METHODOLOGY FOR THE DEVELOPMENT OF EDUCATIONAL RESOURCES WITH EXTENDED REALITY

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Technology is part of the teaching and learning processes
The use of new technologies in classrooms has produced good results in teaching-learning processes

Extended reality (XR)* is a clear trend in education:
“Institutions and vendors are already experimenting with the integration of extended reality (XR) technologies”.
- NMC Horizon Report > 2018 Higher Education Edition

XR is a strategic area at Universidad Europea:
• XR Lab: Laboratory for development, test and research of Learning Resources based on XR technology.
• Use of XR technologies to improve learning of students and help them to become better professionals

* eXtended Reality (XR) is the set of these technologies: virtual reality (VR), augmented reality (AR) and mixed reality (MR)
**XR Lab Methodology**

**Phase 1. Analyzing learning needs**
1) defining the educational needs
2) analyzing what the causes of the problem
3) analyzing consequences of the problem.

**Phase 2. Designing the prototype**
1) establish the objectives
2) devise the actions and resources that are most likely to succeed
3) design the prototype

**Phase 3. Development**
1) educational materials are developed
2) user experience test

**Phase 4. Implementation**
1) developing the minimum viable product (MVP)
2) pilot studies are carried out

**Phase 5. Evaluation and decision-making**
1) project evaluation (milestones, efforts, costs, etc.)
2) student learning performance evaluation
3) student experience (educational, motivational, graphical, usability, and health aspects)
XR Lab - Results

2018: New Products and first experiences with students. Proof of Concept

Risk Simulator

Simulation of Laboratory Accidents

AR Trivia

BM Learn

Plasma membrane and biomolecules

RCSI Medical Training Sim

Labster.com
# XR Lab - Results

<table>
<thead>
<tr>
<th>Developer</th>
<th>Learning Resource</th>
<th>Subject</th>
<th>Degree Program</th>
<th>Year</th>
<th>No. of Students</th>
</tr>
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<tbody>
<tr>
<td>XR Lab (UEM) and Stratesys</td>
<td>Simulation of Laboratory Accidents</td>
<td>Introduction to Laboratory Techniques</td>
<td>Bachelor’s Degree in Biotechnology, Bachelor’s Degree in Pharmacy, and Bachelor’s Degree in Nutrition</td>
<td>2018</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2019</td>
<td>67</td>
</tr>
<tr>
<td>Legal Trivia</td>
<td>Private International Law</td>
<td>Bachelor’s Degree in Law</td>
<td></td>
<td>2018</td>
<td>26</td>
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<tr>
<td>BMLearn</td>
<td>Biochemistry and Cell Biology</td>
<td>Bachelor’s Degrees in Dentistry, Medicine, Biotechnology, Pharmacy, Nursing, Nutrition, and Physical Therapy</td>
<td>2018</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell Biology and Human Genetics</td>
<td>Bachelor’s Degree in Dentistry</td>
<td></td>
<td>2019</td>
<td>39</td>
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<tr>
<td>RCSI and VR Immersive Education</td>
<td>Medical Training Sim</td>
<td>General Laboratory Techniques</td>
<td>Advanced Diploma in Anatomic Pathology, and Cytodiagnosis</td>
<td>2018</td>
<td>18</td>
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<tr>
<td></td>
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<td></td>
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<td>2019</td>
<td>22</td>
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<tr>
<td>Labster.com</td>
<td>Virtual Gene Therapy Laboratory</td>
<td>Virology</td>
<td>Bachelor’s Degree in Biotechnology and Pharmacy</td>
<td>2019</td>
<td>17</td>
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<tr>
<td></td>
<td>Virtual Cell Culture Laboratory</td>
<td>Microbiology</td>
<td>Bachelor’s Degree in Nutrition, Biotechnology, and Pharmacy</td>
<td>2019</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Virtual Confocal Microscopy Laboratory</td>
<td>Advanced Instrumental Techniques</td>
<td>Bachelor’s Degree in Biotechnology</td>
<td>2019</td>
<td>15</td>
</tr>
</tbody>
</table>

**XR experiences during 2018 and 2019**
Conclusions

XR technology allows students learn concepts and skills for their profession in a more immersive manner.

XR Lab Methodology was created to develop learning resources based on XR technology.

It supports the correct planning of the design and operation of the projects carried out.

It allows continuous improvement of the learning experience by evaluation of the usability, student satisfaction and student academic performance.

The methodology has also allowed the professors to naturally adopt and introduce extended reality technology as just another classroom tool.
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