

A Walk Through Fourth-Grade Design Thinking

"You are a budding creative designer and engineer — invent a light for someone in your life." Fourth-grade teacher Lori Mustille posed this challenge to her class in January 2018, and her students embarked upon their 16-week Design Thinking project: to design and build an LED lamp to help someone in their lives. At Nueva, students are exposed to Design Thinking beginning in prekindergarten, and fourth grade is a perfect time developmentally for this extended, end-to-end experience, building deep engagement in Design Thinking practices that students will draw upon throughout their Nueva experience and beyond. "2018 marks the 12th year of the I-Lab," said Kim Saxe, Founding Director of Nueva's Innovation Labs. "The LED Lamp Project, like many Nueva projects, has been iterated and made even better over the years. Need-finding tends to be the most difficult part of the design process and this project was designed to develop skills in that area."

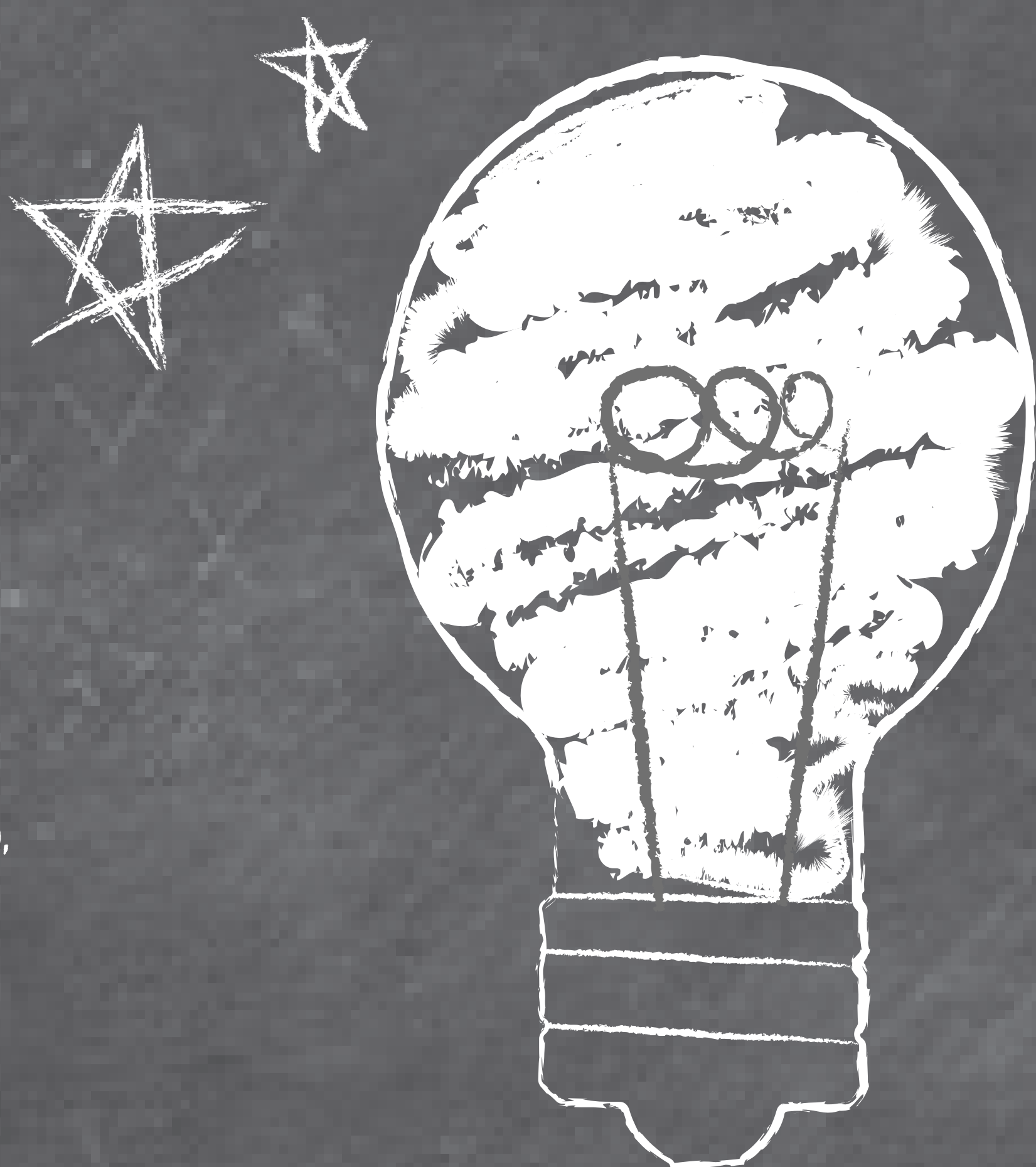
Intrinsic Motivation for Learning

During their time in the I-Lab, fourth graders participate in lessons on electricity, I-Lab safety, and working in the woodshop, and Design Thinking practices including concentrated explorations of writing needs statements and brainstorming. Students have the opportunity to use soldering irons, glue guns, saws, and many other new tools, which is exciting and always a powerful motivation for learning engineering principles.

"Each year in this effort, we devote class sessions that run in tandem with the project to help students develop essential skills. We interject these sessions so that they are immediately meaningful to the students," Lori said.

The LED lamp project is interdisciplinary, incorporating fourth-grade curriculum: math (fractions and budgeting), science (electricity and circuit design), writing (observations, brainstorming ideas, and reflections), and, of course, Design Thinking.

"I loved the free rein the students had over the design — the final lamps had incredible variation," said fourth-grade parent Saraleah F.



Observe!

"Pretend you're a spy watching your user," Lori told the class.

With this instruction to conduct detective work, students began by honing their observation skills. "This project builds students' empathy muscle for observation, as well as develops their questioning skills," Lori described. "The more we practice thinking about the needs of others, the better we can make the world."

"We were supposed to spy on our family members and see where they needed light," shared fourth grader Anna K. "Mom hates our current hallway lamp because you have to keep replacing the bulb that burns out." Anna decided to design a lamp for her family's hallway by focusing — through empathy — on her mother's needs.



Brainstorming and Prototyping!

Brainstorming is a crucial element of Design Thinking, building the ability of students to ideate. Through purposeful practice with peers and coaching from teachers, students develop brainstorming strategies that stretch them. During this phase, Lori and Michelle encouraged students to be patient, let their ideas flow, and avoid reaching conclusions too quickly.

