Mixed Reality in medical Education based on Interactive Applications (MIREIA)

Reference: 621668-EPP-1-2020-1-ES-EPPKA2-KA

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

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„This project has been funded with support from the European Commission. This communication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.“

Background

Medical education

- Long and demanding process
- Requiring the learning of extensive theoretical knowledge as well as a set of technical and non-technical skills.

Formative methods

- ***Traditional***: Based on static learning content and sometimes far removed from actual clinical practice.
- ***Currently***: Based on the use of information and communication technologies (ICTs): Extended reality (XR) technologies (VR, AR, MR) and three-dimensional (3D) printing.

Challenges

1. There are no existing technologies for quick and automatic generation of 3D models, which means that models must be obtained from third parties with limited personalization
2. There are no accepted standards to exploit these novel immersive technologies with methodological guidelines in medical training.
3. Scientific evidence to support the validity of personalized models as learning and training tools is scarce.

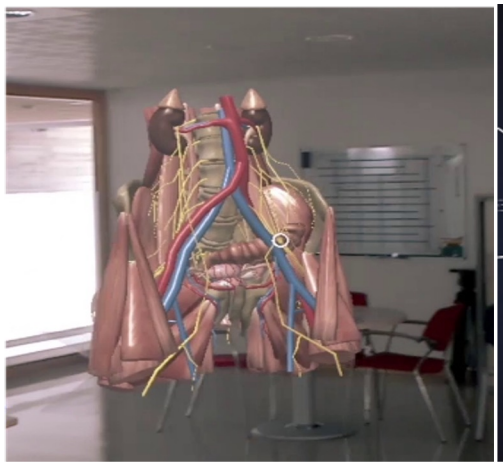
What is MIREIA?

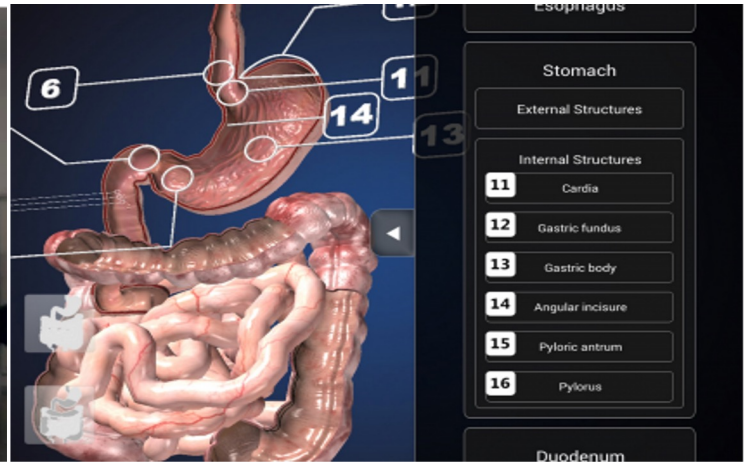
MIREIA

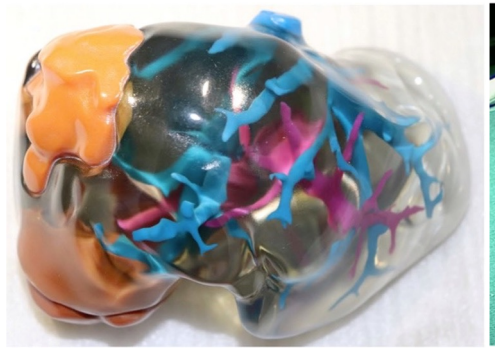
MIREIA is a unique Knowledge Alliance involving Higher Education institutions (HEIs) and companies that will combine the use of cutting-edge technology in immersive virtual technology (VR, AR, MR) and 3D printing with personalized learning content to promote the student-centred learning process of medical students and residents in minimally invasive surgery (MIS).

