Case Study

"We want to inspire that curiosity, that raw passion for science, [the miniPCR] really meets all of our needs and then some."

Sara Shayesteh, High School Biology Teacher, South San Francisco Unified School District

miniPCR™: Bringing Real-World STEM Experiences to the Classroom

Sara Shayesteh was enjoying the time she'd spent so far as a high school teacher in the South San Francisco Unified School District (SSFUSD), but as the years passed she'd noticed something that worried her. The teens in her biology class at El Camino High School regularly performed labs that included building models of organic molecules or dissecting a frog—all part of the state curriculum. But those activities bore little resemblance to the kind of biology that occurs in industry and academia today, and Shayesteh was concerned that her students were losing their passion for science.

Just as these thoughts were beginning to materialize, however, Shayesteh and SSFUSD received a proposal from Genentech. The biotech giant, almost as if to address Shayesteh's concerns, sought to revitalize science education by bringing real-world STEM experiences to the classroom at the elementary, middle, and high school levels—and it wanted her to kick off the program in SSFUSD high schools by designing a curriculum for a biotechnology unit to be taught in ninth grade biology classes.

Pleased to oblige, Shayesteh turned to her prior experience as a researcher to decide which technologies to include in the unit, eventually settling on PCR and gel electrophoresis based on the dual criteria of simplicity and workplace relevance. But she envisioned more for her students than what the standard research PCR machine, a 96-well thermal cycler, could give them. She wanted each student to be able to touch the machine, program it, learn how it worked—something that wouldn't be possible with thirty students working out of one complicated device. But at first she saw no alternative.

Fortunately, it was then that Shayesteh heard from a colleague working on a similar program in nearby San Mateo of a portable thermal cycler produced by biotech startup Amplyus. The miniPCR, as the company called it, retailed for just a fraction of the cost of a traditional machine, had a user-friendly interface and software, produced reliable results, and was durable enough to survive repeated handling from students.

It was a revelation for Shayesteh. Seeing an opportunity for every student in her classroom to experience PCR in a hands-on way, she quickly purchased—at the same cost of a single bench-top machine—enough miniPCRs for students to operate them in small groups. Before long, the biotech unit was in full swing, and students were using the devices in the classroom in conjunction with reagents and protocols derived from Amplyus' narrative-driven Learning Labs.

The experiments, Shayesteh says, have been a runaway success: the students love visualizing the science they've learned and are particularly thrilled about being able to handle the machines themselves. "Up until now we've only been able to lecture. We've never had the…opportunity to create something hands-on,"

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she says. "So this has really been a fantastic opportunity for our students, [who] had no idea what biotech even was and are now more exposed to the field and the careers available to them."

Indeed, though her students themselves may not know it yet, Shayesteh recognizes how important it is that they are interacting with biology in much the same way they would in the "real world." It's through these means, she says, that they will be able to develop an interest and an involvement in STEM. "We want to inspire that curiosity, that raw passion for science," she says. "[The miniPCR] really meets all of our needs and then some."

– *Victoria Lin*

About miniPCR™

miniPCR™ is a groundbreaking miniaturized thermal cycler offering fully-featured PCR performance for a fraction of the price.

- **Powerful:** miniPCR thermal cyclers deliver high-end performance.
- **Simple:** Our unique, easy to use, software interface allows users to control and visualize their PCR reactions from their Windows, Mac or Android devices. Students can follow experiments in real time, analyze, and understand the data.
- **Engaging:** The transparent design allows students to engage with the technology on an intimate level, eliminating the "black box" effect.
- **Open:** miniPCR is fully compatible with standard PCR tubes and reagents, making it ready for any classroom curriculum.

Feature	Specification
Sample format	8 x 0.2ml PCR tubes (strip compatible)
Max heating ramp rate	3.2°C / sec
Heated lid	Independent lid heater up to 120°C with PID control
Max cooling ramp rate	2.2°C / sec
Program sharing and backup	Unlimited libraries, .pdf file format
Temperature control	Resistive heating; forced air cooling
Control system	Embedded thermistors and PID algorithm
Temperature range	20°C – 99°C
Operating range	9°C to 40°C ambient temp.
Dimensions	2'' x 5'' x 4''
Power supply	AC 100-240V, 50-60hz, 70W
Battery operation	4h – 6h uninterrupted run time on Li-Ion battery

miniPCR is based at the Harvard Launch Lab, an incubator for innovative companies run by Harvard University alumni based in Boston, Massachusetts.

The miniPCR team of molecular biologists, engineers, and educators is dedicated to miniPCR's mission of making science accessible to everyone, everywhere