DESIGN FUTUREVERSE: INTEGRATING SOCIAL VR IN DESIGN EDUCATION

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ABSTRACT
In an era defined by rapid technological advancement and complex global challenges, design education must evolve to equip students with the critical, creative, and anticipatory skills needed to shape sustainable futures. The paper presents *Design Futureverse*, an innovative didactic experiment integrating Virtual Reality (VR) and a social platform to enhance design students' creative potential and promote a hybrid learning methodology. *Design Futureverse* creates interactive virtual environments where students explore speculative futures, collaborate on design projects, and develop future-oriented mindsets. The project operates on three levels: individual, team, and process, offering personalised learning experiences, fostering teamwork, and enhancing storytelling and communication through immersive speculative environments. This experiment examines the potential of VR to bridge the gap between abstract design concepts and tangible experiences, demonstrating how immersive technologies and hybrid didactics can transform design education.

Keywords: Design education, design futures, social VR, hybrid learning, creativity

1 INTRODUCTION
In complex and uncertain times, marked by the exponential development and diffusion of digital technologies, as well as global challenges such as climate change, biodiversity loss and resource depletion, design education plays a critical role in equipping students with the skills needed for the future. Designers are increasingly required to integrate technological, social, and emotional competencies, fostering critical thinking and creativity to address complex problems that will affect the future of our society. One of the most pressing issues in design education today is enabling students to develop anticipatory skills and envision future scenarios, helping them navigate uncertain futures. However, fostering students to imagine, experience and engage with possible futures remains a persistent challenge in future studies. To address this gap, recent research has begun to explore the integration of Virtual Reality (VR) with speculative design methodologies, enabling the creation of immersive, experiential futures. VR offers a more tangible and impactful way [1][2] for individuals to interact with possible future scenarios, enhancing their ability to anticipate and engage with future challenges. As design education evolves, teaching methodologies must adapt to equip students with emerging skills that align with both industry needs and new-generation learning needs. This paper presents *Design Futureverse*, an innovative didactic experiment that integrates immersive VR technology and a social platform to augment design students' creative potential when designing for the future, promoting a hybrid learning methodology. While explaining this case study, the paper explores two key areas: first, the opportunities of immersive technologies in fostering future-oriented design skills and mindsets; and second, how VR and social platforms can serve as a model for hybrid learning, contributing to the ongoing transformation of design education.

2 PROJECT BACKGROUND
The rapid advancement of emerging technologies has reshaped learners' expectations, demanding more digital, active, and experiential approaches. Traditional educational models struggle to meet their needs, emphasising the urgency for innovative, student-centred, and tech-enhanced learning. The COVID-19 pandemic further exposed the limitations of conventional teaching, accelerating the shift to hybrid methodologies that blend remote and in-class experiences. In this context, VR and AR (Augmented

Reality) have proven to be powerful tools [2][3] for boosting engagement, fostering creativity, and connecting abstract concepts with tangible experiences in design education.

2.1 Virtual and Immersive Reality for Design Education

VR introduces innovative experiential learning opportunities that boost engagement and knowledge retention [4]. By offering tools such as 360-degree videos, virtual travel, simulations, and interactive 3D modelling, **VR enables students to explore complex design elements** in unprecedented ways [4]. It stimulates motivation through dopamine-driven engagement, leading to increased enthusiasm and commitment, even beyond class hours [3]. Beyond enhancing engagement, VR transforms learning environments by **fostering collaboration in immersive digital spaces**. It replicates physical presence, strengthening teamwork, brainstorming, and co-creation [2], essential elements in design education. Virtual rooms **allow geographically dispersed individuals to work closely together**, enhancing creative interactions and the sense of shared space. Platforms like Think Space enable design teams to ideate in unconventional settings, *such as virtual deserts or remote islands,* reducing fear of judgment and promoting risk-taking and divergent thinking. These playful environments align with creative cognition theories, suggesting that a shift in context can lead to novel insights by disrupting fixed thinking patterns. VR also **bridges the gap between abstract concepts and tangible experiences,** especially when dealing with complex challenges like climate change and technological disruption [5] [6]. Traditional speculative methods - such as scenario building and design fiction - focus on provoking imagination rather than offering embodied experiences [7]. **VR, however, provides multisensory and interactive experiences that allow users to inhabit speculative worlds instead of merely conceptualising them.** Unlike books or films, VR engages spatial memory, tapping into the deeply embodied nature of human cognition [5]. **Immersing individuals in speculative environments enhances empathy and agency** by allowing users to adopt perspectives of those most affected by future crises, **promoting proactive action in the present** [8]. Immersive Design Fiction Experiences (IDFEs) further deepen understanding of future possibilities by positioning participants within virtual storyworlds [5]. Similarly, Spiers et al. [9] introduced the "Museum of the Future," a VR environment that enhances futures literacy through cognitive estrangement, prompting users to question their anticipatory assumptions. **VR facilitates cognitive flexibility** by enabling users to navigate digital worlds, interact with 3D models at various scales, and **explore alternative perspectives** [3]. By adopting virtual identities - such as avatars with superpowers or non-realistic traits - students can **break through creative barriers and engage in idea generation more freely**. The anonymity and altered identity of avatars help alleviate self-consciousness, encouraging broader participation, particularly among those hesitant to share ideas in traditional settings. These capabilities make VR a transformative tool in design education. It empowers students with critical competencies, including spatial visualisation, critical thinking, and creative confidence, key skills for addressing evolving industry challenges [1]. By offering immersive and interactive ways to engage with speculative futures, VR reshapes how design is taught and learned, preparing the next generation of designers to navigate and influence complex future scenarios effectively.

