



**Title: Makerspaces and XR Toybox to enhance teaching, learning, research, and innovation: The case of the University of Pretoria Department of Library Services**

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# 2025 ANNUAL CONFERENCE

**Libraries as Innovation Hubs: Empowering Communities**

**30 SEPTEMBER - 3 OCTOBER**

**BOARDWALK HOTEL, GOEBERHA**

# Road map

- What is a Makerspace and XR Toybox?
- What We Aim To Achieve
- Makerspace and XR Toybox in Higher Education
- Makerspace usage
- Example of equipment in the Makerspace and XR Toybox
- Examples of 3D prints
- Examples of projects completed
- The XR Toybox (Health Sciences Library)
- User Experiences in Makerspaces and XR Toybox Facilities
- Benefits, Best practice and lesson learned
- Charting the Way Ahead

# What is a Makerspace & XR Toybox?

A **MakerSpace** is a dynamic and collaborative environment **designed to provide individuals** with **access to tools, technologies, and resources to explore creativity**, learn through experimentation, and bring innovative ideas to life. It serves as a hub for **hands-on learning, fostering collaboration, skill development, and problem-solving** by enabling users to design, prototype, and build projects across various disciplines. MakerSpaces are inclusive spaces that **cater to diverse skill levels and encourage a culture of innovation and knowledge sharing.**

An **XR Toybox** is a groundbreaking initiative at the University of Pretoria that uses **extended reality (XR)** to transform how students and staff learn. By blending the **physical and digital worlds**, it **creates interactive environments** where users can **explore, discover, and practice skills** in new and **engaging ways.**

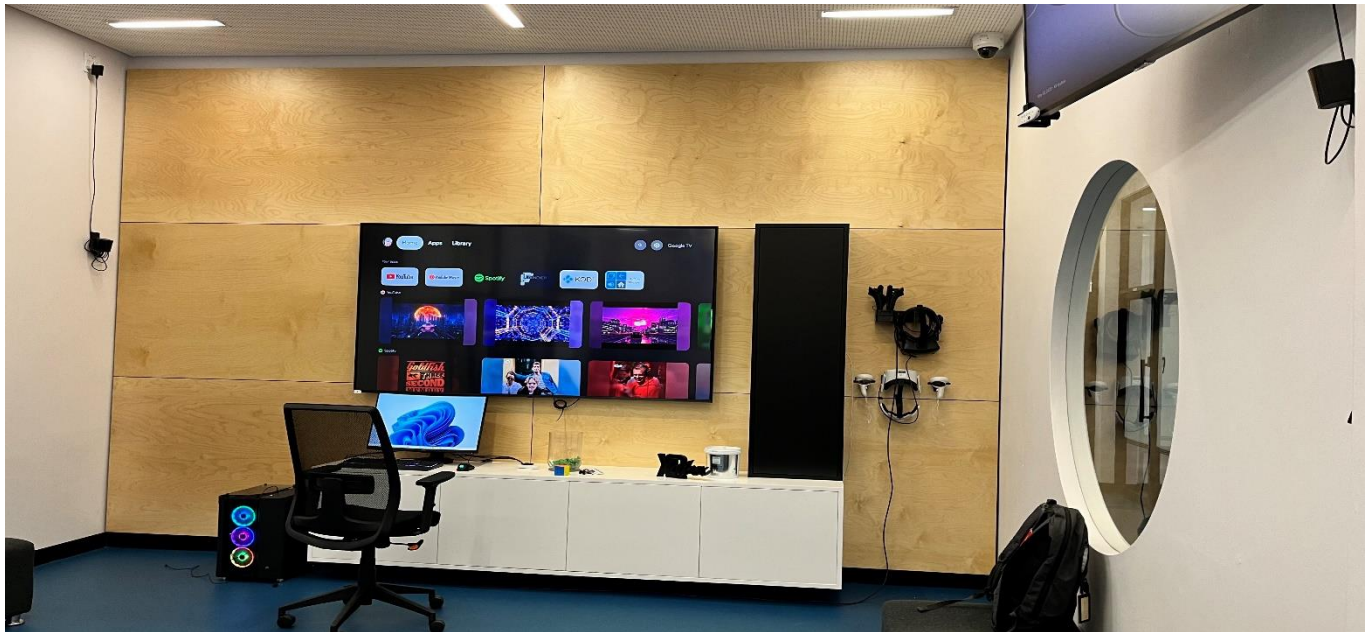
# What We Aim To Achieve



- Examine user experiences
- Present best practices, lesson learned, and benefits
- Highlight partnerships across faculties

