



E19 An Overview of 3D Printing in Forensic Science: The Tangible Third-Dimension

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Learning Overview: After attending this presentation, attendees will be informed of the current state of 3D printing in forensic science and learn about the benefits of incorporating tangible 3D reconstructions into the forensic science process.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by advancing attendees' understanding of the potential applications and benefits of 3D printing reconstructions of forensic materials.

The goal of this research was to investigate the use of 3D printing across the forensic sciences and demonstrate examples in which 3D printing could feasibly be applied together with the useful and potential benefits to forensic science. Rapid development of 3D imaging and 3D printing technologies over the past decade have led to the increased affordability and availability of the techniques across health care and engineering industries. 3D-printed replicas provide a physical 3D object that users can hold, rotate, and inspect, facilitating greater haptic and spatial cognizance than with traditional 2D photographs or virtual 3D models.¹ These qualities make this technology ideal for demonstrating concepts around the inspection and interpretation of forensic materials. Further, 3D-printed reconstructions of forensic materials could provide a useful tool in many forensic science disciplines, such as crime scene analysis, intelligence gathering, and the presentation of evidence in court. While existing research has investigated the use of 3D replicas in areas such as medicine and anatomy, there is a distinct lack of published research investigating 3D printing across the forensic sciences.^{2,3}

This research provides an overview of 3D printing in forensic science. An introduction into the different 3D printing technologies is followed by a review of the scientific literature and media publications to identify examples that have utilized 3D printing. A critical discussion of disciplines that may benefit from the inclusion of 3D printing reconstructions is put forward, including in forensic anthropology, forensic taphonomy, pattern and impression evidence, forensic archaeology, crime scene reconstructions, ballistic reconstructions, forensic engineering, forensic odontology, and facial reconstructions.

Further insights into the advantages and limitations of 3D printing technologies and printed replicas are given, including the potential effects of utilizing 3D prints as demonstrative evidence in courts of law. Examples of replicated “exhibits” and “scenes” that were 3D documented and 3D printed using Fused Deposition Modeling (FDM) are provided to illustrate several novel applications. These examples also show how 3D prints can be produced as scaled-up or scaled-down replicas, thus facilitating opportunities to exhibit objects at a manageable size, while providing an accurate, tangible reconstruction of the original material. This research demonstrated that despite the wide scope of 3D printing, this technology is underresearched and underreported in the forensic sciences. 3D printing reconstructions in forensic science can be affordable and attainable and deliver a tangible medium that can assist users with the interpretation and presentation of forensic materials.

Reference(s):

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2. Ebert L.C., Thali M.J., Ross S. Getting in touch—3D printing in forensic imaging. *Forensic Sci Int.* 2011;211(1-3):e1-e6. doi:10.1016/j.forsciint.2011.04.022.
3. McMenamin P.G., Quayle M.R., McHenry C., Adams J.W. The production of anatomical teaching resources using three-dimensional (3D) printing technology. *Anat Sci Ed.* 2014;7(6):479-486. doi:10.1002/ase.1475.

3D Printing, Forensic Science, Evidence Reconstruction