COMPUTATIONAL THINKING EQUITY PROJECT

Augustus Hawkins High School
John Muir Middle School

UCLA Center for the Transformation of Schools

National Science Foundation
WHERE DISCOVERIES BEGIN

CONTENTS

SUMMARY

Funded by the National Science Foundation, this Research-Practice Partnership between the UCLA Center for The Transformation of Schools and the Los Angeles Unified School District seeks to establish a **Computational Thinking vertical articulation STEM pathway** between Augustus Hawkins High School and John Muir Middle School.

Our theory of change model centers on teachers collaborating with STEM undergrad mentors (near-peer mentoring) to increase teachers' pedagogical and instructional approaches in Computational Thinking (CT) development by ensuring that students are developing the habits of the mind associated with building computational thinking and their problem-solving skills. We believe that student mentors will gain an appreciation of the pedagogical mindsets needed to fully support and engage students, while also playing a role in supporting and motivating students themselves. This Research-Practice-Partnership (RPP) can help inform district intervention policies and practices seeking to effectively close learning gaps, in particular mathematics gaps, for historically marginalized groups.

Project Overview

The Computational Thinking Equity Project (CTEP) builds upon our previous "EAGER: Building a Pipeline to STEM Careers in South Central Los Angeles Through Computer Science" CS4ALL project that focused on identifying the key supports necessary to take students at their current stage of academic preparation and help build foundational computer science knowledge, skills and competencies aligned with the Exploring Computer Science curriculum at Augustus Hawkins High School's Computer Design & Gaming School (C:\DAGS) by expanding to include John Muir Middle School (JMMS). CTEP is organized around strategies for increasing computational thinking. We will utilize Lee, et. al (2011) "use, modify, create" framework to support CT development. We are expanding our STEM pathways from two cohorts of 25 9th grade students from our previous grant to 300 6th-12th grade students between both school sites. The purpose of the RPP is to advance our understanding of: 1) effective teaching approaches (models) (e.g., shared planning & instruction across grade levels, near-peer mentorship) for CT student development in schools that serve predominantly low-income students of color; 2) the types of educational pathways and partnerships that can remove barriers to learning; and 3) how CT development can be used as a means for promoting student learning in mathematics. This model will utilize a common instructional strategy of using open-ended questioning that promotes CT development, and mentorship from UCLA's Center for Excellence in Engineering and Diversity (CEED), an organization that will provide a pipeline of undergraduate mentors that will work with teachers and student mentees at both schools on joint CT projects.

The RPP between CTS, Augustus Hawkins High School and JMMS seeks to address three research questions:

1. ***What are the most impactful learning spaces for CT development in an RPP focused on shared instructional goals and near-peer mentorship?***
2. ***How does CT development happen in different learning contexts of the RPP?***
3. ***Can a focus on CT development improve student learning, in particular in mathematics?***

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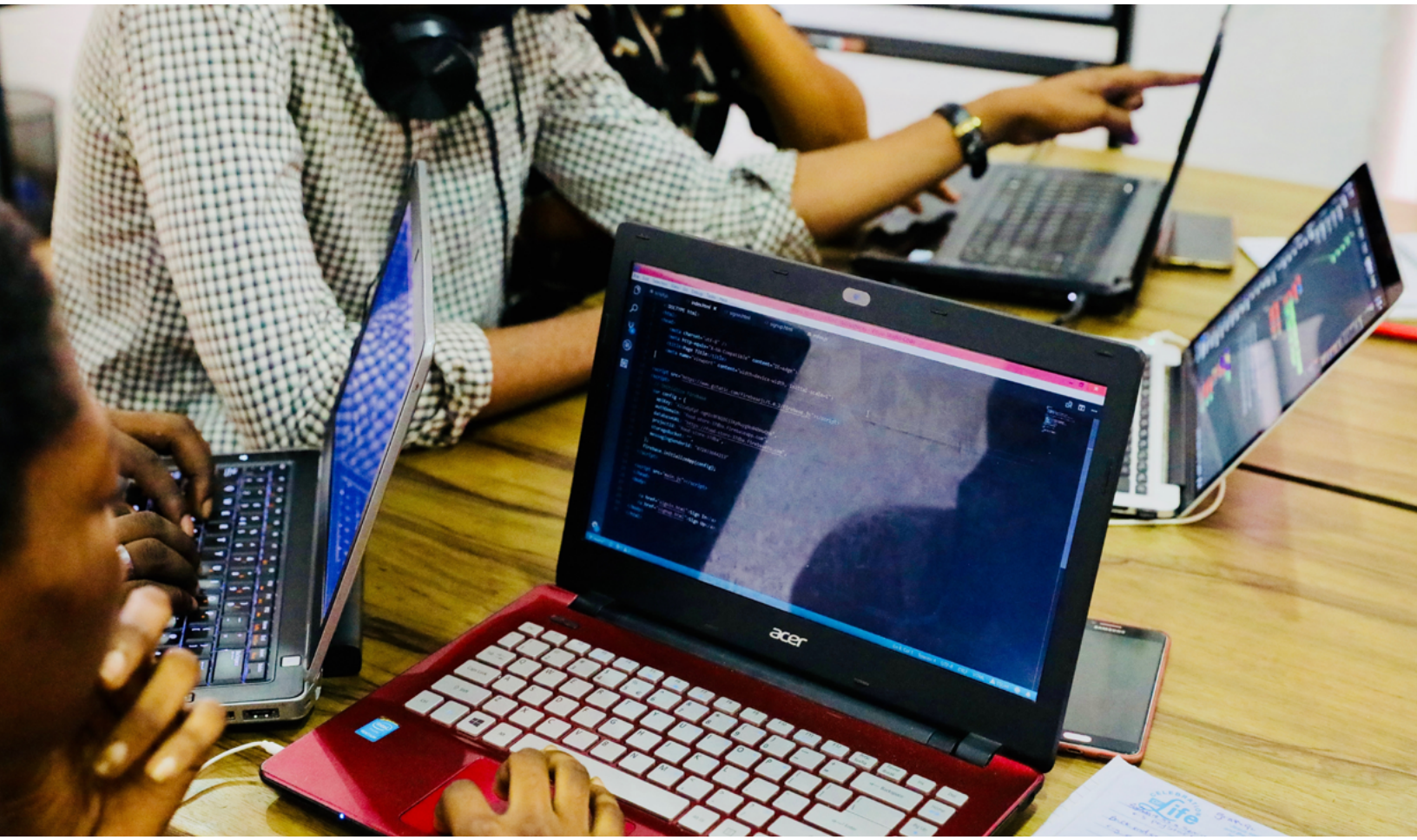
Intellectual Merit

