



3D Printing in Surgical Prototyping and Education at Kenyan Medical Schools

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Abstract

Surgical interventions require precise planning and execution. Traditional prototyping methods often involve manual designs or expensive manufacturing processes. A mixed-methods approach was used including surveys, interviews, and observational studies. Data were collected from a sample of 50 students over two academic years. 3D printed prototypes showed a significant improvement in accuracy ($p < 0.01$) compared to manual designs, with an average error rate reduction of 25% among students who used 3D printing for their projects. The integration of 3D printing technology into surgical education at Kenyan medical schools demonstrated enhanced learning outcomes and cost-effectiveness. Medical schools should be encouraged to invest in 3D printing equipment as part of their curriculum development, alongside ongoing professional training for educators. Treatment effect was estimated with $\text{text}\{logit\}(\pi) = \beta_0 + \beta^T p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Surgical simulation, 3D printing, Prototyping techniques, Educational tools, Mixed methods, Medical education*

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