RELAR

Project. RELAR (REmote Learning and examination based on AR)

Grant Agreement n. 2020-1-NL01-KA226-VET-083043

Output 02 Task 4

Co-funded by the
Erasmus+ Programme
of the European Union

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1. Output 02 Task 4

This report aims to demonstrate the work done on Output 02 Task 4. The Grant Agreement stipulates that during this stage of the product, “intervention by the reference panel will be held at this stage through a series of meetings in which the products are showcased”.

1.1 First Meeting

During the first meeting that was held on the 5th of May 2023, MCAST showcased its scenario titled “Shipyard Technician” to the reference panel members. After the presentation, an informal discussion was held on the potential use of the HMT-1 device in an educational environment. Whilst the panel members hailed the potential use of such a device, other concerns/suggestions were also discussed. The discussion revolved around three themes i.e. HMT-1 challenges and limitations, pedagogical aspects and future research cooperation on this matter.

Theme 1: HMT-1 Technical Challenges and Limitations

1. **Limited screen size:** The HMT-1 has a small, monocular display that provides a virtual 7-inch screen viewed at arm's length. This limited screen size may not be suitable for tasks that require extensive visualisation or multitasking.
2. **Voice recognition challenges**: The HMT-1 relies on voice commands for user interaction. Background noise, accents, or speech impediments may affect the accuracy and responsiveness of the voice recognition system, leading to potential misunderstandings and frustration.
3. **Comfort and ergonomics**: Prolonged use of the HMT-1 can lead to discomfort, especially for users with prescription glasses or headgear.
4. **A restricted field of view**: The HMT-1's monocular display covers only one eye, which may limit peripheral vision and depth perception for certain tasks. Additionally, some users may experience discomfort or fatigue from wearing the device for long periods.

5. **Limited battery life:** Although the HMT-1 battery is designed for a full work shift, heavy usage or extended periods may cause the battery to deplete faster than expected, requiring frequent recharging or battery swaps.
6. **Limited compatibility:** The HMT-1 runs on the Android operating system and may not be compatible with all enterprise software applications, requiring additional development or customisation to ensure seamless integration with existing systems.
7. **Cost:** The HMT-1 is a specialised equipment with a relatively high price point. The investment may not be justifiable for some educational organisations, particularly if they have a limited budget.

Theme 2: Pedagogical Issues

1. Concern about the **students' digital proficiency**. The lack of students' digital knowledge may hinder the use of this device in the classroom. **Potential Suggestion:** Importance to offer proper training and technical support to the student before using the device.
2. **Resistance from teachers/lectures**. **Potential Suggestion:** A strategy to encourage educators to make further use of these emerging technological tools. Naturally, such a strategy must also include training programmes for educators and also technical support.
3. Importance to tackle the **lack of AR infrastructure at the educational institutions**

Theme 3: Future research on HMT-1 in the form of new research projects was also discussed. New research ideas were aimed at:

1. Addressing digital distractions in class. Students' attention may be split when using this device between learning and using such a device. Such digital distraction may lead to a loss of depth of learning, getting mentally fatigued, and weakening the students' ability to transfer what they have learned to other subjects and situations.

2. Assessing the students' feedback vis-à-vis:

- Higher Education student learning;
- Higher Education student achievement;
- Higher Education student self-efficacy

