Overview
This course approaches computational thinking through the lens of teaching for social justice. We will examine how (and why) practitioners and schools can support students’ engagement with computational thinking practices through interdisciplinary means. This course will develop students’ understanding of computational thinking to engage in important ways with power, privilege, and identity. Utilizing computational thinking as an approach to problem solving empowers individuals to recognize the influences technology brings to our society and the impact it has on ethics and equity. The goals of this course are to:

- Describe the core practices of computational thinking and be able to use it as a way for students to access information, express their thinking, learning, and ideas, and increase their computational fluency.
- Develop technological and content knowledge in order to utilize these practices in your discipline.
- Understand how to choose appropriate learning environments for students to engage in computational thinking related activities with an emphasis on pedagogy.
- Empower practitioners to recognize opportunities where they may be able to engage an audience in utilizing computational thinking skills.

Acknowledgements
We acknowledge that Stanford University sits on the land of the Muwekma Ohlone people. We acknowledge the painful history of genocide and forced removal from this territory, and we honor and respect the many diverse Indigenous peoples still connected to the land on which we gather. We remember their continued connection to this region and we offer our respect to their Elders and to all Ohlone people of the past and present.

This course would not have been possible without the help of Moni Yupa, STEP class of 2018 who advocated for and tested out a trial version of this course. Additionally, Chris Proctor, PhD Student in Learning Sciences and Technology Design who tirelessly worked with us to develop the syllabus. We also must acknowledge this course is available thanks to funding from the TELOS initiative at Stanford.

Expectations
What do we expect of you?
This course is designed to create a collegial culture in which we can all learn from one another. To that
end, engaging with the texts, discussions, and activities in this class means being fully present. We expect you will come to class prepared to curiously engage with the content, actively challenge your own understandings, be willing to work through ambiguity, and be respectful of the diversity of experiences and identities of your colleagues.

There are 3 expectations we consider especially important

1) Participation - our collective engagement in class activities and discussions will facilitate your learning and others. Participation looks and sounds different for each learner and our goal is to provide a variety of opportunities for everyone to engage. We expect for you to mind your own airtime, and either step back to create space for others or step in to share your ideas.

2) Communication - Class starts promptly at 4pm and will end promptly at 6:50. We are aware of the commitments you have outside of our class and will do our best to communicate about the arc of the course so you can prioritize your time accordingly. We also appreciate the same. In the case of absence (for major illness or family emergency), email us before the session. If missing a class is unavoidable for other reasons, we will ask you to submit reflections on your readings. Additionally, we will be available 1 hour before every class or you can email us to set up a time to meet.

3) Digital Tools - we will be using digital tools in this class. For tools that are new to us, we ask you to explore with an open mind and a willingness to try it out. Additionally, when they are not central to our learning, we expect you to set them aside, this includes personal devices - please check in with family, friends, colleagues, and the internet at large during breaks.

What can you expect of us?

You can expect that we will work to get to know you as a student, but more importantly as a human. We will strive to create a collaborative and equitable learning environment where each of you feels comfortable sharing what you’ve learned, challenging others’ ideas, and wrestling through your own uncertainties. We will work to build trust with you and amongst our community of learners. We will provide you continuous feedback and be available to meet with you when you need it. You can expect we will do a lot of hands-on activities, reflections, moving around and not a lot of lecturing. You can also expect us to be organized and communicative in order to support your learning.

Assessment

In full transparency, we do not find grades indicators of your learning. We also do not find grading, in the traditional sense, the best use of our time. You are all graduate students taking our class to learn, engage, and grow with the content. Our job as instructors, and your job as students, is to provide continuous feedback to support engagement with our course. If you are adhering to the above expectations and make sincere efforts to fully participate in assigned tasks during and outside of class, you can expect an A.

Activities

Reading  We collated thoughtful and digestible amounts of reading each week. The readings will guide our learning for that class and in order to fully participate you need to have read. Each week we name our Essential Question(s) and learning goals and intend for them to act as guides for your reading. As there is so much rich content, we will always include supplemental readings for you to bookmark for the future, but these are not required.

