

UQ Summer Research Project Description – 2026

Project title:	3D printed Wear-Resistant Occlusal Splint
Hours of engagement & delivery mode	6 weeks, 12 Jan – 20 Feb 2026 Hours of engagement: 24 hours Location: Herston, Oral Health Centre, School of Dentistry Delivery Mode: Can be offered in hybrid mode of virtual (30%) and in-person/onsite (70%)
Description:	This summer project focuses on the 3D printing of occlusal splints with enhanced wear resistance, addressing an important challenge in restorative and preventive dentistry. Occlusal splints are widely used for patients with bruxism and other functional disorders, but their long-term effectiveness depends on material durability and resistance to wear under simulated chewing forces. The student will receive training in the operation of a dental 3D printer and learn how to design and optimize fabrication parameters such as print orientation, layer thickness, and infill density. Using these skills, the student will fabricate occlusal splint specimens under different conditions and systematically investigate how these parameters affect performance. To evaluate durability, the project will employ a chewing simulator to replicate oral loading conditions and measure wear resistance of the printed splints. Data will be collected, analyzed, and interpreted to determine optimal printing strategies for high-performance occlusal splints. By the end of the six-week project, the student will have gained valuable experience in digital manufacturing, experimental testing, and data analysis, while contributing to ongoing research in dental biomaterials. The outcomes will include a report and presentation summarizing the findings, with potential to inform future publications in the field of biomaterials and clinical dentistry.
Expected learning outcomes and deliverables:	This project will provide undergraduate students with hands-on experience in applying advanced digital manufacturing and materials evaluation techniques to address a clinically relevant dental challenge. The focus is on designing, fabricating, and testing 3D-printed occlusal splints with improved wear resistance, a key factor in ensuring long-term durability and patient comfort. Learning Outcomes for the Student During the six-week program, the student can expect to gain skills and knowledge across the following areas: 3D Printing and Digital Design: Receive proper training in the operation of a dental 3D printer. Learn how to prepare digital files and optimize printing parameters (e.g., layer thickness, infill density, orientation) for occlusal splint fabrication. Understand the impact of different fabrication parameters on material properties and performance. Experimental Design and Materials Testing: Plan and conduct experiments to systematically evaluate splint specimens under varying fabrication conditions. Gain hands-on experience with a chewing simulator to assess wear resistance, simulating real oral environments. Collect, record, and analyze data on wear patterns, surface roughness, and material degradation. Critical Thinking and Research Skills: Develop the ability to link printing parameters with material performance, drawing evidence-based conclusions. Engage with relevant literature on occlusal splints, 3D

	printing in dentistry, and biomaterials testing. Strengthen problem-solving skills by troubleshooting printing challenges and optimizing workflows. Communication and Professional Development: Present findings in clear and concise formats, such as data reports, figures, and short presentations. Receive mentoring in scientific writing, with the opportunity to contribute to a future publication or conference abstract. Build confidence in oral communication by delivering a final presentation to peers and supervisors. Expected Deliverables By the end of the project, the student will be expected to: Produce a set of 3D-printed occlusal splint samples optimized for wear resistance. Collect and analyze wear resistance data using the chewing simulator. Prepare a concise written report summarizing methodology, results, and recommendations. Deliver an oral presentation outlining key findings and reflecting on the skills gained during the project.
Suitable for:	This project is open to undergraduate students with an interest in materials science, mechanical engineering, biomedical engineering, or dentistry-related studies. It will particularly suit students who are: Interested in 3D printing, digital design, and advanced manufacturing techniques. Keen to learn about biomaterials and their clinical applications in dentistry. Motivated to develop hands-on skills in experimental design, materials testing, and data analysis. Considering future pathways such as honours, research higher degrees (MPhil/PhD) in materials science, engineering, or biomedical research. From programs including Materials Science and Engineering, Mechanical Engineering, Biomedical Engineering, Pre-Medical Provisional pathways, and related disciplines. Note: As in previous years, MD students are not eligible to participate due to the shorter break in the MD academic calendar.
Primary Supervisor:	Dr Abdalla Ali abdalla.ali@uq.edu.au https://dentistry.uq.edu.au/research/cor3
Further info:	The supervisor CAN be contacted by students prior to submission of an application