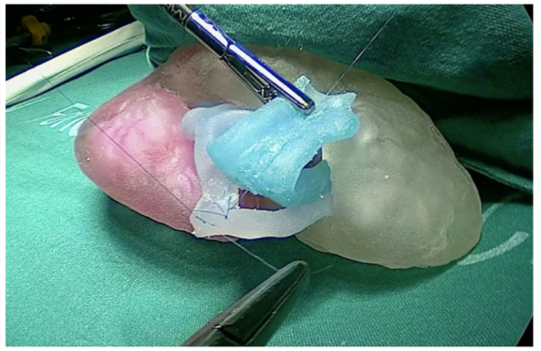
Tools to be provided for medical education

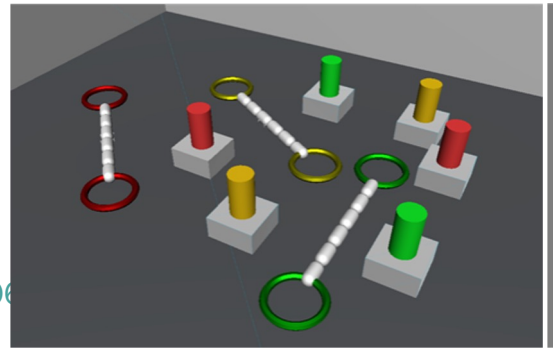
1. Extended reality (VR, AR, MR) and 3D printing models
   - ➢ Medical education and training of technical and non-technical surgical skills
2. A semi-automatic creation of anatomical 3D models
3. Creation of personalized virtual training environments
4. Open access online content repository