Emerging research has focused on the development of different environments and tools to support CT, as well as curricular initiatives in the K-12 environment *(Lee et al., 2011; Grover & Pea, 2013).* Economically disadvantaged students of color are struggling to meet state standards in mathematics, a pattern that is also true in the proposed CT Pathways sites. The research generated from this RPP will provide timely research on how CT is developed and how learning pathways can be leveraged in changing the educational trajectory of students in subjects like mathematics.

Impact

This RPP pathway proposes to generate impact across people, organizations, and the community, in addition to making meaningful contributions and future scholarship and education activities that could make this RPP between a middle school, high school, and university-based research center scalable in other communities with similar racial and economic characteristics. Finally, this RPP can also help inform district intervention policies and practices seeking to effectively close learning gaps, in particular mathematics gaps for historically marginalized groups. For the long-term, we are excited about the possibilities for building new partnerships in the community between students, families, educators, mentors, schools, industry partners and UCLA. We are hopeful students will want to return as college age mentors as a result of their involvement in the program. We anticipate new and unexpected outcomes to result from two school communities that will benefit significantly from stronger connections in South Los Angeles.



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PROJECT VISION

Research-Practice Partnership (RPP)

Our goal is to fully develop and model an effective RPP by working and learning collaboratively with researchers, practitioners, industry and community stakeholders committed to building sustainable STEM access by exposing and increasing students' computational thinking skills. A core group from the school sites will comprise our advisory group, which will meet monthly to help drive our RPP initiatives.

Vertical Articulation

Building upon 3 years of work in the previous project, our findings revealed where vulnerable students lacked skills that would position them to develop the critical thinking and reasoning skills needed to successfully navigate through mathematics and other courses. We believe that two fundamental computational thinking domains–problem solving and grappling with open-ended questions–can be effective in building students' critical thinking and reasoning skills, which can support intervention efforts seeking to close mathematical gaps. Therefore, establishing a vertical articulation between Augustus Hawkins High School and John Muir Middle School can be an effective intervention approach in closing math gaps for students while also supporting a common planning culture between teachers at both sites.

Near-Peer Mentoring

Near-peer undergraduate STEM majors from our partnership with the Center for Excellence in Engineering and Diversity (CEED) at UCLA can help make learning more personalized, culturally relevant, and allow students to relate to mentors as CS scholars of color. The Hidden Genius Project (THGP) will train and prepare mentors to work closely with teachers and students to support CT development, as well as help students develop a positive STEM identity by being role models. The California Mathematics Project (CMP) will also play a role by working and supporting mentors with targeted student math data and recommendations for how teachers and mentors can explicitly address learning gaps and monitor CT development within projects and assignments.

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COMPUTATIONAL THINKING PATHWAY: INTEGRATING CT INTO MIDDLE & HIGH SCHOOL CURRICULUM

Five Aspects of CT and a Model that Can Impact High School and Higher Education

According to The International Society for Technology in Education, the five aspects of CT development (confidence in dealing with complexity, persistence in working with difficult problems, tolerance for ambiguity, ability to deal with open-ended problems, and ability to communicate and work with others to achieve a common goal) are effective indicators used to measure computational thinking *(The International Society for Technology in Education, 2018).* Recent scholarship has examined how CT is learned *(Snow, E. et al., 2017)* and suggests the "use-modify-create" learning progression framework *(Lee et al., 2011)* coupled with better understanding the impact that near-peer mentors may have in supporting the intrinsic and developmental mindsets of students increasing their CT *(Clarke-Midura, J. et al., 2018)* is worth further exploration. We seek to apply the "use-modify-create" model with project-based learning (PBL) and mentoring by integrating the "use-modify-create" methods across math, science, and CS in working with developing two critical CT competencies: (1) problem-solving and (2) responding to open-ended questions through common planning and professional development.

