Extending Learning with Student-Made Video-Tutorials

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Goals today

- Overview of Cryptoclub Project

- Overview of our ITEST Video Tutorial component of CryptoClub

Partners

University of Illinois at Chicago
- Janet Beissinger, PI
- Bonnie Saunders, Co-PI

Eduweb
- Dave Schaller

American Institutes of Research
- Ryan Eisner
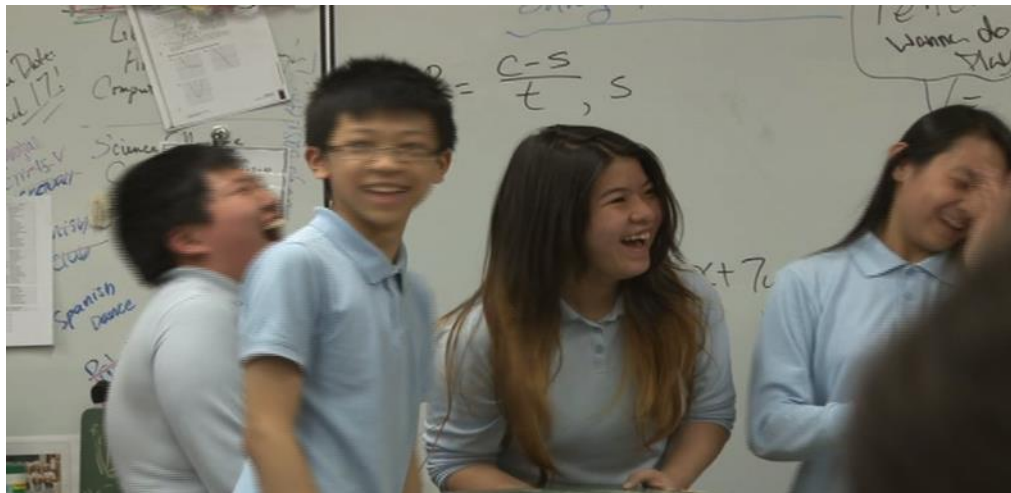- David Gorsky
- Jonathan Margolin

In a CryptoClub Program, middle-grade students use math to make and break secret codes.
Fits well in afterschool, where kids can work at their own pace.

In some activities students move around actively

Treasure Hunt

Relay Race

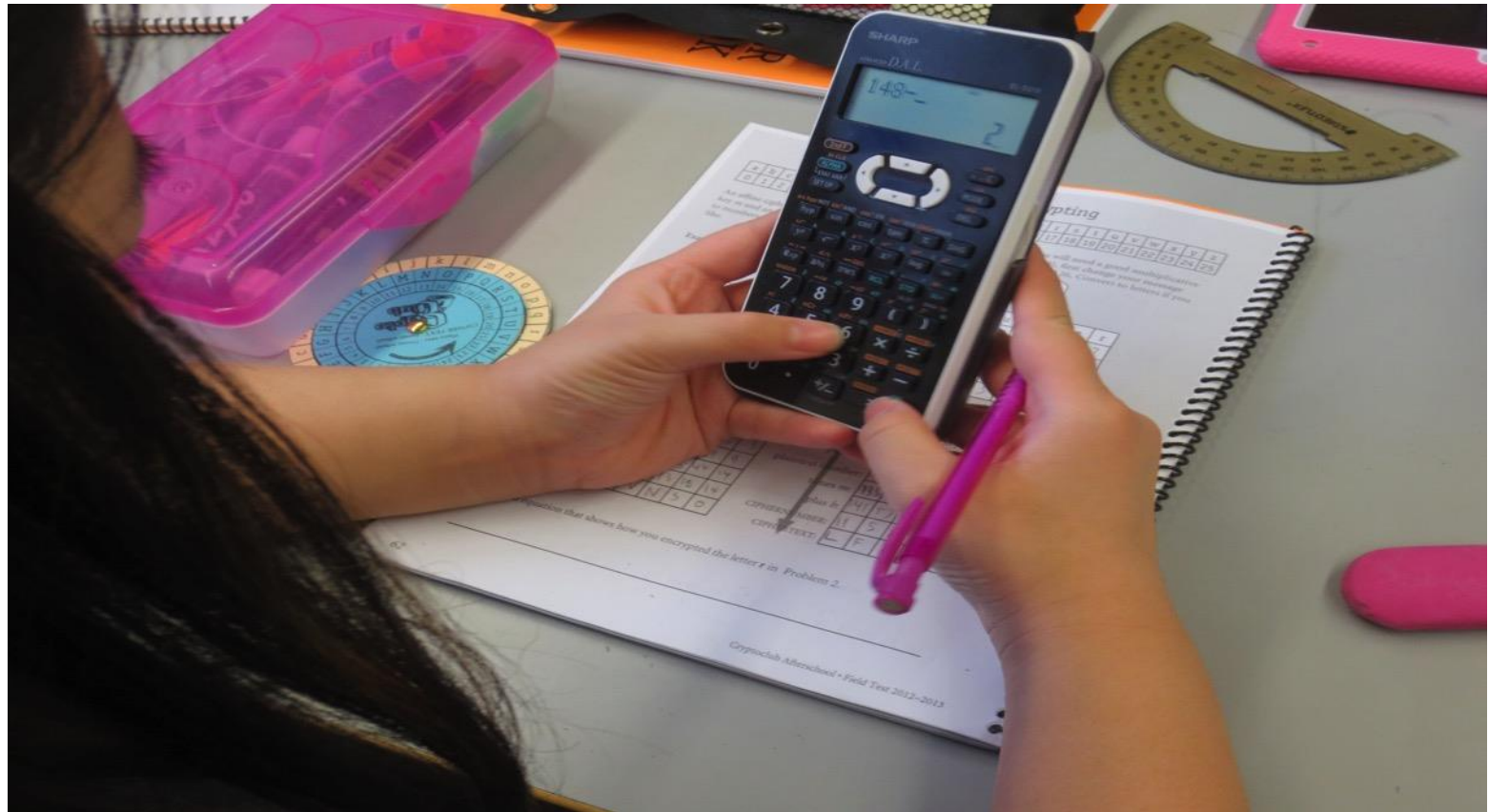In other activities they sit more quietly and think about patterns that might help break a code.