Reflecting  We believe committing to a weekly reflection practice is one of the best ways to authentically learn and track your growth as a learner. Documenting your learning and reflecting on your growth helps us assess our
teaching and also allows for you to see your developing ideas in real time. Each week you will have two reflections, a Reading Reflection and an Application Reflection. The reflections can be done in either a Google Slides deck or a Google Sites page that you will link in Canvas. The design and organization is up to you - each response should be about 500 words and can include other artifacts of learning (photos, videos, links, etc). Some weeks we may ask you to respond to others' reflections in an effort to push our ideas further.

**Reading Reflection:** The reading reflection questions are on the syllabus in the Course Read. You are to respond to the prompts before that week’s class. Reflections should be updated no later than 2:30pm on Thursdays.

**Application Reflection:** Following each class you will then add a reflective response to a question we pose about the class activities. We will post this question on the syllabus at the end of each class but the intention is for you to reflect on how the activities and discussions experienced in class inform your understandings of the reading and your thinking about the content.

**Designing** You will be working in pairs on a Design Project that showcases your engagement with and understanding of computational thinking. The projects are due on Class 9, June 4th. Beginning in Class 3, we will dedicate a majority of the second half of class to working with your partner on the project.

**Accessibility**
If there is anything you need in order to make the classroom space or course content accessible to you as a learner, let us know, regardless of any diagnosis or formally documented accommodations you may or may not have.

**Students with Documented Disabilities**
Students who may need academic accommodations based on the impact of a disability initiate the request with the Office of Accessible Education (OAE). Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk; phone: 723-1066; web site http://studentaffairs.stanford.edu/oae

**Honor Code**
1. The Honor Code is an undertaking of the students, individually and collectively:
   a. that they will not give or receive aid in examinations; that they will not give or receive unpermitted aid in class work, in the preparation of reports, or in any other work that is to be used by the instructor as the basis of grading;
   b. that they will do their share and take an active part in seeing that others as well as themselves uphold the spirit and letter of the Honor Code.
2. The faculty on its part manifests its confidence in the honor of its students by refraining from proctoring examinations and from taking unusual and unreasonable precautions to prevent the forms of dishonesty mentioned above. The faculty will also avoid, as far as practicable, academic procedures that create temptations to violate the Honor Code.
3. While the faculty alone has the right and obligation to set academic requirements, the students and faculty will work together to establish optimal conditions for honorable academic work.

**Violations of the Honor Code**
Examples of conduct that have been regarded as being in violation of the Honor Code include:
- Copying from another’s examination paper or allowing another to copy from one’s own paper
- Unpermitted collaboration
- **Plagiarism**
- Representing as one’s own work the work of another

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**Course RoadMap**

**Class Playlist on Spotify**
As we work, explore, and tinker in class we will play this playlist as our background music. Add songs to the playlist, the more songs the better!

**Resource Guide**
Where we will link slides, lesson plans, and other materials from class.

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**Class 1 | April 9th**

**Essential Question**: To what extent does the practice of computational thinking empower people to recognize the impact technology has on society and its influence on ethics and equity?

<table>
<thead>
<tr>
<th>Learning Goals</th>
<th>Readings:</th>
<th>Reading Reflection:</th>
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<tbody>
<tr>
<td>Develop an understanding of computational thinking</td>
<td>Syllabus</td>
<td>Where have you witnessed or experienced inequities in the culture of technology?</td>
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<tr>
<td>Understand the various approaches to defining computational thinking</td>
<td>Pea &amp; Grover (2013) <em>Computational Thinking in K–12: A Review of the State of the Field</em> (pgs 38-43)</td>
<td>How are you defining computational thinking? Where is it’s place in your work spaces?</td>
</tr>
<tr>
<td>Consider the inequitable effects of identities and stereotypes around computing.</td>
<td>Denning (2017) Remaining trouble spots with computational thinking. (pgs 1-7)</td>
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<tr>
<td><strong>PCK</strong> Creating inclusive computing cultures</td>
<td><strong>For A Deeper Dive in the Future:</strong></td>
<td><strong>Application Reflection:</strong> (will post after class on 4/9)</td>
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<td><strong>boyd (2014) It’s complicated: The social lives of networked teens</strong></td>
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<td><strong>Margolis, et al. (2008) Stuck in the shallow end: education, race, and computing</strong></td>
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## Class 2 | April 16th

**Essential Question:** How do we identify applicable data and patterns for use in models and systems? the algorithms created void of human bias?