Connecting PBL-Centered Mentorship to CT Competencies

Student mentors from UCLA CEED will collaborate with teachers to co-develop lessons and projects that help develop student CT. Research has documented the impact of PBL features (student-centered, formative assessment, and community-based learning environments) on low-achieving students, finding that these students could be motivated through PBL with critical thinking and group interactions *(Horan, Lavaroni & Beldon, 1996).* To ensure a more seamless transition between middle and high school, it is critical that students develop problem-solving skills and effectively know how to respond to open-ended questions and problems. To facilitate this, our RPP will prioritize problem solving skills and teach students how to grapple with open-ended questions by emphasizing a competency-based model approach that prepares teachers and mentors to meet students where they are academically, appropriately assess them for any learning gaps, and mitigate these gaps by exposing students to rigorous CT and standards-based instruction that encourages students to take risks.

The following provides a collaborative approach toward developing CT skills around the ability to deal with open-ended questions. Figure 1 shows an example of how teachers will work with mentors in developing students' abilities to grapple with open-ended questions within middle through high school mathematics courses.

This CT competency learning progression model illustrates the ways in which teachers will work collaboratively with mentors in building students' CT competencies around open-ended questions into their lesson planning and assessments. This same type of planning and assessing collaborative modeling approach will also be done for developing students CT skills in problem solving. We believe that once a student has developed the habits of mind around these two key critical CT competencies (problem-solving skills, and engaging successfully with open-ended problems) coupled with nurturing and support from their teachers and mentors, they will be able to apply these same skills in future classes irrespective of content, in college, and in the workplace.

Figure 1. Example of JMMS & Hawkins High School CT Learning Progressions by Grade

CT Competency: The Ability to Deal with Open-Ended Problems

6-8th Grade	Henry and Jose are gaining weight for football. Henry weighs 205 pounds and is gaining 2 pounds per week. Jose weighs 195 pounds and is gaining 3 pounds per week. When will they weigh the same?
9th Grade Algebra 1	**"Genie in a Bottle"** You are walking along a beach and your toe hits something hard. You reach down, grab onto a handle, and pull out a lamp! It is sandy. You start to brush it off with your towel. Poof! A genie appears. He tells you, "Thank you for freeing me from that bottle! I was getting claustrophobic. You can choose one of these purses as a reward." Purse A which contains $1,000 today. If you leave it alone, it will contain $1,200 tomorrow (by magic). The next day, it will have $1,400. This pattern of $200 additional dollars per day will continue. Purse B which contains 1 penny today. Leave that penny in there because tomorrow it will (magically) turn into 2 pennies. The next day, there will be 4 pennies. The amount in the purse will continue to double each day. How much money will be in each purse after a week? After two weeks? The genie later added that he will let the money in each purse grow for three weeks. How much money will be in each purse then? Which purse contains more money after 30 days? **HSF-IF.B.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
10th Grade Geometry	**"Is It Accessible?"** Some buildings offer ramps in addition to stairs so people in wheelchairs have access to the building. What characteristics make a ramp safe? A school has 4 steps to the front door. Each step is 7 inches tall. Design a ramp for the school. Your teacher will give you the Americans with Disabilities Act (ADA) guidelines. Does your design follow the rules of this law? If not, draw a new design that does. **HSG-MG.A.3** *Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*

11th Grade
Algebra 2

"Around and Around"

A ladybug lands on the end of a clock's second hand when the hand is pointing straight up. The second hand is 1 foot long and when it rotates and points directly to the right, the ladybug is 10 feet above the ground. How far above the ground is the ladybug after 0, 30, 45, and 60 seconds have passed? (Pause here for a class discussion.)

Estimate how far above the ground the ladybug is after 10, 20, and 40 seconds. Be prepared to explain your reasoning.