3 THE DESIGN FUTUREVERSE PROJECT

Design Futureverse is one of the pilot projects funded by Politecnico di Milano as part of the post-COVID initiative *Beyond Flipped Classroom* whose aim was to rethink teaching organisation by balancing remote learning and in-class experiences through hybrid didactics. The pilot has been implemented within the *Design Futures* course of the Integrated Product Design Master's programme at School of Design, Politecnico di Milano, where student teams collaborate to develop future scenarios and products using the **Design Futures (DF) method** developed by IDEActivity Center. This project-based learning approach enables students to apply future-oriented skills and mindsets to address emerging social and environmental challenges while leveraging exponential technologies. Key moments involve peer and instructor collaboration, where students share, discuss, and present their **future scenarios and designed products**. This collaborative exchange is essential in refining ideas, fostering critical discussions, and ensuring that the speculative work is both imaginative and applicable. Since the DF method and its activities already existed, the *Design Futureverse* project primarily focused on integrating virtual environments and a social VR platform to enhance the learning of the DF method while exploring new hybrid learning methodology. The project works on three different levels, each one with a specific key objective:

- **Individual level to foster creativity, imagination, critical thinking and support personalised learning** through customised environments where information and educational materials are always accessible regardless of time or location
- **Team level to create interactive and collaborative educational experiences** that extend beyond traditional in-class activities, engaging both peers and instructors while fostering soft skills critical to the process.
- **Process level to augment communication and storytelling when designing for the future**, by making complex issues more tangible through immersion in speculative environments.

After identifying the primary goals of this design intervention, we proceeded by designing the virtual environments and the interactive dynamics to effectively reach these objectives.

3.1 Setting the experience

The whole didactic experience has been constructed on a DF process that leverages creativity and a People&Planet-centred approach, encouraging students to actively collaborate in envisioning future scenarios and developing innovative ideas and strategies to bring these scenarios to life. The whole process starts with a broad challenge and unfolds through teamwork sessions based on a series of tools, designed to stimulate critical and creative thinking to generate suitable concepts in line with the given context and objective. The DF process is further enriched by integrating a VR and social platform, creating a fully immersive and interactive learning experience.

3.1.1 What has been built in the Design Futureverse?

The initial phase of this educational project focused on designing virtual spaces that enhance and support the DF method across all its stages. The *Design Futureverse* project consists of a series of custom-designed virtual environments developed using Spatial.io and 3D modelling tools. These environments serve as interactive and immersive spaces where students can explore speculative futures, collaborate on design projects, and engage in creative thinking. Three distinct experiences were conceived and developed: the first, an inspirational experience aimed at deepening the understanding of future transformations in response to major challenges; the second, a narrative-driven journey illustrating the key stages of the process; and the third, a dedicated tutoring experience to provide guidance and support. At the heart of the project is the ***Design Futureverse Room***, a central hub, a symbolic space representing the core of the course in which portals lead to thematic rooms, enabling students to seamlessly transition between different speculative environments.

1. **Thematic inspirational rooms** (Individual exploration), three dreamlike, floating environments as inspirational spaces where students can explore speculative futures through visual storytelling, multimedia content, and interactive design fiction.
2. **Personal project rooms** (Team collaboration and process work) customisable virtual workspaces function as persistent, shared environments where students develop their design futures projects.
3. **Hybrid and persistent learning spaces**, environments that remain accessible beyond the course duration, allowing for ongoing exploration, iteration, tutoring, peer learning activities and collaboration.

