

Building Access Where None Existed

Format: CS Scholarship Essay | Pattern: Challenge into Solution | ~500 words

The community center in my neighborhood lost its grant for after-school tutoring in 2022, and the coordinator asked me if I knew any free tools that could help students practice math independently. Everything I found required a reliable internet connection that most students in the area did not have. I spent the following summer building an offline application that could deliver adaptive math practice without a data connection.

The application used a simple spaced repetition algorithm to adjust the difficulty of practice problems based on a student's recent performance. Correct answers accelerated the progression to harder problems; incorrect answers generated similar problems with additional worked examples. All problem sets and responses were stored locally on the device and synced to a shared record whenever a connection was available, which in practice meant once or twice a week at the library.

I built the first version in eight weeks using React and a local SQLite database. The coordinator tested it with twelve students over two months. Eleven of the twelve reported using it at home. Average math assessment scores for those students improved by approximately 14 percent compared to the previous semester, though I am cautious about attributing that improvement solely to the application given the absence of a control group.

The experience taught me two things that have shaped how I think about software development. The first is that the most consequential design decision is often the one made before a line of code is written: in this case, the decision to build for offline-first rather than to require connectivity. That decision changed everything about the architecture and made the application useful for exactly the population it was designed to serve. The second is that the gap between a working prototype and a tool that people actually use in their lives is larger than the technical work required to close it. The twelve weeks I spent refining the interface, responding to feedback from students and the coordinator, and fixing the problems that only appeared in real use were as important as the initial build.

I am applying for this scholarship because I intend to continue working on problems of this kind, software that extends access to educational resources in contexts where connectivity, cost, and institutional support cannot be assumed. The scholarship would allow me to pursue a degree program that gives me the systems design and data engineering skills to build tools that work at larger scale and in more constrained environments than a local community center. The problem I solved for twelve students in my neighborhood is a small version of a problem that affects millions

of students globally, and I intend to spend my career on it.

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