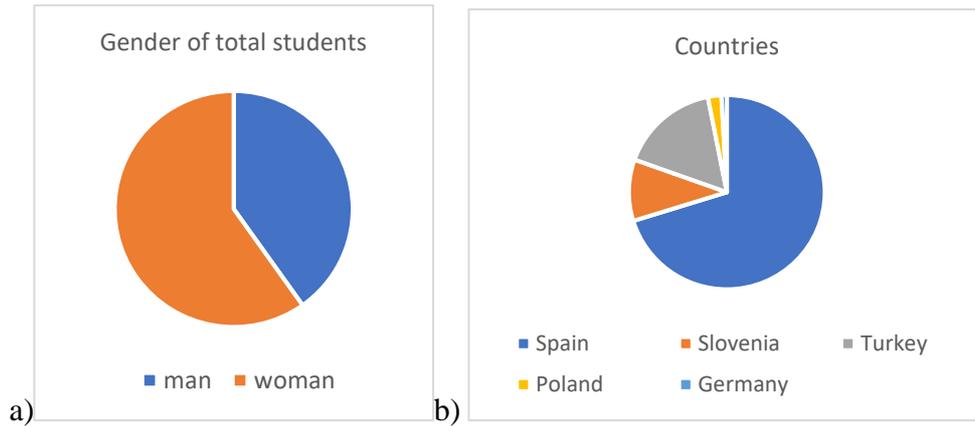
Fig. 1. Data analysis of students enrolled in the courses a) Number of female (orange) and male (blue) students who attend the courses b) origin of students depending on the 5th countries from DigiMates project.
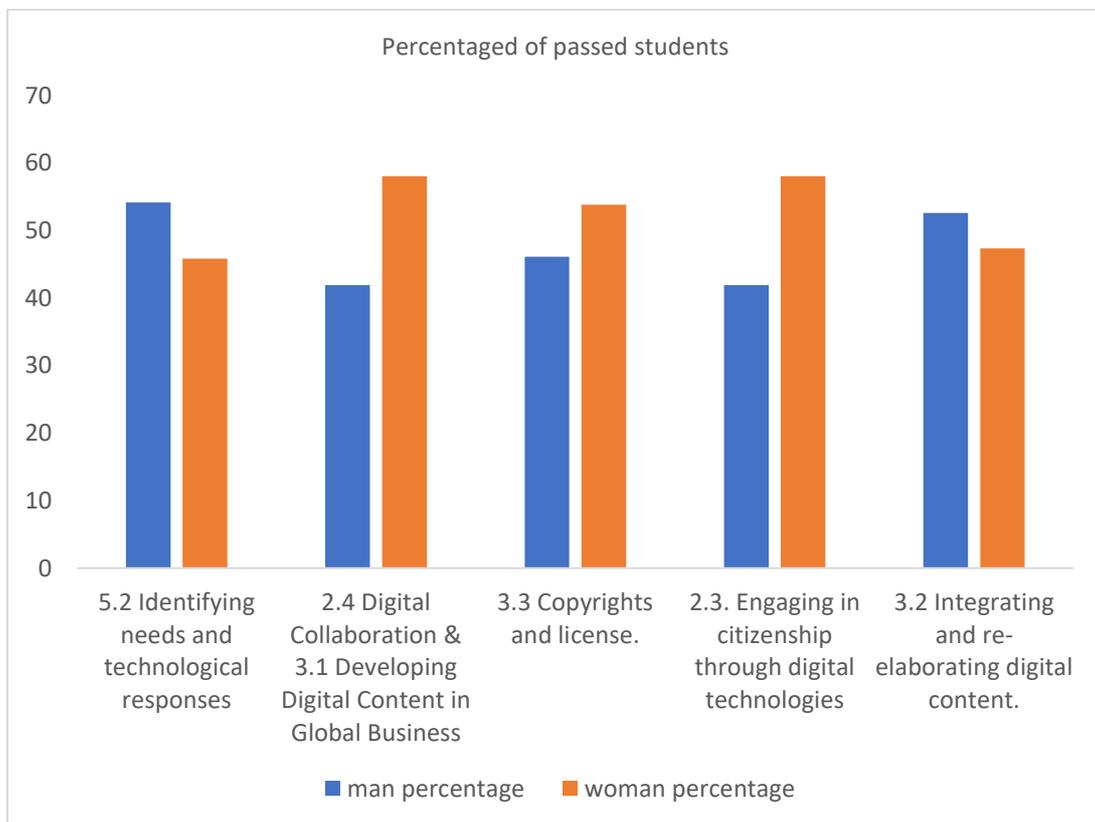