# Makerspace and XR Toybox in Higher Education

- Makerspace & XR Toybox promotes interactive and engaging learning
- Reimagining the future of education
- Position of UP as the first SA university with a Makerspace
- Established in Hatfield campus in 2015
- Groenkloof (Education campus) Makerspace opened in June 2025



# Makerspaces usage

## Sustainable Materials

- Use of biodegradable plastic for printing
- Pay only for the material used

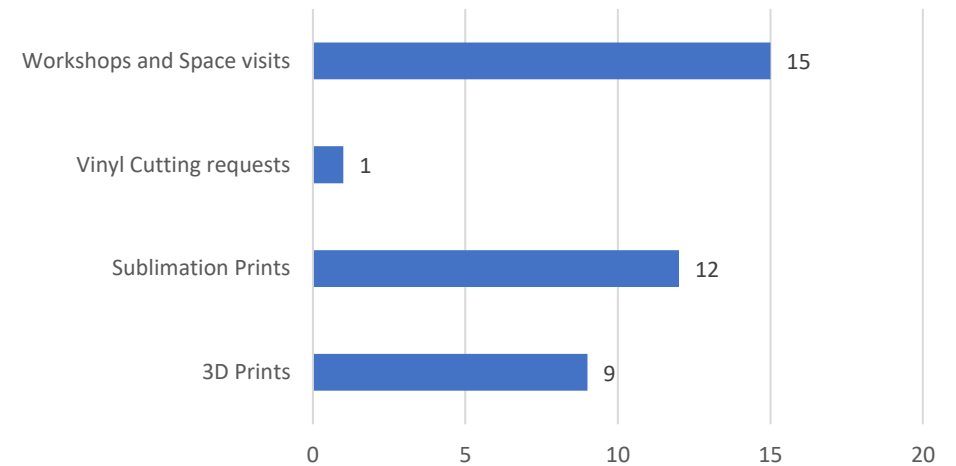
## Management & Access

- Student-managed with professional staff support
- Open to all registered students & staff
- Operating hours: **Weekdays 08:00 – 16:00**