<table>
<thead>
<tr>
<th>Learning Goals:</th>
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<th>Reading Reflection:</th>
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<tbody>
<tr>
<td>Analyze the relationship between programming and computational thinking, and related pedagogical tradeoffs.</td>
<td>Noble, Safiya (2018) Algorithms of Oppression (pgs 1-14)</td>
<td>How has your definition of computational thinking evolved?</td>
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<tr>
<td>Understand algorithms as more than a problem-solving mechanism; rather a political/historical project in what computers do, that maintains humanity.</td>
<td>The New Jim Code? Race and Discriminatory Design (26 minute podcast or read transcript)</td>
<td>Does engaging with computational models support your understanding of the ethical implications of technology? Why or why not?</td>
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<tr>
<td>Discuss how we use data to recognize patterns and answer questions in context.</td>
<td>An Algorithm That Grants Freedom or Gives It Away, NYTimes (1-6)</td>
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<tr>
<td>Understand how computers can help collect or create new kinds of data and the potential implications the interpretations may have on communities.</td>
<td>Teaching Students to Wrangle 'Big Data', Education Week (1-4)</td>
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<tr>
<td>PCK Working with data to think through the language of computation</td>
<td>For A Deeper Dive in the Future: Norman (1999) Affordance, conventions, and design. (pgs 343)</td>
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<td></td>
<td>Taylor &amp; Hall (2013) Onter-Mapping the Neighborhood on Bicycles: Mobilizing Youth to Reimagine the City. (pgs 65-76)</td>
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## Application Reflection:
(Will post after class on 4/16)

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## Class 3 | April 23rd

**Essential Question:** How do we identify a problem and build models that address the problem?

<table>
<thead>
<tr>
<th>Learning Goals:</th>
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<th>Reading Reflection:</th>
</tr>
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<tbody>
<tr>
<td>Understand systems and using decomposition as a computational thinking practice</td>
<td>Yadav (2016) Computational Thinking for All: Pedagogical Approaches to Embedding 21st Century Problem Solving in-K2 Classrooms (1-4)</td>
<td>What are the implications for learning in bringing real world problem solving using computational models into learning spaces?</td>
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<tr>
<td>Process of data collection, analysis, interpretation, and communication,</td>
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and its role in various disciplines

Use computational models to understand systems, both from the perspective of the computational agent and the impact it has on emerging behavior.

**PCK** Using computers as tools for thinking and creating

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**For A Deeper Dive in the Future:**

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How might computational thinking practices and tools elevate students' problem solving skills?

**Application Reflection:**

(Will post after class on 4/23)

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**Class 4 | April 30th**

**Essential Question:** How do we know we are using the appropriate tools to elevate the learning experience and deepen students knowledge?

**Learning Goals:**

- Explore interdisciplinary applications of computational thinking.
- Analysis of task and affordances in selecting educational technologies.
- Evaluate pedagogical considerations of teaching with technology

**PCK** Selecting appropriate tools for integrating computational thinking practices.

**Readings:**

- Barr & Stephenson (2011) Bringing computational thinking to K-12: what is involved and what is the role of the computer science education community? (48-54)

**Reading Reflection:**

How are you differentiating between computational thinking concepts and practices? What is the added value to students learning in utilizing these practices?

In creating learning environments to support these practices, how do you select an appropriate technology tool in service of equitable student learning?

**Application Reflection:**

(Will post after class on 4/30)
## Class 5 | May 7th

**Essential Question:** What is the value of making/tinkering and student agency in learning and where does it fit within computational thinking?