Fig. 2. Percentage of students who complete all the activities of each course per gender.

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**Number and Gender of total students**
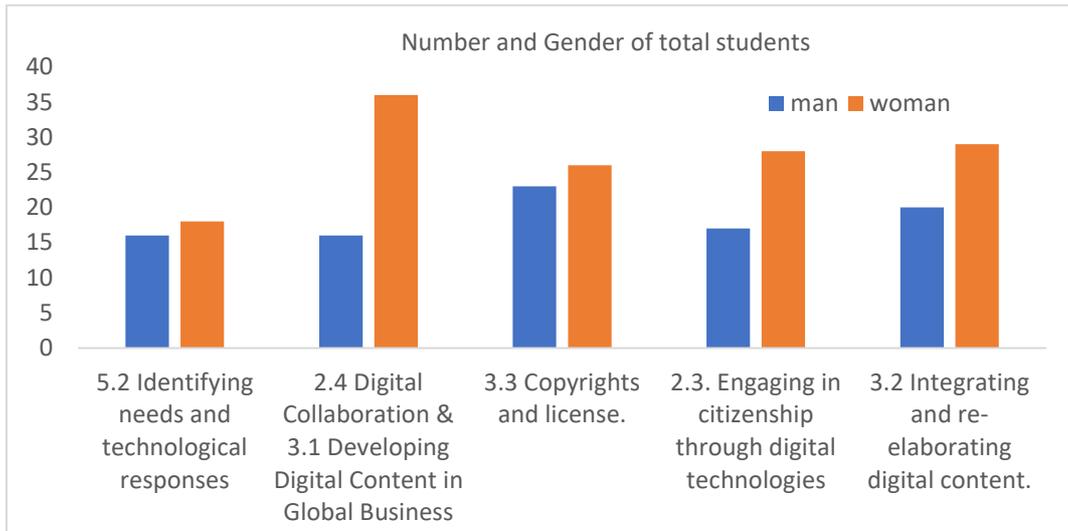
Fig. 3. Number and gender of students who complete all the activities of each course.

After the courses were completed, the exercises and videos made by the participants were reviewed and a certificate of achievement was awarded for each course.

Issues with the development of courses

In some countries from this project the email address was recognizing by Spanish moodle platform as "possible virus" so it does not allowed to enter with that institutional email address. It was thought that the structure @something.sth.sth with 3 words were the problem. So we asked to that university to use their private email account to enroll in the free courses, and it works.

Another issue was that the size for uploading videos to moodle platform was 5 Gb maximum, and some videos exceed this size. It was solved by asking the teachers to upload the videos to youtube and put the link into the courses.

The last issue was that some countries were very protective with their personal data, but the moodle platform need some identification number to be sure that the person trying to enroll was a real person. So for those countries which don´t want to use real identification numbers, we asked them to invent one. The trouble appears when several people select the same number to be identify like "1234" or "1111". In this case only the first person enroll with this number was able to enter in the course.
For future courses we will assign a number for each interested person in attend in order to solve this future issue.

3   OTHER PAPERS AND PUBLICATIONS FROM DIGIMATES TEAM LEADER BY SPANISH TEAM

In addition to these courses, this project has participated in the presentation of the results in several conferences, congress and international journals. In this point we will show that presentations.

