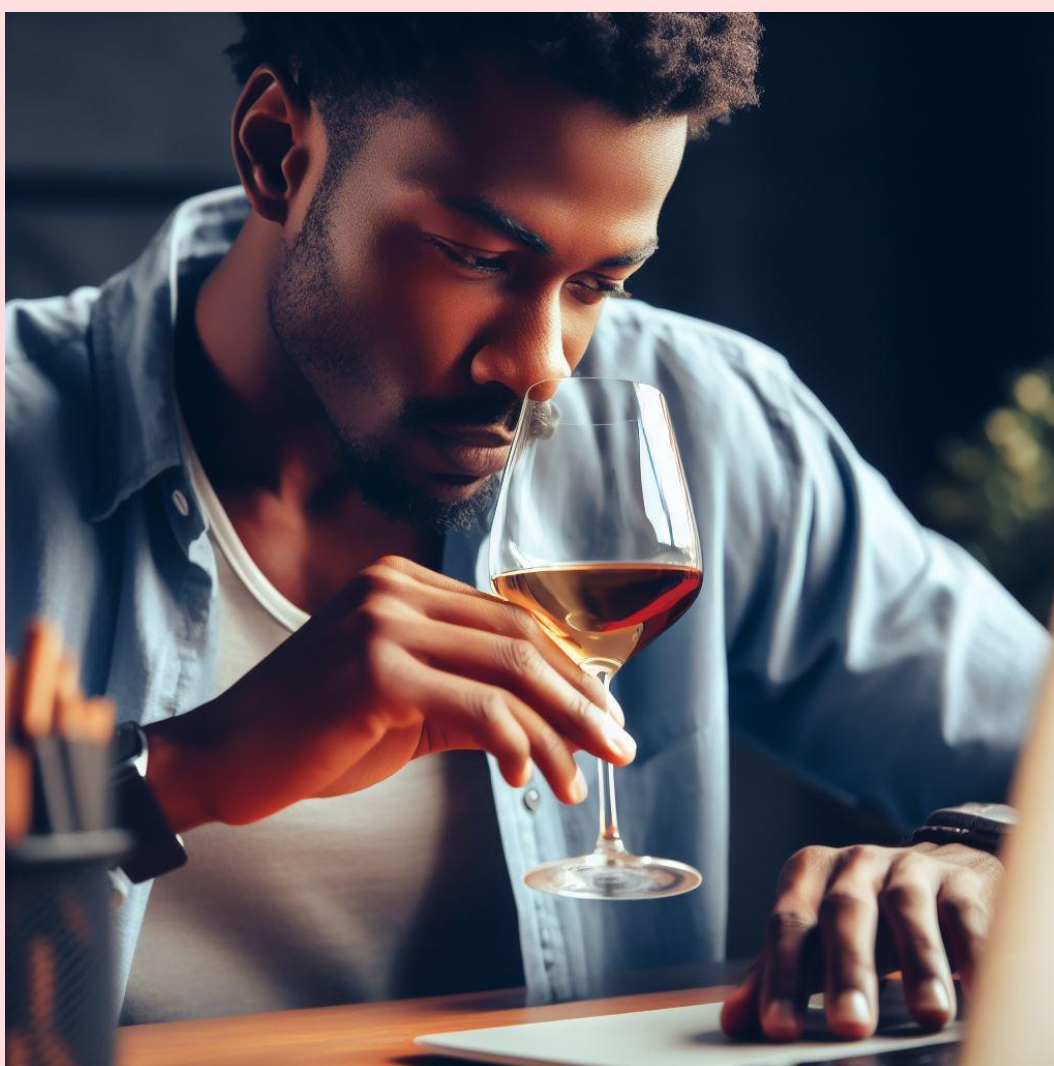# MERGO

Mooc in Enology aimed at Reinforcing competences applying Game-based approach and Olfactive learning for the wine tasting

IO4 – Report of the impact of TUIs in e-learning: best practices and recommendations

PAG
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MERGO

Project number

2020-1-IT02-KA203-080040

Mooc in Enology aimed at Reinforcing competences

applying Game-based approach and Olfactive learning

for the wine tasting

Partnership:

University of Foggia (UNIFG) - Italy
Smarted (SM) - Italy
Universidade De Tras-On-Montes E Alto Douro (UTAD) - Portugal
University Of Cukurova (CU) - Turkey
Vignerons Bio De Nouvelle-Aquitaine (VBNA) - France
Universtiy of Zagreb (UNIZG) - Croatia
Organizzazione Nazionale degli Assaggiatori di Vino (ONAV) - Italy

MERGO

Mooc in Enology aimed at Reinforcing competences applying Game-based approach and Olfactive learning for the wine tasting

The images of the first page are generated by Artificial Intelligence in Bing AI creator (www.bing.com/create).

Index

Sommario

Introduction

There are 12 million olfactory cells present in our noses, categorized into 300 distinct types. These cells play a pivotal role in recognizing a wide array of scents. Unlike other nerve cells in the human body, olfactory cells directly connect with the external environment, serving as receptors for volatile molecules. They facilitate the recognition of fragrances, which can evoke profound memories or simply aid in quick food assessment.

One such food item closely linked to olfactory stimulation is wine. Its rich and complex composition contains a myriad of molecules, making it an exceptional sensory experience. Additionally, wine has significant economic importance in Europe, as statistics from Eurostat reveal that the EU is a global leader in wine production and trade. In 2018, EU Member States exported €22.7 billion worth of wine while importing €13.4 billion. The total wine production in the EU, including sparkling wine, port, and grape must, reached approximately 15 billion liters. European vineyards covered 3.2 million hectares in 2015, representing 45% of the world's total vineyard area and 1.8% of the total utilized agricultural land.

Given the recent impact of the Coronavirus pandemic on the grape and wine market, the following data pertains to the year 2019: global wine production reached approximately 260 million hectolitres, with the European Union (EU) contributing around 60% of this total. This production figure encompasses all types of wine.

In 2019, the leading wine-producing nations were Italy, which produced 47.5 million hectolitres, followed by France with roughly 42 million hectolitres, and Spain at 33.5 million hectolitres. These three countries collectively accounted for approximately 50% of the worldwide wine production, with a significant gap separating them from other producing nations.

During the same year, global wine consumption amounted to around 244 million hectolitres.

When examining major wine-consuming nations, the United States secured the top position, followed by France, Italy, and Germany.

However, the ranking undergoes a notable shift when considering per capita consumption. In this context, Portuguese consumers lead the way, consuming approximately 56 litres per person, followed by the French at around 50 litres, and the Italians at roughly 43 litres per person.

In the EU, Spain, France, and Italy were the primary wine producers in 2015, accounting for 74.1% of the total EU vineyard area and 39.2% of the holdings.

These numbers show the importance of the wine market in the world and in the same line, in Europe, which are some of the most important countries for wine production and distribution.

However, the wine culture not only pertains to food but also has a substantial impact on civil society and academia due to its strong connection with local cultures. Higher Educational Institutions (HEIs) across Europe with agriculture and enology faculties take a scientific approach to the study of wine, training researchers and professionals. These individuals play critical roles in various aspects of the production chain, such as winemaking, viticulture, quality maintenance, and the preservation of indigenous vineyards.

Higher Educational Institutions are central in the role of training these competences to the new students that need to enter this market in different positions regarding the world of wine. Knowing the wine means understanding its features and structures, where are the places of plantation and finally the olfactory needs.

Academic organizations in this field primarily involve theoretical teaching regarding wine that are usually supported by intensive laboratory activities. Students learn to acquire multisensory skills for wine recognition, including olfactory, gustatory, and visual aspects. In contrast to many other fields where theory dominates, wine studies emphasize the ability to recognize scents. To facilitate this, specific methodologies and didactic tools are employed to teach basic sensorial recognition

with expert guidance. Dedicated sensory analysis laboratories and olfactory learning tools assist in different levels of procedural learning.

However, traditional methods can be costly, particularly due to the need for a high teacher-to-student ratio. To address this, some HEIs have developed online courses, known as MOOCs, related to wine. These courses aim to provide students with scientific knowledge and competences related to wine tasting. While they offer declarative knowledge, they lack solutions for procedural learning based on experience, which is crucial in this field.

In recent years, new tools, such as Tangible User Interfaces (TUIs) empowered by artificial tutoring systems, have emerged. These technologies hold promise for enhancing academic learning in sensory training. TUIs allow users to interact with tangible and multisensory objects, including those with scents, which can be recognized by digital components. This approach can revolutionize wine education by enabling procedural learning for olfactory recognition through innovative digital tools.

In this context, it is also necessary to analyze that the organoleptic approach to wine, in particular, generates considerable controversy. There exist various groups of consumers, opinion leaders, commentators, journalists, and technicians who delve into this subject. While the concept of sensory analysis is relatively clear, the distinction between hedonistic and technical tasting remains somewhat unclear and lacks universal consensus.

Sensory analysis, being a scientific discipline, leverages psychophysical knowledge to regard the assessor as a measuring instrument. Consequently, this "detecting tool" requires proper calibration and conditions to ensure reliability. Achieving this reliability entails training, working in standardized environments, understanding the inherent limitations and potential of human physiology and sensory perception, and conducting comprehensive technical studies of the raw materials under scrutiny. These aspects are fundamental in transforming sensory analysis into a valuable tool for studying and enhancing production techniques.

Hence, sensory analysis should be recognized as the most appropriate method for employing human senses to describe, characterize, and define the organoleptic attributes of food products, including wine.

Nonetheless, implementing this discipline in daily practice presents challenges and often depends on the level of knowledge about the raw materials involved.

In this complex background entered the MERGO project funded by the European Commission (Grant Agreement 2020-1-IT02-KA203-080040) in Erasmus+ framework, Key Activity 2 - Strategic Partnership - Higher Education (www.mergoproject.eu).

The MERGO project aimed to bridge the gap between MOOC learning and procedural learning in sensory feature recognition using TUIs. The name "MERGO" derives from the Latin word meaning to immerse or plunge, symbolizing the act of a taster immersing their nose to understand a wine's olfactory bouquet. The project seeks to improve and innovate traditional MOOC methodologies by incorporating TUIs to enhance the effectiveness and efficiency of learning in this field.

The project developed innovative ICT tools that enable students to train independently with olfactory stimuli and apply a validated methodological framework delivered with a scientific approach, including adaptive artificial tutors. The project involves expertise in enology and wine tasting, with a focus on local and regional excellence. The MOOC is accessible to a broader audience and will collaborate with TUI activities. Anyone could learn the wine experience with the e-learning platform hosted in Eduopen MOOC provider and reachable at this link (https://learn.eduopen.org/eduopenv2/course_details.php?courseid=564).

During the project, MERGO project involved wine experts, enologists, sommeliers, academic teachers and all kinds of professionals that are involved in the wine sector in order to co-design the activities. European researchers, professors of agriculture and enology, ICT experts in Technology Enhanced Learning, and wine tasters created the exercises of the MERGO APP (https://play.google.com/store/apps/details?id=it.smarted.mergo&hl=it&gl=US) creating activities and training aligned with the e-learning platform. The application

of the project will be described in this document. In a nutshell, as quickly shown above, the MERGO application is a mobile app that allows the user to train its olfactory ability with real smelling jars. The user must buy the enology kit with 90 different odors, put a simple stripe (NFC antenna) on each smelling jar and tag them autonomously. After this process the user is able to work with the application that is able to detect each jar once the user places it on the back of the smartphone.

In this way, once the system asks for the "vanilla" odor, the user must browse into the different smelling jars and find the odor that corresponds to the request. If the learner must find one odor into the 90 at disposal, he/she could get lost. In this case, the application gives the right request on the learning stage of the player.

Figure 1: a user is interacting with the MERGO APP.

The strength point of the MERGO platform is the creation of a wine course, open and accessible for everyone including the enthusiasts or the beginners in enology and in wine tasting. The course includes some practical activities about wine and odor recognition. In this view, the learner is not only devoted to transmissive learning with traditional materials like videos or texts but could perform an online learning using also a "portable" and smart lab about wine tasting.