### Learning Goals:
- Experience making and inquiry activities to think about integration in interdisciplinary ways
- Identify opportunities for student ownership in solving real world problems
- **PCK** Building student agency

### Reading Reflection:
- How has your understanding of computational thinking evolved from your first reflection and how do you differentiate it from other types of problem solving practices?
- What would a constructivist classroom look and sound like? What are your experiences as a student or teacher with that type of space?

### Application Reflection:
(will post after class on 5/7)

### Reading Reflection:


### Future Deep Dives:
- **Papert (1980). Mindstorms: Children, computers, and powerful ideas.**
- **Blikstein, P. (2013). Digital Fabrication and 'Making' in Education: The Democratization of Invention.** In J. Walter-Herrmann & C. Bogle (Eds.), *FabLabs: Of Machines, Makers and Inventors*. Bielefeld: Transcript Publishers (1-19)
- **Brennan, K. (2015). Beyond Right or Wrong: Challenges of Including Creative Design Activities in the Classroom.** *Journal of Technology*

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### Readings:

### Future Deep Dives:
- **Papert (1980). Mindstorms: Children, computers, and powerful ideas.**
- **Blikstein, P. (2013). Digital Fabrication and 'Making' in Education: The Democratization of Invention.** In J. Walter-Herrmann & C. Bogle (Eds.), *FabLabs: Of Machines, Makers and Inventors*. Bielefeld: Transcript Publishers (1-19)
- **Brennan, K. (2015). Beyond Right or Wrong: Challenges of Including Creative Design Activities in the Classroom.** *Journal of Technology*
Class 6 | May 14th

**Essential Question**: How do we use computational thinking to leverage learning?

**Learning Goals:**
- Recognize opportunities where computational thinking practices can be enacted in learning settings.
- Differentiate between the variety of computational thinking activities and understand the range of entry points from computer less activities to programming.
- **PCK** Integrating computational thinking into the curriculum

**Readings:**
- Kafai & Burke (2013) *The social turn in K-12 programming: moving from computational thinking to computational participation* (pgs 603-608)
- Lee, V.R., Recker, M *Paper Circuits: A Tangible, Low Threshold, Low Cost Entry to Computational Thinking* (1-7)

**Future Deep Dives:**

**Reading Reflection:**
Would you consider computational thinking a necessary literacy for students to develop? Explain.

**Application Reflection:**
(will post after class on 5/14)
### Class 7 | May 21st

**Essential Question:** How is computational thinking used to address issues of equity?

**Learning Goals:**
- Discuss with community organizations how they are addressing problems of equity through computational thinking.
- Understand what ways different organizations are supporting the growth of student identity in computational spaces.
- Evaluate ways practitioner organizations create partnerships with community organizations.

**PCK:** Utilize community partnerships in curriculum.

**Readings:**

**Future Deep Dives:**

**Reading Reflection:**
How are organizations supporting school efforts to integrate computational thinking? Where are the inequities in their work? What about their work provides more equitable experiences for students?

**Application Reflection:** (will post after class on 5/21)

### Class 8 | May 28th

**Essential Question:** What is the future of computer science in K-12? How does computational thinking inform this movement?

**Learning Goals:**
- Describe the current state of computer science pathways.
- Define the benefits and challenges of integrating computer science into K12 settings.
- **PCK:** Integrating computer science into core curriculum.

**Readings:**
- Proctor & Blikstein (2019). Defining and designing computer science education in a k12 public school district (314-319)

**Future Deep Dives:**
- Papini, et al. (2017) Preparing and Supporting Industry Professionals as Volunteer High School Computer

**Reading Reflection:**
How do you differentiate computational thinking from computer science? What is their relationship?

**Application Reflection:** (will post after class on 5/28)
Class 9 | June 4th

**Essential Question:** How have we applied our understanding of computational thinking to our design projects?

**Learning Goals:**

- Understand the various ways our peers have applied computational thinking to their context
- Experience a variety of applications of computational thinking

**No Readings**

**Design Projects Due**