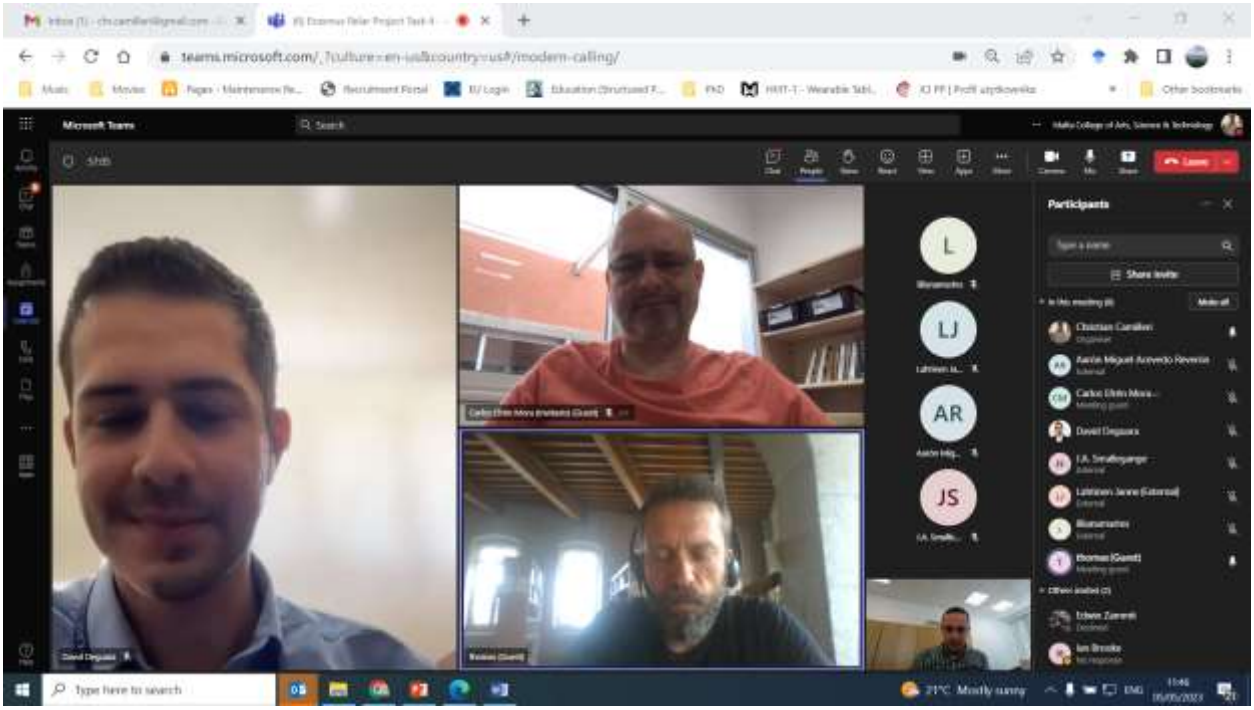

Figure 1: Meeting held on the 5th of May 2023.

1.2 Second Meeting

The second meeting was held on the 19th of May 2023. During this meeting, University La Laguna showcased their scenario on Marine Engineering and SAMK showcased the third scenario on Logistics / Fleet Assistant. The following encapsulates the main points discussed:

Presentation and discussion of Marine Engineering Scenario by the University of La Laguna

The representatives from University La Laguna provided an in-depth overview of their new training scenario in Marine Engineering. Their approach is grounded on the concept of Digital Active Learning Processes (DALP), a pedagogical framework for RELAR rooted in active learning.

