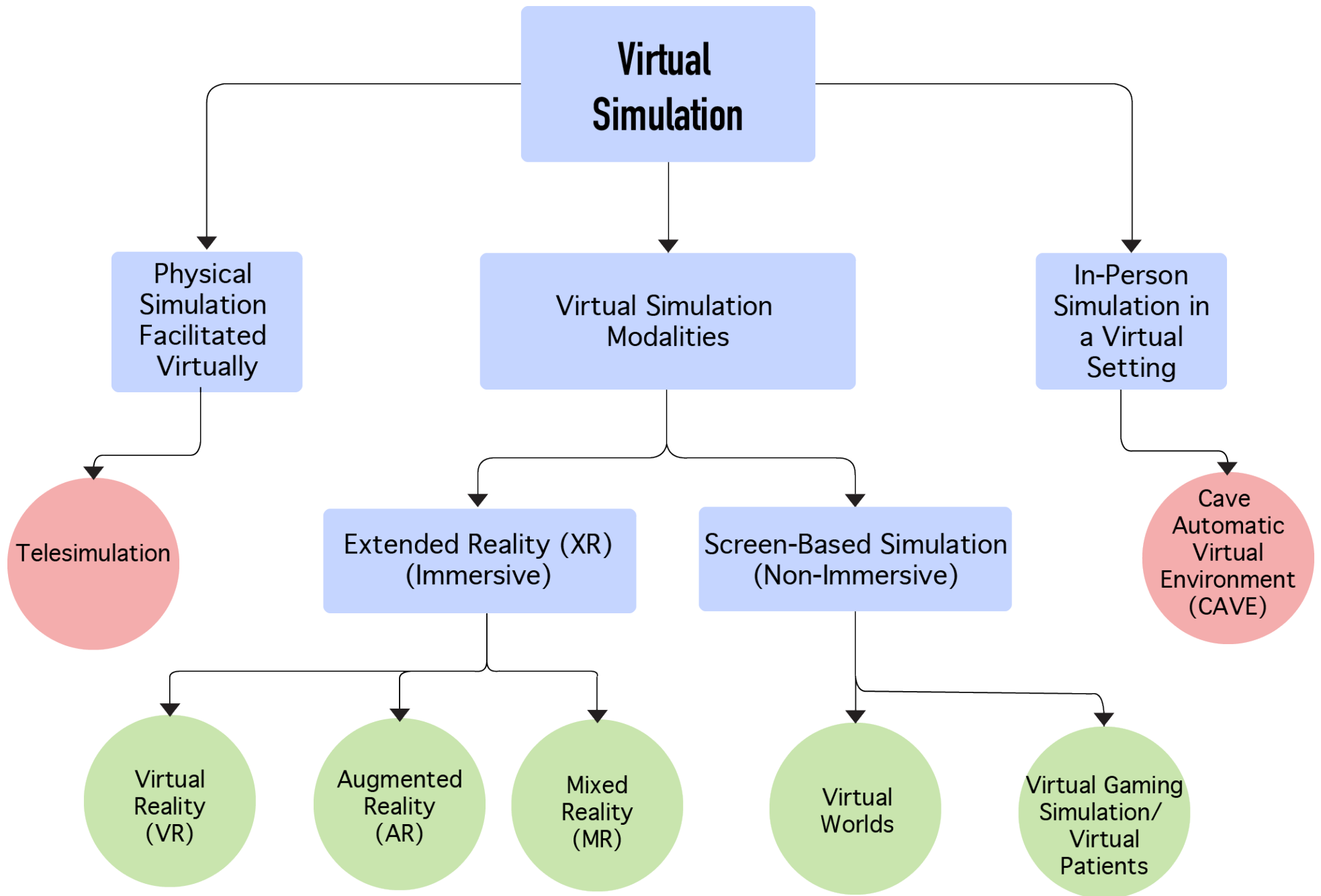


Figure 1.1: Taxonomy of Virtual Simulations



Virtual Simulation: Many diverse and sometimes contradictory definitions of “virtual simulation” exist in the literature. The term is used even more broadly in daily practice. Therefore, for the purposes of this book, virtual simulation is used in a broad sense to encompass its many uses.

- Physical Simulation Facilitated Virtually (will not be focused on in the Pressbook)
 - **Telesimulation:** "A process by which telecommunication and simulation resources are utilized to provide education, training, and/or assessment to learners at an off-site location" (McCoy et al., 2017, p. 133).
- In-Person Simulation in a Virtual Setting (will not be focused on in the Pressbook)
 - **Cave Automatic Virtual Environment:** "Large cube wall structure inside which a participant stands; the walls have projected images to simulate an immersive, virtual environment, [sometimes] including shadows cast by the participant. CAVE participants [may] use specialized goggles for the illusion of stereoscopic depth when inside the CAVE" (Lioce, 2020, p. 11).
- Virtual Simulation Modalities (main focus of the Pressbook)
 - **Extended Reality:** "Extended Reality (XR) is a fusion of all the realities – including Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR) – which consists of technology-mediated experiences enabled via a wide spectrum of hardware and software, including sensory interfaces, applications, and infrastructures. XR is often referred to as immersive video content, enhanced media experiences, as well as interactive and multi-dimensional human experiences" (XR Safety Initiative, 2019).
 - **Virtual Reality:** "Virtual Reality (VR) is a fully immersive software-generated artificial digital environment. VR is a simulation of three-dimensional images, experienced by users via special electronic equipment, such as a Head Mounted Display (HMD)" (XR Safety Initiative, 2019).
 - **Augmented Reality:** "Augmented Reality (AR) overlays digitally-created content on top of the user’s real-world environment, viewed through a device (such as a smartphone) that incorporates real-time inputs to create an enhanced version of reality" (XR Safety Initiative, 2019). Rather than putting the participant into the virtual world, a virtual entity is placed in the real world through the device.
 - **Mixed Reality:** "Mixed Reality (MR) seamlessly blends the user’s real-world environment with digitally-created content, where both environments can coexist and interact with each other. In MR, the virtual objects behave in all aspects as if they are present in the real world, e.g., they are occluded by physical objects, their lighting is consistent with the actual light sources in the environment, and they sound as though they are in the same space as the user. As the user interacts with the real and virtual objects, the virtual objects will reflect the changes in the environment as would any real object in the same space" (XR Safety Initiative, 2019).
 - **Screen-Based Simulation:** "A simulation presented on a computer screen using graphical images and text, similar to popular gaming format, where the operator interacts with the interface using keyboard, mouse, joystick, or other input device" (The Terminology and Concepts Working Group, 2020, p.41).

- **Virtual Worlds:** Virtual worlds immerse the learner within a 3-dimensional world by using a 2-dimensional screen. They "immerse the learner within a virtual world through a controllable avatar, and [virtual worlds] can present multiple patients, austere environments, and social interaction; Second Life is a common example" (Chang et al., 2016, p. 106). In some cases, a virtual world can be accessed using a 3-dimensional headset (virtual reality) or via a 2-dimensional screen.
- **Virtual Gaming Simulations / Virtual Patients:** This is perhaps the most difficult to define precisely, as there is significant diversity within this group. What various definitions in the literature share is the notion of a game-like, computer-based, 2-dimensional simulation where the learner takes the role of a professional to work through a real-life task or encounter. In healthcare, for example, this is most commonly a client appointment, but may be a breadth of specialized simulations, including clinical or surgical procedures, physiology, population health, laboratory techniques, communication, and more (Kononowicz et al., 2014; Chang et al., 2016; The Terminology and Concepts Working Group, 2020).