Bridging the Gap Between Academia and Industry: Teaching Experiences on Natural Hazards

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In a rapidly changing world, higher education must prepare future professionals to think critically and work across disciplines. Universities need to close the gap between academic training and job-market needs by combining technical knowledge with adaptable thinking. To this end, Politecnico di Torino has developed several initiatives that place students at the heart of learning experience. Within the RETURN project, these activities applied innovative teaching methods to the study of natural hazards and their effects on ecosystems and communities.

The experience we gained includes challenge-based learning, international theses and student teams.

The Challenge format engages multidisciplinary groups to solve real problems with guidance from active researchers. These activities build entrepreneurial skills and strengthen ties with industry. Company-driven Challenges (by Firm) target business issues, while university-led ones (by Students) explore strategic themes. In 2024, the *Living with Natural Risk* Challenge invited master students to design solutions to improve awareness, prevention and mitigation of floods, landslides and wildfires. Projects focused on early-warning systems, public education and community preparedness. In 2025, the focus moved to mountain environments and climate-change impacts, in partnership with the *Club Alpino Italiano* (CAI). Master students worked on water-resource management, energy supply and monitoring, supported by researchers who linked academic results with real technological applications.

The multidisciplinary team approach also showed the value of digital collaboration. Through a Concurrent Engineering (CE) project with TU Darmstadt and Wroclaw University (within the *unite!* Alliance), students and researchers co-designed a self-sufficient, sustainable Tiny House across six areas of expertise. The process unfolded in two stages: researchers were first trained in CE methods and tools, producing a design concept; students—master's abroad and bachelor's in Turin—then developed their own project during a four-week intensive session with on demand tutor support. At Politecnico di Torino, the project ended in three bachelor's theses on water management, focusing on rainwater harvesting, purification, and wastewater treatment through nature-based solutions.

Finally, the dissemination event *Comunicare il rischio con il gioco*, organised by *Mi LEGO al Territorio*—a long-running student initiative on flood and earthquake risk aimed mainly at children and teenagers—highlighted how universities can engage both the productive and non-profit sectors. Partnerships with *LARES*, *Protezione Civile* and *Psicologi per i Popoli Torino* confirmed the role of academia in awareness, prevention and emergency response.

Across all activities, students developed technical and transferable skills alike. Feedback showed clear growth: stronger communication, better problem-solving, greater independence and faster, more creative thinking when facing the complex challenges of today's world.

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