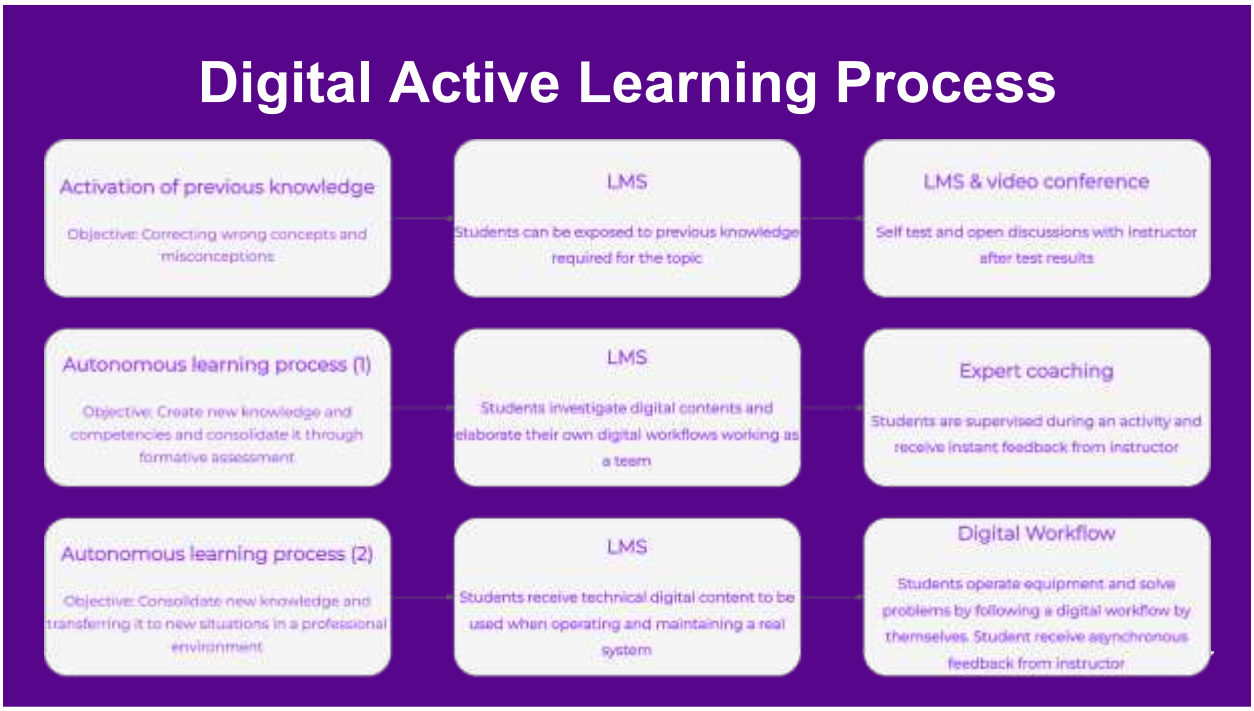

Figure 2: Pedagogical framework for RELAR Digital Active Learning Process.

Two distinct DALP strategies are deployed in this innovative learning scenario: Expert Coaching and Digital Workflow. The Expert Coaching DALP involves students operating a system or addressing a local issue under the guidance of a remote expert, executing predefined procedures. This approach allows for immediate, online formative assessments, enabling students to apply their skills and knowledge in real-time problem-solving scenarios.

On the other hand, the Digital Workflow DALP involves students creating, testing, and documenting their own workflows, thereby facilitating asynchronous formative assessments. Students gather evidence of their successes and failures, thereby learning from hands-on experience.

To facilitate the DALP model, specific technical requirements need to be met. Students need access to the RELAR Scanner app and Zoom for HMT1, along with an optional 3D scene-oriented camera for Expert Coaching DALP. Instructors require the RELAR Scanner Google Sheet, Zoom for PC, detailed technical documents, and system images. An optional tablet equipped with scribbling capabilities and access to Real Wear Explorer also enhances the learning process.

Practical testing of this scenario took place on a real cooling plant and electrical training panels, yielding valuable insights. Some limitations of the HMT1 system were identified, such as its document visualization catering only to vertical format, requiring the creation of a specific template. Also, the microphone placement on the screen obstructs voice command recognition when adjusting the screen. Furthermore, Spanish command functionality requires further refinement.

An ongoing study was shared by the University La Laguna team examining the impact of HMT1 on the learning process. They are comparing three groups of students; those receiving specific HMT1 training before performing a task, those receiving the HMT1 with no training before task performance, and a control group that does not use the HMT1.

Preliminary results indicate that students do not require specific HMT1 training and can adapt to its use with minimal effort. Interestingly, the HMT1 does not appear to affect students' self-efficacy either positively or negatively. Thus, the HMT1 seems suitable for learning environments where hands-free operation adds value without adversely affecting students' perception of their abilities. The study's final results will guide future pedagogical practices involving the HMT1 system.

Presentation and discussion of Logistics / Fleet Assistant Scenario by SAMK

Theme 1:Technical challenges

First, the HMT-1 device is clearly designed for one on one interaction where the majority of the shared information is transferred from the person wearing the glasses to the remote person. The visualisation through the lens in the HMT-1 is not big enough to provide a sensation of a group situation in a meeting. This is sometimes a problem even when using computers and associated screens. Therefore, the HMT-1 is strong when connecting students to a learning context in separate situations.

