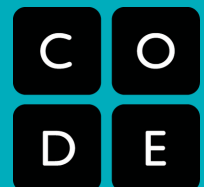**Code.org**

Big Bets in Computer Science Education

CODE

Transitioning Code.org from "steady state" to "growth"

When Code.org launched in 2013, we envisioned a bold but time-limited push to bring computer science (CS) to all U.S K-12 schools through a focus on system change and advocacy. We invested deeply in curriculum development, professional learning for teachers, state-level advocacy, and marketing to support this change. We imagined that the organization could start scaling back and operating in a maintenance mode within a decade.

Our experience has shown us that reaching our goal will take longer than anticipated. Two years ago, we debated whether or not to scale back and ultimately chose to stay the course, set metrics goals, and revisit our progress in 2025.

Today, we see a very different landscape in education. The pandemic brought to the forefront the importance of technology and computer science. As schools were compelled to implement new learning modes, more students were given access to devices, and teachers became more tech-savvy. We see a unique opportunity for CS in this new landscape, and with approval from our Board of Directors, we are transitioning into "growth" mode.

Today, Code.org's curriculum supports the majority of schools that offer the AP CS Principles course, and we are on the verge of similar success with the upcoming release of our newly-developed AP CSA. We see that our potential for impact has only just begun. In the U.S., there's room for tenfold growth. Globally, our annual active student count is only 1% of the student population.

We plan to grow in order to pursue strategies to unlock this potential. There is increasing demand to teach CS integrated into math, science, and other subjects. Ministries of education want to make Code.org the standard curriculum for their country. We must make our platform technically extensible and interoperable to meet their needs. We see limitless opportunities to make CS part of education's new normal.

Now in its eighth year, Code.org has reached maturity and steadiness, allowing for both audacious and strategic thinking about the next level of impact we want to have in CS education while ensuring our organizational health and sustainability.

Further, we are excited to write the next chapter in increasing the presence, persistence, and achievement of underrepresented groups (URG) in CS and helping to grow, support, and equip the CS teacher workforce. Code.org's intentional focus is on impacting students and teachers, particularly those who are underserved and underrepresented.

The following are high-level descriptions of large-scale, multi-year projects that would enable Code.org to reach an even greater scale in making CS a standard in education globally. As we develop these ideas in detail (timeline, budget, necessary headcount), we will consider the following questions:

- What are the implications for our current daily business? Is this something that should be accelerated/prioritized within the next year?

- What will the downstream effects be on the long-term sustainability of the organization?

- How will creating new products and services increase the need for ongoing maintenance (engineering, curriculum support, teacher support, etc.)?

- Instead of doing everything ourselves, can we create incentives or partnerships for partners to fill key roles?

- Given the current global growth of CS and our role in this space, will this new work allow us to sustain, grow and foster this movement (which might be outside of the 2025 goals)?

- How will these make Code.org a better, different organization than we imagined at its inception?

These projects go above and beyond Code.org's everyday work, and, overall, any of these projects would lead to increased STEM education impacts.

Big Bets

01 —— Reignite Interest in CS and Reach Underserved Populations

02 —— Code.org Platform 2.0

03 —— Code.org on Mobile Devices

04 —— Supporting Exponential International Growth

05 —— CS Connections — Cross-Curricular Integration

06 —— Teacher Certification - Strengthening the Educator Workforce

07 —— CS as a Graduation Requirement in U.S. High Schools

08 —— Bringing Personalized Learning to Code.org's Curriculum

09 —— Expanding our Leadership in Data + Research to Influence CS Teaching and Policy

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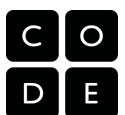
Reignite Interest in CS and Reach Underserved Populations

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We have built a robust program and partnership network to expand CS to every school in the U.S. Thanks to our Regional Partners, every U.S. school has potential access and teacher training scholarship support to participate in our program. But most schools still do not teach CS, and as we've seen in the past two years, the remaining schools are harder to reach. Additionally, even among schools that teach CS, critical work remains to grow participation from young women and underrepresented groups.

We are not satisfied with the declining attendance brought about by the global pandemic. To expand upon our success and establish CS as a new normal for education coming out of the pandemic, we must invest in new tactics to reach the schools and communities that are hardest to reach and expand participation by students in schools that already teach CS.

The following are core projects we plan to undertake in support of this priority:

- A broad-reaching marketing campaign to reignite interest in CS education globally and locally.

- District-by-district "go big in CS" plans created and promoted in partnership with our regional partners, donors, local businesses, celebrity ambassadors, local government.

- A deeper effort to reach and engage parents to support their students to enroll in and persevere in CS or to advocate for CS in schools. Parents are our fastest-growing audience, and we are understaffed to take advantage of this.