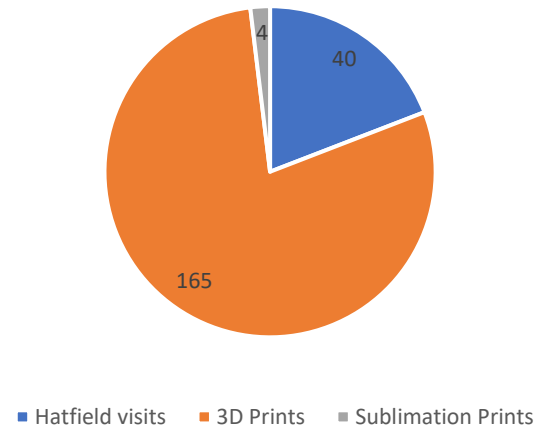
## Outreach

- Marketing initiatives to promote services

Groenkloof June - Sept

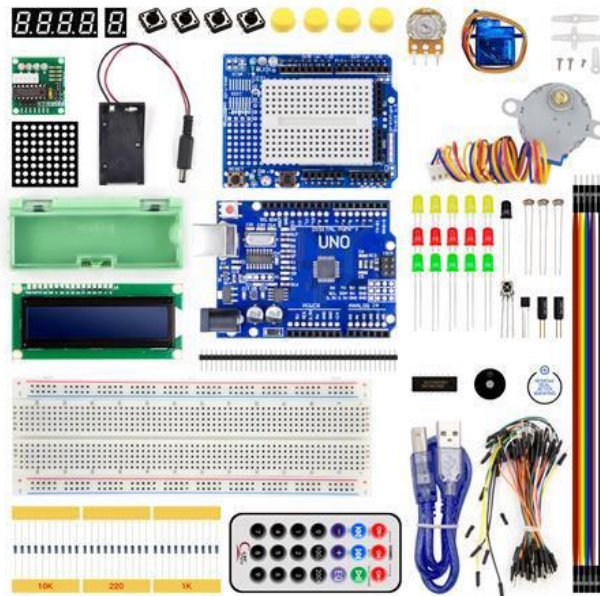


Hatfield Jan-Sept



# Examples of Equipment in the Makerspace

Internet of things (IOT) Kit