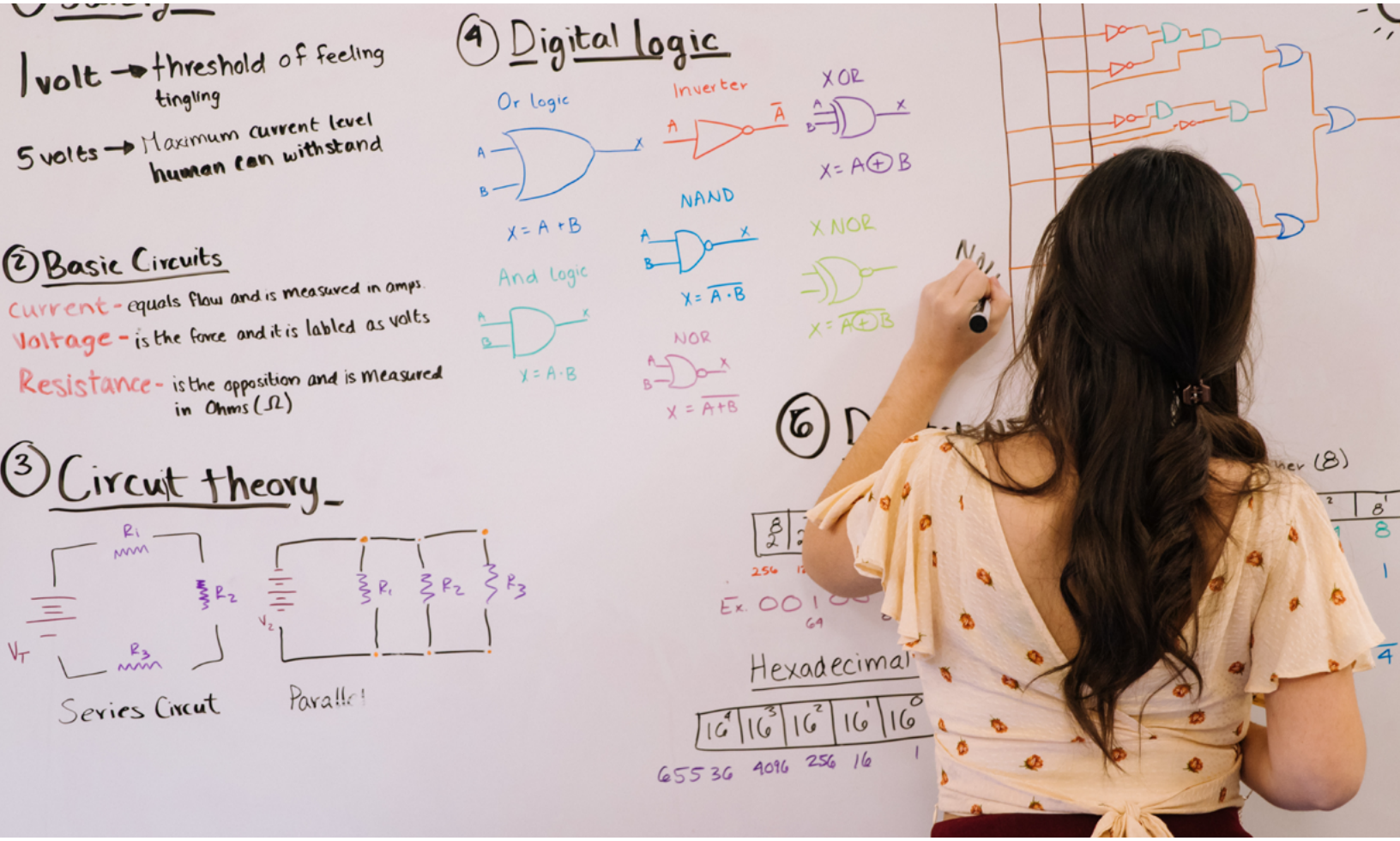
If the ladybug stays on the second hand, describe how its distance from the ground will change over the next minute. What about the minute after that?

At exactly 3:15, the ladybug flies from the second hand to the minute hand, which is 9 inches long. How far off the ground is the ladybug now?

At what time will the ladybug be at that height again if it stays on the minute hand? Be prepared to explain your reasoning.

HSF-TF.A

Extend the domain of trigonometric functions using the unit circle.



OUR APPROACH TO CT DEVELOPMENT

We will focus our CT development efforts around **developing persistence in working with difficult problems (problem-solving) and responding to open-ended questioning competencies.** These skills are not only critical in promoting CT development, they can also be applied across middle and high school subjects.

The following essential questions for teachers, mentors, and students will be considered to promote CT development.

Teachers:

What does CT competency look like at different grade levels?

What are the range of ways that students show their understanding of/skill in CT competency at particular grade levels?

Students:

How can we effectively arrive at solutions, outcomes, and conclusions through multiple pathways?

When solving problems, we "use" information and data presented; we "modify" the information; and we "create" and make recommendations predicated upon what emerges from our data to make informed decisions and sound conclusions.

These essential questions will aid in developing the knowledge, skills, and habits of mind necessary in building CT and will be the primary focus in lesson planning, design, and professional development. We will integrate two CT competencies: problem-solving skills and responding to open-ended questions and problems into Hawkins High School courses (math, science, computer science) by using a collaborative planning approach (see Common Planning and Assessment section) through teacher professional development, common planning and assessing, project-based learning centered on peer mentoring, and establishing a sustainable professional learning community advisory board.

Computational Thinking Vertical Learning Community (CTVLC): Teacher & Mentor Professional Development, Planning and Assessment

The CTVLC will be led by the California Mathematics Project and mathematics and CS teachers at Hawkins High School and John Muir Middle School. CMP's goal is to support computational thinking by engaging students in open-ended questioning and problem solving.

Steps:

1. Teachers administer the Mathematics Diagnostic Testing Project (MDTP) readiness assessments to determine student strengths and areas for growth.
2. Teachers analyze test results to identify an area of focus for lesson planning.
3. Teachers work with a CMP facilitator to select open-ended tasks for their students and learn instructional routines to support student engagement with these tasks.
4. Teachers evaluate student work and meet together to share successes and challenges with implementing open-ended tasks.
5. Taking what they learned from the student work, teachers will choose another open-ended task to implement in their classrooms.

This cycle will repeat twice a month during the Spring Semester.

Strategies for teacher and mentor professional learning include observations, feedback, and planning with the further goal of developing sound and effective CT lesson plans that are measurable and aligned to CT objectives and competencies.