"Some students will hit upon creating possibilities right away, and for others this step can be challenging," Lori shared. "Students need practice at brainstorming to let go of their inner critic."

When they were ready to move forward with one idea, they began work on a prototype. "Students used all low-tech materials: straws, cardboard, markers," Lori said. "We thoroughly discussed prototyping, including the subtle, but extremely important, definition of an effective prototype, that is, one that truly tests product criteria they need feedback on."



Testing and Iteration (Feedback Loop)

To complete the testing and iteration phase of the Design Thinking process, fourth graders get feedback from their users on their product prototypes. In class, teachers model the interview process, and through role playing they coached students to pose meaningful questions, listen carefully, and ask powerful follow-up questions.

Students are guided in this phase by the User Prototype Feedback form in their Design Thinking binder. It includes a drawing of the prototype and helps students document the results of their user interview. They also present the physical prototype to their user at this time.

"Having the prototype was useful," fourth-grader Sean said, "because my user could see it and touch it, and give feedback. Talking about it was very helpful, also, because I could explain what I was thinking, and the user gave me important input."

After interviews are complete, students debrief in class: "What is my next action to incorporate the user's feedback?"

Learning Leaps Forward During Troubleshooting!

"Every student encounters problems at some point, and the process of debugging the problem and working through how to fix it is where some of the most valuable learning happens," described Michelle. "We watch as the students build resilience, perseverance, and confidence, and also empathy for one another, as they start to help each other."

Reflections on the Design Thinking Process

Design Thinking, like everything else at Nueva, is a learn-by-doing experience. With continued exposure, it starts to feel less like a process and becomes a way of approaching creation and problem solving. According to I-Lab Engineer, Michelle Grau, in fourth grade it's still mostly a step-by-step process, because one goal for these students is ensuring understanding of all the process parts.

"I have the privilege of also working with upper school students, and this is where I see Design Thinking get truly fluid. Students start applying it to other parts of their lives without thinking about it," said Michelle. "However, I do see their idea of what Design Thinking is change rapidly starting in fourth grade!"

Lori summed up the process: "This project takes place during the winter and spring, a time when they are ready for this multifaceted challenge. They are the heroes in the story of their fourth-grade year, and this experience really fires their curiosity and takes their energy, capability to tackle challenges, and zest for learning to new horizons."

