CIFellows 2020-2021

Computing Innovation Fellows

Integrating Social, Critical, & Technical in a High School Computing Teacher Professional Development

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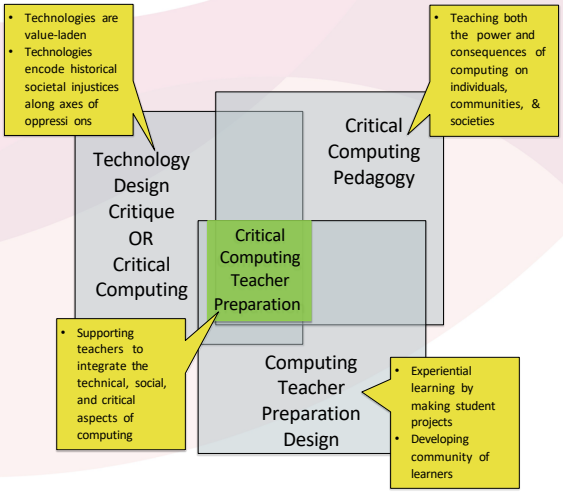
GUIDING QUESTION: How did high school teachers engage critically with computing during a professional development session?

Theoretical Framework

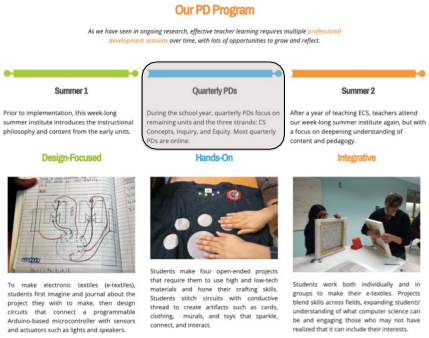


Study Context

Exploring Computer Science

CS CONCEPTS INQUIRY EQUITY

STITCHING the Loop



Research-Practice Partnership

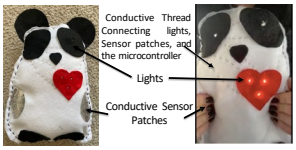
Three Experienced E-textile Teachers
: White, male (session facilitator) Jesse: Mixed, male
Angela: Asian, female

Eight New E-textile but Experienced ECS teachers
: White, female
: Black, male Francesca, Tiara: Black, female

Eight Researchers and Program Designers
Diana, Kayla, Gracie, Jade: White, female
Yaani: Mixed, female Geeta: Asian, female
Maria: Black, female Leo: Latinx, male

Addie's Human Sensor Project

Plush Toy Bear



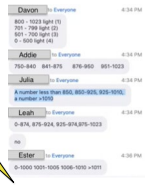
The toy made four different light patterns for different kinds of sensor touches.

Preliminary Findings

"Will everybody be able to use your device the same?"

[teachers are programming with analog sensor patches on their personal human sensor projects; they have tested their patches with people at home like children, partners, etc.]

Ben How would you look at all the data that everybody has put into the large [spreadsheet]. How would you break up [the sensor ranges] so that you have four distinct light patterns?



Ben questioning about inclusiveness situated in teacher personal human sensor projects

Macie & Davon reflecting on their design limitations and implications for users

Ben I have a question for you all. Do you think everybody will be able to use your device the same [way]?

[Ester, Macie, Leah, Julia nod to indicate no]

Davon I do not.

Ben Why not?... How are the decisions we make about these light patters manifest in the way people will use it?

Davon For me, when I am using the regular one [sensor] , I don't know if that's the big difference.. I had to squeeze real hard just to get my lowest numbers. Somebody may not be able to squeeze.

Ben So, your lowest range is 0-500, right? Did anyone get down to below 500?

Macie I didn't but my daughter did. So, in our case, at home, we all did it differently. I was pressing on top of the table, my oldest was holding and squeezing [gestures squeezing using both hands], and the youngest was barely touching it with her 4 fingers. So, no, I don't think we all get the same. Because we all did it differently... it depends on the individual.

Ben So, it sounds like the difference is in the individual physiology, the cultural ideas of how we do the thing, like do I squeeze really hard or just put my hands on it. There's an environmental aspect as well. It's possible that things might be different if you are in a drier area than a wetter area... It's all individualized.

Davon That's why I didn't want to eliminate 500 and below. You know, different factors can make those numbers change.

"What decisions did you make when you came up with those ranges?"

Ben Did anyone of you make a conscious decision, I don't know, to be *inclusive* when you were designing your four buckets?

Julia and Leah sharing their design decisions to make their projects somewhat inclusive

Ester and Julia, from personal experience, discussing everyday technologies that fall short of being inclusive

Julia I decided that I want everyone to get at least one light pattern. 1005 was the highest [on the spreadsheet]. So, I wanted my cut off for the highest had to be above that so that that person could get that.

Leah I did similar...So, I was trying to accommodate everyone so that the range that is working for everybody would have a variety of choices in there. But, if it very sensitive, if the ranges are too small, I don't think it would work. So, I was trying to balance accommodating the range for everyone but trying to have the range big enough so that we could see the differences.

Ben That's true... Can anyone think of any technology that you use everyday that did not think through inclusiveness?

Leah I would say touch screens on cellphones and individuals who have large fingers, it's really difficult to accurately press those keys on the keyboards

Ben What are some of the other ways in which I have noticed differences in how people interact with technology?

Ester So, the lights in my classroom go off and leaves me in the dark. It's not enough to do this [weaving hands to activate motion sensor]. I have to get up and walk to the right place. The sensor was not designed with the actual people, probably, in mind [laughs].

Julia My 5-year-old has Down's syndrome. So, we have a lot of adaptive supplies at home. But, as far as the technology goes, Alexa is really hard for him to communicate with for him. I know, in Canada, Google or someone is collecting data from people with Down's syndrome, different speeches, to advance those technologies.

"How would you bring out these conversations in your classrooms?"

[Julia narrated an episode from her class where a group of boys had designed a pair of sun glasses and tested them only with boys. And, when girls tried on their prototype, it failed for them and for Julia]

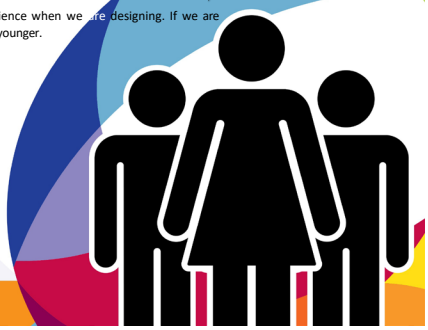
Julia Helping the kids understand that it's very important to be inclusive in design... Helping them understand who should be in their sample size. I had mistakenly thought that they would have a broad representation. They didn't on their own

Julia, Leah, and Macie sharing discussing ways they can take these conversations to their classrooms

Leah We can ask the students what could be missing? And, how could we do better? Or, who might be missing?

Ben This really is a beautiful culmination of a lot of the [ECS] conversations about how do we collect data and what kind of data do we collect? How is it aligned with the questions we are asking? For all the conversations we have, here is another opportunity [during human sensor project]. They get to experience it in a computational way [gesturing excitement].

Macie I think the main takeaway is knowing how is our target audience when we are designing. If we are designing for someone younger, we need to sample more of younger.



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http://www.exploringcs.org/

http://www.exploringcs.org/e-textiles

CRA Computing Research Association

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