3.1.2 The social VR platform: Spatial

The *Design Futureverse* project uses the social VR platform "Spatial.io" to facilitate both remote and hybrid learning experiences, seamlessly blending physical and virtual spaces. Spatial was chosen for its broad accessibility, being a multi-device compatible (desktop, VR, smartphone) with easy browser-based access. It supports **real-time collaboration** through **customisable 3D spaces** for immersive learning, **media sharing** (images, videos, 3D assets) and **interactive tools** like virtual whiteboards and voice-to-text input to enhance teamwork. Users can either import 3D environments or choose from pre-designed templates providing flexibility for different needs. To encourage ongoing engagement the platform, enable the creation of your own avatar, which help people feel more immersed in the virtual space.

3.2 Designing the experience – activities, virtual environments

Design Futureverse enables real-time collaboration and communication within a shared virtual space, allowing users to create, manipulate, and interact with virtual objects. The immersive activities and environments have been designed to support all three learning levels outlined earlier: individual, team,

and process. Specifically, in the paper, we'd explore the two most interesting types of functional environments that have been developed and provided to students:

- **Thematic inspirational rooms** (individual level): designed for asynchronous content consultation, these spaces provide resources to enhance inspiration, creativity, and critical thinking on specific topics.
- **Personal project rooms** (team and process level): these spaces support key stages of the DF process, including trend research, scenario creation, and project presentation, fostering collaboration and peer exchange.

The environments created within Spatial perform as persistent spaces, evolving over time and remaining accessible even after the course ends. This ensures that ideas and projects continue to grow and spread, extending the learning experience beyond the classroom. Blender, a free 3D modelling software, was used for the design and construction of the virtual environments, as it supports the export of 3D assets in the formats required by Spatial.io. The choice to use free tools, both for the 3D modelling of spaces and their integration into immersive collaborative platforms, was an enabling strategy aimed at teaching students how to use tools they can continue to apply beyond the course.

3.2.1 Thematic inspirational rooms

Figure 1. Design Futureverse central hub (top left) and the thematic inspirational rooms

The *Design Futureverse* inspirational environments in Spatial (Fig. 1) was developed to immerse students in a speculative future world, using dreamlike and imaginative settings to activate their creative and speculative thinking. These virtual spaces transport participants into an alternate reality, fostering deep engagement and structured collaboration while challenging them to envision and critically explore future scenarios beyond the constraints of the present. The central room *Design Futureverse*, as highlighted above, symbolise the core of the course. This environment features a massive central tree surrounded by lush vegetation, symbolising the growth of ideas and knowledge, and a transparent tubular structure carrying a fluid that represents the “lifeblood” of the course - ideas, inspirations, and contributions from participants. Students can access three thematic inspirational rooms from this central hub, each designed to foster critical and creative thinking on future-oriented topics. The *Nature Design Futureverse* explores the role of natural elements in both utopian and dystopian futures, examining speculative ecologies shaped by biotechnology, genetic modifications, and microbial interactions. The *People Design Futureverse* envisions the human body and mind in future scenarios, investigating advancements in medicine, prosthetics, assisted reproduction, and cryogenics, as well as their implications for individual identity and human relationships. The *Artificial Design Futureverse* delves into the future of artificial structures, hyper-connected environments, and emerging technologies,

including biometrics, social control, sustainable urbanism, and next-generation transportation and energy systems. Within these spaces, students can freely navigate, explore multimedia content, and reflect on global challenges, ethical concerns, and the societal impacts of technological and social transformations. VR serves as a bridge between the real and the digital, creating a multi-sensory experience that blends visual, tactile, and auditory stimuli. By balancing the disorientation of immersion with tangible cognitive engagement, VR enables participants to critically reinterpret their perceptions, fostering deeper reflection on the different contents presented.