Students at Hawkins are required to complete culminating portfolio projects to demonstrate mastery of various CT skills through their school's Link Learning assessment model in which CT skills are aligned to measured assessments. Therefore, aspects of problem solving and responding to open-ended questioning and problems is inherently built into the school's model and overall curricular and instructional approach. These collaborative approaches naturally allow teachers to integrate CT across the curriculum where students are using creativity, problem solving, writing, reasoning, and evaluating.

At JMMS, teachers are developing student CT skills (persistence in working with difficult problems (problem solving) and open-ended questions) with explicit direct instruction in math and science along with scaffolded critical thinking and problem solving in their instructional delivery. Our partnership with the CMP will present a unique opportunity for supporting Hawkins and JMMS teachers with inquiry-based teaching and coaching strategies from data collected through structured classroom observations, data analysis, feedback sessions, and ongoing professional development related to CT and problem solving.

California Mathematics Project (CMP) Professional Development

Computational Thinking Vertical Learning Community (CTVLC)

Introduction to MDTP

- What is the MDTP?
- Test administration

Analysis of MDTP results

- Identifying Areas of Strength
- Identifying Areas for Growth

Lesson Planning

- Use MDTP areas identified for growth to plan instruction
- Identify open ended tasks to engage students
- Share pedagogical strategies to support student engagement in open-ended tasks
- Share student work from open-ended problems

PARTNERSHIPS

Los Angeles Unified School District (LAUSD) Senior Leadership

Working closely with the CAO, Local District Superintendent, Community Schools Administrators, and leadership of Augustus Hawkins High School and John Muir Middle School is arguably the nucleus of our RPP. It is expected that LAUSD senior level management will support the RPP and serve as an active participant throughout the project. This includes fully endorsing the RPP and working closely with UCLA CTS to ensure that teachers and administrators at Augustus Hawkins High School and John Muir Middle School actively participate in all professional development opportunities pertaining to the RPP. While CTS will be responsible for the majority of expenses associated with operating the RPP, it is expected that LAUSD senior leadership will provide supplemental financial support to cover additional hours that are required of teachers beyond their normal school day. Finally, it is expected that LAUSD will support CTS in its data collection efforts (i.e., consent/assent, interviews, surveys, etc.) that will be used to evaluate the overall effectiveness of the RPP.

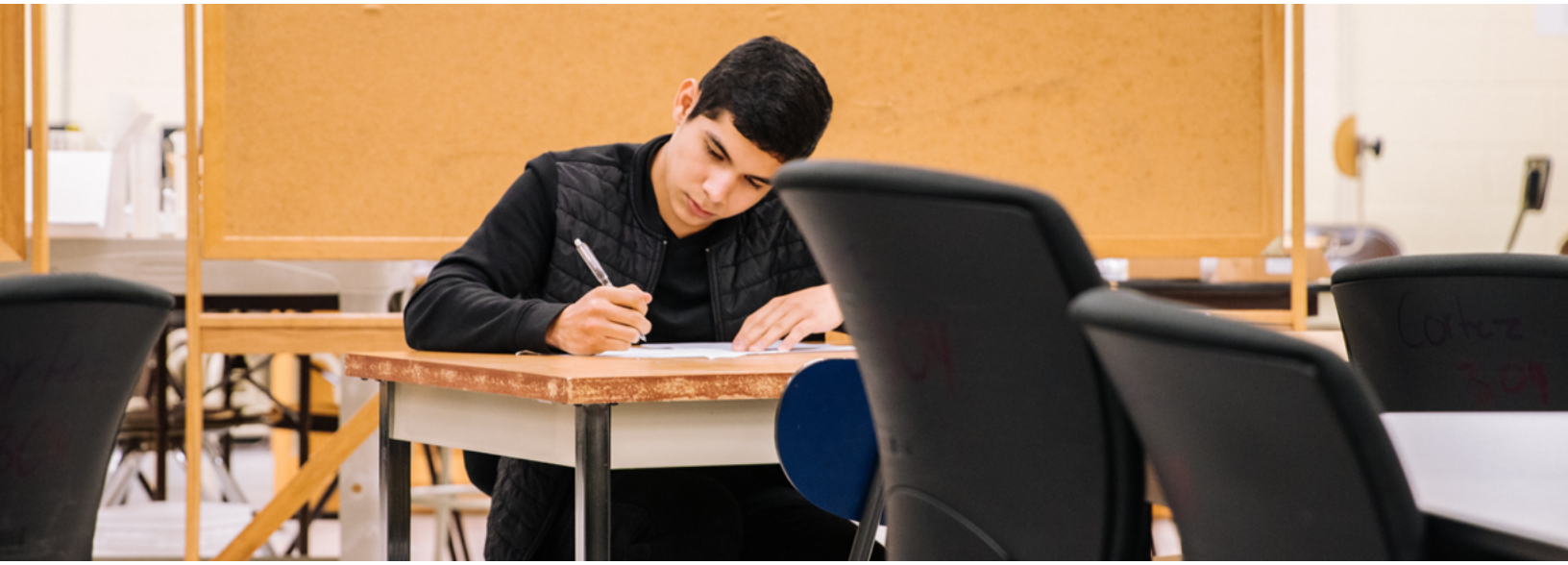
District Office Leadership

Alison Yoshimoto-Towery
Chief Academic Officer,
Los Angeles Unified School District

