

Ákos Lédeczi, Brian Broll
Tiffany Barnes and Shuchi Grover

#1949472
Beyond CS Principles:
Engaging Female High School
Students in New Frontiers of Computing

NSF ITEST PI Meeting
September 2021

CSF

Computer Science Frontiers
<http://csfrontiers.org>



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GLASS VENTURES



Broaden Female Participation in Computing



Students who say computer science is important for them to learn

49%

BOYS

31%

GIRLS

GALLUP | Code with Google

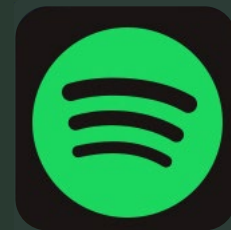
	Males	Females
AP CS-A	52,752	17,767
AP CSP	76,955	39,570
AP Calc AB	134,174	132,062
AP Calc. BC	74,211	53,559

Challenge

- Life after AP CSP?
 - AP CSA:
 - Introductory college-level computer science course (Java)
 - Reputation for being dry and unengaging
 - Popular *only* among students who plan to major in CS or have a fair amount of prior coding experience
 - What can students take after their interest in CS have been raised by AP CSP?

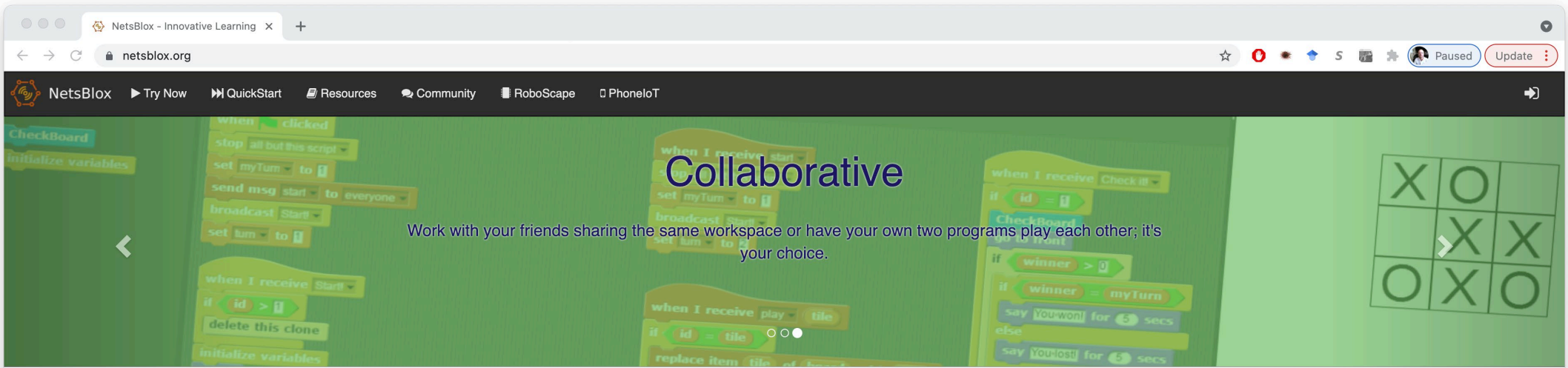
Advanced Computing Utilized Daily

- Distributed Computing
- Computer Networking
- Cybersecurity
- Internet of Things
- Cloud Computing
- Machine Learning

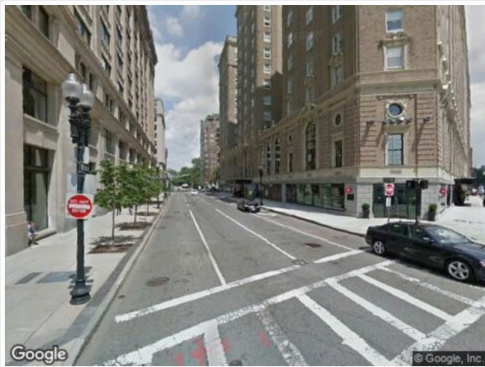


Questions

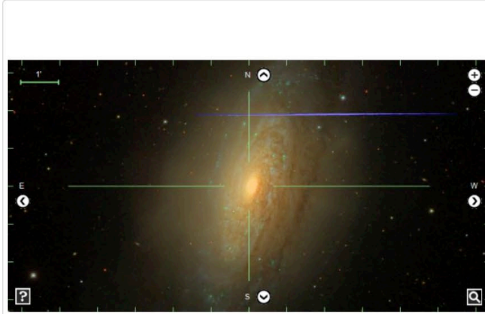
- Can we teach the underlying advanced computing concepts in high school?
- Can we make the curriculum engaging and appealing especially to girls?



