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An examination of the factors correlating with course failure in a high school computer science course

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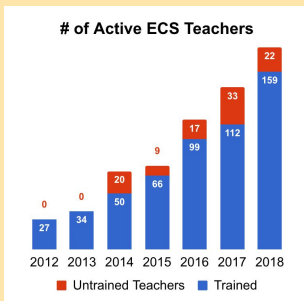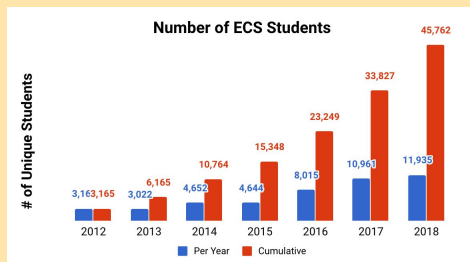# An examination of the factors correlating with course failure in a high school computer science course

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Growth of ECS in CPS

Number of ECS Students

(Per Year / Cumulative)

2012: 3,163 / 165
2013: 3,022 / 6,165
2014: 4,652 / 10,764
2015: 4,644 / 15,348
2016: 8,015 / 23,249
2017: 10,961 / 33,827
2018: 11,935 / 45,762

# of Active ECS Teachers

(Untrained Teachers / Trained)

2012: 0 / 27
2013: 0 / 34
2014: 20 / 50
2015: 9 / 66
2016: 17 / 99
2017: 33 / 112
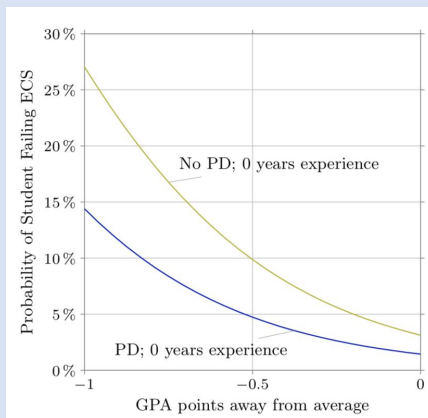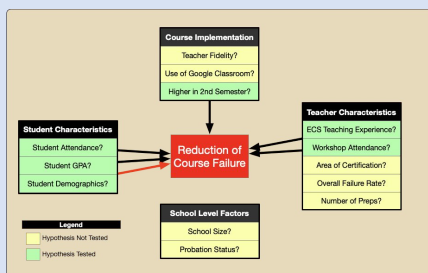2018: 22 / 159

Foundations

ECS is the primary course that students have been using to fulfill the graduation requirement in CPS. The ECS curriculum is composed of activities that are designed to engage students in CS inquiry around meaningful projects. The pedagogy of ECS is structured around three interwoven strands: *equity, inquiry,* and *CS concepts*. The ECS professional development program is designed to prepare teachers to implement these inquiry-based activities while also guiding teachers in building a classroom culture that is culturally responsive and adapting lessons to the backgrounds and interests of the students.

Course Units
Human Computer Interaction
Problem Solving
Web Design
Introduction to Programming
Computing and Data Analysis
Robotics

Collaborative Problem Solving

Course Implementation
- Teacher Fidelity?
- Use of Google Classroom?
- Higher in 2nd Semester?

Student Characteristics
- Student Attendance?
- Student GPA?
- Student Demographics?

Teacher Characteristics
- ECS Teaching Experience?
- Workshop Attendance?
- Area of Certification?
- Overall Failure Rate?
- Number of Preps?

Reduction of Course Failure

School Level Factors
- School Size?
- Probation Status?

Legend
- Hypothesis Not Tested
- Hypothesis Tested

Probability of Student Failing ECS vs GPA points away from average

No PD; 0 years experience

PD; 0 years experience

Assessing CAFÉCS

Erin Henrick

Building Trust and Cultivating Partner Relations
- Collaborative decision-making is a hallmark of CAFÉCS ethos and meetings
- Team members value diverse expertise of the group to inform research design

Conducting Research to Inform Action
- CAFÉCS members share a common goal: to support CPS to bring CS to all students
- Weekly and monthly meetings provide a space for problem-solving and brainstorming
- Data sharing MOU
- CAFÉCS whole team meetings offer learning opportunities:
  - Problem solving and brainstorming
  - Discussions to build common understandings towards shared goals, vision, purpose
  - Sharing research findings