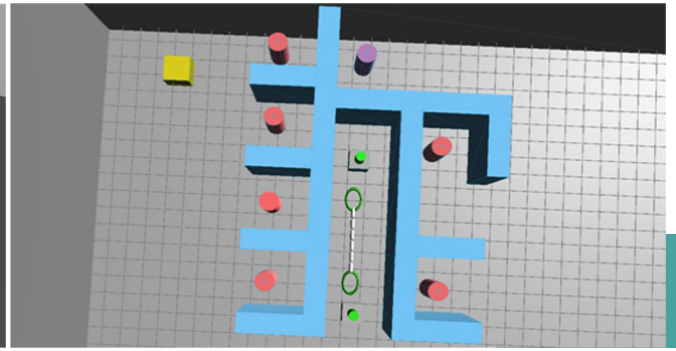






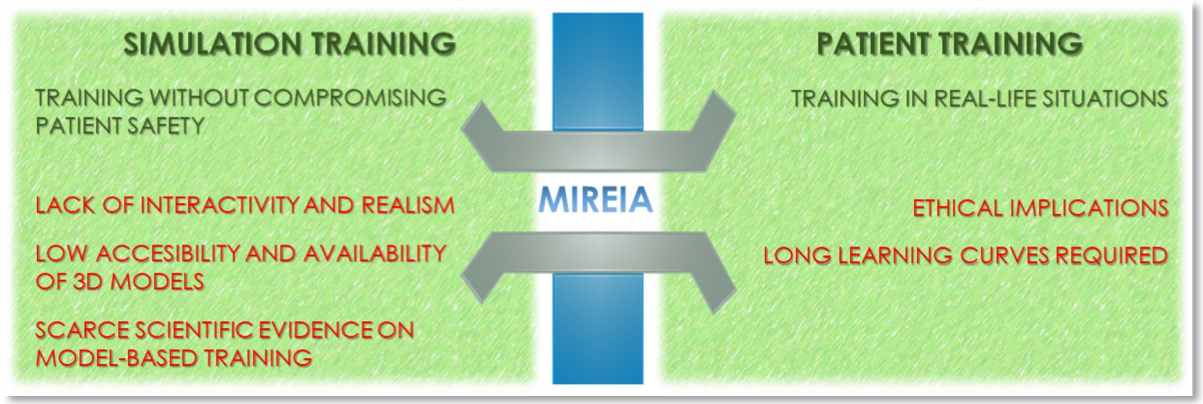


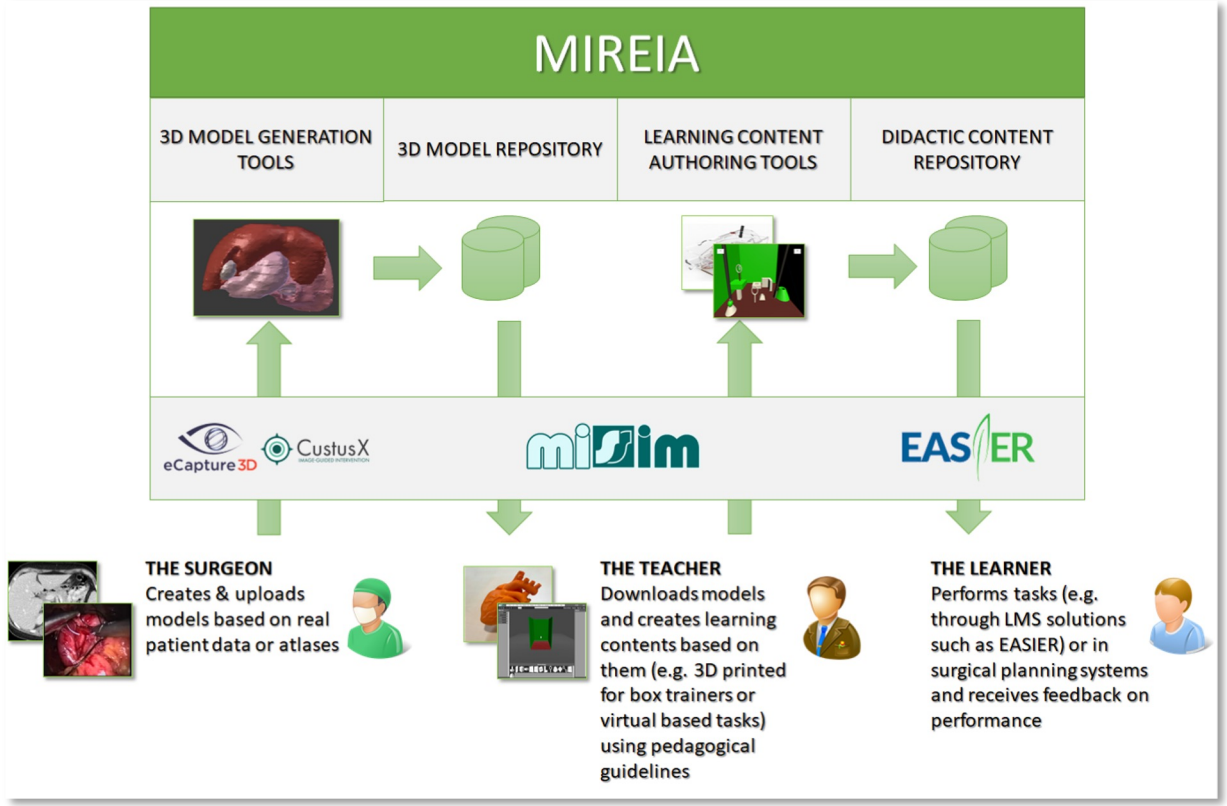




What are our goals?

- To bridge the gap between classroom learning and laboratory training and actual clinical practice.
- To provide an innovative methodology incorporating tools and guidelines to support the early stages of medical training and MIS education through learning content based on immersive technologies (VR, AR and MR) and 3D printing.





Project consortium

Project consortium

Centro de Cirugía de Mínima Invasión
Minimally Invasive Surgery Centre
Jesús Usón

Cáceres (Spain). Project Coordinator.
More than 20 years of experience in surgical training and surgical research.

UNIVERSIDAD POLITÉCNICA MADRID
POLITÉCNICA

Madrid (Spain). Scientific coordinator.
Experience in technology enhancement learning (TEL) for healthcare education.

TU Delft

Delft (The Netherlands). Quality actions and pedagogical needs leader.
One of the most important European research groups in TEL applied to medicine and surgery.

SINTEF

Trondheim (Norway). Learning content creation leader.
Scandinavia's largest independent research organisation dedicated to creating innovative technological solutions.

Project consortium

Badajoz (Spain). Exploitation leader.
Experience in the development of 3D digitization and 3D modelling technologies.