FECIES 2022 Congress

Together with the rest of Digimates project, we present a symposium entitled "**THE ROLE OF GAMIFICATION IN HIGHER EDUCATION FROM THE PERSPECTIVE OF THE DIGIMATES PROJECT**" in FECIES 2022 congress (https://www.forofecies.com/), presenting 4 sessions:

1. "**Designing game-based learning method in higher education: a comprehensive approach**" by María Fernández Raga, Darija Aleksić, Aysun Kapucugil İkiz, Susanne Stetter, Joanna Bednarz, Adriana Suárez Corona, Aleš Toman, Banu Demirel, Susanne Wilpers, and Magdalena Markiewicz.
2. "**Determining the level of digital competences in the DigiMates community**" by María Fernández Raga, Adriana Suárez Corona, Roberto Baelo Álvarez, Alicia Quirós Carretero, Fernando Santamaría y Mario Grande de Prado.
3. "**Game-based learning in higher education: A bibliometric análisis**" by Darija Aleksić, Aleš Toman, Jure Erjavec
4. "**Toolkit**" by Susanne Christine Stetter.

Article in Sustainability, 2023

Spain was the main coordinator of the article that we have sent to be published in the journal Sustainability, entitled "**Development of a Comprehensive Process for Introducing Game-Based Learning in Higher Education for Lecturers**" DOI: 10.3390/su15054453 (Fernández-Raga, 2023), which describes from a general point of view what steps a professor should follow to gamify his subject, in order to promote project-based learning in teachers of different educational levels. In this paper, a comprehensive procedure for introducing a cost-effective game-based learning method in higher education, which includes thirteen steps to help lecturers introduce game-based activities straightforwardly into their teaching processes was developed. In addition, we also present security, cultural, and quality assurance issues that need to be considered when implementing game-based learning in higher education. This article has been very welcome by several universities and schools, and we have received more that 10 emails asking for information about development of game base learning in different subjects.

Collaboration with Nice Network 2022

In addition, a presentation has been prepared for the Nice Network 2022 conference, entitled "Do educators have the necessary digital competencies to successfully implement the online game-based learning?" by María Fernández Raga, which was presented together with others similar presentations carried out by the others colleagues from DigiMates project about each IOs.

4   COLLABORATION FROM UNIVERSITY OF LEON WITH OTHER INTELLECTUAL OUTCOMES.

In relation with the IO1, we have to organize several interviews with teachers and students, and also focus groups with groups of students and teachers, trying to detect the impression and best experiences that they think should be implemented for the designing of Digimates methodology.Later, a translation of all the information recovered during this interviews was done, and an analysis of the main conclusions also.

For the final implementation of the DigiMates Method, and in the IO2, we proceeded to design a real engineering problem, the fall and rise of a new engineering bridge (Fig. 4). Together with sloven team, the definition of the main roles for the students from engineering present in Spain was defined, because University of Leon is the only one with an engineering profile. The topic selected was the construction of a bridge because it touches on a multitude of disciplines, from engineering to economic aspects, personnel control and law.

Fig. 4. Pictures showing the section of the Castro viaduct in the province of Leon has collapsed during refurbishment work.

It has been designed in such a way that students with different complementary training in all these areas, together with their professors of these subjects and belonging to the different universities of DigiMates, collaborate creating multidisciplinary groups that try to solve this complex problem. For example, in the case of the Spanish students, engineering students, these students will have to provide the technical solution of how to design a new bridge with an indicated budget, and meeting certain requirements of location, use of materials, time, functionality, etc. that have been defined by the teacher. Each Spanish student will collaborate within a multidisciplinary group formed by colleagues from all digimates countries and of course from all different backgrounds. In this way, all the teams, which will be formed by students from different countries, will be able to respond to the global challenge of building a bridge.

