# WHOLODANCE

## Whole-Body Interaction Learning for Dance Education

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# Deliverable 6.5

# Report on validation process

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## Executive Summary

This report is an accompanying document to the video clip that is the main part of this deliverable. The document explains the validation process, the paradigms tested and validated, and the user's feedback.

**Section 1** introduces the demonstrator and describes the validation tests structure, the challenges and the current solutions offered for the challenges.

**Section 2** refers to paradigm validated and the decision making involved in the validation process. It also relates to validation questions pertaining to the user's experience.

## Contents



# 1. Demonstrator introduction

This accompanying report describes the paradigms validated that facilitate the WhoLoDancE main objective of offering a dancer a novel teaching method of immersive **whole-body interaction learning** The validation tests of the demonstrator carried out, are shown in the video clip which is the main part of this deliverable.

The validation process had two main parts. A technical validation and the concept performance validation.

Technical validation included the following items:

- Hardware performance
    - Computers: minimal system requirements
    - Computers: Graphic cards performance
    - Computers: Network protocols performance
    - Router: Minimal system requirements and configuration
    - Holographic displays: Field of view
    - Holographic displays: Display speed
    - Holographic displays: Tracking accuracy
    - Holographic displays: Robustness
    - Holographic displays: Near and far planes

- Software performance
    - Unity: Shared world anchor performance enabling multi user accurate presence in shared coordinate system
    - Unity: Network streams: Data sampling speeds from repository
    - Unity: Network streams: Data sampling speeds from blending machine
    - Unity: Network streams: Data sampling speeds to multiple holographic displays
    - Unity: Avatar display real time changes through ChoreoMorphy integration.
    - Unity: Operator's ease of use
    - Unity: Scene management, Loading / saving and version control.

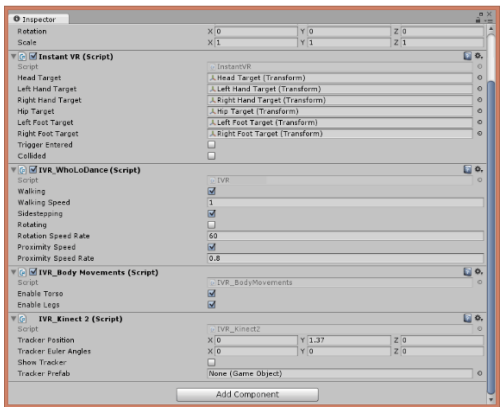
# 2. Paradigm validated

### Demonstrator "Whole-body interaction learning"

The WhoLoDancE main paradigm involved offering a dance student a novel immersive learning method through real time, whole body interaction with a virtual dance master.

The questions that needed validation of the actual experience were:

- Can dance skills or knowledge be delivered to a dance student via this learning method?
- Can such learning experience be transferred and remembered after the experience in the real world?
- Does immersion improve or rather disturb the transfer of such knowledge to the real world?
- How does this paradigm surpass the traditional tools such as the studio mirror?
- What needs to be improved or redesigned to make the experience more effective?





- **Can dance skills or knowledge be delivered to a dance student via this learning method?**

  The demonstrator setup involved a first-year young dance student who had not previously been exposed to either classical dance, flamenco or traditional Greek dance. She had learnt only contemporary dance. One of our validation questions was, how much could she learn from being "inside" an avatar that performed dance moves that she was seeing for the first time?

  At first, it was confusing only watching the enveloping avatar, but when we introduced the virtual mirror, things fell into place. We started with some steps taken from the Greek folk dance, and after 4 repetitions, she was able to largely improve her score. (The demonstrator uses a gamification paradigm of "try to stay inside your virtual body". As collisions are detected when the dancer limbs exit the avatar (see deliverable D6.4) we set a score for the number of collisions. Fewer collisions mean a higher score.)

After 5 repetitions, she was hardly looking at the virtual mirror and was more focused on the enveloping, moving avatar.

- **Can such learning experience be transferred and remembered after the experience in the real world?**

  We have tried, after the session ended, to play the Greek dance again, Tamar (the dance student) remembered the steps she learned and was able to do them correctly. However, this being a single trial in a prototype lab settings, can hardly answer this question conclusively.

- **Does immersion improve or rather disturb the transfer of such knowledge to the real world?**

  We evaluated this part of the validation throughout the session. We talked with the dancer during the session and discussed the following questions with her:

  Does wearing the head-mounted holographic device disturb the dance? (And if so how much?).

  The answer here was that it seemed awkward at the beginning, but once the session was underway, and after a few minutes, the awkwardness was largely forgotten and the experience took over.

  What disturbs the immersion?

  The clear answer here was the field of view. Once a part of the avatar disappeared from the viewing frustum, it was disturbing and "the illusion was gone"

  How does the immersion improve the experience?

  Tamar said that there were several things that were very compelling. Once the technique became familiar, she could repeatedly improve the movements in a way that was never possible with either looking at a teacher or using a mirror. Another unexpected answer was that the immersive experience heightened the "sense of self" and "sense of presence"

- **How does this paradigm surpass the traditional tools such as the studio mirror?**

The main advantage of having a virtual mirror is that the user is not limited to seeing themselves in one perspective. The virtual mirror can display any perspective, so that the dance students can see themselves also from the back, from the top or from any perspective that the teacher deems important for conveying information. Furthermore, the virtual mirror can be dynamic, and move in real time to any place and direction in the space. It can be close or far from the student. In

addition, there is little in terms of performance and speed degradation if we place several virtual mirrors in the space.

- **What needs to be improved or redesigned to make the experience more effective?**
    - The technology still has to improve. Holographic headsets should offer a much larger field of view and range. The engulfing avatars are sometimes confusing. The sense of self during the execution of new dance steps is intermittent, since on occasion, the dancer knows that a body part is intersecting with the avatar, but cannot decipher in time, which body part it is.
    - The software platform needs to be expanded to enable multi-user capacity. Currently only a single dancer and a single teacher / choreographer can experience being inside the avatar or view the dancer and avatar in the correct world coordinates. Additional people wearing hololenses can view as well, but performance speed is degrading. The user experience in itself can be improved in both avatar display transparency mapping, virtual mirror dynamic placement modifications and collision response triggering.

# 3. The clip

## Setup

We recorded 3 main video sources in real-time:

- Main video camera that showed the dance student in the space
- Hololens1: Student view. This view shows what the dance student sees inside the holographic display
- Hololens2: Teacher view. This view shows what the teacher student sees inside the holographic display

In addition we also recorded screen captures from the Unity operating interface and from the repository and blending machine UI (when used). Interviews were carried out during the session and afterwards using the main video cameras and mobile phones.

During the edit, we used split screens to show the main camera and next to it Dancers and Teaches views. In some cases we zoomed in on specific sources to explain specifics.

The clip is available in the Media section of the project website.