Sublimation Printers



VR Headsets



# Soldering Tools



# Tool Benches

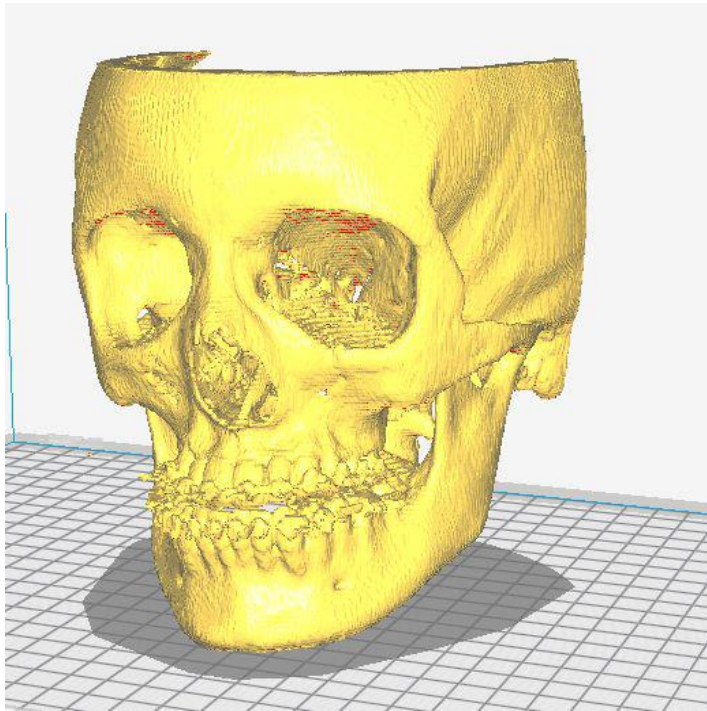


# Examples of 3D prints

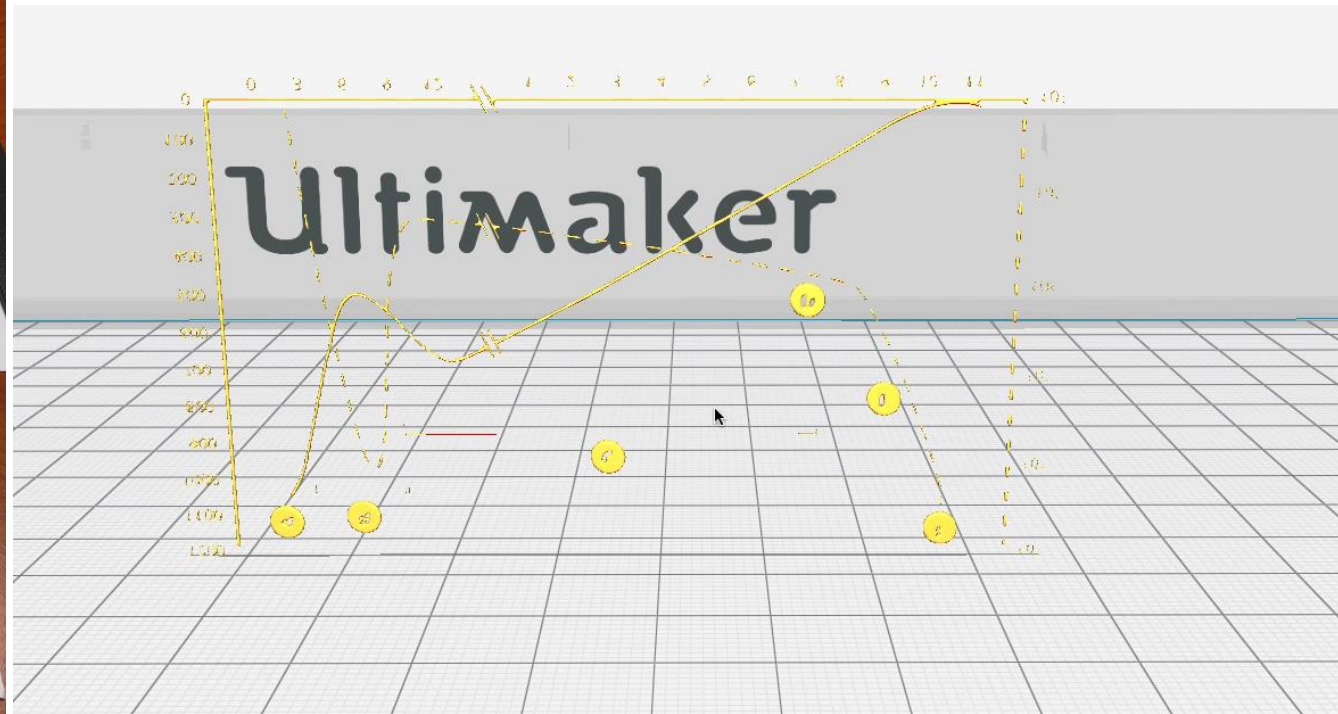
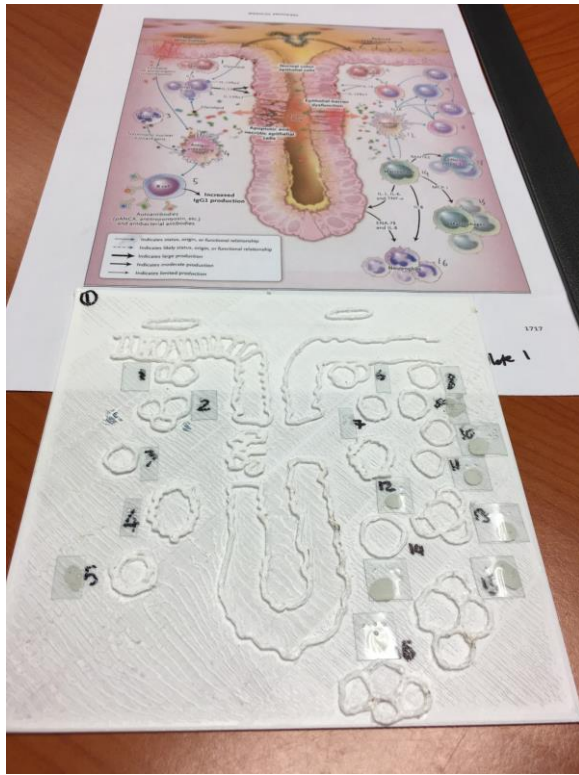