School Site Leadership

Monique C. Fordham
Principal, Augustus Hawkins High School

Dr. Sonia Leffall
Principal, John Muir Middle School



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Industry and Community Stakeholders

An advisory board with Link Learning Coordinators, CDAGS and JMMS leadership, will continue to develop and include partnerships with STEM industry professionals. To help inform and provide students and mentors with models and examples of what they are learning and how to visually see CT theory in action. Students will also have opportunities to go on field trips and connect with STEM industry professionals with workshops, presentations, and seminars/conferences from leading industry professionals. Our primary goal is to reinforce and provide relevant scaffolding so that they develop the habits of the mind that will enable them to develop CT.

Research Community Advisory Board

We recognize the high value of an Advisory Board composed of experts in areas such as CT development and assessment, engagement of underrepresented youth in STEM, Math education and CS course articulation across grade levels. An Advisory Board, which includes Alison Towery, Chief Academic Officer for Los Angeles Unified School District, Dr. Kamau Bobb, national STEM expert at Georgia Tech and former program officer at NSF, Dr. Kim Gomez, professor at UCLA and math education expert, Dr. Brandon Nicholson, founder of The Hidden Genius Project and national expert on work-based learning and industry partnerships and Dr. Jean Ryoo, a national scholar on issues of equity and CS education at UCLA will help our team reflect on our progress, challenges, connections to other projects and especially NSF-funded projects) allowing for leveraging knowledge and tools. Our Advisory Board will be tasked with the challenge of assuring the integrity of our research questions, data analysis, and our enactment of the iterative cycle of practice informing research and vice versa. They will also help us review our efforts to build more concrete course pathways and CT learning progressions across grade levels.

Site Administrators

Because site administrators play a pivotal role in the success of the RPP, it is expected that they will provide space for all professional development endeavors (i.e., libraries, classrooms, gyms, resource centers, etc.) Site administrators are also expected to support UCLA CTS researchers by allowing access for classroom observations, interviews, and the facilitation of surveys from teachers and students participating in the RPP.

Teachers

Participating teachers will be required to attend monthly professional development trainings and sessions to help facilitate their instructional methods for increasing computational thinking. They will form a learning community led by researchers from the CMP who will help with lesson planning and sharing best CT development practices (i.e., problem solving and open-ended questioning, etc.). Teachers will be required to attend advisory board vertical articulation meetings (i.e., Augustus Hawkins High School, John Muir Middle School, Linked Learning, STEM Industry Professionals, etc.)

Mentors

Mentorship from the UCLA Center for Excellence in Engineering and Diversity (CEED) undergraduate students includes STEM majors from the American Indian Science and Engineering Society (AISES), the National Society of Black Engineers (NSBE), and the Society of Latino Engineers and Scientists (SOLES). The introduction of first-generation, near-peer college mentors can help make learning more personalized and culturally relevant, allowing students to relate to mentors as CS scholars of color themselves. Mentors will be paired with a group of students from JMMS and Augustus Hawkins High School for special CT or CS related programming. Students can work up to 20 hours monthly (4-5/weekly). Expectations include:

- Collaboration with teachers and students
- Bi-weekly student/teacher support during classroom hours
- Check-in with teachers
- Lesson planning
- Student support
- Checking for understanding
- Supporting and mentoring
- Weekend availability for projects/field trip/etc.
- CT Vertical Learning Community (CTVLC
- Attend CMP bi-monthly CTVLC meetings with teachers
- Attend co-planning lessons and projects
- CTEP monthly meetings
- Training and support with THGP

The Hidden Genius Project (THGP)

The Hidden Genius Project trains and mentors Black male youth in technology creation, entrepreneurship, and leadership skills to transform their lives and communities.

Dr. Brandon Nicholson
Executive Director,
The Hidden Genius Project

California Mathematics Project (CMP)

The California Mathematics Project (CMP) develops and enhances K-12 teachers' content knowledge and instructional strategies aligned with the California State Board of Education adopted California Mathematics Content Standards and Framework.

Dr. Kyndall Brown
Executive Director,
California Mathematics Project

National Science Foundation (NSF)

NSF's mission is to "promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense; and for other purposes." Their vision is "a Nation that creates and exploits new concepts in science and engineering and provides global leadership on research and education."

Dr. Allyson Kennedy
Program Officer,
National Science Foundation

UCLA Center for Excellence in Engineering and Diversity (CEED)

CEED works with a community of partners to ensure equity and parity in the K-20 pathways that lead to engineering and computing degrees.

Catherine Douglas
Director, UCLA Center for
Excellence in Engineering and Diversity

Meeting Frequency

Meetings with CTS researchers and administrative teams (or designee) at the district and site levels will occur monthly. The purpose of these standing meetings is to develop a consistent space to discuss aspects of the RPP with respect to progress, challenges, and any pertinent logistical and operational business concerns.

LAUSD and Site Leaders

Monthly standing meetings with CTS researchers, LAUSD District and Site Administrators (or representatives) from AHHS and JMMS to heck in, problem solve, and provide operational updates.

