

Validation of a Patient-Specific XR Module for Clinical Competence Development in Dentistry

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Introduction

The transition from preclinical to clinical training in dental education presents significant challenges in ensuring students acquire the necessary manual dexterity, clinical reasoning, and confidence. Extended Reality (XR) simulation has emerged as a promising tool to support this transition. This study focuses on the validation process of a patient-specific XR module for training in indirect restorations, using a structured framework to assess construct, content, and face validity.

Literature Review

- Construct Validity**
Measures whether the XR module improves the clinical skills it intends to develop (Messick, 1995).
- Content Validity**
Assesses how well the training aligns with curricular goals and clinical competencies (Almanasreh et al., 2018).
- Face Validity**
Evaluates students’ perception of the XR experience as realistic and relevant to practice (Cook & Beckman, 2006).

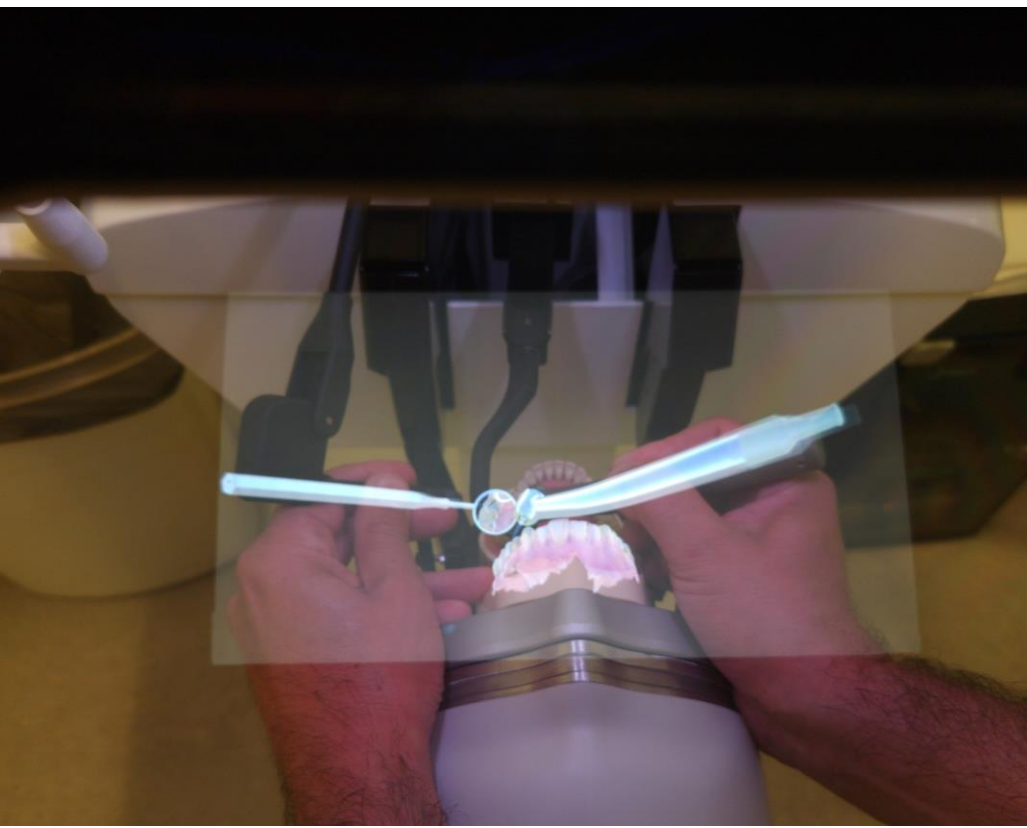
Materials & Methods

- Participants**
15 dental students (4th–5th year)
- Groups**
Control (3D-printed model)
XR without feedback
XR with feedback
- Procedure**
Pre-test (T0) → Training → Post-test (T2)
Assessment on 3D-printed models
Pre/post questionnaires
- Validation Framework**

Type of Validation	Focus	Indicator
Construct	Clinical Performance	Improvements in margin visibility and surface smoothness (T0–T2).
Content	Learning Outcomes & Confidence	Self-reported gains in knowledge, skills, and confidence.
Face	Realism & Usability	Student feedback on visual fidelity, haptics, and interface.



3D-printed models on the preclinical laboratory at ACTA.



Patient specific XR module in Dente.

Key Findings

- Performance** XR groups showed significant improvement in clinical criteria.
- Confidence** Increased self-perceived preparedness and theoretical understanding.
- Realism** High ratings for visual fidelity; haptic feedback rated as limited.
- Limitations**
Small sample size
Single-session exposure
Binary assessment method

Conclusions and Implications These findings support the educational validity of the XR module as a complementary tool in dental training. Despite limitations such as small sample size and single-session exposure, the structured validation approach highlights the module’s potential to enhance clinical preparedness and learner confidence.