Number P120A200056. This work would not have been possible without the support of DOE and DoEd.

References

- L. Chong, S. Ramakrishna, S. Singh, "A review of digital manufacturing-based hybrid additive manufacturing processes," *Int. J. Adv. Manuf. Technol.* 95 (2018) 2281–2300.
- [2] O. Ivanova, C. Williams, T. Campbell, "Additive manufacturing (AM) and nanotechnology: promises and challenges," *Rapid Prototyp. J.* 5 (2013) 353–364. doi:10.1108/RPJ-12-2011-0127.
- [3] S.H. Huang, P. Liu, A. Mokasdar, "Additive manufacturing and its societal impact: a literature review," *Int. J. Adv. Manuf. Technol.* 67 (2013) 1191–1203. doi:10.1007/s00170-012-4558-5.
- [4] M. Eisenberg, "3D printing for children: What to build next?," Int. J. Child-Computer Interact. 1 (2013) 7– 13. doi:10.1016/j.ijcci.2012.08.004.
- [5] M. Horejsi, "Teaching STEM with a 3D Printer," Sci. Teach. (2014) 10. doi:10.1126/science.1153539.
- [6] G. Bull, J. Groves, "The Democratization of Production," *Learn. Lead. with Technol.* (2009) 36–37. http://www.eric.ed.gov/ERICWebPortal/recordDetail?accno=EJ86 3943.
- [7] T.R. Kelley, J.G. Knowles, "A conceptual framework for integrated STEM education," *Int. J. STEM Educ.* 3 (2016) 11. doi:10.1186/s40594-016-0046-z.
- [8] W. Easley, E. Buchler, G. Salib, A. Hurst, "Fabricating Engagement: Using 3D Printing to Engage. Underrepresented Students in STEM Learning," in: ASEE Annu. Conf. Expo., ASEE, Columbus, USA, 2017.
- [9] E. Buehler, N. Comrie, M. Hofmann, S. McDonald, A. Hurst, "Investigating the Implications of 3D Printing in Special Education," ACM Trans. Access. Comput. 8 (2016) 1–28. doi:10.1145/2870640.
- [10] M. Chen, Y. Zhang, Y. Zhang, "Effects of a 3D printing course on mental rotation ability among 10-year- old primary students," *Int. J. Psychophysiol.* 94 (2014) 240. doi:10.1016/j.ijpsycho.2014.08.925.
- [11] "Making in a Middle School Classroom," in: *FabLearn* 2015, Stanford, USA, 2015.
- [12] R.E. Stamper, D.L. Dekker, "Utilizing rapid prototyping to enhance undergraduate engineering education," in: 30th Annu. Front. Educ. Conf., IEEE, Kansas City, USA, 2000: pp. 1–4. doi:10.1109/FIE.2000.896570.
- [13] S.S. Horowitz, P.H. Schultz, "Printing Space: Using 3D Printing of Digital Terrain Models in Geosciences Education and Research," J. Geosci. Educ. 62 (2014) 138–145. doi:10.5408/13-031.1.
- [14] UTEP, "Graduate Certificate in 3D Engineering and Additive Manufacturing," (2018). http://catalog.utep.edu/grad/college-of-engineering/mechanical-en gineering/grcertificate-3dam/.
- [15] M.K. Niaki, F. Nonino, "Additive manufacturing management: a review and future research agenda," *Int. Prod. Res.* 7543 (2017) 0. doi:10.1080/00207543.2016.1229064.

- [16] Y. Wei, D. Tay, B. Panda, S.C. Paul, N.A.N. Mohamed, M.J. Tan, K.F. Leong, "3D printing trends in building and construction industry: a review," *Virtual Phys. Prototyp.* 12 (2017) 261–276. doi:10.1080/17452759.2017.1326724.
- [17] Y. Abou Hashem, M. Dayal, S. Savanah, G. Strkali, "The application of 3D printing in anatomy education," *Med. Educ. Online.* 20 (2015). doi:dx.doi.org/10.3402/meo.v20.29847.
- [18] K.L. Cook, S.B. Bush, R. Cox, "Creating a Prosthetic Hand: 3D Printers Innovate and Inspire and Maker Movement," *Sci. Child.* 53 (2015) 80–86. http://stats.lib.pdx.edu/proy.php?url=http://search.ebscohost.com/ login.aspx?direct=true&db=ehh& AN=111061979&site=ehost-live.
- [19] P.G. McMenamin, M.R. Quayle, C.R. McHenry, J.W. Adams, "The Production of Anatomical Teaching Resources Using Three-Dimensional (3D) Printing Technology," *Anat. Sci. Educ.* 7 (2014) 479–486. doi:10.1002/ase.1475.
- [20] A. Stangl, B. Jernigan, T. Yeh, Write, "Design, and 3D Print Tactile Stories for Visually Impaired: Critical"
- [21] J. Loy, "eLearning and eMaking: 3D Printing Blurring the Digital and the Physical," *Educ. Sci.* 4 (2014) 108–121. doi:10.3390/educsci4010108.
- [22] P. McGahern, F. Bosch, D. Poli, "Enhancing Learning Using 3D Printing: An Alternative to Traditional Student Project Methods," *Am. Biol. Teach.* 77 (2015) 376–377. doi:10.1525/abt.2015.77.5.9.
- [23] J.A. Reuscher, "Three-Dimensional (3-D) Scanning Within Academic Libraries: Exploring and Considering a New Public Service," *Pennsylvania Libr. Res. Pract.* 2 (2014) 64–70. doi:10.5195/PALRAP.2014.56.
- [24] E. Unver, P. Atkinson, D. Tancock, "Applying 3D Scanning and Modeling in Transport Design Education," J. Comput. Des. Appl. 3 (2006) 41–48. doi:10.1080/16864360.2006.10738440.

AUTHORS

A. C. Megri is with the North Carolina A&T State University, Greensboro, NC, USA. (e-mail: acmegri@ncat.edu).

S. Hamoush is with the North Carolina A&T State University, Greensboro, NC, USA. (e-mail: <u>sameer@ncat.edu</u>).

I. Z. Megri served as a teaching assistant (TA) and technical support for the outreach program. He is at Northwest Guilford High School, Greensboro, North Carolina, USA. (e-mail: <u>12614690@stu.gcsnc.com</u>).

Y. Yu was with the North Dakota State University, Fargo, ND, USA. (e-mail: yao.yu@ndsu.edu).