Dear TEALS Volunteer and Teachers,

As we head into our 10th year, we created this guide to always be there in your pocket for a quick review, reminder, or inspiration when you are teaching or planning your next CS lesson. We hope it serves you well in your CS classroom journey. As always, thank you for your dedication and partnership helping high schools across North America build and grow their CS programs.

Kevin Wang
TEALS Founder & Ringleader
Our Four Pillars for Teaching Computer Science

Notional Machine
Students need to build a mental model of how a computer works

Problem Solving
Using strategies to help solve CS problems and bugs is an integral part of what students need to learn and do
Hierarchy of Skills

Teachers should be mindful about the varying complexity of CS concepts and the assessments we create, as learning to write programs is a many-layered skill.

Cultural Responsiveness

Teachers should help build all students' identities as computer scientists by being mindful of their cultural backgrounds.
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Classroom Procedures

Classroom procedures help your class run smoother with little waste of time.

- Create new ones opportunistically
- Optimize for efficiency
- Plan to teach and rehearse them

Example Procedure: Start of Class

1. Start computers
2. Open:
   - Remote Classes
   - Browser
   - Snap!
   - Eclipse
3. Take out notebook & pencil/pen
4. Start Do Now

https://aka.ms/tealsprocedures
Encouraging Productive Discussions

- Take turns being the first one to talk
- Take turns presenting ideas
- Do not dominate the conversation
- Think about alternative ways to solve the problem
- Ask for clarification

Even if your group-mate has said something very clearly and correctly, it’s a good idea to repeat it yourself.

Repeat other student’s questions and answer
Differentiated Instruction

Help *all students* grow and learn in your classroom.

Consider different groups of students during planning.

Add scaffolding to move up or down *Bloom's Taxonomy*.

Tailor to students’ strengths, interests, background, home life, and lived experiences.

Allow for student choice:
- How do they demonstrate mastery of new content?
- Select some, not all, of quiz questions.
- Project alternatives.

https://aka.ms/tealsdifferentiated
Bloom’s Taxonomy

CREATE
Produce new or original work

EVALUATE
Justify a stand or decision

ANALYZE
Draw connections among ideas

APPLY
Use information in new situations

UNDERSTAND
Explain ideas or concepts

REMEMBER
Recall facts and basic concepts

The Full Diagram

https://aka.ms/tealsblooms
Culturally Responsive Teaching

A way of teaching that includes students' cultural references in all aspects of learning to increase the participation and achievement of students from underrepresented groups.
Co-Teaching Configurations

Which format is most useful for today’s lesson?

- One Teach, One Support
- Team Teaching
- Parallel Teaching
- Station Teaching
- Alternative Teaching

https://aka.ms/tealscoteaching
The Habits of Highly-Effective TAs

During Instruction
- Determine which students will need the most help
- Check who turned in assignments
- Work with previously-absent students
- Interject with alternative explanations or personal anecdotes
- Hand out raffle tickets

During Lab
- Provide differentiated instruction to students who need individual attention
- Lead a review session on a tricky topic

Outside Class
- Create additional *formative assessments*
- Help with grading
- Help classroom teacher learn material
Raffle Tickets

Give them out for:
Participation
Helping other students
Notebooks
Extra credit

Then do:
Weekly and/or monthly drawings

Raffle items not provided by TEALS for classroom enrichment classes.

https://aka.ms/tealsraffle
Getting to Know the Students

Learn and use student names

- Name placards
- Seating charts
- Mnemonics

Insist students use your name

Learn about students' interests

- Student experiences survey
- Chat before or after class
- Attend school and community events

Incorporate student interests into examples and assignments

https://aka.ms/tealsknowstudents
You're struggling because this is a hard problem. I know you have the tools you need to be able to work this out!

Set high expectations
Give personal assurance
Provide an actionable next step

https://aka.ms/tealsencouragement
(see pg 29)
Re-engaging with Distracted Students

Avoid escalation. When in doubt, get help from the classroom teacher.

Walk closer to student

Remote Option -
Join a Breakout Room

Consider a seating chart to break up disruptive pairs

Break up activities into chunks

Incentivize with raffle tickets

Re-evaluate pacing of the lesson or lab

https://aka.ms/tealsdistracted
Dealing with Failure/ Growth Mindset

Growth Mindset

Abilities can be acquired through study and effort.