3.2.2 Personal project rooms

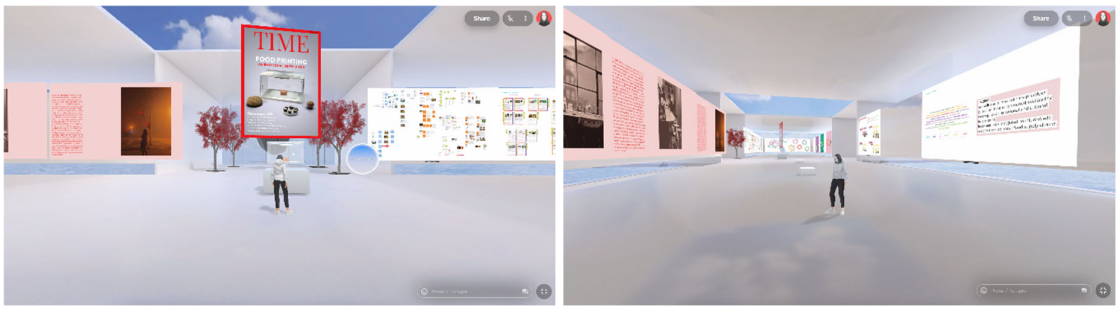

Figure 2. Student team's personal project rooms in Design Futureverse

During the *Design Futureverse* project, students used their own personal project room (Fig. 2) to build and immerse themselves in future scenarios, transforming abstract speculation into lived experiences. Personal project environments were conceived to support students throughout the design process, facilitating knowledge exchange, resource sharing, and project presentations. Instead of working with static representations, they navigated and interacted with speculative 3D worlds, exploring alternative futures in a dynamic and engaging way. These virtual rooms offered an unparalleled opportunity to build speculative worlds populated with personas and future objects, making abstract future possibilities more tangible and experientially engaging. To guide their creation, students received an instructional kit with four template room options, a curated selection of online resources for sourcing 3D objects, and a step-by-step guide for integrating content into their virtual space. The students chose rooms as dynamic workspaces that evolved alongside their research process to support trend exploration, scenario development, and final project visualisation. Students embodied future personas as part of their exploration, stepping into different perspectives to better understand societal and technological shifts. These personas were not just conceptual profiles but interactive avatars that responded to the virtual environment, helping students experience firsthand how people in the future might live, work, and interact. In addition to inhabiting these futures, students designed and tested speculative objects, bringing abstract ideas to life in 3D. They created and interacted with future artifacts, evaluating their usability and impact within different contexts. By manipulating and refining these objects, they critically examined their role in shaping future societies, fostering discussions about desirability, ethics, and technological feasibility. Through this personal project room, students envisioned possible futures and actively engaged with them, challenging assumptions and co-creating alternative possibilities. The *Design Futureverse* project provided them with the tools to step inside the future, explore its complexities, and contribute to its design in a meaningful way. The personal projects space also acts as a collaborative hub for tutoring feedback sessions and peer learning while also enabling cross-group exchanges. Students can meet beyond class hours to share progress, offer insights, and refine their ideas collectively. This interactive structure empowers students to take ownership of their learning environment, transforming it into a continuously evolving space for knowledge-sharing, innovation, and creative exploration.

4 DISCUSSION AND CONCLUSION

Design Futureverse is an immersive project where futures are not only imagined but experienced. When students put on a VR headset, they enter a speculative world where they can walk through and interact with fully realised future scenarios. Instead of merely reading about future challenges, they witness and test their feasibility in real-time. The project goes beyond environments by bringing future personas to life. These personas, embedded with behavioural traits and interactive narratives, help students connect

emotionally with societal and technological shifts. Students do not just analyse these personas, they embody them. For instance, they might experience life as a climate refugee turned biotechnologist or a gig worker negotiating contracts with AI, allowing them to understand these realities from the inside.
Design Futureverse also offers interaction with speculative objects in a virtual lab. Students engage with artifacts like biodegradable smart devices, personalised energy storage, and neural interfaces, examining their functions and societal impacts. These objects act as dynamic experiments, prompting reflection and discussion. By fusing immersive scenarios, interactive personas, and tangible future artifacts, the *Design Futureverse* transforms speculative thinking into a lived experience. When the headset comes off, the visions remain, sparking new ways of imagining and shaping the future. Tested in two classes with 45 students each, *Design Futureverse* introduced a hybrid learning model that blended advanced technology with collaborative methodologies to reshape design education. The initiative balanced remote and in-person learning through hybrid didactics, teamwork challenges, and collaborative activities, fostering active student engagement. By merging physical and virtual environments, the project emphasised immersive and experiential learning. For about a month, students engaged in real-world design challenges through dynamic in-class activities and flexible, asynchronous collaboration. The "experiential futures" approach [6] allowed them to transform abstract concepts into tangible experiences, enhancing engagement and focus. While the hybrid model offered students autonomy and flexibility, educators noted challenges. Creating and managing virtual environments required specific skills, time, and dedication, which some students perceived as an additional workload. Balancing physical and virtual components was also complex, particularly during in-class sessions. The model proved most effective for asynchronous collaboration and remote presentations but was less suitable for traditional classroom settings. Overall, *Design Futureverse* demonstrated VR's potential to enhance creativity, engagement, and global collaboration. However, it also revealed the need for a more integrated approach to maximise educational impact and improve interactivity within virtual platforms. Optimising the integration of virtual tools into educational frameworks is crucial to fully leverage immersive learning environments.

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