



**IUFFP**

ISTITUTO UNIVERSITARIO  
FEDERALE PER LA  
FORMAZIONE PROFESSIONALE

*L'eccellenza svizzera  
nella formazione professionale*

# Exploring the educational value of immersive technologies in vocational education

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Zürich, FoBBIZ Jahresveranstaltung, November 2<sup>nd</sup>, 2021

# Agenda

Introduction: Basic **terminology**

Immersive technologies: educational **potential** at a glance

**Examples** of experiences we had in VET

Outlook and **Take home message**

eSchool Media's  
Annual Trends Report

## 25 Trends for 2018



# Seeing is believing

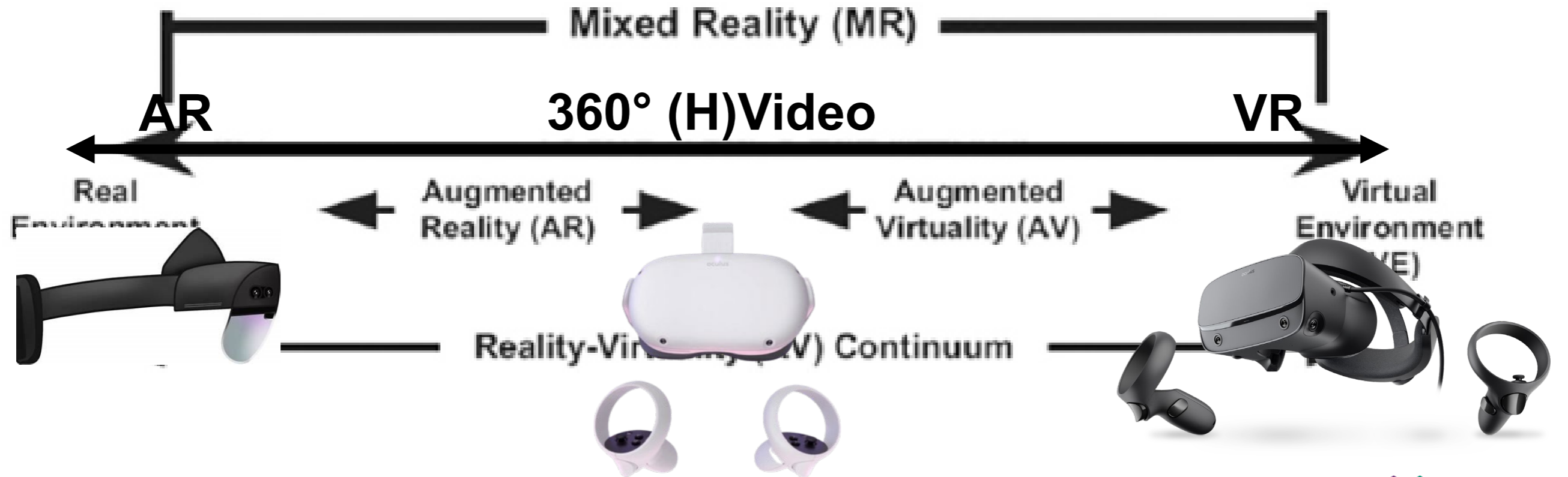
How virtual reality and augmented reality  
are transforming business and the economy



 Meta

# Basic terminology: the Virtuality continuum

(Milgram & Kishino, 1994)



# Basic terminology: the XR characteristics



Interactivity



Immersion



Presence

# Instructional advantages

AR: Akçayir & Akçayir, 2017; Bujak et al., 2013; Chen et al., 2017; Garzon et al., 2021; Jetter et al., 2018; Radu, 2014; Sirakaya & Sirakaya, 2020  
VR: Allcoat et al., 2018; Hamilton et al., 2021; Huang et al., 2020; Jensen & Konradsen, 2017; Kaplan et al., 2021; Li et al., 2018; Wu et al., 2020

- **Motivation** and satisfaction
- **Engagement** and collaboration
- **Learning outcomes** (both physical and cognitive dimensions)
- Error rates reduction
- Time and cost saving