It makes central the experiential learning that is essential in another important asset of the project that is the report "*Pedagogical strategy for implementation of multisensory approach in MOOCs*" (in the Erasmus+ codes it is labeled as Intellectual Output number 1) where it is analyzed the alignment of the MOOC and the training phase, that is possible with the MERGO mobile app.
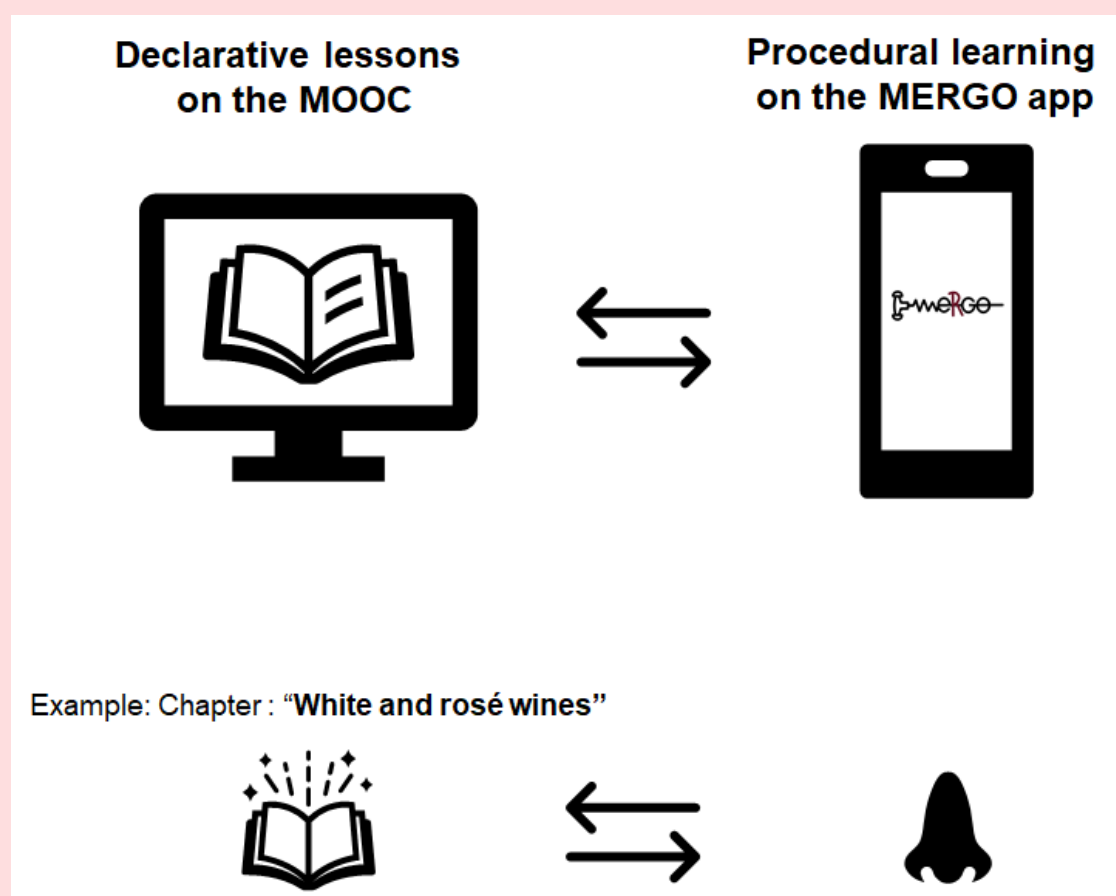

Figure 2: A diagram that describes the way of interaction of the MERGO project.

As shown in Figure 2, the lesson on the MOOC elicits declarative learning (by traditional tools) and it is reinforced with laboratory interaction with procedural

learning with the MERGO app. In order to better explain, the user that is studying the Chapter in the MOOC called "White and rosé wines" will have the possibility to perform olfactory exercises with the smart objects (smelling jars empowered with NFC tags) on the white and rosé wines, putting in action the knowledge acquired during the previous lessons. The idea is to strongly connect the two environments:

1) Traditional learning by the MOOC

2) Training activity with the olfactory and smart lab

This framework is possible by distance learning and open to all. An important element is related to the openness of the system. The learner is not obliged to buy the kit, he/she could learn and be enrolled in a traditional online learning experience if the student does not want to buy the kit. If he/she buys the olfactory kit (that is very popular by sommelier trainers) and with an easy tagging the student could improve its olfactory skills with an innovative and smart system that interacts and replies just-in-time giving the appropriate feedback and supporting the learning.

This document is fundamentally centered on the reapplication and prospective utilization of the results derived from the activities undertaken within the context of the project. A significant implication of these efforts is the potential expansion of the innovative tools developed beyond the wine industry, offering promising opportunities for various sectors. These applications may include enriching tourism experiences, the creation of thematic itineraries within local regions, and the preservation and revitalization of cultural traditions.

Contained within this document is a comprehensive consolidation of the key insights and findings garnered from the practical implementation activities of the MERGO project. By furnishing practical examples, real-world narratives, and stories of success, we aim to construct a robust set of guidelines. These guidelines are envisioned as valuable resources for Higher Educational Institutions (HEIs) and businesses, whether they operate within the wine sector or diverse industries. They serve as a roadmap for integrating the knowledge gained through these endeavors into both formal and informal learning programs. Additionally, this document provides recommendations for policy development on a broad scale, extending

from European to national levels. These recommendations include proposals for recognizing and adopting the international certification earned through the project.

At its core, the primary aim of this document is to present the tangible outcomes of the project, including the results obtained from a series of tests, comprehensive training sessions, and rigorous evaluations. These activities have been instrumental in assessing and validating the effectiveness of the MERGO Platform. The report delves into the methodological and technological facets of these tests, offering a detailed exploration of their execution in practical, real-world contexts. Moreover, it highlights the vital role these evaluations play in equipping students with the necessary skills for wine tasting, thus ensuring that the project's objectives are met.

All told, the MERGO project aims to strengthen the knowledge triangle in the wine sector by connecting education, research, and innovation. Its transnational and EU dimension facilitates multilingualism and takes advantage of cultural differences in the wine sector. This document intends to give a complete vision of the work performed in the projects, showing its results and providing recommendations for further exploitations.

MERGO platform

MERGO platform is made by two parts:

1) MERGO Hardware
2) MERGO APP

MERGO Hardware

The MERGO kit seamlessly marries tradition with cutting-edge technology. At its core, it harnesses an extensive array of scent jars that have garnered favor among sommelier experts, wine enthusiasts, and oenology university courses worldwide. These jars, sourced from Aromaster[1], house a rich collection of 88 distinctive scents, serving as indispensable tools in the realm of wine tasting assessments. They play a pivotal role in sharpening the olfactory skills of newcomers embarking on the journey of wine evaluation. While these jars may appear uniform at first glance, they are thoughtfully organized into olfactory categories, encompassing fruity (white wines), fruity (red wines), vegetal, floral, mineral, oak barrel maturation, wine faults, and more.

Figure 3: Mergo KIT adpted from the Aromaster kit. Each smelling jar is recognized by an Android smartphone using the MERGO app.

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[1] https://aromaster.com/product/master-wine-aroma-kit

To enrich this sensory experience, the kit adopts the Tangible User Interfaces paradigm. It incorporates discreet antennas on the jars, harnessing the capabilities of Near Field Communication (NFC) technology. Thanks to these NFC antennas, smartphones can effortlessly identify these scent jars. Given that most commercial smartphones are equipped with NFC antennas, they have the inherent ability to detect objects embedded with passive NFC tags. Each antenna is thoughtfully tagged with a unique code, instantly recognizable by the MERGO application.

MERGO APP

The MERGO learning environment is actualized through its software, designed as an Android application tailored to smartphones equipped with NFC capabilities. This application is readily available for free on the Google Play Store[2].
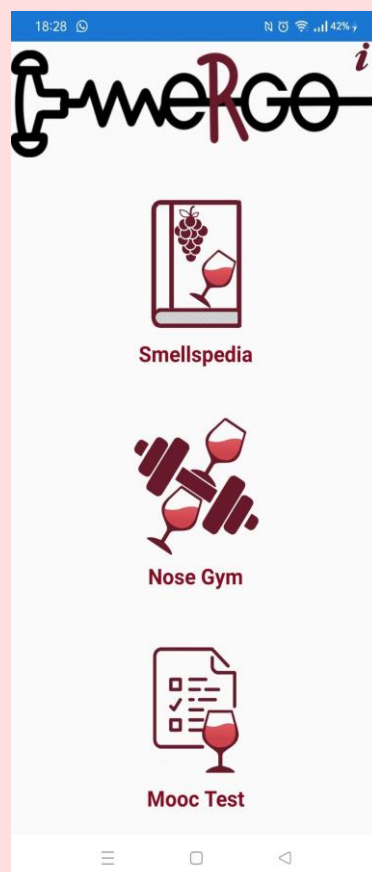
Figure 4: Main menu of the MERGO application with three sections: Smellspedia, Nose Gym and Mooc Test.

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[2] https://play.google.com/store/apps/details?id=it.smarted.mergo&hl=it&gl=US

The application unveils three distinctive areas:

Smellspedia:
This segment is a treasure trove for aspiring sommelier students looking to explore the 88 scents featured in the Aromaster kit. Users select a jar, savor its scent, and bring it into proximity with their smartphone's NFC antennas. At this juncture, the system seamlessly deciphers the scent jar's unique code. The application then unveils the scent's name and imparts insightful information about its relevance within the wine industry. These descriptions are thoughtfully curated by wine experts actively engaged in the MERGO project.

Figure 5: Display of Smellspedia for the Lemon's scent, with the description and the possible wine where this aroma could be present.

Nose Gym:

In this domain, learners embark on a journey to refine their olfactory senses using the scent jars. The system presents a quiz-game format designed to deepen one's understanding of wine-related olfactory learning. This section is thoughtfully subdivided into specific sub-sections, comprising:
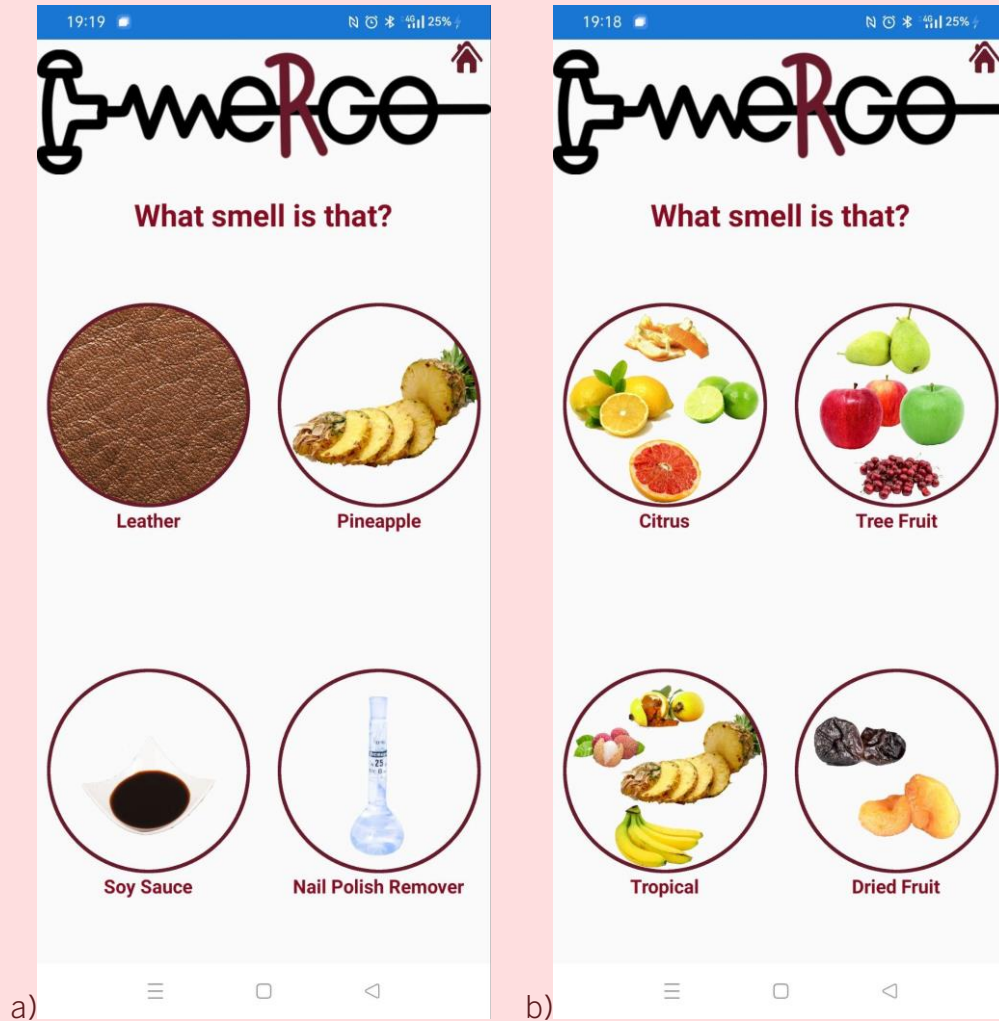
Figure 6: Screenshot of two different exercises: a) on the left "Recognize the smell", b) on the right "Recognize the Smell Family".

