Integration of 3D Printing into Engineering Curriculum
Joel Boulter & Michael A. Perez, Ph.D., CPESC

INTRODUCTION
- Fall Semester, 2017: ISU Construction Engineering (ConE) program awarded a grant from J.E. Dunn Construction.
- Overarching goal of the grant: increase collaboration between ConE and Architecture students.
- Spring Semester, 2018: LulzBot TAZ 6 3D printer is purchased for the program using funds from the grant.
- Rest of semester spent making the printer operational and finding space for it within Town Engineering.
- Fall Semester, 2018: Attention focused onto how 3D printing could be used in courses in ConE and CE curriculum.

OBJECTIVES
The objectives of this project were designed keeping the overarching goal of the grant in mind. Accordingly, the objectives of this project were to:
- Integrate the use of 3D printing into courses within the ConE and CE curriculum.
- Teach students about the process of 3D printing and the software used in it.
- Introduce students to architectural design concepts and methods.

METHODS
- Classes within ConE & CE curriculum were identified in which 3D printing would fit well with the existing coursework.
  - ConE 121/122: ConE Learning Community
  - CE 170: Civil Engineering Graphics
- Specific assignments were developed for each course with two common goals:
  - Introduce students to the software used in 3D printing.
    - AutoCAD 2019, Autodesk Revit, & Cura
  - Give students the opportunity to design their own building model.
- Assignments offered as part of an extra-credit workshop outside of regular class (ConE 121 pilot in Fall 2018).
  - Included presentation from student or lecturer in Architecture program.
  - Taught students the 3D printing process and how to use the necessary software programs.
  - Gave time during the workshop to complete the assignment.
- Successful models were printed out for students to keep.

RESULTS
ConE 121/122
- Fall 2018 & Spring 2019
- Software: AutoCAD
- Students: 12
- Printed Models: 7

CE 170
- Spring 2019
- Software: Autodesk Revit
- Students: 22
- Printed Models: 19

CONCLUSION
- Overall positive feedback from participating students as well as the architecture presenters.
- Valuable ideas shared as to how the workshop and assignment can be improved for future students.
- Biggest challenges to address:
  - Cura not installed on desktop computers for students to use.
  - Unforeseen technical difficulties with AutoCAD and Revit.
- Positive takeaways:
  - Lessons learned will improve the two assignments in the future.
  - Assignments are a solid start for the implementation of 3D printing into the ConE curriculum.
  - Collaboration with architects began to fulfill the overarching goal of the grant.

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