# Disadvantages

(e.g., Akçayir & Akçayir, 2017; Bacca et al., 2014; Bujak et al., 2013; Chen et al., 2017; Jetter et al., 2018; Lee et al., 2019; Moro et al., 2021; Park et al., 2019; Radu, 2014; Wuller et al., 2019)

- Technical issues (e.g. perfect overlapping, response rate, graphical resolution,...)
- Content development is difficult
- Costs (HW, SW development,...)
- Usability and Cybersickness



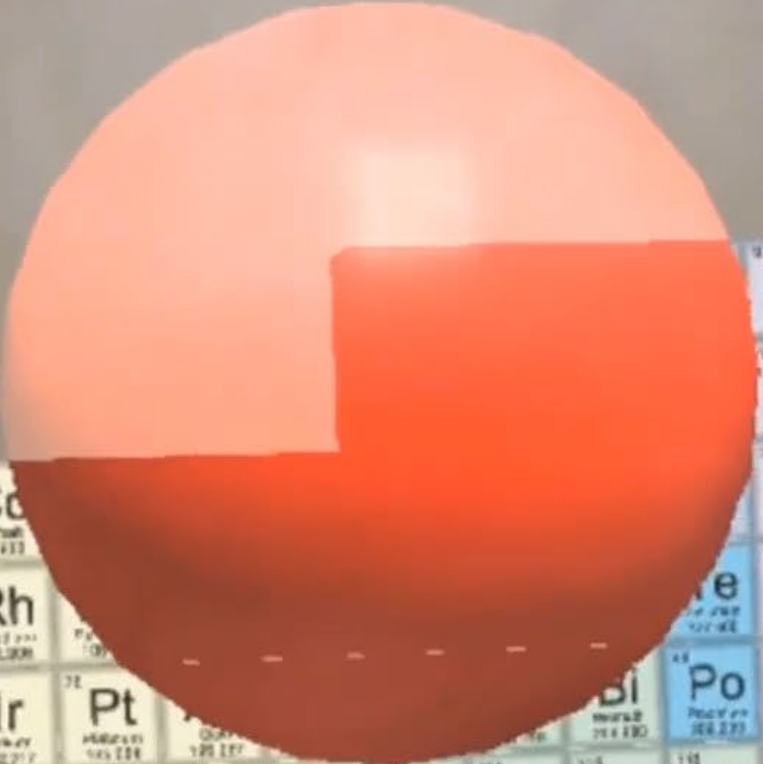
# Top affordances



**Credit: VRMT**







|                                     |                                    |                                    |                                   |                                    |                                  |                                     |                                  |                                  |                                  |                                 |                                 |                                |                               |                                  |                                 |                                  |                                 |                                    |                              |  |  |  |  |  |                                 |                                |                              |                           |
|-------------------------------------|------------------------------------|------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------------|----------------------------------|----------------------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|-------------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------------------|------------------------------------|------------------------------|--|--|--|--|--|---------------------------------|--------------------------------|------------------------------|---------------------------|
| <b>H</b><br>Hydrogen<br>1.00794     |                                    |                                    |                                   |                                    |                                  |                                     |                                  |                                  |                                  |                                 |                                 |                                |                               |                                  |                                 |                                  | <b>He</b><br>Helium<br>4.002602 |                                    |                              |  |  |  |  |  |                                 |                                |                              |                           |
| <b>Li</b><br>Lithium<br>6.941       | <b>Be</b><br>Beryllium<br>9.012182 |                                    |                                   |                                    |                                  |                                     |                                  |                                  |                                  |                                 |                                 |                                |                               |                                  |                                 |                                  |                                 | <b>F</b><br>Fluorine<br>18.9984032 | <b>Ne</b><br>Neon<br>20.1797 |  |  |  |  |  |                                 |                                |                              |                           |
