

Teaching Documentation through

3D Printing and Instructables

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Problem Statement

A growing range of industries increasingly demand experience with 3D modeling, 3D printing, and technical communication.^{1,2} Many such industries also employ primarily white heteronormative men, while marginalizing and excluding individuals based on race, gender, and sexuality.^{3,4}

In response, the so called "Maker Movement" promotes access to emerging digital fabrication technologies, such as 3D printers, and uses inclusive language in its branding. However, the "Maker Movement" often fails to enact meaningful change regarding diversity issues, thus reinforcing industry problems.^{5,6,7}

This study presents an assignment sequence designed to facilitate change within maker communities and industry through 3D printing and technical communication.

Students design 3D printable objects that respond to social issues, and document their design process through step-by-step guides on Instructables.com. Additionally, this assignment responds to student needs for step-by-step 3D modeling tutorials, rather than video tutorials.

In doing so, this assignment engages open source communities of technical communicators to teach technical communication, rhetoric and 3D printing skills.

Methods

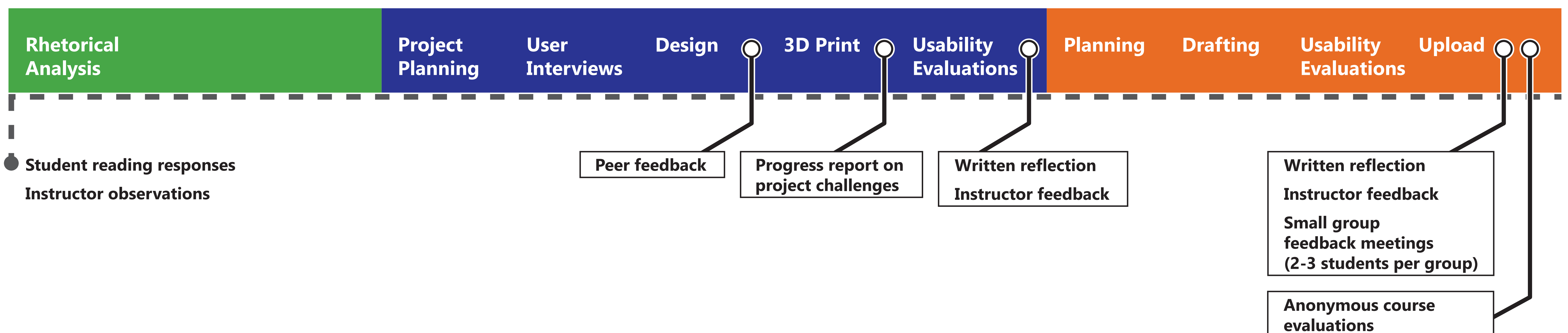
This case study used student feedback and instructor observations to evaluate the potential effectiveness of combining 3D printing with writing Instructables to teach foundational principles of technical communication, rhetoric, and usability, to first-year students.

The instructor observed two first-year writing classes over two semesters (Spring 2015 and Fall 2015 for a total of 32 weeks), with a total of 30 students and 10 group projects.

Rhetorical Analysis 5 weeks

3D Modeling and Printing 7 weeks

Instructables 4 weeks



Outcomes

1) It is possible, and practical, to teach documentation using 3D printing and Instructables.

2) Challenges

Limited Time

Four weeks leaves little time to revise or learn from failure, particularly at the end of the semester.

Limited Formatting Options

The Instructables interface is more familiar to students than design software like InDesign, but limited to blog-style formatting options.

Lack of Software Tutorials and Limitations of the 3D Modeling Program

This assignment helps create more online step-by-step tutorials, and I plan to integrate newer software for 3D modeling.

3) Student Learning

Better Understanding of Audience and Rhetorical Goals

Students expressed that they better understood audience and rhetorical goals through:

- writing usability evaluation questions, and articulating what they did during the design phase for an audience outside the classroom; and
- having a "live" audience (students were shocked to be featured and receiving 1,000+ views in a day).

Students also commented that they didn't understand what 3D printing or Instructables had to do with writing or rhetoric at the start of the semester, but by the end they could see how audience needs guided their rhetorical design choices across media and contexts.

Valuing of "Practical Skills"

Most students enjoyed writing instructions and documenting their work, as they could see a direct application to their careers.

