Computational Bead Design

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1. Introduction

Computational Bead Design is an interdisciplinary project designed to introduce students (K-20) to computing (beginning programming), digital modeling and additive manufacturing techniques. Throughout history beads have been considered to hold symbolic and sacred knowledge. They can communicate social standing, political history, and religious beliefs. Beads have been a representation of a civilizations' technological advancement. The technical sophistication of bead manufacturing often mirrors the general technological level of the society (Dubin). This project highlights the bead, once again, as a marker of our current technological advancements through computing and 3D printing.

2. Exposition

Through the process of bead generation, this project introduces the participant to design principles and computer science concepts. The project employs Rhinoceros© (Rhino) NURBS modeling software and the graphical programming interface Grasshopper to create stereo lithography files for 3D output methods (aka 3D printing.)

Grasshopper includes an interface for programming in the scripting language, Python. Using Python to customize and tailor the design of bead geometry, we present a gateway to learning Python and computational design.

Finally, the finished designs are output for each student using digital fabrication processes, creating tangible evidence of the learning outcome for this project.

2.1 Elaboration

Modeled after the work of Plural Studios bead design (figure 1), this project will introduce a beginning design and computing student to logical thinking and computing through the creative exercise of modeling beads. This project is interdisciplinary and touches upon the history of communication and technology of beads, basic programming, 3D modeling and additive manufacturing processes. The project is a STEM (Science, Technology, Engineering and Math) to STEAM (Science, Technology, Engineering, Art and Math) initiative at teaching the core subjects of science, technology, engineering and math through art and design (Rhode Island School of Design). The project has been supported with grant funding from the National Center for Women & Information Technology's (NCWIT) AspireIT program, Georgia Tech and Winthrop University. The pilot project will run as a weeklong summer program for middle school girls in July of 2014.

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Figure 1. *Plural Studios, Rennie Bead. Sintered Metal Print*

3. Results

The project is ongoing and the co-investigators will be working to evolve the project to be applicable to any level of K-20 education. The results are tangible output of the computing and modeling processes, therefore an accessible and unique approach to the introduction to computer programming and coding.

4. Conclusions

Computational Bead Design is a relevant K-20 activity with interdisciplinary STEAM learning objectives. The project addresses a missing component to many STEM projects, design and aesthetics. Through the context of the bead these topics are addressed as the student is introduced to computing.

References

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