1. **Recognize the Smell:** Users encounter a jar, inhale its fragrance, and subsequently identify the specific scent from among four available options.

2. **Recognize the Smell Family:** Participants position a jar in close proximity to the NFC antenna, striving to accurately discern the familial category associated with the scent, choosing from four available options.

*Figure 7: Screenshot of "Recognize the smell", in two different moments: a) the question b) positive feedback once the student founds the right aroma.*

3. **Look for the Smell:** The system guides students in a quest to locate four distinct scent jars, challenging them to identify the particular scent indicated by the app, such as the aroma of cherries, from a selection of four possibilities.

4. **Look for the Smell Family:** In this exercise, students are tasked with selecting four scent jars from the collection and identifying the family classification specified by the application, such as "wine faults."
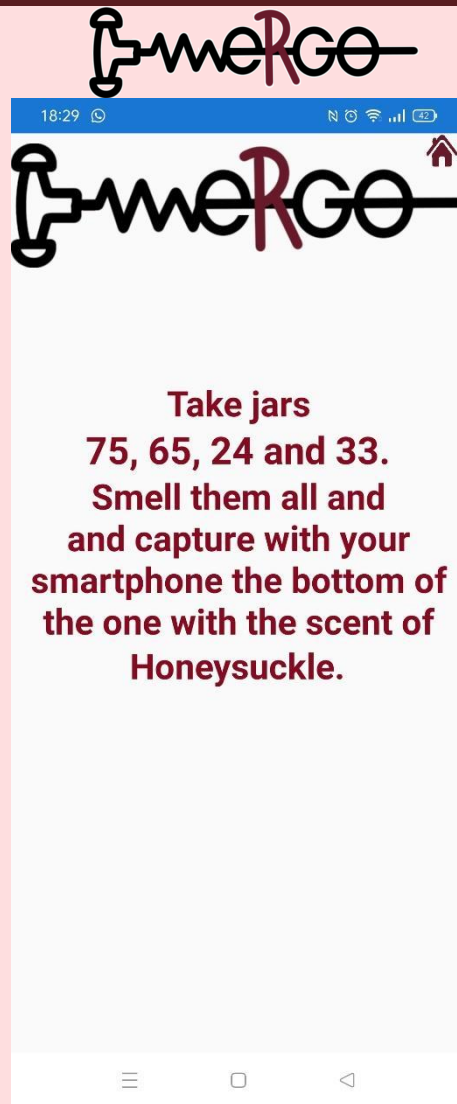
Figure 8: Screenshot of "Look for the smell" section. The user has to pick the smelling jars labelled with the numbers 75, 65, 24 and 33 and find the aroma of Honeysuckle.

The application fosters a conducive learning environment, permitting students to revisit these exercises at their leisure. Notably, the application refrains from implementing a scoring or leveling system, instead providing auditory feedback, including gentle sounds for incorrect answers and positive reinforcement for successful task completion.

MOOC test

The third section is related to the MOOC and it is called MOOC test. The student could perform the exercises that are strongly related to the competences achieved during the learning made by the e-learning platform. Once the user has completed the lesson, he/she could access to the related section as shown in the picture below


Figure 9: Screenshot of the MERGO APP in the "MOOC test" section. The user could select the topic he/she prefers.

The section shown in the previous screen reflects the lesson that are taught in the MOOC, in the same order these are shown on the platform. These sections have all the questions that was collected during the multiplier events and in particular it brings the "Pick&Play" questions. To summarize this type of questions, the user must select a lesson, then randomly the system provides a question from all the questions that are collected for this topic. The question requires to proceed as "Look for Smell" or "look for the smell family". The students must pick up 4 option on the basis of the design made by the expert. Once the aromas are in front of the

student, he/she tries to identify the more appropriate answer on the abasis of the
88 aroma a disposa.
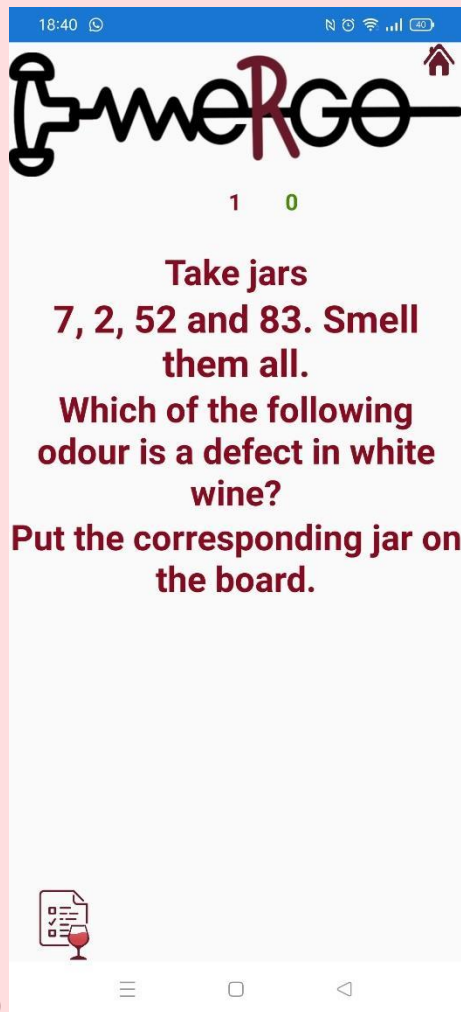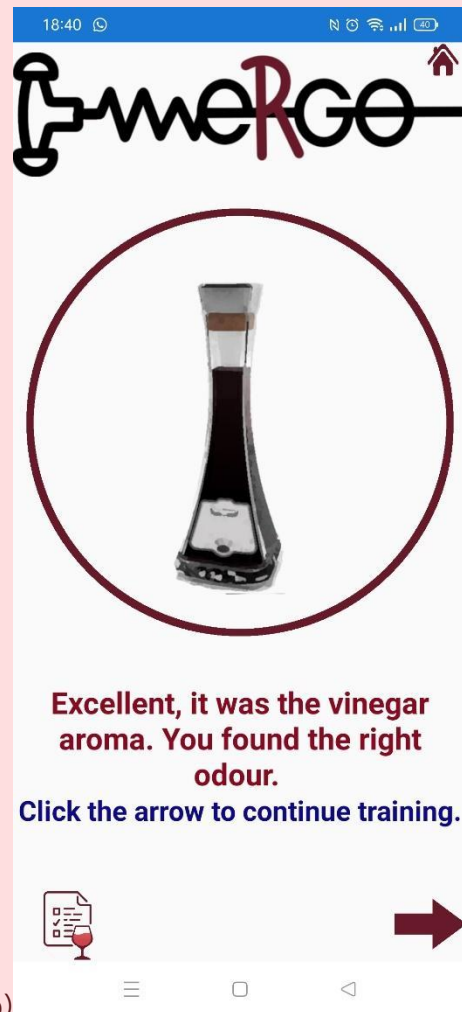
Figure 10: Screenshot of "MOOC test" section. The user must pick the smelling jars labelled with the numbers 7, 2, 52 and 83, as written in the OER by the expert and replies with the right aroma to the request made at the beginning. In this case the reply (b) is vinegar.

International Certificate for the MOOC

In the MERGO project, ONAV (Italian National Association of wine tasters) supported the view of the tasters planning with the collaboration of all Partners the criteria and procedures to evaluate the acquisition of the competences by learners in the wine sector. As MERGO is conceptualized in a modular way, so that the odor game home-kit is not mandatory, from one side, ONAV developed an attendance certification of "Wine Technical Tasting - Theoretical Knowledge Acquisition - Wine Odor Recognition" (Figure 1) to be delivered to MERGO users passing both theoretical and practical (olfactory games) evaluations with at least 70% of correct answers to all questionnaires of MERGO course.

From the other side, in the case of users choosing only the theoretical part of MERGO, ONAV developed an attendance certification of "Wine Technical Tasting - Theoretical Knowledge Acquisition" (Figure 2) to be delivered to MERGO users passing theoretical evaluation with at least 70% of correct answers to all theoretical questionnaires of MERGO course.

Figure 11: attendance certification of "Wine Technical Tasting - Theoretical Knowledge Acquisition - Wine Odor Recognition"

Figure 12: attendance certification of "Wine Technical Tasting - Theoretical Knowledge Acquisition

Experimentations

The impact of MERGO and of its integration with TUIs in e-learning have been measured through different tools using a mixed methods design – including online surveys, interviews and expert reviews The following five dimensions have been considered (see the evaluation plan) by setting five corresponding trials.

AREA 1 - DEVELOPMENT OF COMPETENCES REGARDING THE THOERETICAL ASPECT OF WINE TASTING

AREA 2 - LEARNING AND IMPROVING OF OLFACTORY SKILLS IN WINE

AREA 3 - BOOSTING THE KNOWLEDGE TRIANGLE AND CREATION OF A COMMUNITY OF PRACTICE

AREA 4 - THE LEARNING TOOLS (MOOCs AND MERGO TUIs TOOL)

AREA 5 - IMPACT OF THE PROJECT

AREA 1 - DEVELOPMENT OF COMPETENCES REGARDING THE THEORETICAL ASPECT OF WINE TASTING

In this trial, the development of competences on the theoretical aspects of wine has been assessed in students after the MERGO application.

Materials and Methods.

A quantitative instrument was used: pre and post questionnaires (i.e. self-assessment tool) with MERGO students, comparison with students that are not involved in the pilots (normal courses of oenology). The used survey is reported in the Appendix A (IO1).

Data were collected from the Partner Universities, by distributing the survey links via email or learning platform, and collecting answers anonymously. One of the survey links was sent to 33 students who had access to the MERGO App (called experimental group) and the other survey link to the reference group (called control group) including 33 students attending normal courses of oenology and not involved in MERGO. The reason for making two surveys was to ensure both anonymity and to separate the two groups from each other, to better evaluate the progress.

The first survey (Appendix A), called pre-survey, was issued during the first week of the course (according to the needs and the regular calendar of oenology courses in the Partner Universities) and answered within a period of 2 weeks.

The second survey, called post-survey, was issued during the last week of the course and answered within a period of 2 weeks. Post-survey was the same as pre-survey (Appendix A) to measure the improvement in the learning process.

Indicators of achievement:

- Improvement of students' performance with the self-assessment tool:

80% of the questions that sees an incremental in correct answers for whom had access to the MERGO application assessed a greater improvement of their olfactory skills than their peers who did not have access to the application.

Results of the evaluation tool

During M29 and M30 the University of Foggia planned a final experimentation test, to verify students' improvement in wine theoretical knowledge and wine olfactory skills using the MERGO Serious Game.