Aspects of this next-level effort might include: providing resources to Regional Partners beyond teacher scholarships, catalyzing regional CS summits, delivering both national and regionally-targeted marketing campaigns focused on increasing interest among teachers and administrators, appealing to parents and caregivers to engage as advocates and supporters of their students CS engagement, and more. We recognize that this kind of intensive community-level engagement will require more time and capital to increase teacher Professional Learning (PL) pathways and participation numbers.

We have many more ideas in this space and are executing on those we are already resourced to support. Our track record of success tells us that more is possible, and there is tremendous opportunity to "go big."

02.

Code.org Platform 2.0

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The Code.org platform that we have built has addressed many of the most pressing needs for delivering CS instruction into our classrooms - such as high-quality lesson progressions that meet K-12 CS standards across grade levels, rostering integrations that enable easy account set up for the most popular U.S. systems and teacher tools for tracking progress and providing feedback. However, as CS education continues to expand into more school districts and is adopted in regions beyond the U.S, it is clear that many needs aren't yet being met with our current platform. Investing in our platform to meet the more unique needs of a global audience and a maturing K12 subject will open the door for adoption in more classrooms and reach more students.

Furthermore, the current Code.org platform, while effective, has been organically built in-house over time as functionality needs arose. As we plan for increased student and teacher reach and as we look for greater efficiencies in our functionality overall, it is clear that a platform redesign is a critical need. We seek an accessible, sustainable, scalable version of the Code.org platform that addresses ongoing "technical debt" while supporting an array of technical enhancements that will enable greater access to Code.org offerings globally. These include:

- Accessibility support to meet the needs of all students in our classrooms as well as to ensure that our platform meets the requirements set forth by school districts.

- Offline access for students and teachers with little or no broadband availability.

- Interoperability with partner websites, learning management, student rostering and authentication systems used by our global partners to provide a seamless experience that integrates into their standard workflows and provides reporting.

- Customization of our curriculum for local needs within large districts and by governments who wish to customize our course offerings. Teachers might also leverage this capability to customize their own curricula; this might be integrating CS into other subjects, meeting state-specific standards, or simply creating engaging content relevant to one particular classroom.

- A truly localizable, not just translatable, curriculum and platform to meet the demands of a global audience, whether it is about the imagery, text, or content that we use in our lessons or about how student data is stored and delivered to meet local needs.

Code.org 2.0 is a complex and large-scale undertaking in engineering, architectural planning, and human resources. However, we are confident that this next evolution of the Code.org platform will enable the exponential reach of our platform and allow for far greater efficiencies in the long term.

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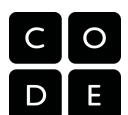
Code.org on Mobile Devices

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The spread of mobile technology across the entire spectrum of society is already changing how students learn and how teachers educate across the globe. While most U.S. schools have devices with internet access, this is undoubtedly not true globally, and it is also not true for all U.S. students at home. The proliferation of mobile devices, especially in emerging markets, presents Code.org with an opportunity to reach otherwise disconnected student populations.

Developing a mobile-first pathway, in parity with our traditional online access will enable Code.org to expand curriculum integration into schools (even those without personal computers) and to increase access to CS directly to students and within low-resourced educational settings (imagine the rural village in India or Sub Saharan Africa or the tribal nations school with little to no access to the internet).

Functionally, our approach to mobile access would include creating native apps for core curriculum and tutorials, tools for teacher training, and optimizing our current UX for mobile (particularly tablet) use. Programmatically, a focus on mobile capabilities would enable Code.org to follow through on its commitment to reach underrepresented communities in the United States and abroad, particularly across the African continent and largely underserved communities in Asia and Latin America.

Doing this well would require more than the technology and support — it would ideally include partnerships to build excitement and reach students outside of the traditional school environment, and to grow distribution+bandwidth partnerships with mobile operators, to grow a direct-to-student learning opportunity for those students who may never get access to CS in their school.

In many respects, mobile access would be the kind of audacious effort that would take Code.org back to its earliest ambitions and appetite for risk-taking. But when executed successfully, the solution would remove the largest hurdle in our ability to bring computer science to every child.
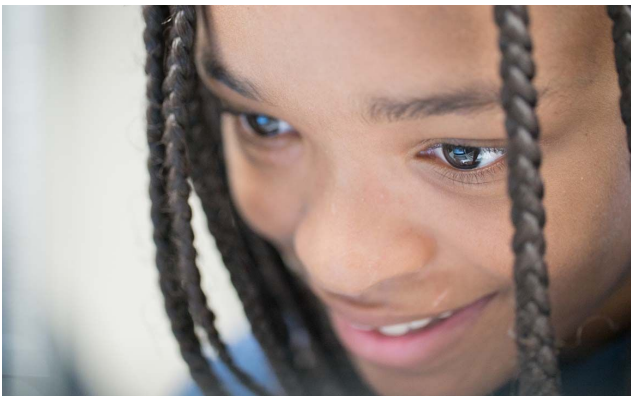
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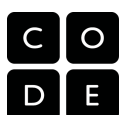
Supporting Exponential International Growth

