GenCyber

Teaching Readiness

For both Teacher Only GenCyber Camps and Teachers in a GenCyber Combination Camp, the goal of having teachers attend GenCyber camp is to get the "ready" to teach cybersecurity. In other words, the goal of having teachers attend a GenCyber camp is to facilitate their teaching readiness.

What is teaching readiness? Teaching readiness is teachers' **disposition** and **ability** to transfer what they learn to their teaching practice. Research shows that there are 3 critical factors that best predict teachers' ability to transition what they learn to their teaching practice: 1) teacher knowledge to teach content, 2) teacher vision to teach the content, and 3) teacher motivation to teach content (Shulman and Shulman, 2004[1]; Dark, 2000[2]).
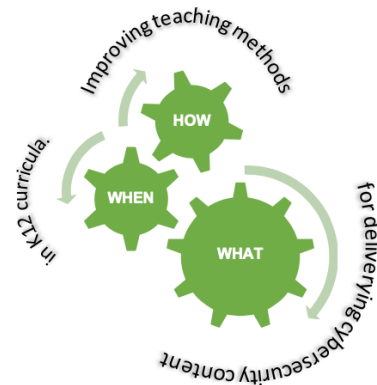
Knowledge

Knowledge is an essential factor for preparing teachers to transfer what they learn to their teaching practice; teachers cannot teach what they do not know. The knowledge category is large and includes three types of knowledge that teachers need in order to teach a subject. The first is content knowledge = **what** to teach; the second is curricular knowledge = **when** to teach it; the third is pedagogical content knowledge = **how** to teach it. These three forms directly align to the third goal of the GenCyber program.

Let's look at them more closely.

Content knowledge:
- Includes amount and organization of knowledge in the mind of the teacher.
- Teachers must 1) understand that something is so (truth claims in the field) and 2) have substantive structures for organizing the facts, concepts, and principles of the discipline to include an understanding of what is essential/somewhat essential/peripheral.
- Regarding truth claims, teachers must understand not only that something is so, but why something is so, i.e., under what grounds it can be asserted, under what circumstances its justification can be weakened or even denied.

Curricular knowledge:
- Teachers need to know how to tie new content into the existing curriculum.
- This includes how to relate cybersecurity content to the other content in the course(s) in which cybersecurity is being added.

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[1] Lee Shu man & Jud th Shu man (2004) How and What Teachers Learn: A Sh ft ng Perspect ve, Journa of Curr cu um Stud es, 36 (2), pp. 257-271

[2] Dark, M. (2000). A Reduced Pred ct ve Mode for Trans t on to Teach ng Pract ce. Purdue Un vers ty, https://www. b.purdue.edu/

- For a stand-alone cybersecurity course, teachers need to know how to sequence content, i.e., the relationships among topics, which include prerequisite, co-requisite, related, and remedial knowledge.
- When to teach what, given other factors, such as the available resources, equipment, labs, etc.
- How to align cybersecurity content to academic standards.

Pedagogical content knowledge:
- Pedagogical content knowledge (PCK) is a specialized form of subject matter knowledge *for teaching.*
- PCK is knowledge about the teachability of content for given learners, i.e., the **knowledge** needed to make that subject matter accessible to students.
- Types of PCK knowledge are:
    - most regularly taught topics.
    - most useful forms of representation of ideas so that it is comprehensible to others and alternate forms of representation.
    - most powerful analogies, illustrations, examples, explanations, and demonstrations.
    - understanding of what makes the learning of specific topics easy or difficult.

To develop and deliver meaningful instruction on any subject matter, a teacher must have <u>comprehensive</u> content knowledge of the material, i.e., a level of knowledge beyond remembering, recall, and understanding. So regardless of whether teachers are attending a teacher-only camp or a combination camp, the curriculum needs to be developed to take teachers beyond basic recall knowledge to apply, analyze, and evaluate content to support delivering it effectively in the classroom. If the only knowledge that a teacher can teach in the classroom is the regurgitation of a preformed lesson, they are NOT likely to teach the content because they will not be able to answer any of their students' questions that arise during the lesson. *The key question for proposals to address is how to structure a camp such that teachers gain their depth of knowledge. And especially for combination camps, how will the schedule be structured in such a way that teachers are not merely learning side by side with students but are learning the content to a depth beyond students.*

To develop and deliver meaningful instruction, a teacher must have a well-formed idea of when they will teach new cybersecurity lessons in their curriculum and how they will connect these new lessons to the other content being taught to students. *The key question for proposals is how to structure their camp to build teachers' curricular knowledge. This is a topic that is unique to teachers. It should be purposefully built into the schedule for a teacher only camp and deliberately designed to be a part of the schedule for a combination camp separate from the curriculum delivered to students.*

Both teacher and combination camps require the teachers to leave camp with two-lesson plans, established follow-up plans and have an observed practicum. This aspect of both teacher camps and combination camps for teachers focuses on the third type of knowledge, i.e., pedagogical content knowledge. *The key question for proposals to address is how to structure the teacher only camp or the combination camp to provide provisions for and support teachers' pedagogical content knowledge. For teacher-only*

camps, how will teachers gain practical experience teaching the lessons? How will they get meaningful feedback on how to improve their teaching of lessons? And how will they then share what they have learned with the other teachers in the camp and vice versa so that together the team of teachers' experiences advances the cybersecurity teaching practices of all members? For combination camps, how will the presence of students in camp be used to allow this to occur in real-time during camp?