Monthly Team Meeting (School Sites)

Programmatic and operational meetings with CTS researchers and school sites to discuss RPP progress, share classroom observation insights, and discuss ways to strengthen CT vertical articulation.

Practitioner Community Advisory Board (LAUSD, Industry, Linked Learning)

An advisory board that consists of teachers, Linked Learning staff, and STEM industry professionals will meet quarterly to engage in meaningful dialogue and discussions around STEM pathways, field trips, and other relevant opportunities for students and teachers. Meetings will provide spaces to share data, trends, anecdotal information, and strengthen conversations around continuous improvement and ways to increase CT development (i.e., lesson planning, lesson review, model lessons, feedback sessions, etc.).

CT Vertical Learning Community (CTVLC)

Teachers will meet bi-monthly in a professional development learning community led by the California Mathematics Project. They will receive quality CT development and strategies to help develop lesson plans that include open-ended questioning and problem-solving CT domains. Mentors will also attend these meetings and work collaboratively with teachers.

Weekly Site Observations

CTS researchers will observe the Exploring Computer Science classroom at AHHS and math instruction at JMMS bi-weekly in classrooms with student mentors.

Advisory Board

Alison Yoshimoto-Towery
Chief Academic Officer,
Los Angeles Unified School District

Alison Yoshimoto-Towery oversees birth to adult education within LAUSD, including specialized programs for English learners, Standard English learners, Gifted learners, academic counseling, guiding post-secondary success, advanced placement programs, linked learning and career technical education. Alison has served Los Angeles Unified for more than 28 years as a teacher, principal, director and top administrator, and represents the Los Angeles community on a number of local, state and national working groups. She is a fierce advocate of high expectations for all students and believes it is up to educators to find a way to reach every child. She champions multi-tiered systems of support for the whole child and doing "whatever it takes" so students are ready to thrive in college, career, and life.

Alison has a bachelor's degree from the University of California, Irvine; a master's degree in education and reading specialist credential from Cal State Los Angeles; and a master's degree in education and an administrative credential from UCLA. In 2020, Alison was awarded the Curriculum and Instruction Administrator of the Year for the Association of California Administrators, Region 16.

Dr. Kim Gomez
Professor, Urban Schooling Division
UCLA School of Education &
Information Studies

Kimberley Gomez is a Professor in the Urban Schooling Division in the Department of Education at UCLA, and is jointly appointed in the Information Studies Department at UCLA. She is the Principal Investigator on a National Science Foundation Computer Science for All: Researcher-Practitioner Partnership (RPP) grant that focuses on how to effectively teach problem solving practices in 3rd – 4th grade computer science classes, in low-income communities. Professor Gomez is leading understanding in how to effectively integrate technology into teaching and learning with an emphasis less on the designed tool as the catalyst, and more towards pedagogy and lesson design enhanced with technology. More broadly, her research aims to deeply understand the contribution of literate practices to STEM teaching and learning with the aim of supporting more socially just and equitably focused designed tools and contexts.

Gomez received the Ph.D. from the University of Chicago. She served as a postdoctoral fellow and a research associate in the Center for Learning Technologies in Urban Schools (LeTUS) NSF-funded study at Northwestern, in Northwestern University's , Learning Sciences program. Since 2011, Gomez has been the lead language and literacy fellow at the Carnegie Foundation for the Advancement of Teaching. Gomez has been a tenured faculty member at University of Illinois at Chicago, the University of Pittsburgh, and is currently a tenured Professor of Education at the University of California, Los Angeles (UCLA).

Dr. Kamau Bobb
National STEM & Policy Expert
Director of STEM Education &
Strategy, Google

Dr. Kamau Bobb is the Director of STEM Education Strategy at Google and the founding Senior Director of the Constellations Center for Equity in Computing at Georgia Tech. He is an engineer and science and technology policy scholar whose work focuses on the STEM enterprise, large educational systems, and the structural conditions that influence contemporary American life. Dr. Bobb is a former Program Officer at the National Science Foundation. In that role, he worked to help shape the national research agenda for effective means of delivering equitable and quality computational education to all students. He has worked with members of the Office of Science and Technology Policy in the Obama Administration to set the national strategy for STEM education at both post-secondary and secondary school levels. He was selected as a member of President Obama's My Brother's Keeper STEM + Entrepreneurship Taskforce to help U.S. cities craft strategies to engage young men and boys of color in the STEM landscape. Prior to his federal appointment, Dr. Bobb was the Director of the STEM Initiative for the University System of Georgia, a collaborative effort with the governor's office to improve STEM education across the 30 public institutions serving approximately 325,000 students in the state. Dr. Bobb holds a Ph.D. in Science and Technology Policy from Georgia Tech and M.S. and B.S. degrees in Mechanical Engineering from the University of California, Berkeley.