During M29 and M30 the University of Foggia planned a final experimentation test, to verify students' improvement in wine theorical knowledges and wine olfactory skills using the MERGO MOOCs and the MERGO toolkit.

The trial took place in the Humanities Department of the University of Foggia, set in via Arpi 176 in Foggia.

The target goal of the trial were 30-35 people that i) were not already involved in the project, ii) were not experts in wine teaching and learning, iii) were involved in the wine industry, but not experts in wine teaching and learning.

The experimentation was divided in 5 different moments:

1. Invitation of potential participants, collecting availabilities and defining a schedule
2. Pre-test, both theorical and practical with the MERGO toolkit
3. The participants were invited to attend the MERGO miniMOOCs
4. Post-test, both theorical and practical with the MERGO toolkit
5. Analysis of the pre and post-test

1. Invitation of potential participants, collecting availabilities and defining a schedule

The potential participants were identified with people (students and non-students) pertaining to the Humanities Department, for two main reasons:

1. There are no courses on wine theory or wine olfactory training in the Humanities Department
2. The people responsible of the planning of the trial work in the Humanities Department, so it was easier involving and motivating people.

The potential participants were contacted via mail, explaining them what the MERGO project is, explaining them the goals of the trial and how it was supposed to play out; then, they were asked if they were available on participating.

Once they made themselves available for the trial, they were asked day and time availability, in order to form small groups of max 4-5 people to perform the test simultaneously.

The organization of the small groups was necessary because only one MERGO toolkit was available.

Once the schedule was set, participants were invited in the day and time they gave availability for, in order to perform the trial.

2. Pre-test, both theorical and practical with the MERGO toolkit

First of all, the participants were asked to answer to the theorical pre-test.

The test was sent to them in the form of a link to a Google Form. The participants were told not to worry if they felt frustration due to their ignorance in the field, because one of the goals of the trial was to enhance their knowledges in the field.

The theorical pre-test was organized in multiple choice questions with 4 possibilities with 1 correct option. There wasn't the possibility to put a personal answer or to modify the answers.

The participants answered to the questions, sometimes laughing and commenting about their lack of knowledges in the field.

Even if they supposed they didn't collect a positive final vote (even though the final vote wasn't shared with the participants), they had fun in reading some words of the wine field they even didn't heard about.

After the theorical test, it was the moment of the olfactive pre-test.

The MERGO toolkit was shown to the participants, and they were explained how it works. It was made a little experiment with the MERGO app to show participants how the Serious Game works.

It was asked to the participants to smell some of the MERGO toolkit jars and they were asked to answer to the questions made by the MERGO app.

The participants found the experiment fun.

Then, it was explained to the participants that they hadn't to use the MERGO app, but they had to follow the instructions of the olfactive pre-test that had sent them via link to the Google Form.

The olfactive pre-test was organized in multiple choice questions with 4 possibilities with 1 correct option. There wasn't the possibility to put a personal answer or to modify the answers. In this case, the answers were represented by the numbers of the jar participants had to smell in order to identify the right answer.

For each question, the participants had to smell 4 jars and detect the right answer, in their opinion.
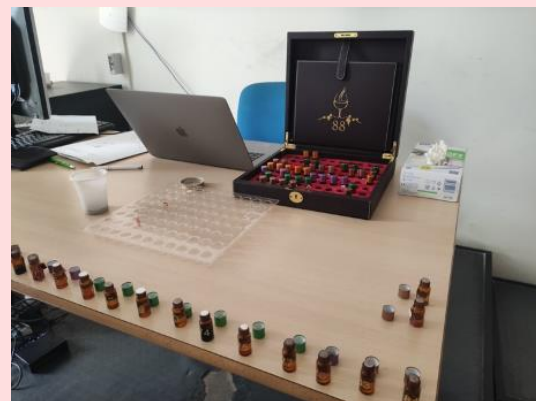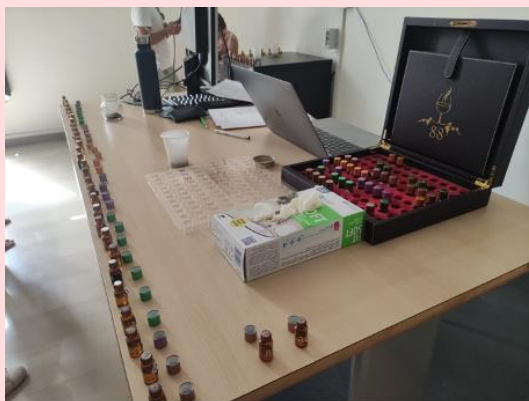
Figure 13: the MERGO toolkit

Figure 14: MERGO toolkit with the jars opened and ready to be smelled.

Figure 15: the MERGO toolkit jars opened, with glasses filled with coffee powder, which, when smelled, allows the nose the be "cleared" in order to be able to detect new odors

Limits and problems to phase 2

The participants were asked if they found it easy or difficult to focus for the trial. Some of their opinions were:

- The setting of the room was not ideal to smell all those odors: the jars were too close one to the other, it was difficult to isolate the smell of the single jar;

- The temperature of the room, even with the air conditioned on, was hot (the trial was performed in July, outside temperature ~35°) and the medley of smells present in the room was not so ideal to perform a smelling test;

- Even with the set of small groups of 4-5 participants, participants were not able to find the jar they needed to smell available every time: there was already another participant smelling the same jar, so the participants had to wait on others.

Nevertheless, the participants found the trial fun and the methodology interesting, motivating and engaging.

When all participants sent the questionnaires with the answers, they felt were right, they were told to wait for a following email with the instructions where to find the MERGO miniMOOCs they had to attend in order to participate in the post-test trial.

3. The participants were invited to attend the MERGO miniMOOCs

After the trial, the participants were sent an email with the link where they could find the MERGO miniMOOCs on the EduOpen platform. The link is available in the Introduction of this very document.

Participants were asked to attend at least 3 miniMOOCs before the post-test phase. Participants were given 30 days to attend the miniMOOCs, and then they were called on for the post-test phase.

4. Post-test, both theoretical and practical with the MERGO toolkit

The theoretical and olfactive post-tests were planned according to the participants' opinions that were collected after the pre-test phase.

The room of the test was changed. A smaller room where to perform the trial was found, with air conditioning and an air vent that allowed the room to remain fresh and with the lowest possible odor concentration.

The groups were maintained of 4-5 people, but the MERGO toolkit jars were divided in more spots than the pre-test and were disposed with more space between each jar.

The theoretical test was sent to the participants in the form of a link to a Google Form.

The theoretical post-test was the same as the pre-test, of course, organized in multiple choice questions with 4 possibilities with 1 correct option. There wasn't the possibility to put a personal answer or to modify the answers.

The olfactive post-test was the same as the pre-test, organized in multiple choice questions with 4 possibilities with 1 correct option. There wasn't the possibility to put a personal answer or to modify the answers. In this case, the answers were represented by the numbers of the jar participants had to smell in order to identify the right answer.

For each question, the participants had to smell 4 jars and detect the right answer, in their opinion.

When all the participants sent the questionnaires with the answers, they felt were right, the trial was declared concluded. The participants were thanked for their availability.

The participants asked if it was possible to know their pre and post-test scores to see if they improved their knowledge through the miniMOOCs study and the MERGO toolkit use, but they were told that this was not possible.

5. Analysis of the pre and post-test

The participants to the pre and post-test were 33 people, very close to the goal of 35 participants.

Nevertheless, we were able to collect only 25 valid tests (pre and post) due to human errors.

The theoretical test

The theoretical test was made by 13 questions. In the pre-test we found very different percentages of correct answers: from a minimum of 0% to a maximum of 76%. This is important, because as we said, the participants were not experts in the winery field.

The percentages are presented in the following table:

Question	% correct answers	% wrong answers
1	72	28
2	32	68
3	68	32
4	64	36
5	56	44
6	0	100
7	76	24
8	28	72
9	28	72
10	28	72
11	16	84
12	28	72
13	24	76

Figure 16: Percentage of the pre-test results

On average, there were 40% of correct answers on the theoretical pre-test.

The post-test, as said in **4.**, was performed by participants after they attended a minimum of 3 MERGO miniMOOCs.

The percentages of the post-test are presented in the following table:

Question	% correct answers	% wrong answers
1	88	12
2	60	40
3	80	20
4	76	24
5	80	20
6	76	24
7	80	20
8	48	52
9	52	48
10	40	60
11	52	48
12	60	40
13	52	48

Figure 17: Percentage of the post-test results

On average, we had 65% (64,92%) of correct answers, with 25% correct answers increased thanks to the MERGO miniMOOCS enhancement of knowledge.

Even though there are some percentages that are below or around the 50%, we considered a higher percentage in order to deliver the MERGO certificate. Only 7 questions out of 13 present an average that could grant the MERGO certificate.

We can consider the theoretical results of the experimentation group a success, looking at how the percentages were enhanced in the post-test, but they were not sufficient to consider the test passed by the entire class.

Although, a limit to consider is that some of the participants stated that they remembered some of the answers they gave in the pre-test, and those were the answers they felt very sure about. The participants stated also that they answered to the questions they remembered in the post-test in the same way they answered in the pre-test.

The reason behind these strong memories, as participants stated, was that the winery field is not something they usually deal with in their everyday life, so they had a bright memory of the pre-test.

Seeing the results of the next picture it is clear that the difference of results from the post test and the pre-test is relevant for all the questions (more than the threshold of 80% initially expected). The improvement of the users is significant.

Question	PRETEST % correct answers	POSTTEST % correct answers	DELTA POST-PRE
1	72	88	16
2	32	60	28
3	68	80	12
4	64	76	12
5	56	80	24
6	0	76	76
7	76	80	4
8	28	48	20
9	28	52	24
10	28	40	12
11	16	52	36
12	28	60	32
13	24	52	28

Figure 18: Difference pre-test / post-test in the theoretical replies.

AREA 2 - LEARNING AND IMPROVING OF OLFACTORY SKILLS IN WINE

In this trial, the learning and the improvement of the olfactory skills regarding single odors that can be found in wine have been measured in students after using the MERGO app.

Materials and Methods.

Similarly, to the previous trial, a quantitative instrument was used: pre and post questionnaires (olfactory games) with students, comparison with students that are not involved in the pilots (normal courses of oenology). The used survey is reported in the Appendix B of Evaluation Plan

Data were collected from the Partner Universities, by distributing the survey links via email or learning platform and collecting answers anonymously. One of the survey links was sent to the experimental group, including 33 students who had access to the MERGO App, and the other survey link to the control group, including 33 students attending normal courses of oenology and not involved in MERGO.

The pre-survey (Appendix B) was issued during the first week of the course (according to the needs and the regular calendar of oenology courses in the Partner Universities) and answered within a period of 2 weeks. The post-survey was issued during the last week of the course and answered within a period of 2 weeks. Post-survey was the same as pre-survey (Appendix B) to measure the improvement in the olfactory skills.

Indicators of achievement:

- Improvement of students' performance with the self-assessment tool:

80% of the questions that sees an incremental in correct answers for whom had access to the MERGO application assessed a greater improvement of their olfactory skills than their peers who did not have access to the application.

The olfactory test was made by 19 questions. In the pre-test we found very different percentages of correct answers: from a minimum of 4% to a maximum of 60%. This is important, because as we said, the participants were not experts in the winery field.

The difference that we can notice with the theoretical test, considering the participants' opinions collected in the olfactory pre-test, is that the olfactory pre-test percentages are significantly lower than the theoretical pre-test ones.

The percentages are presented in the following table:

Questions	% correct answers	% wrong answers
1	24	76
2	20	80
3	44	56
4	48	52
5	4	96
6	60	40
7	36	64
8	20	80
9	32	69
10	28	72
11	28	72
12	36	64
13	4	96
14	28	72
15	4	96
16	28	72
17	44	56
18	28	72
19	32	68

Figure 19: Percentage of the pre-test results

On average, there were 28,84% of correct answers in the olfactory pre-test.

The post-test, as said in **4.**, was performed by participants after they attended a minimum of 3 MERGO miniMOOCs.