Students also said they had never heard of 3D printing before the class, but had learned how it was being used in their fields (through a short-term research project for the class).

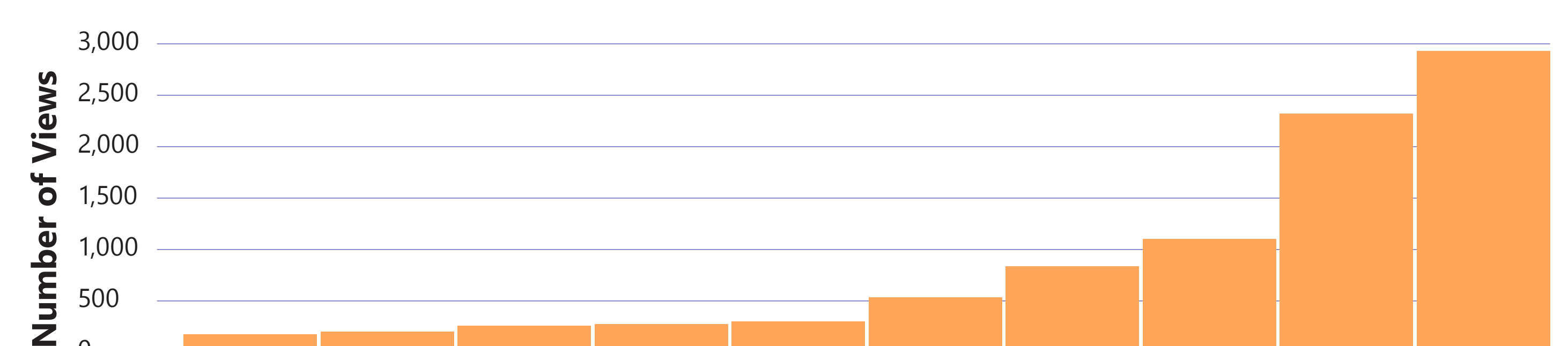
Usability and Participatory Design

Many students initially failed to understand the rationale behind usability evaluations. After a second experience with usability evaluations for the final project, however, students expressed and demonstrated that they better understood audience and usability.

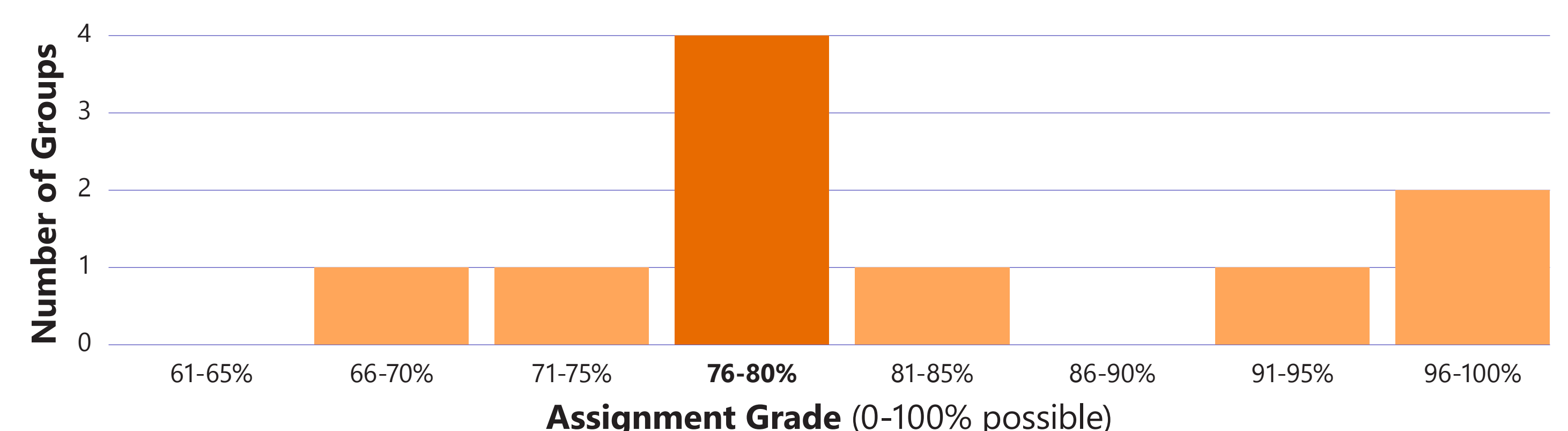
Some Students Hated the Class

A few students complained throughout the course that they didn't understand how it would improve their writing. In particular, students who expected to write 8-10 page research papers were disappointed, as they didn't see planning documents, progress reports, documentation, and analyses as "writing."