| <b>Na</b><br>Sodium<br>22.98976928  | <b>Mg</b><br>Magnesium<br>24.304   |                                    |                                   |                                    |                                  |                                     |                                  |                                  |                                  |                                 |                                 |                                |                               |                                  |                                 |                                  |                                 | <b>Cl</b><br>Chlorine<br>35.453    | <b>Ar</b><br>Argon<br>39.948 |  |  |  |  |  |                                 |                                |                              |                           |
| <b>K</b><br>Potassium<br>39.0983    | <b>Ca</b><br>Calcium<br>40.078     | <b>Sc</b><br>Scandium<br>44.955912 | <b>Ti</b><br>Titanium<br>47.88    | <b>V</b><br>Vanadium<br>50.9415    | <b>Cr</b><br>Chromium<br>51.9961 | <b>Mn</b><br>Manganese<br>54.938045 | <b>Fe</b><br>Iron<br>55.845      | <b>Co</b><br>Cobalt<br>58.933195 |                                  |                                 |                                 |                                |                               |                                  |                                 |                                  |                                 |                                    |                              |  |  |  |  |  | <b>Br</b><br>Bromine<br>79.904  | <b>Kr</b><br>Krypton<br>83.798 |                              |                           |
| <b>Rb</b><br>Rubidium<br>85.4678    | <b>Sr</b><br>Strontium<br>87.62    | <b>Y</b><br>Yttrium<br>88.905848   | <b>Zr</b><br>Zirconium<br>91.224  | <b>Nb</b><br>Niobium<br>92.90638   | <b>Mo</b><br>Molybdenum<br>95.94 | <b>Tc</b><br>Technetium<br>98       | <b>Ru</b><br>Ruthenium<br>101.07 | <b>Rh</b><br>Rhodium<br>102.9055 |                                  |                                 |                                 |                                |                               |                                  |                                 |                                  |                                 |                                    |                              |  |  |  |  |  | <b>I</b><br>Iodine<br>126.90547 | <b>Xe</b><br>Xenon<br>131.29   |                              |                           |
| <b>Cs</b><br>Cesium<br>132.90545196 | <b>Ba</b><br>Barium<br>137.327     |                                    | <b>Hf</b><br>Hafnium<br>178.49    | <b>Ta</b><br>Tantalum<br>180.94788 | <b>W</b><br>Tungsten<br>183.84   | <b>Re</b><br>Rhenium<br>186.207     | <b>Os</b><br>Osmium<br>190.23    | <b>Ir</b><br>Iridium<br>192.222  | <b>Pt</b><br>Platinum<br>195.084 |                                 |                                 |                                |                               |                                  |                                 |                                  |                                 |                                    |                              |  |  |  |  |  |                                 | <b>Po</b><br>Polonium<br>209   | <b>At</b><br>Astatine<br>210 | <b>Rn</b><br>Radon<br>222 |
| <b>Fr</b><br>Francium<br>223        | <b>Ra</b><br>Radium<br>226         |                                    | <b>Rf</b><br>Rutherfordium<br>261 | <b>Db</b><br>Dubnium<br>262        | <b>Sg</b><br>Seaborgium<br>263   | <b>Bh</b><br>Bohrium<br>264         | <b>Hs</b><br>Hassium<br>265      | <b>Mt</b><br>Meitnerium<br>266   | <b>Ds</b><br>Darmstadtium<br>267 | <b>Rg</b><br>Roentgenium<br>268 | <b>Cn</b><br>Copernicium<br>269 | <b>Uut</b><br>Ununtrium<br>270 | <b>Fl</b><br>Flerovium<br>271 | <b>Uup</b><br>Ununpentium<br>272 | <b>Lv</b><br>Livermorium<br>273 | <b>Uus</b><br>Ununseptium<br>274 | <b>Uuo</b><br>Ununoctium<br>276 |                                    |                              |  |  |  |  |  |                                 |                                |                              |                           |