The percentages of the post-test are presented in the following table:

Questions	% correct answers	% wrong answers
1	36	64
2	56	44
3	56	44
4	72	28
5	36	64
6	80	20
7	68	32
8	28	72
9	52	48
10	60	40
11	44	56
12	56	44
13	48	52
14	40	60
15	32	68
16	68	32
17	64	36
18	48	52
19	72	28

Figure 20: Percentage of the post-test results

On average, we had 53,47% of correct answers, with ~15% correct answers increased thanks to the MERGO miniMOOCS enhancement of knowledge.

Unfortunately, even if all the answers increased the percentage of correct answers, only 3 questions out of 19 present an average that could grant the MERGO certificate.

We can still consider the olfactory test results of the experimentation group a good success, looking at how the percentages were enhanced in the post-test, but the entire class would have not passed the test and obtained the MERGO certificate in a non-pilot test.

The time and setting of the olfactory test must be set better, in an environment that consider air ventilation and that allows participants to move as freely as possible, without the rush to smell the jar they're smelling because there are other participants waiting.

A solution could be test performed individually, but in this case, there should be enough time to allow every participant to perform the test.

Conclusion

The overall data showed a better performance in the post-test.

We can say that the MERGO miniMOOCs helped participant in enhancing their knowledge in the winery field, but, especially in the olfactory test, participants were really far from the percentage of correct answers we set as minimum to obtain the MERGO certificate.

AREA 3 - BOOSTING THE KNOWLEDGE TRIANGLE AND CREATION OF A COMMUNITY OF PRACTICE

Co-creation impact of the project - Organization of the Multiplier events

One important aspect of the project represents the co-design of the activities. This methodology allowed to actively involve the target of the project and have a real way to bring into the project multiple voices.

The project aimed to involve a huge number of participants.

Participants included different targets:

1. Lecturers, professors, winegrowers, and professionals in the wine sector and in wine tasting for the MOOC contents creation.

2. Professionals outside the Partnership for the co-creation of the exercises.

These experts created the exercises that are included in the MERGO Odour Wine Game.

The featured exercises within the MERGO project have been meticulously designed as Open Educational Resources (OERs) and seamlessly integrated into the MOOC framework, where their primary purpose is to facilitate the acquisition of olfactory skills. These OERs hold a central role in the learning journey, serving as accessible, valuable resources that enable students to delve into the world of sensory perception. Furthermore, they serve as a dynamic canvas for perpetual improvement, guided by the invaluable feedback and insights contributed by experts in the field. This iterative process stands as a crucial component for honing the exercises, making them a bespoke fit for the distinctive requisites of the wine sector.

In tandem with the collaborative exercise enhancement process, the MERGO project is actively fostering partnerships with a diverse spectrum of organizations. These collaborative ventures encompass Higher Educational Institutions (HEIs), corporate entities, and stakeholders from the third sector. The overarching aim of this outreach initiative is twofold: first, to rigorously assess the initial prototype, and second, to collaborate closely with subject matter experts in co-designing innovative exercises leveraging the MERGO Odour Game kit. This collaborative approach seeks to create a dynamic and dialogical environment, fostering an inclusive space where an array of skills and competencies harmonize. Through the synergy of diverse knowledge and the wealth of experiences contributed by stakeholders and researchers, this process endeavors to generate shared value, ultimately enriching the educational landscape for all participants involved in the journey.

How did we involve the co-designers?

MERGO project uses the "Multiplier events", a tool that is included in the project management of the Erasmus+ projects. Multiplier events are normal events that have the aim to reach a broad group of people (103 the co-creation events;) in five countries, namely Italy, Croatia, Portugal, France and Turkey.

The event was designed with a twice aim:

1) Disseminating the project and its preliminary results.
2) Involving the experts in order to make them an active part of the project.

In the first part of the event, the Partners discussed the project aims, allowing a common understanding of the goals. The Partnership created a template presentation that would be possible to be shared by each Partner during the event that explained:

1) The goals of the project
2) A brief presentation of the involved Partners
3) A description of the game and the methodology behind its creation

For this reason, the technical Partner of the project (Smarted srl - www.smarted.it) created some videos to allow each Partner to share this knowledge and train the experts involved in the multiplier events.

The videos are:

- Video 1: What is a Tangible User Interface? https://youtu.be/c-08MsjoC2s An introduction to the role of Tangible User Interfaces in education
- Video 2: How the system works https://youtu.be/IT6VoUNUyXU - A brief video that shows how the implemented exercises works and the platform too. During the video, it is possible to see how the user could manage the smelling jars.
- Video 3: Create a new exercise for the MERGO project https://youtu.be/4hohUI00uGg - In this video it is shown how to create a new exercise and how to involve the participants of the events.

All the videos include a previous version of the system. The first prototype developed during the project included a non-mobile version: it used an NFC antenna wired to the PC that recognized each smelling jar. Nevertheless for the final user, it means the co-designer experts for the exercises drafting, the tasks were the same: they had the role to start from the smelling jars and design exercises aligned with the assigned argument. The argument was related to the country where the event was organized because the University involved in the organization was responsible for a specific topic.

On the website of the project the Partnership included the MERGO OER templates for two kind exercises (https://mergoproject.eu/o3-mergo-odour-game-kit/):

1) Smellspedia
2) Pick & play

Smellspedia merges two words Smell and Wikipedia, because it represents a sort of encyclopedia of odors. The Partnership after a deep discussion decided to use the olfactory box made by Aromaster.

The kit includes 88 aromas and the expert is called to describe the aroma, assign an aroma family with its aroma sub-family. To these descriptive indicators the expert was called to list all the wines where the selected aroma is relevant.

The OER template was created with an open and free platform that is Google Forms and in the website the results are open and published (https://mergoproject.eu/smellspedia/).

The result on the application is displayed in the following picture.

Figure 21: Smellspedia section, here is shown the result for the lemon.

From the user view, Smellspedia works to understand which aroma the student is smelling and then understands more about its features and application in the wine sector. The student has to select one aroma from the 88 at disposal and put it on the phone (in correspondence with the NFC antenna on the back of the phone). The smartphone detects and recognizes the aroma and then displays the right Smellspedia's page describing all the features of a certain wine odor.

Regarding Pick&Play exercises the structure was more interactive for the student that must reply to an answer made by the system. The exercises, and then the questions, are made and co-created by the experts involved. The expert had the possibility to type a question, for example:

"*Choose the aroma of white wine aged in wooden barrel*".

The OER creator has to decide which level is the question. If the question has a high level of difficulty, he/she must select the right aroma (that determines the right answer), two odor that could create confusion or could be considered similar to the right aroma (i.e. in the same family or sub-family) and odor that is completely different from the right aroma.

In the case the experts prefer to create an easier exercise, he/she will select two odors that are completely different and one distractor aroma (that could be confused with the right answer). In the example we brought here, the right answer is oak; while the two distractors are cedar and liquorice: finally the third option that is completely different is the sandalwood.

The multiplier events produced **223 different OERs** produced by the experts. In this pot:

1) **135** were created for the Pick&Play exercises.
2) **88** were created for the Smellspedia.

The exercises were created in the multiplier events and these involved 103 participants:

- 19 people were attending the Multiplier event in Italy, Foggia (Multiplier Event 1) in the Department of Humanistic Studies in University of Foggia - Aula 1, on the 20th of December 2022.

- 20 people participated in the Multiplier event in Portugal (Multiplier Event 2), which took place on June 3, 2022, in Baltar, near Vila Real.

- 20 people participated in the Multiplier event in Turkey (Multiplier Event 3) on March 11, 2022, in Cukurova University, Adana.

- 21 people took part in the multiplier event in France (Multiplier Event 4), on the 30th of June 2022, Beychac et Cailleau (near Bordeaux).

- 23 people were attending the Multiplier event in Zagreb (Multiplier Event 5), on the days of 10th and 11th May 2022.

Figure 22: Multiplier event in Italy, presentation of the MERGO system

Figure 23: MERGO Kit ready for the exercises creation. Multiplier event in Italy.

Figure 24: Multiplier event in Portugal, the experts are creating the activities assessing the wine and thinking to new exercises.

Figure 25: Experts that listen to the videos in Portugal event.

Figure 26: Multiplier event in Turkey, experts are creating exercises.

Figure 27: Multiplier events in Croatia, experts are defining the exercises paper and pencil (in the repository the exercises are reported by few "experts" -namely Radeka, Curko, Damijanic - that reported on PCs the exercises).

Figure 28: Multiplier events in Croatia, final picture after the work.

AREA 4 - THE LEARNING TOOLS (MOOCs AND MERGO TUIs TOOL)

System Usability Scale Results

In our research, we began by assessing the digital competence of participants. To accomplish this, participants self-assessed their digital skills through the DigComp 2.0 assessment tool, available on the mydigiskills website (https://mydigiskills.eu/). This assessment tool covers four distinct domains:

1) Information and Data Literacy,

2) Communication and Collaboration,

3) Digital Content Creation, and

4) Safety.

The assessment questionnaire consists of a total of 82 questions across these four areas, with each question providing four response options. The final assessment results classify participants into one of four proficiency levels: Base, Intermediate, Advanced, or Highly Advanced.

Figure 29: Example of a result of the DigiComp auto-assessment grid obtained with the platform mydigiskills.

Following the digital competence assessment, we delved into a comprehensive evaluation of the MERGO platform. This evaluation encompassed both its hardware and software components and involved active participation from users. To measure user acceptance, we used the System Usability Scale (SUS) (Brooke, 1996)[3], a ten-question questionnaire. Respondents rated these questions on a 5-point Likert scale, tailored to shed light on the user-friendliness of the software system. SUS scale generates a single numerical score that provides a holistic assessment of the system's usability, with individual item scores holding limited standalone significance. In accordance with this methodology, we implemented a grading system based on guidance from Lewis and Sauro's study[4] (2009), where letter grades correspond to the achieved scores.

This grading system facilitates the categorization of the tool's usability. For example, a score of 84.1 or higher is designated as "A+," indicating exceptional

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[3] Brooke, J. (1996). Sus: a "quick and dirty'usability. *Usability evaluation in industry*, *189*(3), 189-194.

[4] Lewis, J. R., & Sauro, J. (2009). The factor structure of the system usability scale. In *Human Centered Design: First International Conference, HCD 2009, Held as Part of HCI International 2009, San Diego, CA, USA, July 19-24, 2009 Proceedings 1* (pp. 94-103). Springer Berlin Heidelberg.

usability, while a score of 62.5 or above corresponds to a "C-" rating, signifying that the tool is reasonably user-friendly.

The MERGO Platform, as detailed earlier, was introduced to participants during a pre-service teacher training program for secondary schools specializing in special education, referred to as Tirocinio Formativo Attivo (TFA) Support Specialization Course (VII cycle), held at the University of Foggia in July 2022.

The study involved a cohort of 88 participants, comprising 73 females, 14 males, and 1 non-binary individual. The average age of the participants was 38.94 years, with a standard deviation of 8.81. Notably, none of the participants possessed prior experience as sommeliers or held similar certifications.
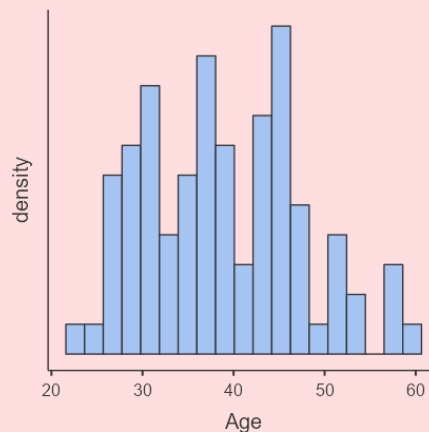
Figure 30: Age distribution of the sample.

During an initial session, participants completed the DigComp 2.0 questionnaire. Upon concluding this session, they downloaded and stored the resulting data in their personal repositories.

In a subsequent session, held the following week, the group was presented with an overview of the MERGO project, along with a brief 5-minute explanation on how to use the application, delivered by the developers. Following this explanation, participants were instructed to download the MERGO app onto their own smartphones, provided they were equipped to recognize NFC tags.