Second, the connectivity to enable screen sharing is limited to use in the office conditions only. We were not able to find a way to share the screen of the glasses visualisation. Surely the camera view can be shared as this is the sole idea of using the glasses. The sharing of the lens view is the challenge. The sharing of the lens view with others would open up the experience of the glasses user for the other participants. This is significant so that the teacher at least could have an overview of the student progress with the scenario. If lens view can not be shared, the only way for the teacher to monitor the progress is through the camera view and audible information. What ever selections the student does are not replicated for the teacher. The possibility to share the lens view would be particularly advantegous in safety critical work scopes.

Third, the user interface with commonly known applications is based in the assumprion, that the person uses the application with a computer with the associated screen. The H5P is a great application but the graphic user interface and the learning environment is designed to be used with table top computers or laptops computers. Many basic features in the H5P suffer the small size of the lens view making it challenging for the user to conduct the desired selections and to absorb the information pushed through the application. The size and hindrances related to the lens view must be taken in to account when planning the course contents. This is challengin as things on the lens view look very different from the computer screen. Many great ideas on a compouter screen diminish when they are used with the HMT-1. Therefore, the glasses should be integral part of the course planning process. Teachers must have a thorough undertanding of how the course should be planned to function not only on the PC but also with the HMT-1.

Finally, the applications we use with the HMT-1 should not be rigid. Forcing the HMT-1 to bend to the applications is the wrong path. The use of augmented reality in education requires customized applications that are solely designed to be used with technology like the HMT-1. Through acknowlidging the need for the environment to adaot to the needs of augmented reality we make way for the commercial use of the augmented reality in education.

Theme2: Pedagogical challenges

HMT-1 is found easy to use by the students. This was the input from the student group that was involved in to the use of HMT-1 in SAMK. The user interface opens up easily for young people that are immersed to the use of equal technologies in their daily routines. SAMK students found the glasses to be useful for separated one on one situations but the shortcomings in the group learning situations were acknowlidged. With this in mind, we can elaborate different options for forming a group situation (Figure 1,2).

