Teaching students how to design and produce storytelling props.
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1. Specific Educational Aims.
We all have to be prepared to describe our work anywhere and to anyone. We are trained to use diagrams for props but these don’t work well outside of a formal lecture or poster setting; without these props we are left waving our hands in the air. My goal is to equip students with a small object that they can use as a visual aid to focus listeners’ attention and help describe their work to both experts and novices. For example, I’ve been designing jewelry that graphs the multidimensional data my lab produces. I hand these objects to people and they can explore the data on their own during a discussion. I find that it helps people understand what I’m describing; I see this as a subtle use of manipulatives that lets the diverse people I talk to understand my story better because I can engage them in different ways and not just focus on the verbal learner. This helps switch a conversation from a simple didactic interaction to one where the listener is invited to actively explore my data, rather than passively absorb a description. These props help me teach inclusively by offering a variety of learning modes to my students. My goal is to show Stanford students how to teach in this inclusive manner.

2. Project rationale.
Many of the abstract ideas we study are difficult to convey in words alone. I plan to teach our students how to be better teachers themselves by training them to use different modes of teaching.

3. Approach
This spring, I signed up to give a new mini-course in which I will teach students how to model their data or a representation of their work and then print this in a durable material. I will be teaching this in winter 2017 and if the class fills up, as I expect it will, I will offer the class again in the Spring and repeat this cycle until the students stop signing up. I have experience teaching a similar course as I’ve been running a mini-course on animation for the last three years. The point of providing an animation course was to help students better explain their projects when they are giving a slide presentation; now I want to help the students with more informal discussions. The animation course filled within seconds when it opened on Axess and has been highly rated and oversubscribed. To help the students continue with their animation, I kept an animation bench open in my lab that could be used by ex-students as it was needed and I plan to do the same with this modeling and printing class.

I will run this new mini-course as an art studio class where we will meet for two hours a day for a week to first brainstorm ideas and then make computer models of our data and then to iteratively print and test our models. When I do this on my own, I use an inexpensive PLA 3D printer in my lab and rely on Shapeways to make final products. To do this effectively for 12 students in an intensive mini-course I will need to be able to print more objects rapidly and I would like to print at a higher resolution and using different material so that we can make final products during the course. Though we can send our models to commercial printing enterprises or use printers on campus, the process works best when we can do things iteratively in a short time frame and this requires dedicated printers. I plan to use the one printer that I have already and the purpose of this proposal is to request funds to purchase a resin based printer to make smaller high resolution objects and a laser cutter to make larger objects and pop-up paper constructs for posters or cards that can be given away.

4. Timeline and plan for implementation.
I am scheduled to teach this course in the winter quarter of 2017 and likely again in the spring quarter 2017 and I will repeat the class yearly. I would like to purchase the
equipment in the fall of 2016 to test it out to ensure that we can achieve a high rate of throughput. I have developed some starter lessons to demonstrate how the students can make objects out of their data but the challenge and opportunities for the greatest success will come when we allow the students to invent their own story telling props. I’m excited to see their inventions.

5. **Anticipated work product**
   We will produce several types of products. The first will be a simple studio course for teaching students how to model and print their data and diagrams. Second will be the actual objects that the students can use for storytelling. I have been posting my forays into this field on my blog (phasecurveblog.wordpress.com) and would be happy to display the student’s work there as well. I didn’t have enough space to explain all of these and urge you to take a look at the models with their explanations online. I’ve built things that range from bracelets and pendants to candies that I can hand out to interested observers. Once we accumulate enough objects, it would be useful to display examples in one of the regular LKSC art exhibitions.

6. **Evaluation Plan**
   The long-term goal of this project – the improvement of the way our students describe their own work – is difficult to assess in a quantitative manner. In the short term I will use teaching evaluations for my mini-course to evaluate whether the students find this approach interesting and useful. I will send a questionnaire out to the students a year after they have finished the course to ask them if they found the course changed the way they explain their work.

7. **Dissemination of results.**
   My goal is to produce a product that the students will share whenever they describe their work, so in a sense, success will mean that the project will be disseminated by its nature. We will actively disseminate the project on the web through my blog and locally through an exhibition of the products the students produce. If successful, I will look for an outlet to publish the work in a more formal manner; for example, I recently did this in an essay in Trends in Immunology, where I discussed the use of horror movies to teach the dynamics of infectious disease in a Freshman Seminar I taught (Schneider, DS. What can vampires teach us about Immunology? Trends in Immunology. 2016 Apr;37(4):253-6.). As a way of generating local interest in this process, I plan to rent a booth at the annual Bay Area Makers Faire, to share our models with others who use these technologies. I would like participants from the class sit in the booth and explain their projects to the public.
8. Budget and Justification.
What holds me back in running this course, is my ability to rapidly produce the models designed by the students; therefore, I’m requesting the purchase of equipment. This equipment will have a lasting impact, as it will be used repeatedly each quarter as we run through different iterations of the course. Once these machines are purchased, the project will be sustainable, as it will simply involve me teaching the course quarterly. I had already planned to teach the course and do not require any compensation for planning or teaching but I need to equip the studio to allow us to manufacture our products iteratively.

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<th>Non-Compensation</th>
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<th>Justification</th>
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<td>Resin Printer: Form 2 Complete package.</td>
<td>Required to print high-resolution models.</td>
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<td>Glowforge basic laser cutter + air filter</td>
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