Supporting the Practice Partner in Achieving Its Goals
- CAFÉCS arms CPS staff with relevant research that guides implementation

Assessing Research-Practice Partnerships
Five Dimensions of Effectiveness

Example of CAFÉCS Impact

Results inform CPS communication strategies
- Sharing information with principals
- Increased workshop attendance

Results inform CAFÉCS research agenda
- Secured NSF EAGER Grant to address credit recovery through hybrid course

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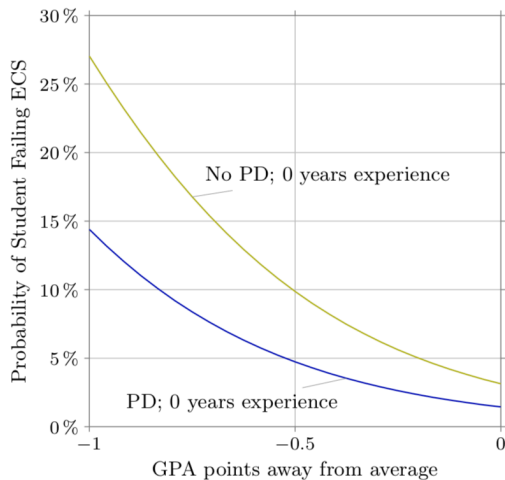Table 2: Distribution of the total number of times a teacher taught ECS

Number of Times	ECS Teachers
1	49%
2	23%
3	14%
4 or more	14%

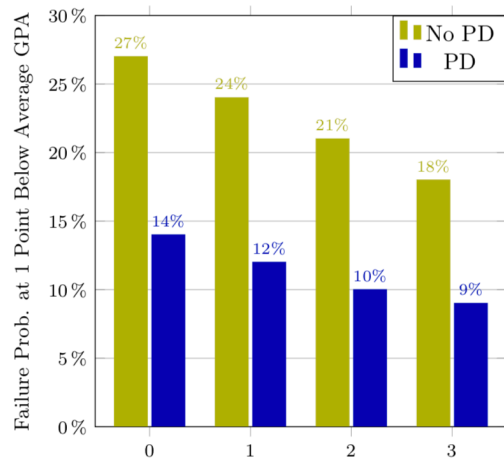Table 3: Demographic characteristics of ECS students relative to the general district population

Demographic Information	ECS Students	District Students
%Female	44%	—
%Caucasian	9%	8%
%African-American	37%	43%
%Hispanic	47%	43%
%Asian	5%	3%
%Free or reduced lunch	87%	85%
%Special education	15%	15%
%English language learner	8%	6%
%Freshman	59%	25%
%Sophomore	24%	27%
%Junior	6%	25%
%Senior	11%	22%
Attendance rate	89%	87%
Failure rate	11%	—
Cummulative GPA	2.5	—

Table 5: HLM Model results for probability of failure in ECS, by student, course, and teacher characteristics.

Characteristic	Coefficient	Standard Error	t-ratio	p-value
Average	−3.43	0.29	$t(167)=-11.50$	$p<0.001$
Student Characteristics				
Cummulative GPA	−2.44	0.07	$t(17{,}037)=-35.07$	$p<0.001$
Rate of Attendance	−4.46	0.31	$t(17{,}037)=-14.52$	$p<0.001$
Freshman	−0.41	0.11	$t(17{,}037)=-3.76$	$p<0.001$
Female	−0.30	0.08	$t(17{,}037)=-3.88$	$p<0.001$
Hispanic	0.28	0.13	$t(17{,}037)=2.18$	$p=0.029$
African-American	0.15	0.15	$t(17{,}037)=0.98$	$p=0.329$
Special Education	0.26	0.09	$t(17{,}037)=2.89$	$p=0.004$
Free and Reduced Lunch	0.10	0.13	$t(17{,}037)=0.78$	$p=0.434$
ELL	0.28	0.12	$t(17{,}037)=-2.32$	$p=0.020$
Course Characteristics				
Years of Prior ECS Teaching	−0.18	0.09	$t(129)=-2.01$	$p=0.046$
Teacher Characteristics				
Attended PD	−0.79	0.29	$t(167)=-2.74$	$p=0.007$

(a)

(b)