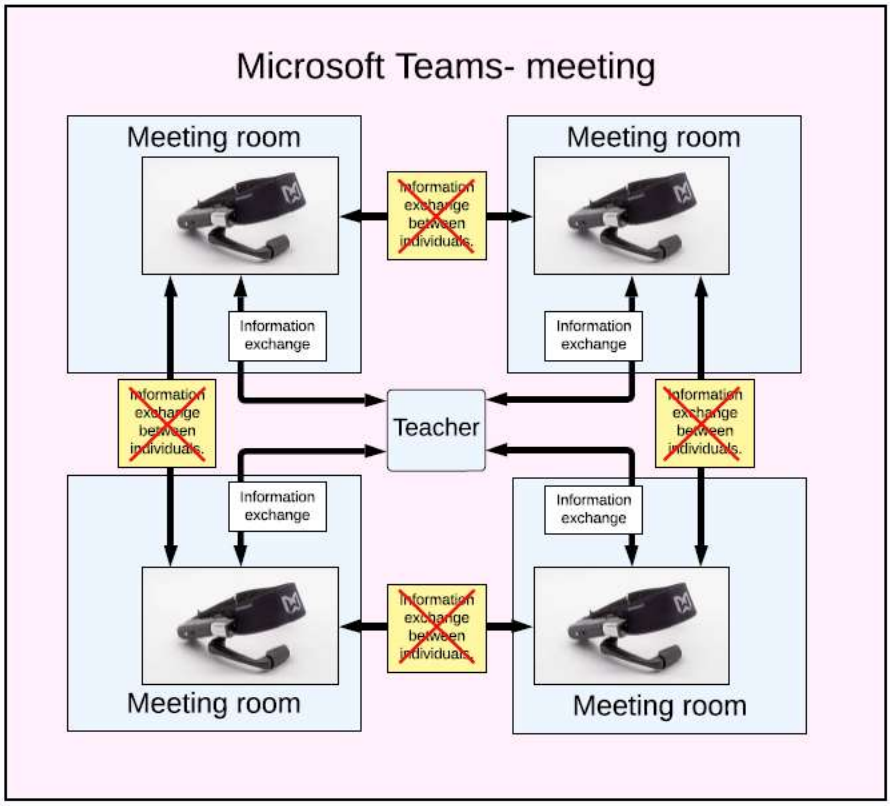

Figure 1. Janne Lahtinen, SAMK, 2023

First, Figure 1 elborates a learning context where the students and the teacher interact on individual bases. Yellow dialogue-boxes marked with an “x” represent the missing lines and methods to communicate. There is no infomation transfer from teacher to a group and there is no information transfer between students.The Figure 2 illustrates the learning context of the Scenario 3. Benefit of this configuration is the teacher ability to focus to a student progress in an individual level having a better connection to the learning process. The downside of this configuration is the teacher inability to share his/her attention to the whole group at any given time. Consequently, this leaves individual student a responsibility to proceed with the lesson independantly. Teacher can select the student he/she chooses to focus to, pending on the set performance indicators.

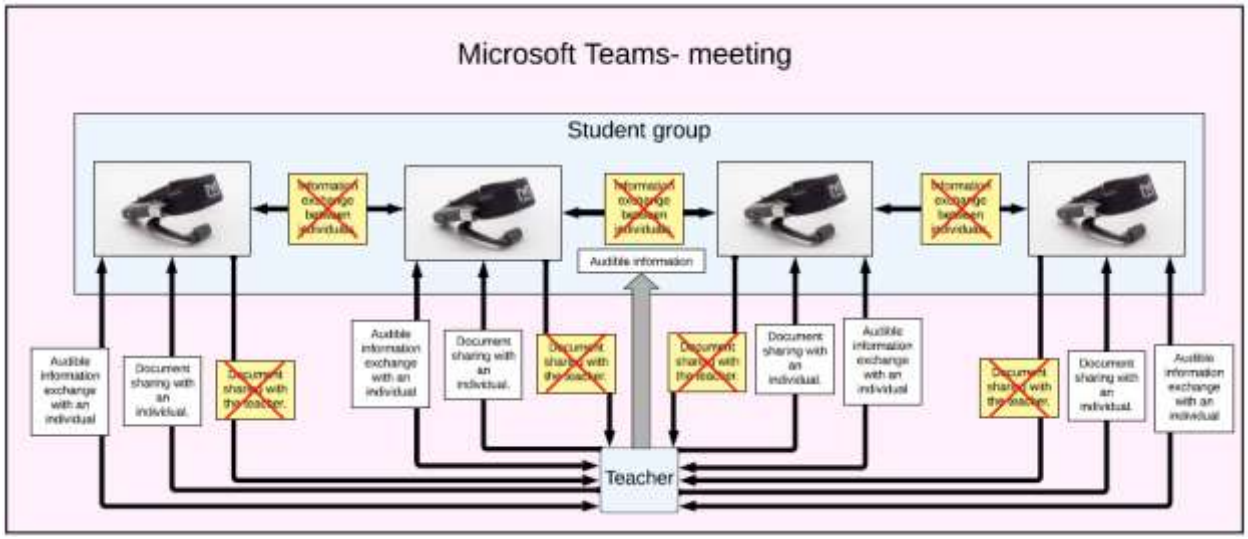

Figure 2, Janne lahtinen, SAMK, 2023

Second, the Figure 2 elaborates a learning context where the students and the teacher interact as a group and as individuals. Yellow dialogue-boxes marked with an “x” represent the missing lines and methods to communicate. This configuration is suitable only when information from teacher to a group is tranferred audibly. The benefit of this configuration is the teacher ability to share audible information to a group. Downside is the inability concentrate to a single individual if needed. This possibility is vitally important in a safety critical process such as the Scenario 3.

Finally, based on the above it can be concluded, that an overarching challenge with the utilisation of ther HMT-1 in group learning context is the enablement of interaction between students. This is likely sovable with the existing hardware, but likely not with the existing softwares available. Therefore, we in SAMK experience the enablement of interaction between HMT-1 users as paramount to commercially sustainable use of this technology.

