Digital Initiatives

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Shelley Goldman Builds Science Education App with GSE IT

Dr. Goldman takes advantage of GSE in-house design and coding expertise to bring her discovery-based science app to life

When Professor Shelley Goldman first conceived her Playful Science app, she envisioned a mobile learning experience through which learners could actively engage with their immediate world. In partnership with Field Trip, a location-oriented note application, she and a handful of graduate students set out to build resources for exploring and exchanging information about natural phenomena.

A few years into development, Dr. Goldman found the project in need of additional functionality and a more learner-centered mission. Iterating towards more specific learning design goals, privacy concerns, and intuitive user interactions proved formidable for the research group. Furthermore, the Field Trip platform, developed independently by Google, was limited in how it could be tailored to the team's vision of a family-oriented digital learning experience. "We we looking for a more general context," she notes.

Dr. Goldman spoke of these concerns with Dr. Paul Kim, CTO of GSE, and Dr. Dan Schwartz, Dean of GSE, relating her team's roadblocks in customizing and configuring the technology to her vision. "Hacking it together," reflects Dr. Goldman, "can be challenging. We needed an in-house group that understands the needs of a research project." These needs intersected with the mission of the newly formed GSE IT app development team: to provide specialized mobile design and development expertise to GSE faculty.

Assembled in 2016, the GSE IT app development team was the

Left to right: Dr. Shelley Goldman, Mobile App Developer Sunmi Seol, and UX Designer KaiFeng Cheng

product of conversations to enhance faculty teaching and research with innovative education technology solutions. Led by Director of Web, Application and Digital Media, Lyudmila Christie, this team of designers and coders has already taken on projects including an early language literacy app, science education app, and apps to support faculty research. The team provides end-to-end mobile development support at subsidized rates for GSE faculty, and dovetails with TELOS (Technology for Equity in Learning Opportunities) grant opportunities aimed at providing viable financing for innovative ideas.

Dr. Goldman took full advantage of this expertise and programmatic support. In their initial meetings, she and the GSE IT development team engaged in brainstorming and design sessions in order to scope the digital learning experience. Then, via weekly meetings, Dr. Goldman and the development team refined their vision for the app, running through mock-ups of potential user experience scenarios. Created by user experience designer KaiFeng Cheng, these digital sketches gave Dr. Goldman and her team a preview of how the technology would feel moment-by-moment for potential users.

Left: User experience maps help to articulate possible interactions

Right: New features like collectible awards were inspired by user feedback

After Mobile App Developers David Luong and Sunmi Seol coded the first versions of the app, Dr. Goldman performed live testing with users. She observed users' experiences via a recording app, Lookback. The interaction data she gathered later informed user behavior insights. "It's essential to regularly collect data on what the user needs," advises Dr. Goldman. Based on these analyses, Dr. Goldman bolstered interactivity within the app with avatars, collectibles, and more precise feedback points.

Dr. Goldman looks forward to devising new possibilities with GSE IT. She stresses how working with a solid design and flexible team
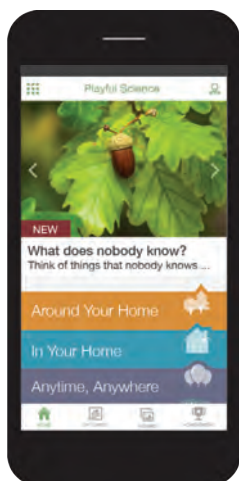

The Playful Science app helps young learners to structure observations of the natural world

members is key to a successfully iterated product. "Work with people that understand how software will change as user demand changes," Dr. Goldman advises. "Discuss what is possible and think as a team." Crucially, she notes, the GSE IT in-house presence affords convenience, expertise, and an alignment of vision towards what Dr. Goldman sees as professionally designed technology that can transition into implementation phases more reliably.

For others interested in partnering on an app, Dr. Goldman suggests reaching out to brainstorm with the GSE IT app development team: "It only takes a hunch or a good idea -- that you could do *this* for *these people* in *this learning situation*. If you just have an idea and a use case, the team can help mold the idea."