Participants were then organized into small groups, typically consisting of 4 team members. Each group was required to have at least one smartphone with the

MERGO application installed. Within the room, three MERGO kits were made available, affording participants the opportunity to engage in training exercises as much as they desired. The participants was free to test the system within a 3-hour timeframe.

Subsequent to the session, where they employed the Bring Your Own Device (BYOD) approach, participants completed the System Usability Scale (SUS) questionnaire. They also had the option to include the results obtained with the auto-assessment obtained from the DigComp questionnaire in the same online form, so the researchers were able to connect the level in digital skills and the usability perceived by the users.

Results

Data was analyzed with the statistical software Jamovi 2.3.21. The results show that the mean of the SUS' results is 76.4 (that refers to a grade B) with a SD = 16.8. Between all the participants the most populated grade is A+ with a frequency of 35 (See next figure). If we consider the group that refers to A (A+, A and A-) it involves more than a half of the participants that used MERGO system, with the 52,3% of the sample.

Frequencies of Grade

Grade	Counts	% of Total	Cumulative %
A	8	9.0 %	9.0 %
A+	35	39.3 %	48.3 %
A-	3	3.4 %	51.7 %
B	5	5.6 %	57.3 %
B+	3	3.4 %	60.7 %
C	10	11.2 %	71.9 %
C+	5	5.6 %	77.5 %
D	12	13.5 %	91.0 %
E	8	9.0 %	100.0 %

Table 1: percentage and frequencies of the usability rade made

The votes under the C are 20 and represent a quarter of the whole sample (the 24,7%). Interesting also the results regarding the digital skills of the participants. We set the level between base = 1 to highly advanced =4.
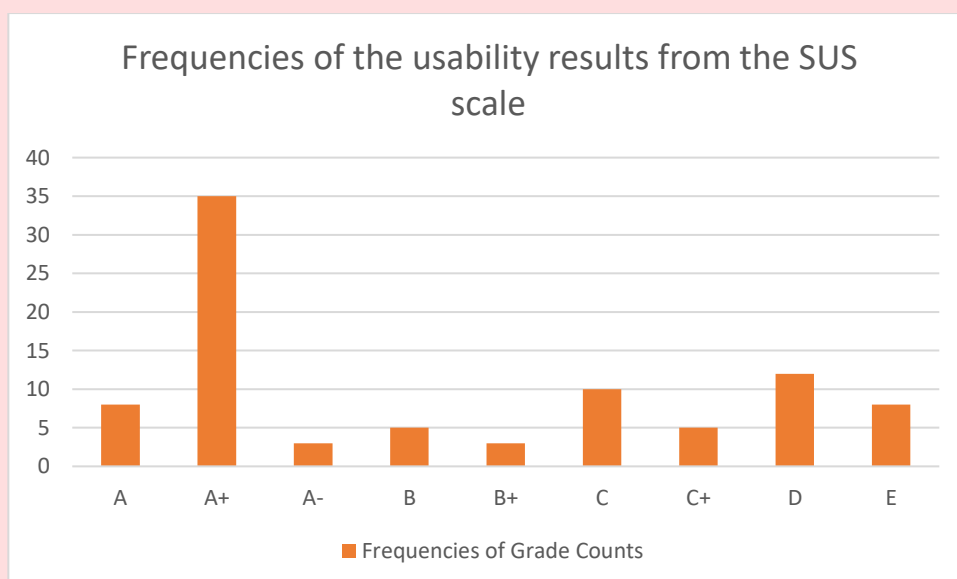

Figure 31: Frequencies of the perceived usability from the users enrolled in the study.

The mean of all the dimensions of the digital skills have as median 2and the following means :1) Information and data literacy M= 1.99; SD= 0.809; 2) Communication and Collaboration M=2.23; SD =0.723; 3) Digital Content Creation M=1.88; SD = 0.708; and 4) Safety M=1.88; SD=0.740.

In addition, we evaluated the impact of the digital skills on the perceived usability of the users. For this analysis we used the Mann—Whitney U test[5] (1947) including as "Low Digitally Skilled" the participants that obtained the level Base or Intermediate and "High Digitally skilled" the participants that obtained Advanced or Highly Advanced.
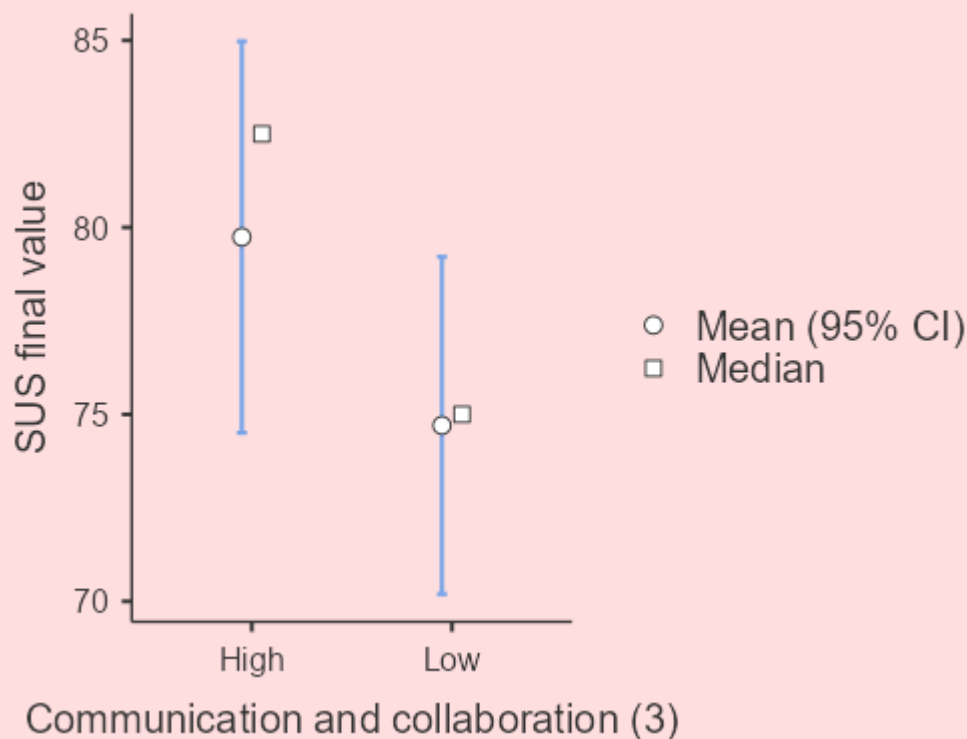
Figure 32: Box plot of the users that have high level in Communication and collaboration and those with a low competence in this side.

If we consider "Communication and collaboration" area, we have the SUS mean for highly skilled in digital environment with 79.4 and the low skilled with 74.7, these two means are statistically different (with the mean of the SUS´ results of high digitally skilled that is above the low digitally skilled) with a p=0.129 (see the table below).

[5] Mann, H. B., & Whitney, D. R. (1947). On a test of whether one of two random variables is stochastically larger than the other. The annals of mathematical statistics, 50-60.

		Statistic	p	Mean difference
SUS final value	Mann-Whitney U	728	0.129	5
SUS final value	Mann-Whitney U	172	< .001	20

Table 2: Mann-Whitney U Test for Communication and collaboration area.
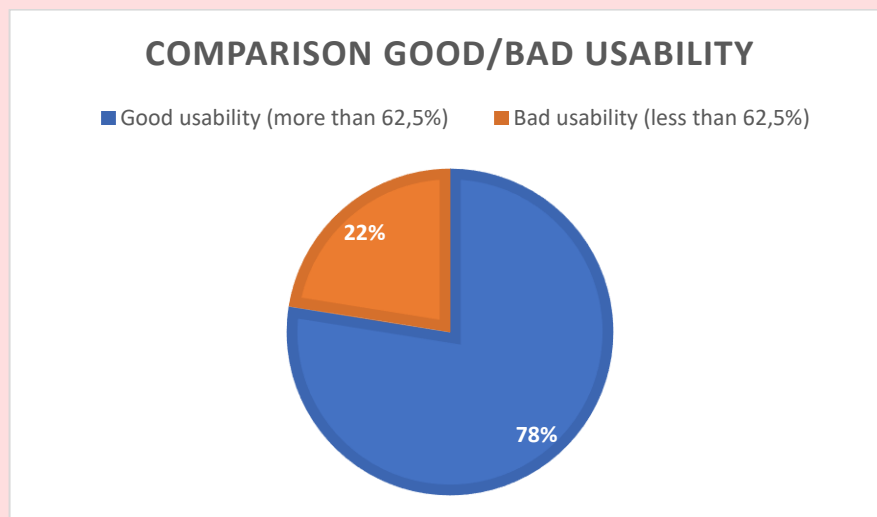
Figure 33: Frequencies of the perceived usability from the users enrolled in the study.

If we consider the "Low level" only as the participants that obtained a "Base" grade in the DigComp questionnaire we have that the High digitally skilled users have a statistically significant increase in usability comparted with the participants with low digital skills.

Discussion of the results

The results showed in the previous paragraph provide an interesting picture of the MERGO application. First of all, it obtained a good degree of usability, with three quarters of the participants that consider it a sufficient usability and more than half that provide a high rating. Nevertheless, a part of the user groups (22%) considers

it with a low usability. The results are very spread on the sample group with a high degree of variability.

The sample was heterogeneous in terms of age, gender and digital skills. This last element was on the light of the study, that demonstrates as the users with very basic digital skills report lower results on usability with the SUS scale. The relatively high level of the p value, when in "Low digitally skilled" are included also the users that have "Intermediate" level of "Communication and collaboration" in digital contexts, demonstrates that only the users with initial digital competences would have greater results on the usability for the systems.

It appears very interesting because the system could not be so friendly although proposes something completely new for the user (i.e. the user must smell a olfactory jar and put them close to its smartphone that it is able to recognize it) and the results on the usability would be impacted for this reason. On the contrary, the results shows that this approach of olfactory learning is very easy to understand also to newcomers in the sectors.

A reflection is due regarding the level of "Communication and collaboration" that appears as the variable able to discriminate the users' perception regarding the usability: users with low skills in digital contexts tends to consider the instrument more difficult to be used. The other dimensions have not the same discriminatory power, while a natural candidate would be the level of "Information and data literacy". It is a matter that will need further studies and research work, however it useful to underline that "Communication and collaboration" contains the subdomain "Interacting through digital technology" that is a crucial part when it is involved a Tangible User Interfaces technology, and it would explain its discriminatory ability. A good level of usability places MERGO as an interesting tool that could be used by different users, at the same time a further effort would be spent for the users with very initial digital skills that should be more sustained in their application. Next studies would also focus on the learning impact of the interactive learning environment proposed in this article. Finally, we must consider the weak point of the study that refers on the limited sample. A next study would

enlarge the sample and propose the application of the tool in different populations, including users with high oenology skills and different digital skills.

AREA 5. IMPACT OF THE PROJECT

External Expert evaluation (Advisory Board) on the MERGO project

MERGO MOOC, video-recording texts, questionnaires and games have been evaluated by two external expert reviewers, by using Google Forms (Appendix 1 and 2). The reviewers were Angelo Rega from University of Naples Federico II and Neapolisanit srl; and Giovanni Gentilesco from CREA (Consiglio per la Ricerca in Agricoltura e l'analisi dell'Economia Agraria).

The external evaluators found high the originality and the quality of MOOC, including both theoretical and practical parts.

Expert evaluation on oenological impact of MOOC and APP

In the MERGO project an important role is played by the experts that collaborated to the creation of the Open Educational Resources and the MERGO app exercises and the assessment of the results achieved in the project as stated in the previous chapter in the Area 4 (as defined in the Intellectual Output 1).

The experts were involved by the partner for assessing in qualitative manner the results of the MERGO project and to obtain information on a different level.

The questionnaire created is reported on the Annex 1.