NetsBlox is a visual programming language and cloud-based environment that enables novice programmers to create networked programs such as multi-player games. Its visual notation is based on Scratch and it uses the open source JavaScript code base of Snap! NetsBlox opens up the internet with its vast array of public domain scientific and other data sources making it possible to create STEM projects, such as displaying seismic activity anywhere on Earth using an interactive Google Maps background. Similarly, weather, air pollution, and many other data sources such as the Open Movie Database and the Sloan Digital Sky Server are available. NetsBlox also supports collaborative editing similar to Google Docs.



StreetViewMap



Star Map

Hidden Figures



CastShow



COVID-19Daily

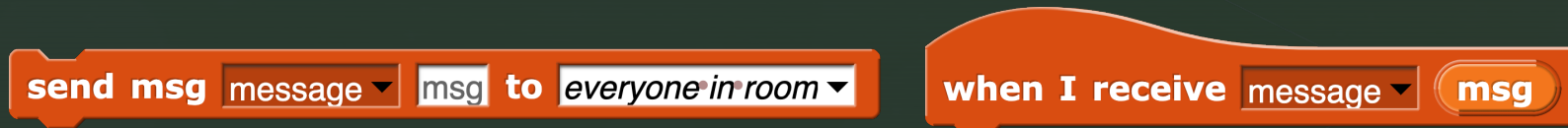
Opening up Snap! to the internet opens up a world of possibilities...

Two Simple Abstractions

- Remote Procedure Calls (RPC)
 - RPC runs on the server
 - Related RPCs are grouped into services (Google Maps, Movie DB, Climate, Cloud Variables, Chart, etc.)
 - A single self-documenting block:



- Message Passing
 - Send data to other NetsBlox projects running anywhere on the internet
 - Two configurable blocks:



Low Floor

```
call MaunaLoaCO2Data / getCO2Trend startyear endyear
```

```
call Chart / draw lines options
```


High Ceiling

COVID-19Daily (4) - NetsBlox

editor.netsblox.org/?action=present&Username=ledeczi&ProjectName=COVID-19Daily

COVID-19Daily (4)

Cases

draggable

Scripts Costumes Sounds Room

when I receive

send msg to

send response

call CloudVariables

run CloudVariables

error

all role names

role name

Make a message type

Make a block

when I receive Map Clicked

hide

go to mouse-pointer

script variables sprite lat sprite long

set sprite lat to call GoogleMaps / getLatitude y position

set sprite long to call GoogleMaps / getLongitude x position

set country to call Geolocation / country sprite lat sprite long

set state to call Geolocation / state* sprite lat sprite long

if not is country a text ?

play sound Pop

else

set options to

list isTimeSeries true list timeInputFormat %m/%d/%Y

list timeDisplayFormat %m/%d list types list boxes

list height stage height / 2 list width stage width

if country = United-States

set cases to

process data call COVID-19 / getConfirmedCounts US state city

days averaged

set value of title in options to

join

Number of New Daily COVID-19 Cases in state (averaged over # days averaged days)

else

set cases to

when clicked

hide

when I am clicked

broadcast hide

when I receive hide

hide

Number of New Daily COVID-19 Cases in Texas (averaged over 14 days)

Number of Daily COVID-19 Deaths in Texas (averaged over 14 days)

Cases Dead Sprite North East West South

Stage

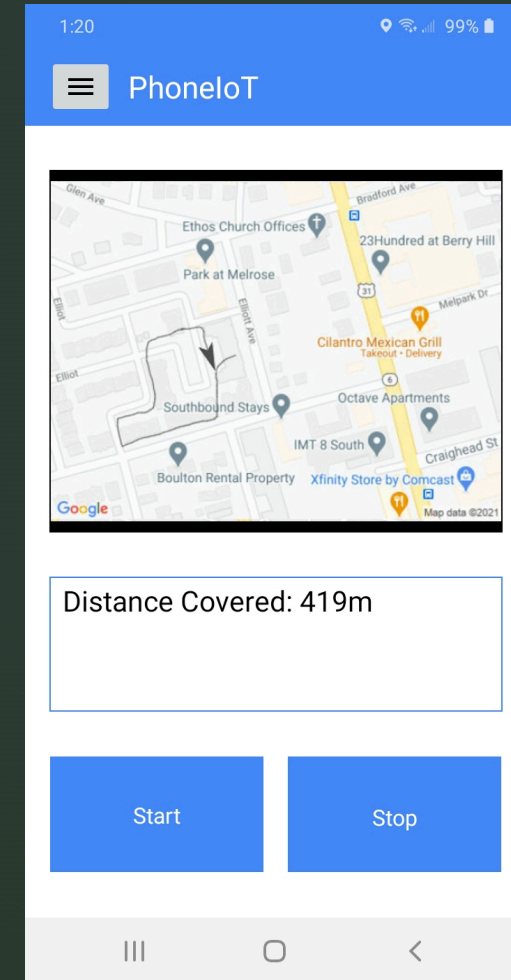
- Interactive map of the World
- Click on any country or state
- Process and plot COVID-19 data