App Development at GSE

In an effort to support GSE faculty who need technical help in designing and developing innovative applications to enhance teaching, learning, and research, GSE IT provides a mobile and web application design and development service. The design process kicks off with a free consultation to determine scope, fit, and technical specifications.
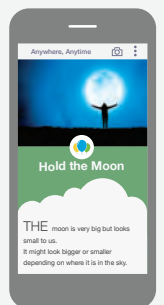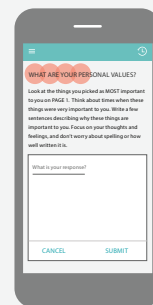
Interested in developing your own app with GSE IT? Here's how to get started:

Check out the general information page:
https://gse-it.stanford.edu/services/app-development

Set up a free consultation with **Lyudmila Christie** (lyudmila@stanford.edu) and **Wilson Wang** (wilsonw@stanford.edu)

Ann Porteus and Candace Thille Leverage Analytics to Inform Instruction

Statistics curriculum incorporates live polling and skills tracking to target student needs

Dr. Ann Porteus

Dr. Candace Thille

Dr. Ann Porteus, Senior Lecturer at the Graduate School of Education (GSE), and Dr. Candace Thille, Assistant Professor at the GSE and Director of Stanford Open Learning Initiative, have made a habit of harnessing live-time data collection and asynchronous learning to hone instructional feedback and outcomes. Together, they co-teach *Introduction to Data Analysis and Interpretation*, a foundational course for education students at Stanford. Dr. Porteus and Dr. Thille spoke with *Digital Initiatives* in order to revisit how they utilize learning analytics to guide data-driven instruction.

What prompted you to adopt live polling?

Live polling was first suggested by a teaching assistant, Brian Henderson. He brought to light unique features like anonymous feedback, and we went from there, iterating and trying things out. We really liked how live data collection could be used for daily check-ins, formative assessments, and end-of-unit evaluations. Since everything is live-time, it's a great way to assess group-wide understanding and get students thinking, acting, and interacting.

Why did you choose Poll Everywhere as your live polling tool?

We initially used clickers, which are separate devices for collecting live data. However, we found the hardware itself was cumbersome. At the same time, good online polling software became readily available. Shawn Kim of GSE IT advised that we try out Poll Everywhere since everything is browser-based -- students can use their laptops or mobile devices to submit responses to pre-formulated polls. That made it more efficient to crowdsource ideas, perform checks for understanding, and track responses. After gathering data with Poll Everywhere, the responses can be shown immediately as a chart, word cloud, bar graph, list, and more.

What do your lessons look like when using Poll Everywhere?

Education 200A is designed as a hybrid course. Before class, students work through online courseware that we developed for the 200A course using the Open Learning Initiative (OLI) statistics courseware. The OLI 200A courseware is delivered via SUclass, a website based on Stanford's version of the MOOC platform Open edX. Students work through the courseware: reading short amounts of text, working with simulations, and answering questions or doing activities about the content. SUclass presents analytics that allow us to walk into class with a good sense of the cohort's competency regarding concepts we will be discussing that day.

We begin class by reminding students of the learning goals for that day and how that day's class fits into the big picture of the course. We use Poll Everywhere in class to pose "meaty" statistical questions. We then ask students to provide their answer using mobile devices or laptops. Sometimes we have students discuss in small groups before submitting their individual responses. Where there is less than 75% agreement, we have students go back and discuss in groups, and then take a revote. The entire class discusses the results, and then we follow up with a short explanation. The polling energizes the class and ensures everyone's participation.

Poll Everywhere displays live answers via charts, lists, and more. The above word cloud reflects responses to the prompt "Tell us about your thoughts, feelings, or attitudes about taking this course".