Oslo (Norway). Implementation leader.
They focus their research on the development and use of new technologies for surgical support.

avaca
TECHNOLOGIES

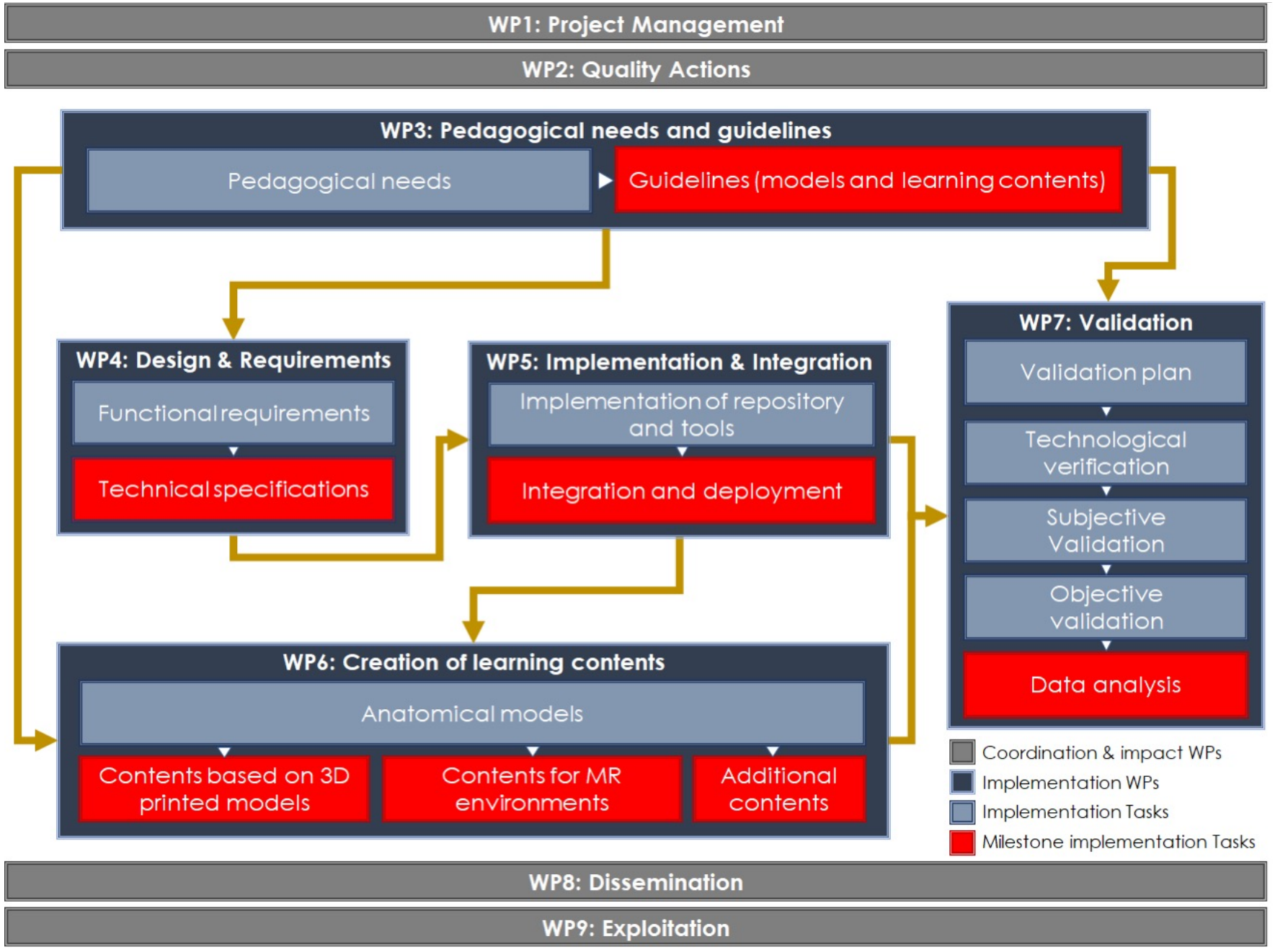
Athens (Greece). Content repository leader.
Extensive knowledge of web platforms, large data implementations, and data engineering and storage systems.

Project consortium

Câmpina (Romania). Dissemination leader.
Surgical partner with direct access to a wide network of surgeons across Europe for dissemination and validation activities.

Trondheim (Norway). Creating learning content and validation.
University Hospital for Mid-Norway and integrated with NTNU (Norwegian University of Science and Technology).