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Halfway into Code.org's three-year international plan, our share of non-U.S. usage, users, and traffic as a percentage of total Code.org reach has grown consistently. We benefit more students and teachers, reach more markets, and make more localized content available on our platform than anticipated at the onset of our international work. We are completing the localization of our curriculum for primary education to 30 "official" languages in more than 150 countries. Still, we recognize that the potential for global reach is vast

We must strengthen our distribution channels to drive greater penetration by evolving the capabilities of our platform (see Code.org 2.0).

There is a tremendous need to develop a professional learning model to help partners build teacher training and retention capacity specific to each geographical market.

Internally, we have intentionally evolved our operational model to organize better and scale our international expansion. We are engaging new partners and exploring new revenue streams, such as product licensing and advisory/research contracts with international financial institutions.

We've strengthened the team and implemented systems and processes to work more efficiently. Yet, there is still much work to be done and challenges to overcome.

The pandemic accelerated the interest by education authorities in our platform and curricula, but it also evidenced our limitations to scale and drive adoption.

Having identified the most relevant blockers and opportunities to achieve our goals, we are confident that with the progress we've accomplished thus far and with support from funders and strategic partners on the ground, we can accelerate the scale of our impact and help drive systemic change globally. We prioritize geographies in the following categories:

- High penetration: developed countries with robust education systems that may yield an impact similar to the U.S., such as Australia, Canada, and the U.K.;

- Broad reach: large emerging markets with a positive environment and significant potential funding, such as Brazil, India, and Mexico;

- Beyond the G20: selected mid-size developed & mid-income emerging markets with partial CS in place that can have national impact in the mid-term, such as Chile, Colombia, Saudi Arabia, Spain, and Taiwan;

- Quick wins: a handful of small countries with strong government support and funding, that can become short-term proof points, such as El Salvador and the UAE.

05.

CS Connections — Cross-Curricular Integration

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Two primary considerations drive the need for the integration of computer science into other curricular subjects. Schools struggle to find time for a separate CS class and look for ways to teach CS concepts that reinforce other learning objectives. CS is a foundational subject that impacts all other academic fields. Educators want a curriculum that guides students to apply CS within cross-curricular concepts in new and innovative ways.

Code.org is in the early phases of developing a new set of curriculum modules called CS Connections integrating CS into other core subjects. We are designing CS Connections lessons to support teachers who cannot teach a longer course of stand-alone CS lessons.

This new approach will build bridges between CS and traditional core subject areas like math, science, English language arts, and social studies. We are already creating lessons aligned with curricula in Grades 3-5. We plan to build a complete suite of K-12 offerings (ideally in partnership with other education organizations) in the long term, which would require a far greater investment.

As we build this, one question will be whether CS can further strengthen student success in other subjects. We've seen initial evidence of this through a joint study with the Broward County School district in Florida and other studies beyond Code.org's offering.

CS is a foundational subject that impacts all other academic fields.

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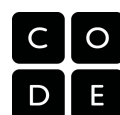
Teacher Certification - Strengthening the Educator Workforce

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Surprisingly, the majority of educators currently teaching computer science aren't certified CS teachers. To mitigate this, Code.org will undertake a national initiative, "Get CS Certified." The goal is to increase the number of CS-certified teachers at the middle school and high school levels. Having a more robust pool of well-trained teachers would subsequently increase the number of CS courses being taught (including advanced courses) and support increased retention of CS teachers.

Code.org is in a unique position to unify national and state partners in support of this initiative. We plan to start in a few critical states with known interest, holding the potential for sizable impact, and pursue a "lighthouse strategy" similar to previous policy actions.

A more robust pool of well-trained teachers would increase the number of CS courses taught across the country.

07.

CS as a Graduation Requirement in U.S. High Schools

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Code.org conducts its advocacy work guided by nine policy recommendations for the advancement of CS policy.

However, we find that states are starting their own push for CS as a grad requirement even without it being among the nine policies. For example, South Carolina (case study), Arkansas, and Nevada enacted CS graduation requirements. Other states are starting to draft legislation. We anticipate that this will be a growing trend, happening faster than expected (in early discussions, Code.org imagined CS as a requirement for graduation for every high school student by 2030, but it now seems plausible to accelerate this goal).

CS as a grad requirement is not a top-down mandate. It is a policy shift meant to advance systemic change based on what is already happening at a grassroots level within the state among educators, parents, and students.