Dr. Jean Ryoo
Research Director, Center X
UCLA School of Education &
Information Studies

Jean J. Ryoo, PhD is the Director of Research of the Computer Science Equity Project at UCLA Center X. She is currently leading the "REAL-CS" Project's effort to understand, from youth perspectives, what students are learning in introductory CS high school courses, and how their experiences with computing impact their engagement, agency, and identity in CS. This research-practice partnership with school districts and classroom teachers has the shared goal of surfacing historically underrepresented students' voices in the growing "CS for All" movement. Prior to this, she worked with the Tinkering Studio of the San Francisco Exploratorium–a museum of science, art, and human perception–to direct research-practice partnerships focused on equity issues in after-school STEM making programs (see, for example, the California Tinkering Afterschool Network). Jean builds on her varied experiences as a museum docent, after-school educator, and public school teacher to inform her focus on using research as a tool to name and counter the inequities that our youth and teachers face in different educational contexts. Jean received her PhD from UCLA, MEdT from University of Hawai'i at Manoa, and her BA from Harvard University.

Dr. Brandon Nicholson
Executive Director,
The Hidden Genius Project

An Oakland native, Founding Executive Director Brandon Nicholson has always felt a deep sense of commitment to promoting equity in the public realm, particularly in the education space. Previously, he was a Senior Associate at Social Policy Research Associates (SPR), where he conducted research, evaluation, and analysis across a range of key social policy areas. Brandon has conducted substantial research in the areas of education and youth development, with a particular focus on issues of equity and access in K-12 education for underserved populations. He has considerable experience investigating linkages among race, class, and youth development.

UCLA Computational Thinking Equity Project (CTEP) Team

Dr. Stanley L. Johnson, Jr.
Project Director,
Computational Thinking
Equity Project (CTEP)

Dr. Stanley L. Johnson, Jr. is the Computational Thinking Equity Project (CTEP) Project Director and an educational consultant, researcher, and practitioner with an extensive background in K-12 leadership, teacher education, and language and literacy development. Johnson previously served as consultant for the Los Angeles County Office of Education (in School Improvement, District Capacity Building, and Curriculum and Instructional Services) and a Managing Director of Teacher Leadership Development for Teach for America where he supported and built capacity with Program Improvement schools and districts in the areas of effective language arts instruction and Common Core State Standards (CCSS) through professional development, coaching, and providing technical assistance to educational leaders and classroom teachers. Johnson was the Founding Principal of the 100 Black Men of the Bay Area Community School in Oakland, CA and he began his career in education through Teach for America, where he taught all levels of English/Language Arts and Advanced Placement English at Centennial High School in Compton, CA. Johnson was awarded a promotion to Program Coordinator, a district office administrative position in curriculum and instruction, after successfully serving as Centennial's Western Association of Schools and Colleges (WASC) Self-Study Chairperson and getting the school's accreditation reinstated.

With respect to academic research, Johnson critically examines effective secondary English teachers who implement culturally relevant and sustaining pedagogical and instructional practices in their classrooms to close literacy gaps and address the academic, social, and emotional needs of their students. Johnson is particularly interested in how Advanced Placement English teachers facilitate high levels of engagement for their high achieving boys of color (and especially African American males) by ensuring that they have access and exposure to language and literacies of power.

Johnson received his Ph.D. in Urban Schooling from the Graduate School of Education & Information Studies at UCLA, his Master of Arts in Secondary Education along with clear teaching and administrative credentials from Loyola Marymount University, and his Bachelor of Arts in American Literature and Culture with college honors from UCLA.

Kirk D. Rogers Jr.
Research Analyst,
Computational Thinking
Equity Project (CTEP)

Kirk D. Rogers, Jr. (he/him/his) is a Ford Dissertation Fellow and PhD candidate in UC San Diego's Department of Education Studies. His research interests include uncovering the institutional and systemic mechanisms that inhibit access to STEM for Black, Indigenous, and other People of Color (BIPOC). His dissertation research centers math as a major gatekeeper for BIPOC students interested in pursuing STEM careers. Kirk taught middle school math and science in Atlanta, GA, for six years and continues to work with youth, teaching at a STEAM summer camp in the summers. His future goal is to make the P—20 STEM pipeline more inclusive by pushing back against traditional notions of who can "do" STEM. Kirk's lifelong career goal is to dismantle the STEM field such that the larger community begins to rethink STEM, ultimately creating more diverse, inclusive, and culturally relevant STEM spaces; spaces that value the strengths and unique talents of BIPOC students, women, and other historically marginalized groups. He is eager to continue collaborating on research connected to equity and social justice in STEM at the Center for the Transformation of Schools.

LOGIC MODEL

COMPETENCY

Confidence in dealing with **complexity**

RPP DESIGN ELEMENT
Informing Research & Practice

RPP DESIGN ELEMENT
Collaborative

COMPETENCY

Tolerance for **ambiguity**

COMPETENCY

The ability to communicate and **work with others to achieve a common goal** or solution

RPP DESIGN ELEMENT
Place-Based

RPP DESIGN ELEMENT
Co-Designed

COMPETENCY

The ability to deal with **open-ended problems**

COMPETENCY

Persistence in working with **difficult problems**

UCLA Center for the Transformation of Schools
Research & Project Management

Center for Excellence in Engineering and Diversity
Mentorship

The Hidden Genius Project
Mentor Training

California mathematics Project CMP
Educator & PBL Support

UCLA Center for the Transformation of Schools

National Science Foundation
WHERE DISCOVERIES BEGIN