Work packages


WP1: Project Management
WP2: Quality Actions
WP3: Pedagogical needs and guidelines
Pedagogical needs
Guidelines (models and learning contents)
WP4: Design & Requirements
Functional requirements
Technical specifications
WP5: Implementation & Integration
Implementation of repository and tools
Integration and deployment
WP7: Validation
Validation plan
Technological verification
Subjective Validation
Objective validation
Data analysis
WP6: Creation of learning contents
Anatomical models
Contents based on 3D printed models
Contents for MR environments
Additional contents
Coordination & impact WPs
Implementation WPs
Implementation Tasks
Milestone implementation Tasks
WP8: Dissemination
WP9: Exploitation

WP1. Management

Leader: CCMIJU

Coordination and management of the project.

T1.1. Set Up (CCMIJU)

T1.2. Coordination (CCMIJU)

- Management Manual

T1.3. Project Documents and Reports (CCMIJU)

- Interim and final reports

WP2. Quality Actions

Leader: TUDELFT

To ensure the quality of the work carried out.

T2.1. Internal Quality Plan (CCMIJU)

- Quality Plan

T2.2. External evaluation of the project (TUDELFT)

- External evaluators

WP3. Pedagogical needs and guidelines

Leader: TUDELFT

To define what are the pedagogical needs of the target users (medical students, residents and mentors).

T3.1. Pedagogical needs (UPM)

T3.2. Methodological guidelines to create, upload and print 3D models (CCMIJU)

T3.3. Methodological guidelines to create learning contents from the 3D models (TUDELFT)

WP4. Design and requirements

Leader: UPM

To design of the proposed tools for 3D model and content generation.

To define the technical requirements (functionalities and specifications of the solutions).

T4.1. Functional requirements (UPM)

T4.2. Specifications of 3D model creation tools (eCapture3D)

T4.3. Specifications of learning content creation tools (UPM)

T4.4. Specifications of the content repository (AVACA)

WP5. Implementation and integration

Leader: OUS

To implement the different tools, following the design and technical specifications (WP4).

To implement the repository for content storage and sharing.

To integrate all the tools and facilitate their access to the contents stored in the repository.

T5.1. Repository for the storage of learning content (AVACA)

T5.2. Immersive visualization technology (OUS)

T5.3. Semi-automatic creation of 3D models based on endoscopic video feed (eCapture3D)

T5.4. System for creating virtual environments for MIS training (UPM)

T5.5. Integration of the tools (AVACA)

WP6. Creation of learning contents

Leader: SINTEF

To provide contents for the project using the guidelines and tools defined.

To create and upload 3D models.

To create VR and MR applications.

T6.1. Creation of anatomical models (SINTEF)

T6.2. Design of virtual environments and tasks for MIS training (UPM)

T6.3. Design of 3D printing models for MIS training (CCMIJU)

T6.4. Additional learning material (MEDIS)

- Audiovisual material: Surgical videos, imaging studies, etc.

WP7. Validation

Leader: CCMIJU

To define a validation methodology for the tools and contents developed in the previous WPs.

T7.1. Validation Plan (CCMIJU)

T7.2. Technological verification (AVACA)

T7.3. Subjective validation (MEDIS)

- Learning content: Anatomy, Laparoscopy and Flexible Endoscopy

T7.4. Objective validation (St. Olavs)

- VR tasks and 3D-printed models for MIS training.

WP8. Dissemination

Leader: MEDIS

To provide information about the project and to raise the awareness of the target groups.

T8.1 Dissemination plan (MEDIS)

T8.2 Project presentation and press release (UPM)

T8.3 Project image and templates (MEDIS)

T8.4 Project website design (MEDIS)

T8.5 Promotional materials (MEDIS)

WP9. Exploitation

Leader: eCapture3D

To develop an exploitation plan for the solutions developed in the Project.