Distribution of Instructables Group Project Views (SP15 and FA15 combined n=10)



Distribution of Instructables Group Project Grades (SP15 and FA15 combined n=10)



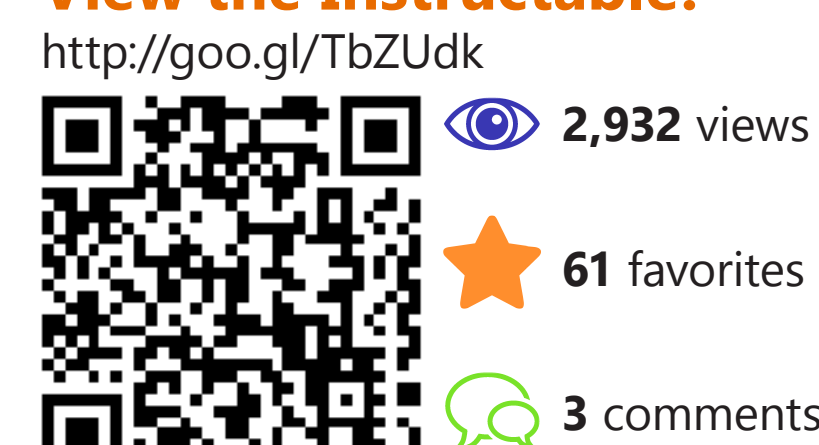
Student Project Samples

Who Controls Whom?



"Anyone who uses a phone can attest that after a while, the phone is simply an extension of the hand. Nobody will think twice when they take out their phone and say it feels different. The very opposite is true of this phone case. The circuits and the wires are all raised slightly higher from the case, making them easily noticeable...The circuit board on the back, with exposed wires transitioning into a loop for the pinky disguised as a shackle and chains, makes the user feel as if they are becoming a part of the phone."

View the Instructable!
<http://goo.gl/TbZUdk>



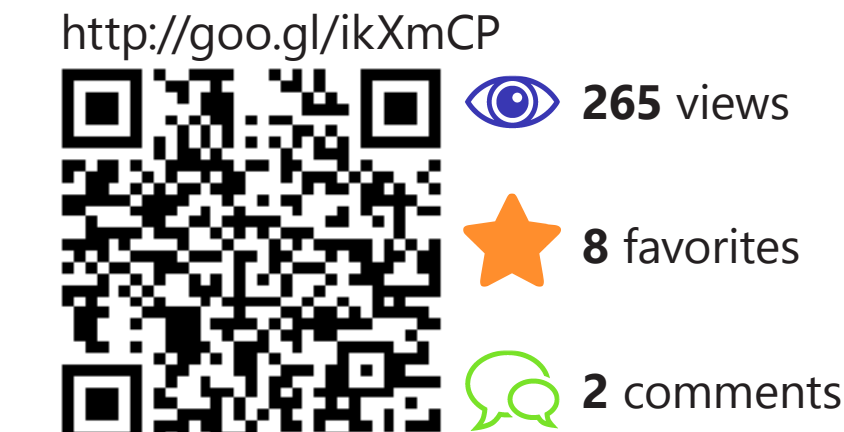
Featured!



Just a Game?

"We claim that the game of chess isn't just a fun, harmless board game, but rather a display of economical stature and social power within a society. This conclusion was reached by analyzing what each piece is allowed to do within the game. This would include how many spaces it can travel, what directions it can move, and how it can attack other pieces. Other factors that helped us arrive to this decision were the physical appearances of traditional chess pieces, especially height... There is a bigger plan for these chess pieces besides just printing them. The overall goal is to have them displayed in a large public area for everyone and anyone to see [such as a park]."

View the Instructable!
<http://goo.gl/ikXmCP>



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