### This is Not a Game

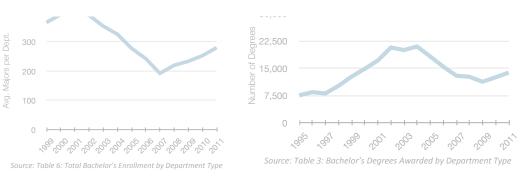
# Early Observations on Using Alternate Reality Games for Teaching Security Concepts to First-Year Undergraduates

Tanya Flushman
Cal Poly, San Luis Obispo

Mark Gondree
Naval Postgraduate School

Zachary N J Peterson Cal Poly, San Luis Obispo

**USENIX CSET 2015** 

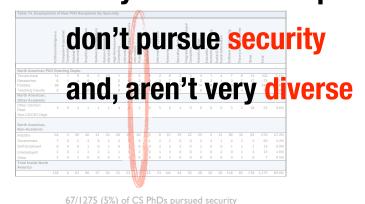


## security education

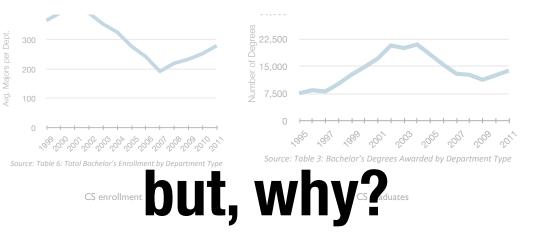
The Future Workforce -- The High School Pipeline:

AP Mathematics and Science Exams 1997-2009

few students pursuing CS in high school or college many leave the discipline after the first year

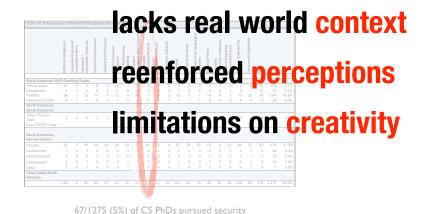


26:		Female		1,623	Female		11.7%		Female
1,41		Total Known Gender		6,591	Total Known Gender	-		9,040	Total Known Gender
4:		Gender Unknown		20	Gender Unknown			246	Gender Unknown
1,456		Grand Total		6,611	Grand Total			9,286	Grand Total
				: = a-					
-	-	Nonresident Alien	56.7%	3,332	Nonresident Alien				
634	_			12	Amer Indian or Alaska		7.0%	524	Nonresident Alien
	ive	Which mount of sugar-turns	U.270	12	Native			30	Amer Indian or Alaska
17	T	Asian	12.8%	753	Asian				Native
16		Black or African-American	1.6%	96	Black or African-American			1,115	Asian
		Native Hawaiian/Pac			Native Hawaiian/Pac			274	Black or African-American
		Islander	0.3%	19	Island		0.3%	22	Native Hawaiian/Pac
465		White	26.1%	1533	White		66.9%	5026	Islander
		Multiracial, not Hispanic	0.1%	1333	Multiracial, not Hispanic		1.4%	104	Multiracial, not Hispanic
2		Hispanic, any race		8				409	Hispanic, any race
	tv	Total Residency & Ethnicity	2.0%	119	Hispanic, any race				Total Residency & Ethnicity
1,31		Known		5,872	Total Residency &			7,513	Known
4	νn	Resident, ethnicity unknown		-	Ethnicity Known			741	Resident, ethnicity unknown
96	-	Residency unknown		320	Resident, ethnicity			1032	Residency unknown
	_	Grand Total			Residency unknown			9,286	Grand Total
1,456		Grand Total		419					
				6,611	Grand Total				



### causes are generally unknown

### **shortcomings** in first-year experience:



300,000		Calculus Biology
250,000		Statistics
200,000 150,000		Physics Environmental Computer Scien
150,000		-
100,000		
50,000		
0	197 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009	

The Future Workforce -- The High School Pipeline:

AP Mathematics and Science Exams 1997-2009

					The second second		
7,983	88.3%	Male	4,968	75.4%	Male	1,154	81.6%
1,057	11.7%	Female	1,623	24.6%	Female	261	18.4%
9,040		Total Known Gender	6,591		Total Known Gender	1,415	
246		Gender Unknown	20		Gender Unknown	41	
9,286		Grand Total	6,611		Grand Total	1,456	
		Nonresident Alien	3,332	56.7%	Nonresident Alien	C24	48.1%
524		Amer Indian or Alaska	12			534	0.2%
39	0.5%		750	42.00/		171	13.0%
1.115	14.8%		-				1.2%
274	3.6%		96	1.6%		10	1.270
22	0.3%		19	0.3%	Islander	4	0.3%
5026	CC 00/		1533	26.1%	White	465	35.3%
104	1.4%		2333	_	Multiracial, not Hispanic	3	0.2%
409	5.4%		110		Hispanic, any race	22	1.7%
7,513		Total Residency &	5,872	2.070	Total Residency & Ethnicity Known	1,317	
					Resident, ethnicity unknown	43	
		unknown	320		Residency unknown	96	
3,200		Residency unknown	419		Grand Total	1,456	
		Grand Total	6,611				
	1,057 9,040 246 9,286 524 39 1,115 274 22 5026 104 409	1,057 11.7% 9,040 246 9,286 524 7,094 39 0.5% 11.115 14.8% 22 0.3% 5026 66.9% 104 1.4% 409 5.4% 7,513 741 1032	1,057 11.776 Female 9,040 Total Known Gender 246 Sender Unknown 9,286 Grand Total  Norresident Alien Amer Indian or Alaska Native Asian 1.115 14.8% Black or African-American 22 0.3% Native Hawaiian/Pac 1502 66.9% White 101 1.4% Multiracial, not Hispanic, any race 7,513 Total Residency & Ethnicity Known 741 Residency Resident, ethnicity 1032 unknown Residency unknown Residency unknown Residency unknown	1,057 11.7% Female Fema	1,057 11.7% Female 1,623 24.5%  9,040 Total Known Gender 6,591  246 Sender Unknown 6  9,286 Srand Total 6,611   Nonresident Alien 3,332 56.7%  33 0,556 Anger Indian or Alaska Nutry Asian 753 12.8%  1115 14.8% Black or African-American 95 1.6%  22 0,33	Male	7,983   88.3 %   1,057   11.7%   Female   1,150   1,623   24.6 %   Female   261   1,024   1,025   1,