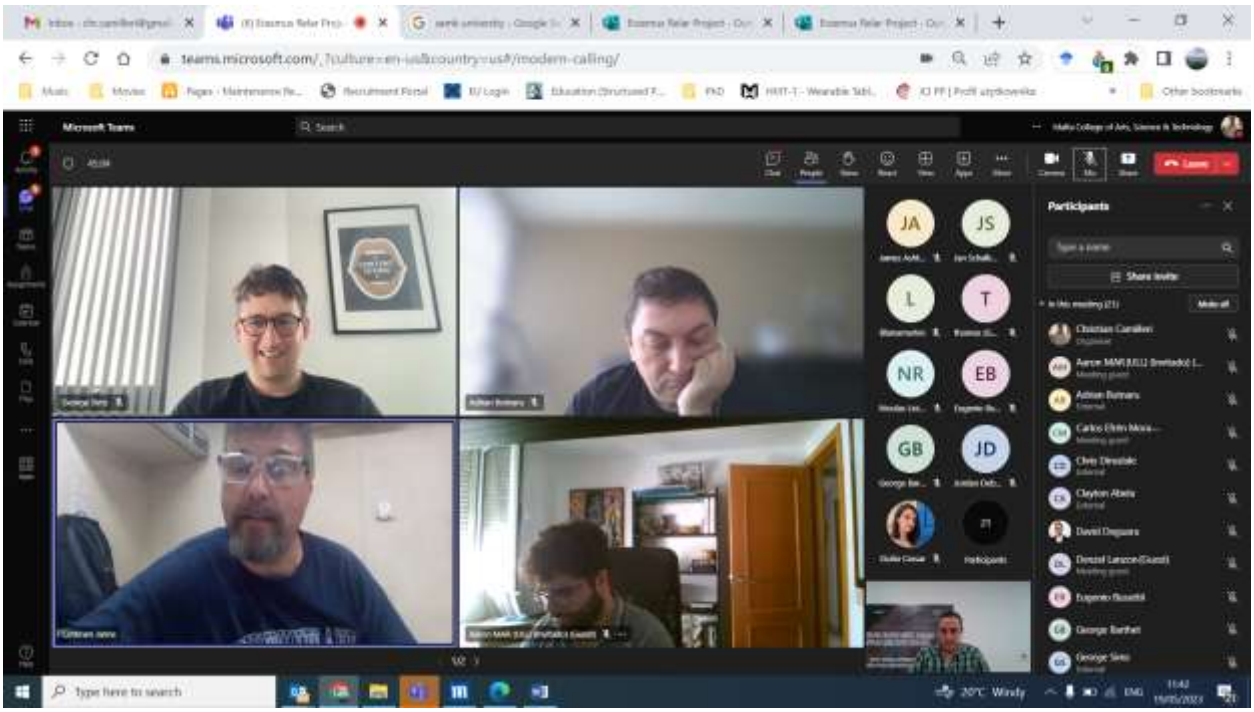

Figure 3: The second meeting was held on the 19th of May 2023.

1.3 List of Participants who attended the Meetings

Institution	Board Member	Role
Malta College of Arts, Science & Technology	Representative	Academic and Industry stakeholder
Malta College of Arts, Science & Technology	Representative	Academic
Malta College of Arts, Science & Technology	Representative	Academic
Universidad La Laguna	Representative	Academic
Satakunta University of Applied Sciences	Representative	Academic
University of the Aegean	Representative	Academic
Stiching STC Group	Representative	Academic
Stiching STC Group	Representative	Academic
Centrul Roman Pentru Pregatirea Si Perfectionarea	Representative	Academic
Universidad La Laguna	Representative	PhD Student

Malta College of Arts, Science & Technology	Representative	Degree Student
Malta College of Arts, Science & Technology	Representative	Degree Student
Malta College of Arts, Science & Technology	Representative	Degree Student
Malta College of Arts, Science & Technology	Representative	Degree Student
Malta College of Arts, Science & Technology	Representative	Degree Student
Tug Malta	Representative	Maritime Industry Stakeholder
Melita Power Diesel	Representative	Maritime Industry Stakeholder
RealWear, Inc.	Representative	HMT-1: Industry stakeholder
RealWear, Inc.	Representative	HMT-1: Industry stakeholder
Knowledge Insights	Representative	HMT-1: Industry stakeholder