# Examples of projects completed

Convert CT scan to 3D model and 3D print



# Visually Impaired Project - Convert 2D images to 3D and 3D print brail based cards



# The XR Toybox (Health Sciences Library)



- Launched in May 2023
- An initiative of the Faculty of Health Sciences
- Designed for Medical education
- Provides immersive simulations and 3D experiences
- Improves teaching & learning outcomes
- Managed by 1 admin staff, 3 developers, and, 4 students to assist with traffic
- The main equipment is the VR headsets

# VR Electrocardiogram (ECG or EKG) training system study

## Programme Overview

- **300 students** accessed the tool (30 per session)
- Designed for **3rd-year medical students**
- Provides **unlimited practical sessions**

## Resources

- Annual funding for **ECG stickers**
- **Limited number of ECG machines** available

## Key Considerations

- **Ethical concerns** if underprepared students must complete skills training on live patients

# VR Electrocardiogram (ECG or EKG) training system



Figure 1a

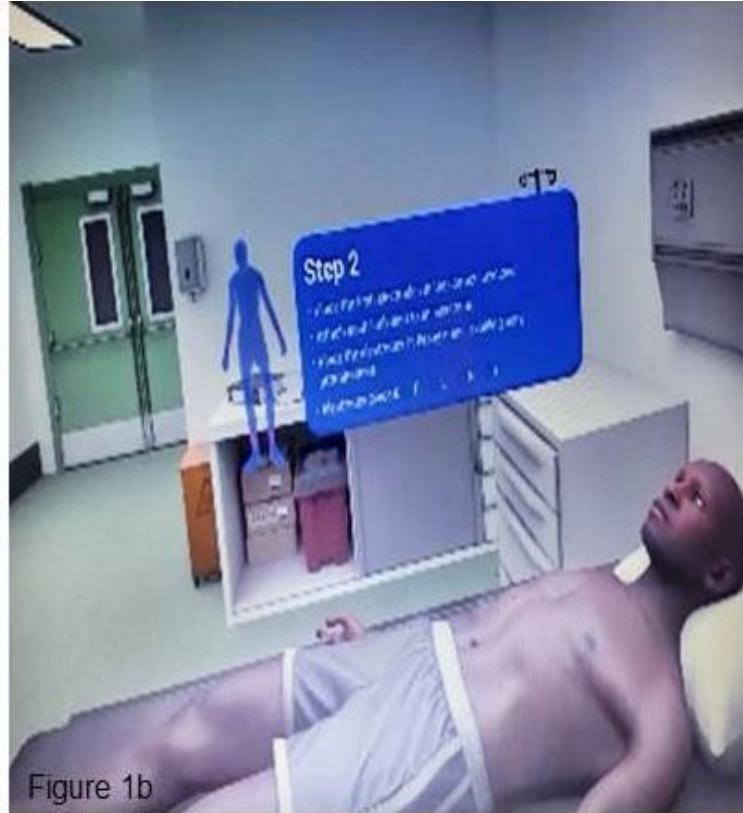


Figure 1b



# User Experiences in Both the Makerspaces and XR Toybox Facilities

Benefits	Barriers
Improved educational experiences	Technological and physical barriers
Controlled learning conditions	Real-world relevance and applicability
Greater confidence and relaxation	Support and orientation
Ease of access and use	
Encouraging entrepreneurial activity and social participation	

# Benefits of having the Makerspace and XR Toybox

- **21st-century skills:** Builds creativity, critical thinking, problem-solving, and collaboration skills.
- **Research and learning enhancement:** XR supports immersive simulations (medical training, architectural visualization, cultural heritage exploration).
- **Industry readiness:** Exposes students to real-world tools and workflows, improving employability.
- **Community engagement:** Creates opportunities for outreach to schools, startups, and local innovators.
- **Global competitiveness:** Aligns UP with international trends in higher education and innovation ecosystems.

# Best practices

- **Cross-disciplinary collaboration:** Encourage use across faculties (engineering, health sciences, humanities, etc.) to foster innovation.
- **Hands-on, project-based learning:** Support practical engagement with tools (3D printers, laser cutters, VR/AR) alongside theory.
- **Student-driven innovation:** Provide platforms for student-led projects, hackathons, and entrepreneurship incubation.
- **Faculty integration:** Embed makerspace/XR activities into curricula rather than treating them as add-ons.
- **Sustainability and scalability:** Adopt maintenance plans for equipment, regular training for staff, and phased rollouts.
- **Inclusive access:** Ensure resources are available to both undergraduates and postgraduates, with structured booking and fair usage systems.

# Lessons learned

- **Training is essential:** Students and staff require continuous orientation to maximize the potential of XR Toybox and makerspace tools.
- **Technology adoption curve:** Some users adapt quickly, while others need more guided support to fully integrate new tools into their work.
- **Interdisciplinary barriers:** Initial reluctance to collaborate across faculties can be overcome by showcasing successful joint projects.
- **Resource management:** High demand for 3D printing, VR headsets, and other tools requires efficient scheduling and technical support.
- **Showcasing outcomes matters:** Demonstrating successful prototypes, research outputs, and student projects drives broader buy-in.

# Innovation across faculty - Future Projects

## Arts Education



- Assemblage & sculpture beginnings
- Puppet-making projects

## Health Sciences



- Exploring an **XR component** in radiotherapy

# CREATIVE & DIGITAL INNOVATION SPACES



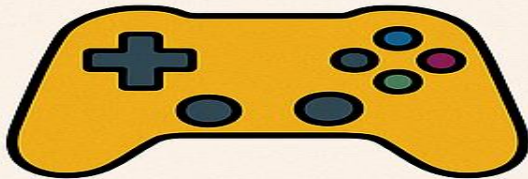
## AUDIO PRODUCTION

- Soundproof podcast studios
- High-quality mics, headphones & editing tools
- Audio editing workstations (Audacity, Adobe Audition, Logic Pro)



## VIDEO PRODUCTION

- Green screens & 4K cameras
- Professional lighting rigs
- Advanced video editing software



## INTERACTIVE LEARNING

- Gamification tools
- Digital makerspace for creativity & innovation

Charting the way forward



# Refurbishment of Makerspace cont.



VISUAL IDENTITY  
UP - FAB LAB

MONOCLE  
INTERIOR ARCHITECTURE

LIASA

**Thank you!**

“Libraries have evolved from places where users access information and use learning spaces to spaces where people connect, create and collaborate. Libraries are transforming into student success hubs”

Lindiwe Soyizwapi