Espousing CS as a graduation requirement presents a risk because a mandate for students could spark opposition. Those who view grad requirements as a zero-sum game may begin to push back on CS, and it is vitally important that the first states adopting a CS requirement are success stories rather than cautionary tales.

Additionally, steps must be taken to ensure such a mandate does not disproportionately impact specific groups' or schools' overall graduation rates. Therefore we aren't rushing into this. We would only support the idea of a graduation requirement when we genuinely believe it is the right time, with the right local conditions and a good base of supporting evidence.

South Carolina, Arkansas, and Nevada have already enacted CS graduation requirements.

08.

Bringing Personalized Learning to Code.org's Curriculum

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While time dedicated to CS continues to grow across schools, it has not yet reached the consistency of availability or broad-scale enrollment of other subjects. This variability means that the students entering the CS classroom come with varying levels of exposure and skills. Teachers regularly ask us how we might help them effectively support their students' differentiated needs. This isn't solely a CS issue and is a common need across all classrooms and subjects. But within CS classrooms, the concern is exacerbated by teachers' own limited or novice experience in CS pedagogy (See Teacher Certification).

The initial solutions we propose in providing more robust tools to teachers are two-fold. An initial step would be to improve the automatic validation of student work in our courses (grades 6-12). Secondly, we would create more robust outcomes assessments for teacher use. Automated progress reports would help teachers track student progress in detail.

The next level of development would be fully personalized and adaptive versions of our courses. Personalized or adaptive learning is an increasingly popular idea for addressing the varied needs of students.

By building systems that provide additional content for students who need extra support or opportunities for students ready for bigger challenges, we can ensure that the engagement and learning by all students in our classrooms unlock the greatest potential. These systems would extend beyond simple customization of the learning progression to a richer platform that can react to student needs in real-time. Examples included providing dynamic hints based on a typical mistake or customizing the projects or prompts based on how well the student completed the previous task.

Investing in a system that supports students as they progress through our curriculum will ensure teachers can prioritize support of students who need more help, up-leveling the depth of learning and engagement among the entire class. These tools will also ensure that the teacher feels more successful in teaching the course, ultimately leading to greater retention and more word-of-mouth recommendations for more teachers to pick up CS.

09.

Expanding our Leadership in Data + Research to Influence CS Teaching and Policy

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Code.org has always prided itself on being a data-driven organization. Our [State of CS Report](#), [CS access database (Access Report)](#), and our [advocacy trackers](#) are the definitive source of information on CS policy and practice in US states and schools. These resources, and the results of our ongoing collaboration with The Brookings Institution to expand similar work internationally, have made us the leading voice on the state of CS policy and practice.

Our work is more about collecting, analyzing, and reporting on data. We aren't a major primary publisher of academic research (other than our longitudinal study and the evaluation partnership in our EIR grant). That said, even when it comes to academic research, our large student population has made us a valuable partner for academic organizations. We will need to strengthen these partnerships as CS education matures. There is an untapped opportunity in helping other CS education organizations to benefit.

The landscape of high-quality research for CS education programs is very sparse.

At the same time, there is a growing body of NSF-funded research. Very little of it allows a school/district to claim they are using "evidence-based" curricula that meet the WWC research standards of rigor for the US Dept. of Education. One pressing problem is a lack of a standardized measure of student learning of CS. Many studies (even ours) are about improving access or about changing attitudes about CS. But there are a lot of ways to measure learning that Code.org might support with:

- Sharing data with researchers;
- Collaborating with researchers to implement things on our platform and scale that would hold up to the levels of rigor needed for such studies;
- Pushing ourselves into realms of research not available to other education non-profits;
- Using both our scale and our connections to teachers to access a broad range of possible areas of research.

Code.org will remain focused on creating curriculum and teacher training using a data-driven approach while relying on research findings by academic partners. Even with this division of responsibility, the increasing maturity of computer science will require our help to enable a growing body of research to support our curriculum work, support government funding, and maintain CS as an increasingly important staple in the core curriculum.

From Ideas to Implementation

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The ideas represented in this narrative result from collaborative thinking and planning by the entire Code.org leadership team. The common threads? Commitment to the mission, audacious thinking, and a fundamental expectation that Code.org intends to embrace a growth trajectory over the next ten years.

In 2023, we will celebrate Code.org's 10th anniversary; we will know where we stand against our stated 2025 goals in four years. As we imagine what lies beyond 2025, and even as we think about how we emerge from the COVID-19 pandemic, we believe now is the time to invest in some of these big bets. As ambitious an idea as Code.org was in its founding and as successful as we have been, we believe that we can continue to make a transformational, global impact in computer science education.