Explain the growth mindset to the class and reference it often.

Share your experiences with failure.

https://aka.ms/tealsgrowth
What to do when you or a student feels vulnerable:

- **Stop**
  - 10s pause to breathe and think

- **Observe**

- **Detach**
  - yourself from the need to be right

- **Awaken**
  - empathy and think from their perspective

Amygdala Hijack

Prevent an amygdala hijack by watching out for potential threats to one’s:

- **CONTROL**
- **CONNECTIONS**
- **STANDING**
- **CERTAINTY**
- **EQUITY**

https://aka.ms/tealsamygdala
Enrolling Diverse Students

Cast a broad net to appeal to all students.

Aim for your CS roster to match the demographic makeup of the student body.

Advocate with guidance counselors and administrators for building an inclusive CS class - the guide to enrolling diverse students can help!

Click or visit this address for our extensive Guide To Enrolling Diverse Students

https://aka.ms/tealsdiversestudents
Learning Objectives

Write objectives on the board!

**SWBAT:** explain what a SWBAT is and why it's important to learning

What is SWBAT?

SWBAT stands for "Students will be able to." It's a short student-centered learning objective that implies a method of assessment.

https://aka.ms/tealslearningobjectives
Anatomy of a Lesson

Sample Lesson

- Do Now
- Hook
- Instruction
- Practice
- Assessment

*see lesson plan for specifics

https://aka.ms/tealsanatomy
Do Now / Warm Up

A quick start-of-class focusing activity that may assess student progress, review recent content, or foreshadow the day’s lesson

- A problem related to previous lesson
- Review HW with a peer
- A challenge that will be explained by today’s lesson

5 Minutes of every class period!

https://aka.ms/tealsdonow
Hook

A lead-in to the day’s lesson designed to pique students’ interest and curiosity

Questions  Puzzles  Video
Demo  Photos  Current Event

Challenge w/ sample code: what’s wrong?

Relate to students' interests or they’ll never hear you.

5 Minutes of every class period!

https://aka.ms/tealshook
Instruction (25%)

Explanations
Definitions
Walkthrough
Research
Worked Example
Demonstration

Role playing
CS Unplugged Activity
Discussions

Go beyond lecture with active learning techniques (p. 22)

https://aka.ms/tealsinstruction
Practice (75%)

[individual, pair, or group work]

Labs
Projects
Worksheets
Textbook problems
Creating presentations

Try to keep Practice at 75% of your class period, and Instruction at 25%.

https://aka.ms/tealspractice
Assessments

Formative Assessments
A **quiz** provides a chance for students to demonstrate their knowledge, while a **project checkpoint** leaves room for feedback and redirection.

A **lab** is a great in-class option for participation and group-learning.

A **worksheet** is similar to a quiz and individual or group **questioning** is the quickest way to dialogue with students.

Summative Assessments
A **project or test** allows students to demonstrate what they learned at the end of a unit.

https://aka.ms/tealsformative
Active Learning Strategies

"What matters is not what the teacher teaches but what the student learns."

Try the formats below to keep students engaged in the learning process.

- Discussion
- Tutorial
- Debate
- Role Play
- Worked example
- Student presentations
- Game
- Unplugged activity

https://aka.ms/tealsstudentcentered
Before Class Checklist

- Arrive early
- Ensure that Learning Objectives are visible to students in classroom.
- Share the Do Now.
- Re-read the lesson plan
- Power up all machines
- Have a Hook

https://aka.ms/tealschecklist
Questioning Techniques

Look- a silent room is no fun, but kids don’t always want to be called on. Create an interactive classroom where everyone participates.

A Playbook to Keep it Moving

Cold calling (with warning)

Around the World

Popcorn

Everyone Writes

Think Pair Share

Wait Time

T  You  S  Student  —  The Question

https://aka.ms/tealsquestioning
Ithaca-Style Memory Diagrams are useful for visualizing the internal state of computer while tracing.