The Partnership involved 15 experts in the following categories:

- Enologist

- Lecturers of Food technology

- Head of wine lab

- Master Wine tester

- Wine tester

- Enthusiast

- Researchers

- Lecturer of viticulture

- Lecturer of Enology

Their knowledge on the MOOC is good, only 3 experts claim to do not have knowledge of the MOOC term and only 4 never attended a MOOC before.

Regarding the replies to the quantitative questions, when we asked: "*The oenological studies cannot do without tasting and olfactive learning*", the answers were positive with an average level (MEAN) of 4.4 and a standard deviation (SD) of 1.1. (See the next figure).

The oenological studies can not do without tasting and olfactive learning

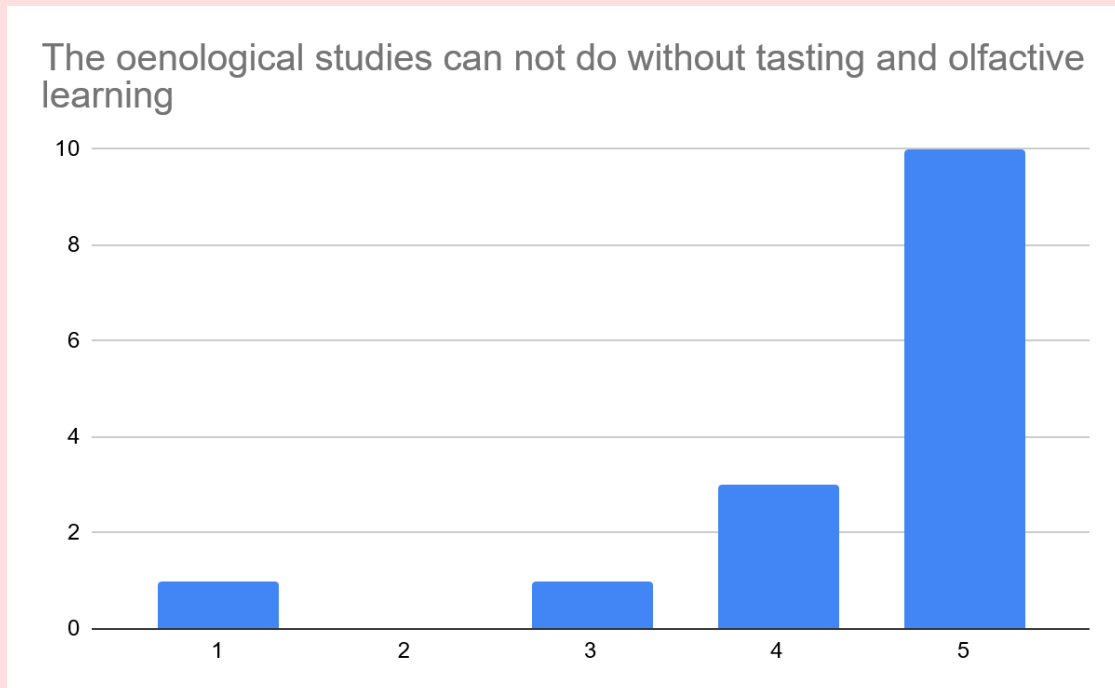*Figure 34: Results for the statement "The oenological studies cannot do without tasting and olfactive learning".*

This remarks the importance of the laboratorial part in the enology studies.

When we asked: "The oenological learning need of laboratory work in presence" the results a little bit smaller since a lot of experts replied with neutral feedback (a rate of 3). This brings to an average of 4.1 and a SD of 0.8.

Do you think that an online course with a practical part of olfactive learning could be useful?

Do you think that an online course with a practical part of olfactive learning could be useful?
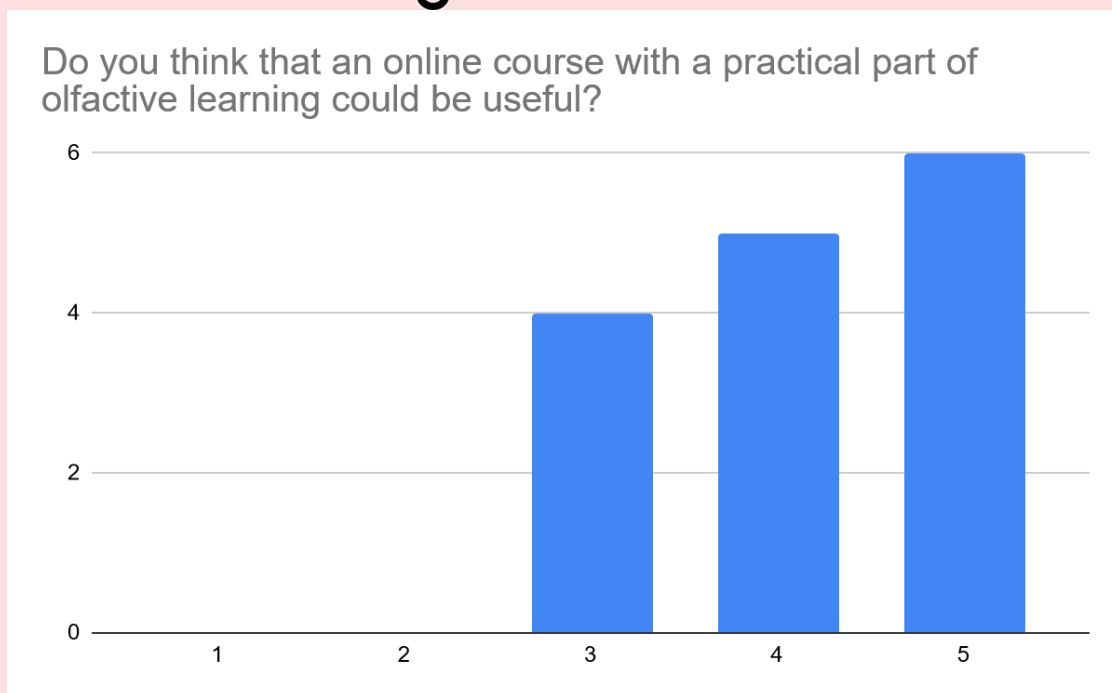
Figure 35: Results for "The oenological learning need of laboratory work in presence".

When we tried to understand the potential of an online MOOC in enology asking "*Do you think that an online course with a practical part of olfactive learning could be useful?*" the group of participants replied with high scores but smaller than in the previous questions, with a MEAN of 3.9 and a SD 1.1..

Do you think that an online course with a practical part of olfactive learning could be useful?

Figure 36: Distribution of the replies for "Do you think that an online course with a practical part of olfactive learning could be useful?".

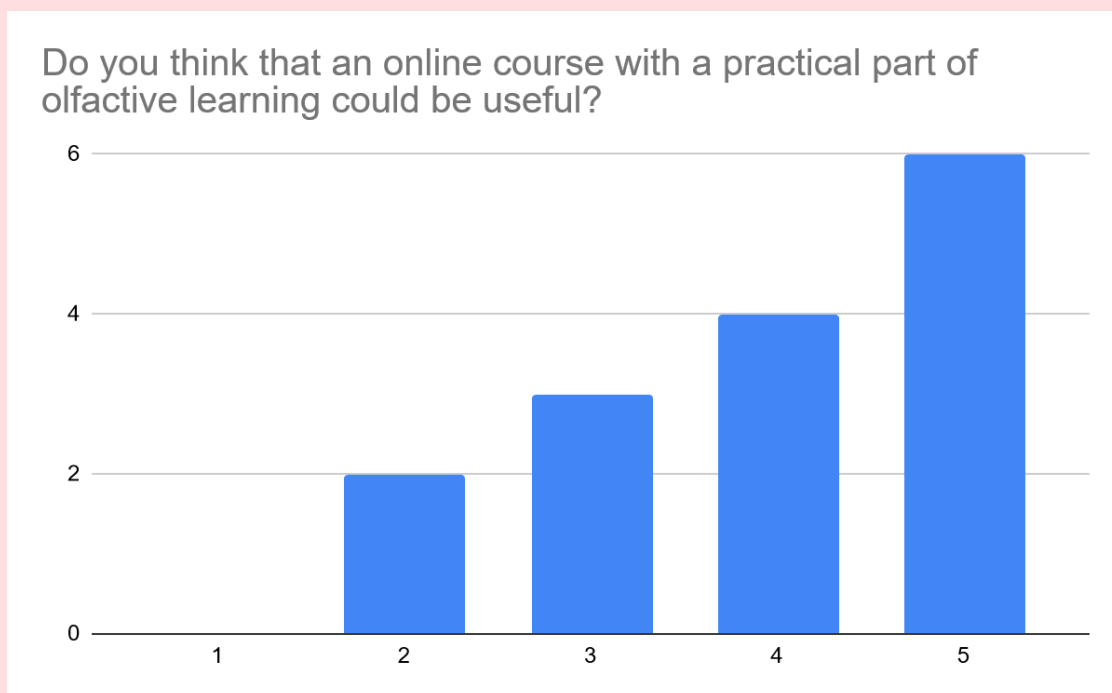Next, the question moved on the importance of self-assessment and self-regulation learning on distance learning. Regarding this the results about the importance of self-assessment are quite high, with a mean that is close to 4, however it seems not completely homogenous (see next picture)
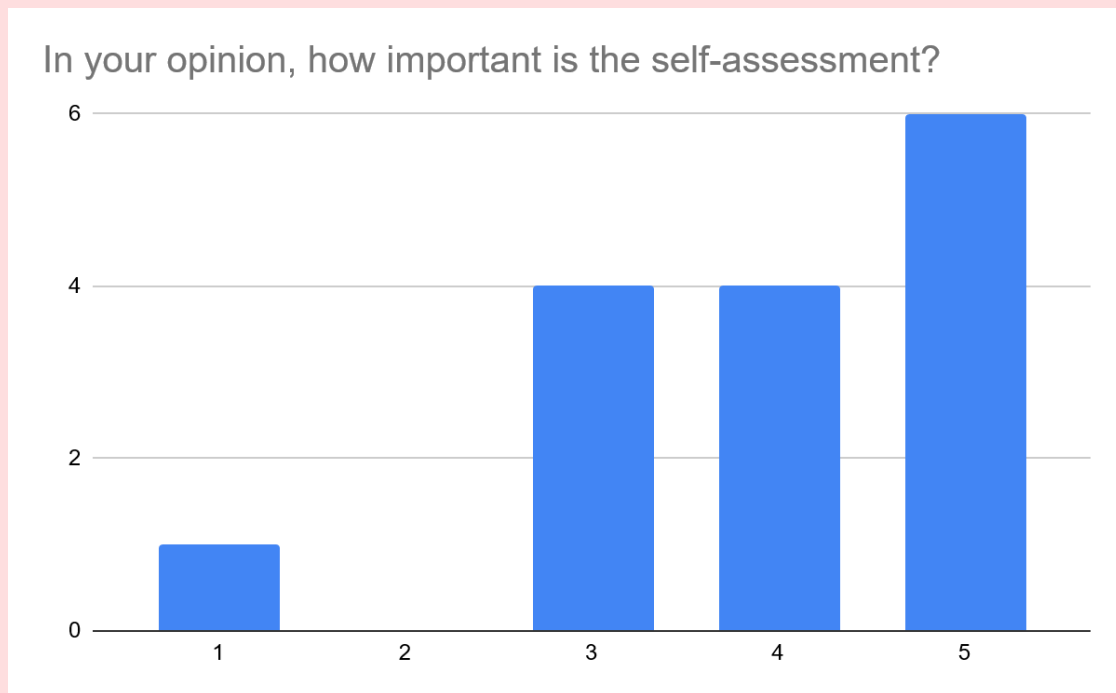

Figure 37: Distribution of the feedback about the question "In your opinion, how important is the self-assessment?".

Regarding the possibility of repeating the course, the group of experts think that the online course that are not so important in a continue repetition with an average rate of 3.5 and a SD=1.2.