|                                     |                                  |  |                                   |                                     |                                     |                                    |                                   |                                     |                                      |                                     |                                |                                    |                                    |                                   |
|-------------------------------------|----------------------------------|--|-----------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-----------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|
| <b>La</b><br>Lanthanum<br>138.90547 | <b>Ce</b><br>Cerium<br>140.12    | <b>Pr</b><br>Praseodymium<br>140.90766 | <b>Nd</b><br>Neodymium<br>144.242 | <b>Pm</b><br>Promethium<br>144.9126 | <b>Sm</b><br>Samarium<br>150.36     | <b>Eu</b><br>Europium<br>151.964   | <b>Gd</b><br>Gadolinium<br>157.25 | <b>Tb</b><br>Terbium<br>158.92535   | <b>Dy</b><br>Dysprosium<br>162.50015 | <b>Ho</b><br>Holmium<br>164.93033   | <b>Er</b><br>Erbium<br>167.259 | <b>Tm</b><br>Thulium<br>168.934    | <b>Yb</b><br>Ytterbium<br>173.0547 | <b>Lu</b><br>Lutetium<br>174.967  |
| <b>Ac</b><br>Actinium<br>227        | <b>Th</b><br>Thorium<br>232.0377 | <b>Pa</b><br>Protactinium<br>231.03688 | <b>U</b><br>Uranium<br>238.02891  | <b>Np</b><br>Neptunium<br>237.04817 | <b>Pu</b><br>Plutonium<br>244.06422 | <b>Am</b><br>Americium<br>243.0613 | <b>Cm</b><br>Curium<br>247.07035  | <b>Bk</b><br>Berkelium<br>247.07035 | <b>Cf</b><br>Californium<br>251.08   | <b>Es</b><br>Einsteinium<br>252.083 | <b>Fm</b><br>Fermium<br>257.10 | <b>Md</b><br>Mendelevium<br>258.10 | <b>No</b><br>Nobelium<br>259.10    | <b>Lr</b><br>Lawrencium<br>260.10 |









# Top affordances per each technology

- VR: Accessing not-accessible / dangerous phenomena  
(in time and space, micro and macro)  
Visualizing abstract concepts / complex spatial relations
- 360°V: Accessing dangerous / not-accessible phenomena  
No development required
- AR: Handle and manipulate things  
Making the invisible visible