Improving Engineering Collaboration, ar Over the

## rethinking CS1

A Support Program for Introductory CS Courses that Improves Student Performance and Retains Students from

Women in CS: An Evaluation of Three Promising Practices many universities reinventing first-year experience

at Cal Poly:

constructivist, open-ended assignments d Deployment of a Robot Designed for

offered in a variety of "flavors"

Tom Lauwers Carnegie Mellon University tlauwers@andrew.cmu.edu

Illah Nourbakhsh Carnegie Mellon University illah@cs.cmu.edu

Emily Hamner Carnegie Mellon University etf@andrew.cmu.edu

now, in a security flavor as an alternate reality game

(CS1) course. We aim to use robotics to improve learning and retention by altering course work so that it is more

relevant to students. posed of design, pilot, and evaluation steps. We have completed the first of these cycles, the alpha cycle, and describe the robot hardware, software, and curriculum development processes as well as key evaluation results from pilots conducted at two community colleges in Fall 2007. We discuss the implications of these results and our experiences on the in-progress beta design cycle and planned pilots.

like Artbotics [6], Crickets [10], and Robot Diaries [5

In the context of steeply declining enrollments [12] a num ber of researchers are experimenting with robots to improve retention in Computer Science; notably in the first [4] and second [8] level courses. A major study of the use of Lego second [8] here courses. A major study of the use of loops of Mindstorms TM robots as educational tools at the US Air Force academy [4] found that students using the robots did not show improved learning or retention. This last study not show improved learning or resemble. This has is easy enumerated a number of weaknesses to using robots in comeverses: Lego Mindstorms Throbots are typically too storms robots are typically solutions, and so students must work

## why ARGs?

alternate reality games in the classroom, can:

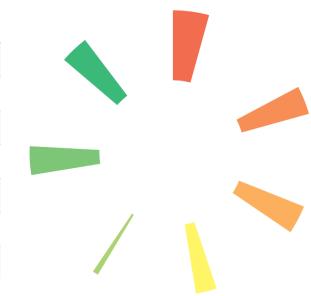
be social and inclusive
stimulate counterfactual thinking
maintain engagement
provide an authentic context for material

## our goals

- (i) increase engagement
- (ii) boost confidence
- (iii) improve awareness

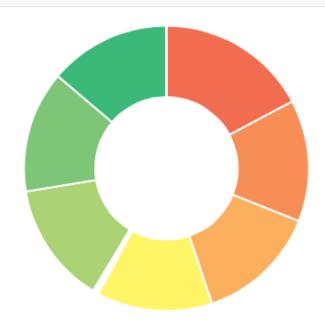
CPE123 Home Scoreboard Challenges Signed in as znjp. Logout

Team	Completed
Byte Me!	5/20
Poly Programmers	4/16
Securi-team	4/16
The League	3/16
Pretty Programmers	1/16
D-Dos	4/16
Peterson's Peppers	4/16



CPE123 Home Scoreboard Challenges Signed in as znjp. Logout

Team	Completed
Byte Me!	25/25
Hackstreet Boys	20/20
Securi-team	20/20
The League	19/20
Pretty Programmers	20/20
D-Dos	20/20
Peterson's Peppers	20/20



### ZNJP's PASSWORD VAULT

#### This is my super secure password storage center.

I was tired of insecure systems that had only ONE password protecting ALL the passwords.

In my system, you must get through all the base authentications to even GET to the per-password security. Each password is secured by a different password, but you can make it less secure than normal because it's so hard to get in.

Enter Access Code Below:

1 2 3

4 5 6

7 8 9

### ZNJP's PASSWORD VAULT

Enter Access Code Below:

1 2 3

Access Level One Confirmed

Confirmation Key =
one\_digit\_is\_super\_secure



### LEVEL THREE AUTHORIZATION

Password:

Submit

cpe123.csc.calpoly.edu/challenge/level3?code=guess

#### LEVEL FIVE AUTHORIZATION

Access Denied, Please Try Again Maintenance mode over, password bug fixed.

SHA-1 HASHES DO NOT MATCH

'943f264d7534aad8d4f5fdda2ed7e16d088f56de' != '77361fca965b3e53ff81a5d48525ca8adb8a9b87

Password: \_\_\_\_\_

Submit

### assessment

evaluated using:

reflective journals

modified computer attitude scale survey

student interviews



## early results

game play: "cloak & dagger" aspects diminished, frustration, increased engagement

group dynamics: experienced students led near-peer instruction, adoption of roles

behaviors & perceptions: actionable changes or an increased cognition and reasoning about no change

## project status

open source: scoreboard framework & story modules continuing to refine our assessment instruments similar project aimed at middle & high school students 3GSE: Games, Gaming, and Gamification in Security Education

## thanks

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