The possibility of repeating the online course several times constitutes an advantage for the student
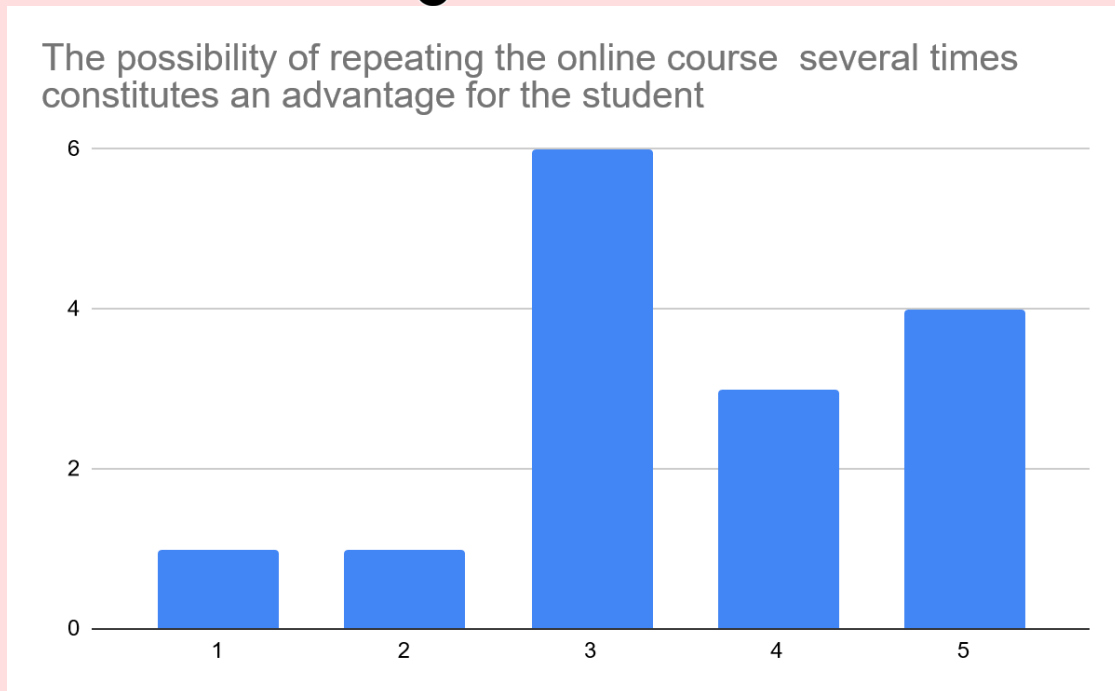
Figure 38: Frequencies of the perceived usability from the users enrolled in the study.

On the contrary, the group consider very important to repeat the olfactive test more than once, considering it a crucial point for the students (MEAN = 4,8 and SD = 0.4).
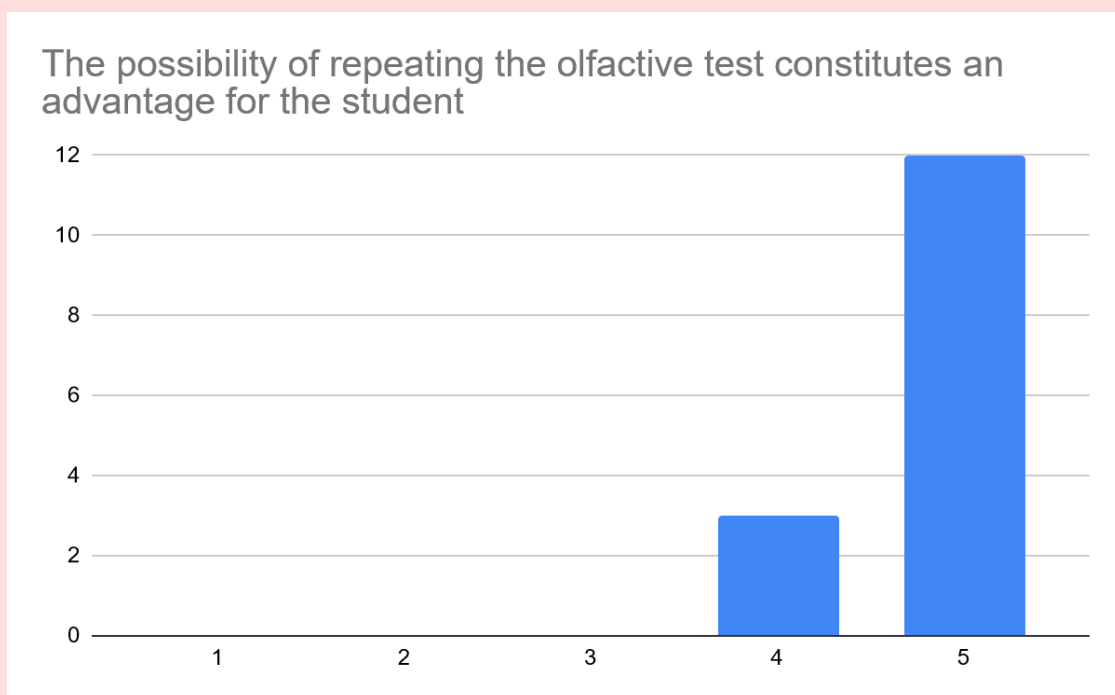
The possibility of repeating the olfactive test constitutes an advantage for the student

Figure 39: Frequencies of the perceived usability from the users enrolled in the study.

At the end of the questionnaire, we asked what the strengths and the weakness are. Regarding the strengths they supported that the self-assessment and the repetition are a crucial aspect of the MERGO application and the enology courses in general.

Regarding the weakness it is considered that the most relevant thing that lacks is the relation with the teacher and lack of wine tasting, because the user could train their olfactory skills but are not using samples of wine.

When we asked what MERGO could give as support, they consider that it is an auxiliary tool, useful for the students that could train as much as they want. However, the experts point out that the experience should be for beginners or students that have not previous knowledge in wine tasting. The experts consider it a useful tool for a remote training, aligned with the new technology opportunities.

Nevertheless, the positive replies as: "It is useful for students and persons who don't have previous experience in wine testing and are willing to obtain basic knowledge on sensory wine analysis." or "An example of this innovative teaching has already been tested by the Assoenologi by coordinating an online tasting for students of all VE courses in Italy and this initiative was greatly appreciated. Obviously, all the various courses must be stocked with the same wines so that it can be guided online, but the initiative is worth repeating in the future too", it received also criticisms like: "I do not consider in a positive way the online courses" or "The weak point could be the cost that the student could face".

The experts gave good feedback for a further improvement and to guide the recommendation of this document. The replies were positive, and in some cases also excellent, however some doubt on costs emerged.

List of best practices and recommendations

The MERGO project has demonstrated its potential to revolutionize the teaching and learning processes, particularly in the field of sensory evaluation in viticulture and oenology. As we look to the future, there are several recommendations that can help fully exploit the project's outcomes and make them accessible to a broader audience, ensuring their sustainability and impact. This document was created to analyze the impact of the project and define a list of recommendations for a further application in the enology and viticulture academic teaching and learning with distance methods. Here are some key recommendations:

1. Expand and Adapt the Curriculum:

  - Consider expanding the existing MERGO curriculum to cover a wider range of sensory evaluation topics, including other beverages and food products.

  - Adapt the content to cater to different levels of expertise, from beginners to advanced professionals, ensuring a broader appeal.

2. Collaborate with Educational Institutions:

  - Collaborate with universities, colleges, and educational institutions across the globe to integrate the MERGO curriculum into their oenology, viticulture, and related programs.

  - Encourage partnerships with educational institutions to offer MERGO-based courses, both online and in traditional classroom settings.

3. Professional Certification:

- Develop a professional certification program based on the MERGO curriculum, allowing individuals to earn recognized credentials in sensory evaluation.

- Collaborate with industry associations to establish standards and promote these certifications within the wine and beverage industry.

4. Localization and Translation:

- Translate the MERGO content into multiple languages to make it accessible to a global audience.

- Ensure localization of content to consider regional differences in sensory evaluation practices and terminologies.

5. Continuous Improvement:

- Regularly update and improve the MERGO curriculum to reflect the latest advancements in sensory evaluation techniques and technologies.

- Gather feedback from users, educators, and professionals to identify areas for enhancement.

6. Promotion and Marketing:

- Develop a marketing and outreach strategy to promote the MERGO project to potential users, institutions, and professionals.

- Utilize social media, industry events, and partnerships to raise awareness about the project.

7. Research and Innovation:

  - Continue research related to sensory evaluation, both in terms of methodology and applications, to keep the MERGO content up to date.

  - Explore innovative technologies and tools that can enhance the learning experience.

8. Collaboration with Industry:

  - Collaborate with wine and beverage industry stakeholders to ensure the MERGO curriculum aligns with industry needs and standards.

  - Encourage industry professionals to participate in the project as contributors, mentors, or advisors.

9. Accessibility and Inclusivity:

  - Ensure the MERGO project remains accessible to individuals with disabilities by implementing inclusive design principles.

  - Consider offering scholarships or reduced fees to ensure affordability for a wide range of users.

10. Long-Term Sustainability:

  - Establish a sustainable business model that allows the project to remain operational over the long term, balancing revenue generation with accessibility.

11. Monitoring and Evaluation:

- Implement robust monitoring and evaluation mechanisms to measure the impact and effectiveness of the MERGO curriculum.

- Use data and feedback to make informed decisions for continuous improvement.

In conclusion, the MERGO project has the potential to revolutionize education in sensory evaluation. By expanding, adapting, and promoting its content, collaborating with institutions and industry stakeholders, and maintaining a commitment to continuous improvement and accessibility, the project can have a lasting impact on the field and provide valuable learning opportunities for students and professionals around the world.

Appendix 1 —

Reviewer 1 answers

MERGO revision

Do you have any potential conflict of interest with regards to MERGO? *

- ○ Yes
- ● No

MERGO REVISION

Originality of MOOC based on the integration of theoretical lessons with olfactive games *

- ● High
- ○ Average
- ○ Low

Quality of presentation *

- ● High
- ○ Avarage
- ○ Low

Quality of questionnaires *

- ⦿ High
- ◯ Avarage
- ◯ Low

Quality video recording texts *

- ⦿ High
- ◯ Avarage
- ◯ Low

Quality of olfactive games *

- ⦿ High
- ◯ Avarage
- ◯ Low

Interest to the readers *

- ⦿ High
- ◯ Avarage
- ◯ Low

Overall recommendation *

- ◉ Accept in present form
- ○ Accept after minor revision (correction to text editing)
- ○ Reconsider after major revision
- ○ Reject (the course serious flaws)

Quality of English language *

- ○ English very difficult to understand/incomprehensible
- ○ Extensive editing of English language and style required
- ○ Moderate English changes required
- ○ English language and style are fine/minor spell check required
- ◉ I am not qualify to assess the quality of english in this course

Comments and suggestions for authors

Questo modulo è stato creato all'interno di Università degli Studi di Foggia.

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72

Appendix 2 —

Reviewer 2 answers

MERGO revision

Do you have any potential conflict of interest with regards to MERGO? *

- ⚪ Yes
- 🔘 No

Originality of MOOC based on the integration of theoretical lessons with olfactive games *

- 🔘 High
- ⚪ Average
- ⚪ Low

Quality of presentation *

- 🔘 High
- ⚪ Avarage
- ⚪ Low

Quality of questionnaires *

- ⦿ High
- ◯ Avarage
- ◯ Low

Quality video recording texts *

- ◯ High
- ⦿ Avarage
- ◯ Low

Quality of olfactive games *

- ⦿ High
- ◯ Avarage
- ◯ Low

Interest to the readers *

- ⦿ High
- ◯ Avarage
- ◯ Low

ḟ-meRGo

Overall recommendation *

- ⦿ Accept in present form
- ○ Accept after minor revision (correction to text editing)
- ○ Reconsider after major revision
- ○ Reject (the course serious flaws)

Quality of English language *

- ○ English very difficult to understand/incomprehensible
- ○ Extensive editing of English language and style required
- ○ Moderate English changes required
- ○ English language and style are fine/minor spell check required
- ⦿ I am not qualify to assess the quality of english in this course

Comments and suggestions for authors

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