# What about VET?

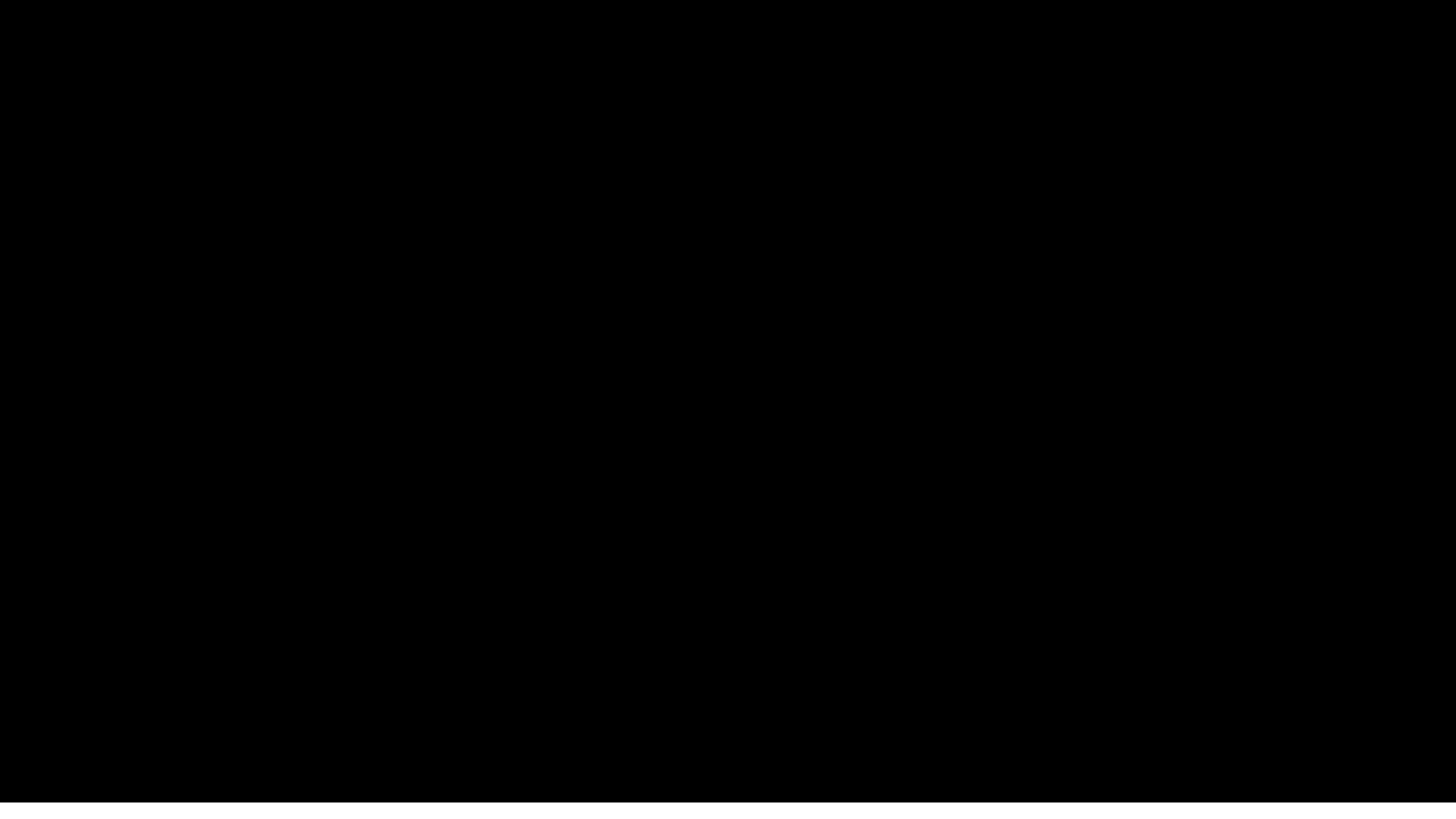
# Dual-T Project 3



## Technologies for Vocational Training

Leading House funded by the  
Swiss Federal Office for  
Professional Education and Technology

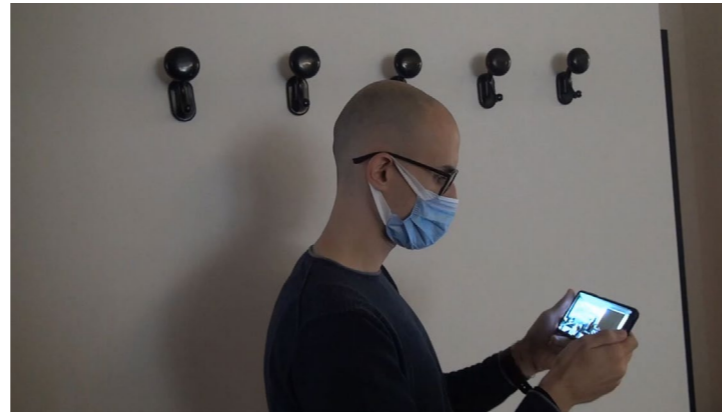




# Mirror 360°



Desktop



Handheld



Immersive

Let the eagle fly

No didactic indications.



# Take home messages



# Take home messages

- Facilitating conditions: infrastructures necessary but not sufficient conditions
- Combine instead than substitute
- Give your learners a generative role
- Need to train teachers and instructors! – knowledge, skills, and... attitudes
- Design matters (to avoid deskilling too)



**NO INFRASTRUCTURE  
NO PARTY**

НАДМІРНЕ СПОЖИВАННЯ АЛКОГОЛЮ ШКІДЛИВЕ ДЛЯ ВАШОГО ЗДОРОВ'Я







# Thanks!

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