Check out the "high ceiling" !!!

Watch our 5-min Tech Demo video on the PI Meeting site!

Additional NetsBlox Features

- Collaboration support (synchronous and asynchronous enabling team projects in-person or virtual),
- Create multi-player games or social apps with message passing,
- Robot programming including hacking and hijacking each others' robots,
- Cybersecurity: how to defend your robots,
- 3D Virtual robotic environment enabling remote learning without access to physical hardware,
- PhonoIoT mobile app: access all the sensors on your phone and configure a GUI on its screen from your NetsBlox program,
- Make your own service/RPCs from within NetsBlox for all,
- Voice Assistant: write your own Alexa skills in NetsBlox.



Exercise Tracker on
Mobile Devices

Project-based Learning

Structured Initial Activities

Collaborative Learning



Relevant & Meaningful

Multidisciplinary Topics

Interactions with Role Models

Computer Science Frontiers

- High School Course (under development)
- Follow-on to AP CSP or other intro CS courses
- Project-based
- Modular: Four 9-week modules
- Full year
- Topics Covered:
 - Distributed Computing
 - Internet of Things
 - Cybersecurity
 - Machine Learning
 - Software Engineering

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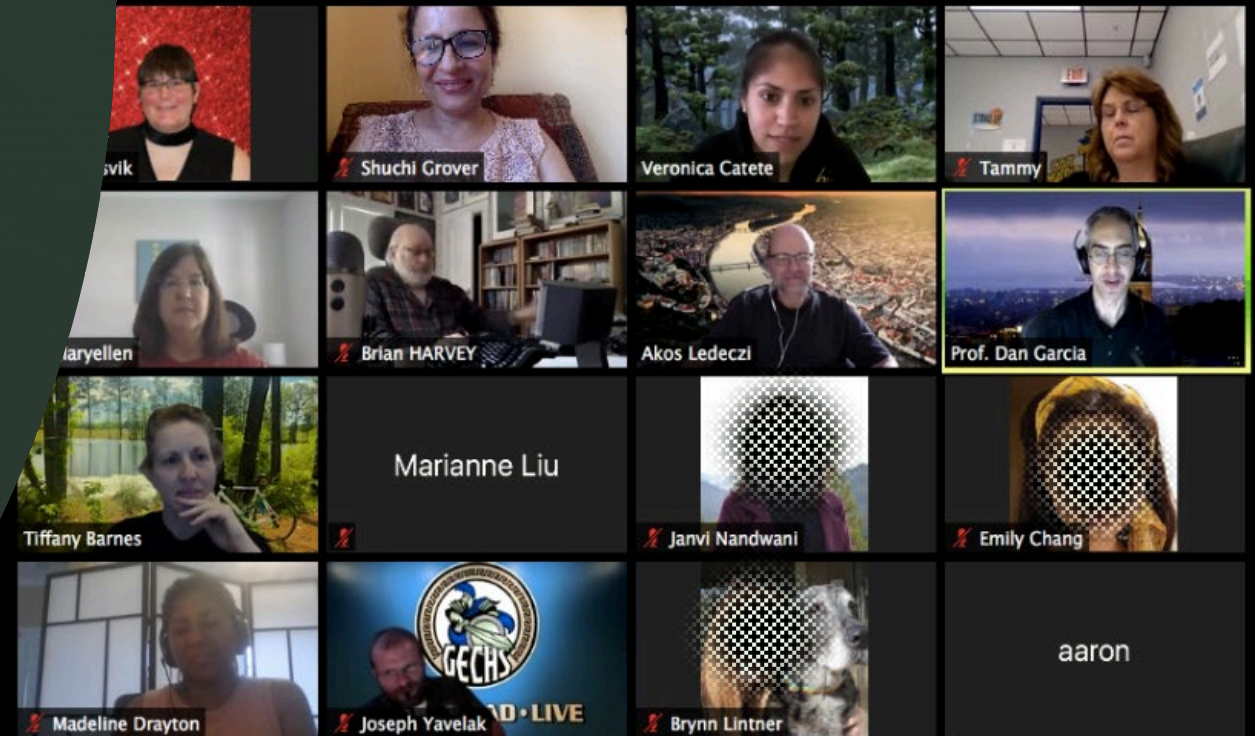
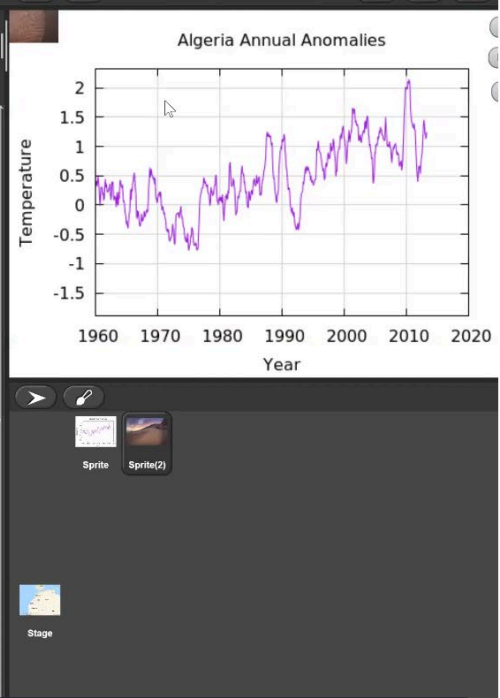
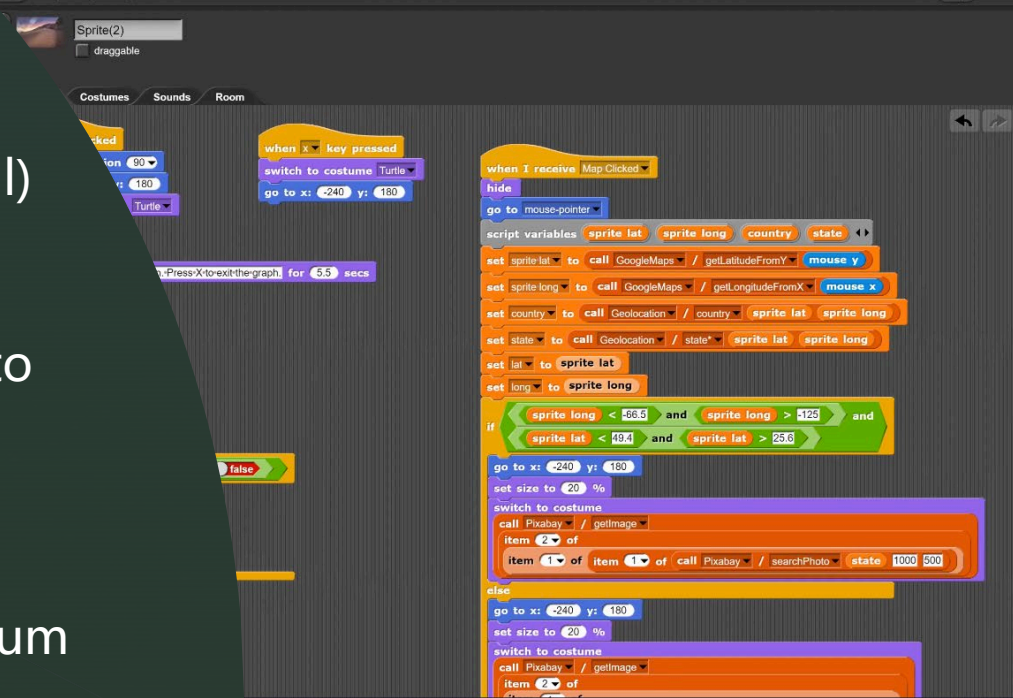
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Summer 2020 Pilot

- 1-week PD and co-design (virtual)
- 1-week virtual summer camp
- Distributed Computing Module
- Sample: 27 students; 25 agreed to participate
 - 19 girls and 6 boys
- Final project showcase
 - Invited creators of Snap! (Berkeley) & the BJC curriculum
 - Interesting mix of student projects
 - Many projects related to Covid-19, climate change, movies.



Summer 2021 Pilots

- 1-week PD and co-design (virtual)
- Four 2-week virtual summer camps
- IoT and ML Modules
- 80 students (incl. additional camps)