After designing the activity, it was presented to the students from each Digimates country, and was received with great enthusiasm by them, who understood that it was a great opportunity to collaborate with other students, have an intercultural exchange, improve in their languages, learn how to work as a team, and all this in an entertaining and playful environment.

To collaborate with IO4, a number of questionaries and interviews were done also with students and with teachers, trying to get the technical, legal and social issues related with the implementation of a methodology online. A resume and some documents were to be filled in order to define the best approach to design the method Digimates.

And for the collaboration with IO5, a report was done, describing all the aspects and issues that we found interesting for the creation of the Toolkit were defined, in order to create the part of the toolkit about the evaluation and improvement of the digital competences. This report, together with some videos produced by us, were added to the final tookit.

5 DIGIMATES METHOD MULTIPLIER EVENT ON UNIVERSIDAD OF LEÓN

On 27th march the DigiMates Method was presented to the community of Universidad de León the Digimates project. A total of 12 people (5 teachers and 7 students) were listening to the work done in the total project, the results achieved and the usefulness for their future work in Spanish.

After the presentation, which lasted one hour, there was a time reserved for questions. A total of four people asked to check the available information and the toolkit to use for their teaching. The focus in different areas (language teaching or didactic). And they specify about the utility and interest that this project has represented for them. We have the session recorded.
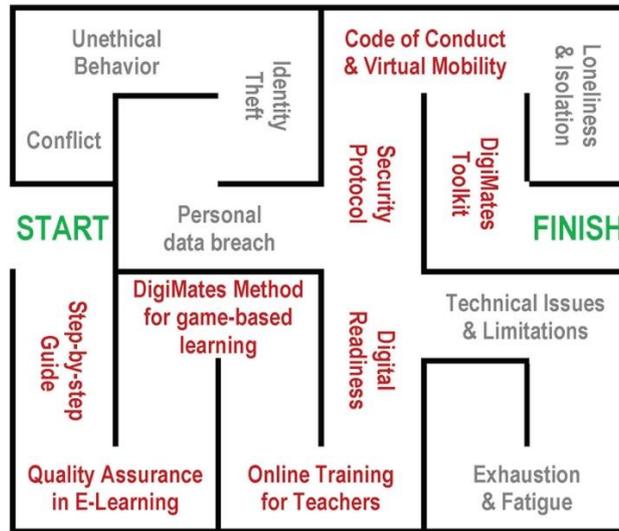
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Fig. 5. Poster presentation of the multiplier event.

CONCLUSION

The Evaluation of quality of e-learning among partner institutions should be a recommended action to be carried out on a frequent basis in universities in order to carry out more useful training actions aimed at implementing digital skills useful for university staff. It is very interesting because it allows a provision of information about teachers needs in terms of digital competences, contributing to the development of online program training for educator. The findings of this analysis of digital competences needed for e-learning will gain the attention of academics and regional policy makers. The results show that the digital competences less developed in each country does not depend on the country or university, but mainly in the role, differencing the digital competences less developed in teachers, students and staff members.

Online teacher training program improve the competencies that teachers need for their work in today's rapidly evolving learning environment, designing a valuable online training program that equip teachers for successful game-based teaching in an online environment. Having an international approach to developing the online training program for learning digital competences of teachers, the course was relevant for teachers from any country or any academic discipline. Moreover, the course was transferable to any discipline in which digital and game-based-learning competencies are required. Some issues due to the structure of the email address and related with the process to identify people and law of data protection along different countries of Europe must be considered, because it complicates the functionality of the course. Moodle was the platform selected as the best platform for the development of the courses in a collaborative way, but it limited the activities that must be implemented, and also the length of the videos. The different timetable and holydays of the different countries were also another issue that should be considered.

Finally, this IO3 have encouraged discussion at universities about how to enable the sustainable development of the competencies that teachers need for their work in today's rapidly evolving learning environment. The fast evolution of digital technology requires a faster preparation of our teachers to be able to offer students content that engage them from the very beginning.

REFERENCES

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