T9.1. Exploitation strategy (eCapture3D)

- Exploitation plan

T9.2 Agreement of exploitation (eCapture3D)

T9.3. Market analysis (SINTEF)

T9.4. Sustainability Plan (eCapture3D)

Current status

- Content repository
- Tools implementation
- Integration

- Anatomical models
- Virtual MIS training
- 3D-printing models
- Additional material

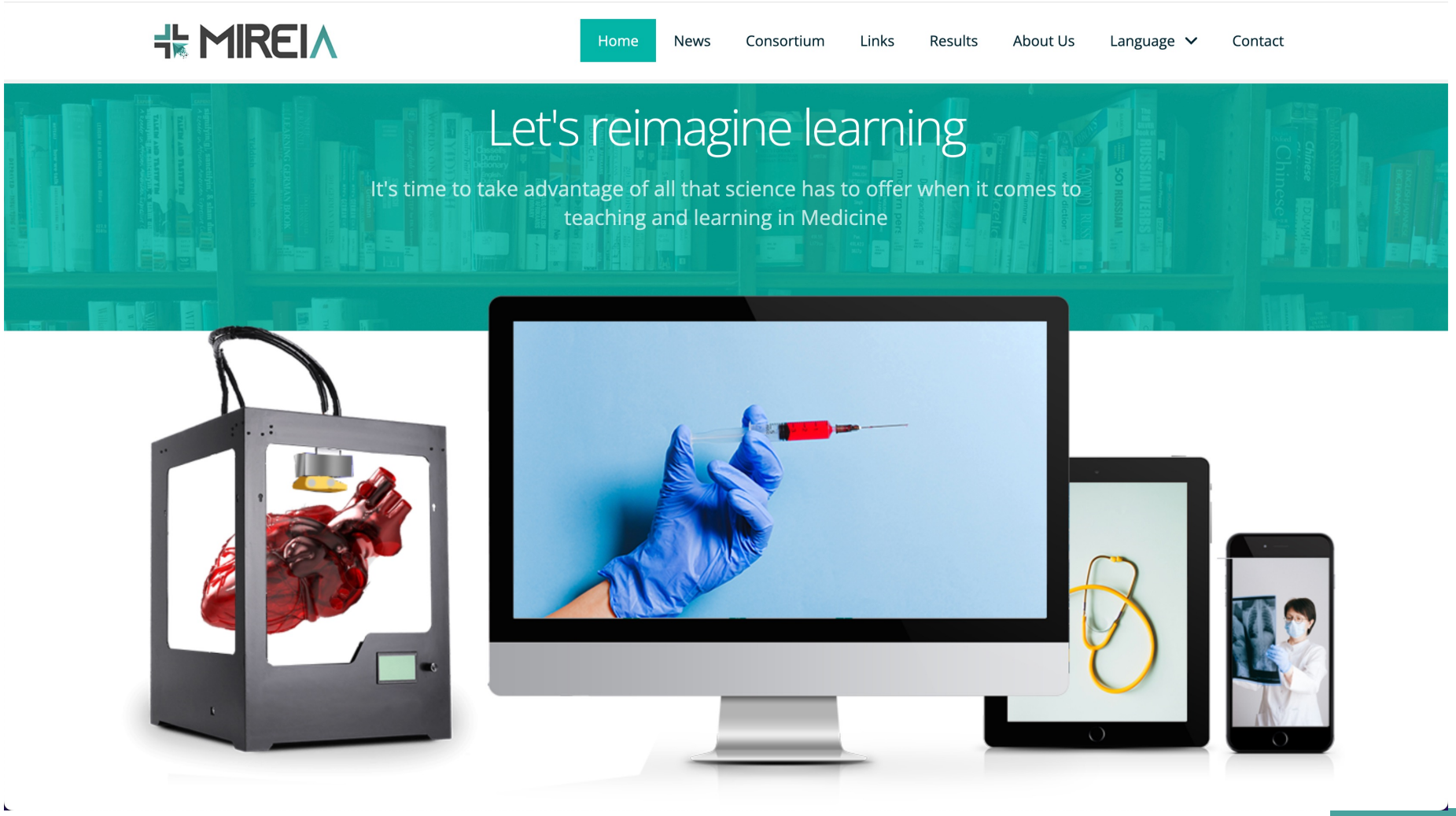
- Technical
- Subjective
- Objective

Website

Website (www.mireia-project.eu)

Website

LinkedIn



Thank you so much for your attention!

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