Online Activities: CryptoClub.org

Opportunities to apply and learn cryptography in a playful way

We use secret codes are a hook for learning and applying mathematics

Mathematics in Ciphers

- Caesar and Additive
  - Addition, subtraction, negative numbers
- Substitution
  - Data collection, decimals, percentages
- Vigenère
  - Factorization, common factors

- Multiplicative and Affine
  - Inverses
  - Division with remainder (modular arithmetic)
  - solving linear equations

- Public Key (RSA)
  - primes, exponents

Problem Solving

Connections: History and Language Arts

Implementation

- Field test in 30 national sites 2012, including Young People's Project in Cambridge, MA
- 250 educators trained. 3000 students have participated

But……

The clubs didn't seem to be going as far or deep into the content as we think they could.

NSF ITEST Project

- Students make tutorials that explain their solutions.
  - Fun afterschool activity
  - Focus on deeper questions
  - Learn from each other.

- End of 3-year pilot project, 6 sites last year (4 afterschool, 2 in-school)

Sample Student-Made Video
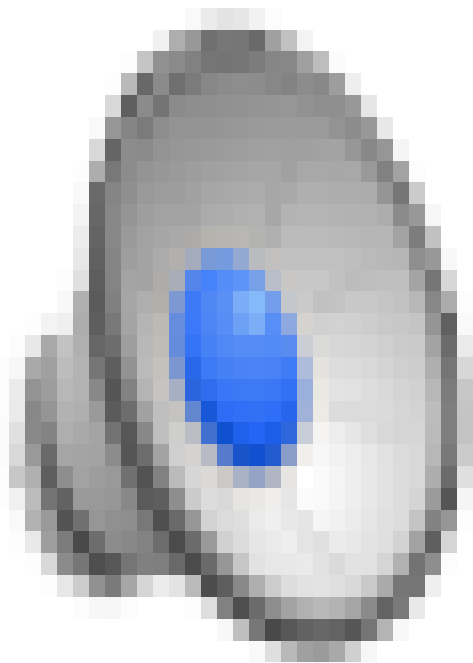
Variety of Production Methods

- iPads using software to capture their work
- Smartboard
- Graphic tablet and stylus
- Camera (can use ipad, laptop, or cell phone as camera)
- Screen capture of website activities

Evaluation

- Goal was to provide formative data to support development of program
- Did not assess student impacts—Would be difficult in afterschool setting
- teacher interviews, student focus groups,
   student surveys, skills test
- Review of tutorials made by students

Data from student survey:

To what extent do you agree with the following statements?	N	Strongly Disagree	Disagree	Agree	Strongly Agree
I enjoyed creating video tutorials about cryptography.	67	6.0%	26.9%	47.8%	19.4%
It was fun to teach others about how to solve ciphers.	66	10.6%	27.3%	48.5%	13.6%
I have used what I learned in CryptoClub to make videos in other classes.	67	20.90%	49.25%	25.37%	4.48%

Note. Rows may not add to 100% due to rounding.

What impact did the CryptoClub program have on:	N	No Impact	Small Impact	Medium Impact	Big Impact
Your interest in cryptography	66	6.1%	25.8%	53.0%	15.2%
Your interest in learning the math skills you will need	64	18.8%	15.6%	48.4%	17.2%

Students reported their enjoyment was related to:

- teaching others through the video
- the chance to be independent
- the opportunity to do something different during school.

Findings from 6 Teacher Interviews:

- Overall, leaders were pleased with the implementation of the video tutorial component at their sites

- Four said students enjoyed the opportunity to show their creativity with the videos, but said students could become frustrated with the editing

- Three reported that the video tutorials deepened students' understanding of cryptography because they have to think through the steps

Evaluators' ratings of videos created:

- Higher scores in the domain related to math and cryptography concepts.

- Lower in domain associated with ability to teach these concepts

Challenges:

- Finding a quiet place to work

- Need better editing software

- Lacked examples of good videos

- Inconsistent attendence in afterschool

Our Next Steps

Video Tutorial Project (NSF-ITEST)

- Annual Video Tutorial contest, open to all

Broad Implementation (new 5-year NSF-AISL)

- Partnering with National Girls Collaborative Project to develop 20 PD sites around country
- Summer workshops for teachers
- Digital cryptography badges

More about CryptoClub

Website: CryptoClub.org

   Follow links on teacher page to project website

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