What trade-offs should instructors be aware of when using Poll Everywhere?
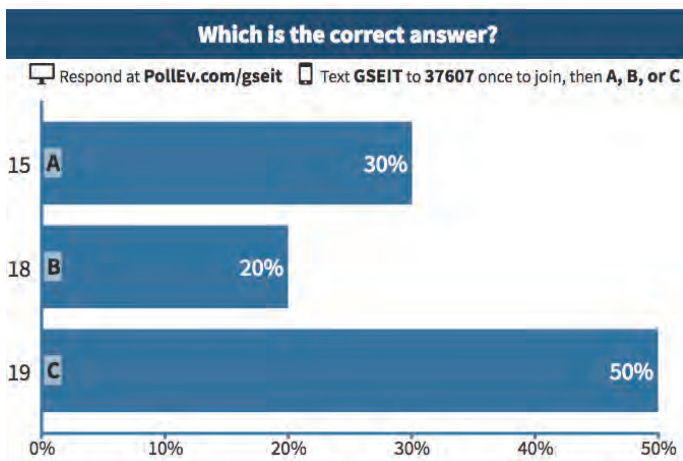
First, it will take some time for students to get the hang of using the polling system. The active learning model may be a

bit of a surprise at first, and their role as participant and feedback engine will definitely need an introduction. That said, students often welcome the agency that this active model affords, and it can be a great way to amplify the voice of those students anxious about speaking in class. In addition, it's fun for the students. It also takes time in class to engage in this process, so instructors need to free up extra time for the question, feedback, and discussion (and sometimes revote) process to work well.

For instructors, there is a design element to consider. Lectures need to be rebalanced to deliver not only content but also feedback opportunities. Devising meaningful data-gathering points (i.e., designing good questions) is not easy, and requires some deeper thinking into the learning objectives and scope of the material you want to get through.

Overall, any best practices or practical advice to share with other instructors when using Poll Everywhere?

First, it is crucial to remember that no technology automatically enhances learning; rather, it must be used thoughtfully and deliberately to advance the learning objectives of a particular course. For instance, live polling responses are only as good as your concept questions, and in particular questions that help diagnose misconceptions.

Which is the correct answer?

Respond at **PollEv.com/gseit**   Text **GSEIT** to 37607 once to join, then **A, B, or C**

15	A	30%
18	B	20%
19	C	50%

Polling results can be displayed in real-time to gauge comprehension

Devising these questions is a challenging task, and one which requires explicit learning outcomes.

It is a good idea to look at the data within a few minutes of collecting it. The live-time capacity is unique, and can inspire some interesting on-the-spot insights regarding learning patterns -- that is to say, what everyone in the room is seeing, thinking, and comprehending. We've had some great collective moments of "wow, that's interesting" when delving into live data together -- it's a great opportunity to model what meaningful data analysis can feel like in a cognitive and experiential sense.

Use a live polling model that works for your instructional style. For example, if PowerPoint is your thing, Poll Everywhere can be included directly into your PowerPoint slides. That said, some instructors integrate a single poll at the beginning of class, while others crowdsource throughout a lecture to inspire novel inquiry. Find what works for you.

Also, if you're tracking comprehension, an ideal threshold is around 75%. Below that point, you are seeing too much variation, and it's a great opportunity to stop and investigate what is causing such disparate responses. Have students discuss their responses in groups, then take a revote. Seeing the variation also lets a student know that they aren't the only one who misunderstands a concept, which can buffer their sense of failure. Making mistakes is all part of the learning process.

When it comes to getting up and running with Poll Everywhere, the benefits outweigh the difficulties. But there is some time investment in getting comfortable, and we still encounter some technical hurdles from time to time. There are in addition some limitations to things like the number of words that can be included in a question or in a response option. Fortunately, the GSE has on-site resources like an Education Technology Specialist, Josh Weiss, to resolve these obstacles with us.

Interested in using live analytics in your lessons? Contact instructionalsupport@stanford.edu

Want to know more about the Education 200A hybrid course? Contact aporteus@stanford.edu