Methods/Functions

```python
1 > def here(valHere)
2 >     valHere = valHere + 1
3 >     return valHere

4 > count = 3
5 > count = here(count)
```

Identifiers Stack

```
here  | valHere | 3,4
-----|--------|------
count| count  | 3
```

Ithaca-Style Memory Diagrams are useful for visualizing the internal state of computer while tracing. Great for worked examples in class!

https://aka.ms/tealsworked
Students need to hear things 7 times or do them 3 times before they are added to long-term memory!
Studies show hand-written notes are an important part of active learning

- Part of classroom procedures to take out notebook
- Tell students to write important concepts in notebook
- Ask students to look up answer in notebooks
- Notebook checks once a week
- Hand out notebook stickers for job well done

Allow written cheat sheet on tests

https://aka.ms/tealsnotebooks
Meerkat

To ensure all students receive support

Quick interactions, 30-60 seconds

Triage through Socratic Questioning

See each student and check in even if they did not ask for help.

Ask open ended questions, not Y/N questions:

“What are you working on?”

~30 sec - 1 min/student

https://aka.ms/tealsmeerkat
**Socratic Questioning**

_**Diagnose**_

“How are you doing?”
“What is this supposed to do?”
“How does it work?”

_**Ask Leading Questions**_

“Where would be a good place to put a print statement?”
“What can you do to isolate the problem?”

_**Give an Actionable Next Step**_

“Think back to lab 3.2 and see if that helps.”
“Trace through this loop to see if you can find a bug.”
“Look at your notebook to see if you can find something similar that will help you.”
Students Seeking Help

Look up in notebook.

Look at previous code

```
1 for (int i = 0; i < 10; i++)
```

Remote Classes:

Call instructor on newrow

Ask another student for help

Cup right-side-up for help

Make a queue of student names

If fielding the same questions:
• Reteach entire class or
• Create a breakout group to reteach

https://aka.ms/tealsstudenthelp
Four Steps to Solving any Problem

Understand the Problem

Plan a Solution

Reflect on Solution

Implement a Solution

https://aka.ms/tealsproblemsolving
Building Problem Solving Skills

Subgoal Labeling:
When you give a short, clear label to each part of your program to illustrate what it does. You can incorporate this into labs, starter code, and sample solutions.

Debugging strategies to teach students:

- Rubber Duck
- Print statements
- Isolating the bug and/or simplifying code

https://aka.ms/tealswhiteboard
Academic Honesty

Set clear expectations on a per-assignment basis: in groups, in pairs, with a buddy, solo.

*Example:* During lab, students are not allowed to touch another student’s keyboard or mouse.

Explicitly state the allowed resources: internet, textbook, notes; no external resources.

Use face-to-face grading of student project.

Require students to cite resources used when working with peers, site collaborators

*Refer to classroom teacher*

https://aka.ms/tealshonesty
### Grading Strategies

<table>
<thead>
<tr>
<th>Type of Grading</th>
<th>Best for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer Grading</td>
<td>Homework, small assignments</td>
</tr>
<tr>
<td>Check / No check</td>
<td>Homework, labs</td>
</tr>
<tr>
<td>Self Grading</td>
<td>Homework, small assignments</td>
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<tr>
<td>Correctness</td>
<td>Test Quizzes</td>
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<tr>
<td>Rubrics</td>
<td>Projects</td>
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<td>Comments</td>
<td>Any time</td>
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<td>Written Feedback</td>
<td>Major Projects</td>
</tr>
<tr>
<td>Face to Face</td>
<td>Major Projects</td>
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</tbody>
</table>

https://aka.ms/tealsgrading
Formative Assessments - Quick

Data collected about what students are learning while they are still engaged in the learning process.

Quick Assessments
Choose an assessment based on the amount of time you have and how thorough you would like to be. Fewer options lead to faster but less thorough assessments.

Fists/palms or Red Cup / Green Cup

Stoplight Cards

1 to 5 fingers

Or, Everyone Writes

https://aka.ms/tealsqformative
Formative Assessments - Online Tools

Some online tools to help with quick formative assessments and surveys

Kahoot.it
Socrative.com
Plickers.com
Nearpod.com
newrow quiz

(remote only)

https://aka.ms/tealssurveytools
Resources

TEALS Regional Manager
Contact:

TEALS Dashboard
Sign In:
https://www.tealsk12.org/dashboard/

Forums
https://forums.tealsk12.org/
A helpful reminder of all the things you learned that will make your life easier.

In specific circumstances anyway.

Microsoft Philanthropies

TEALS

https://www.tealsk12.org/