SaveUFCISE: Before, During and Ongoing

- One Crisis/Opportunity with Many Interwoven Backdrops and Narratives
  - Hindrances against organizing Engineering and CS faculty and students
  - New pressures on Higher Ed and Unions in general in right-to-work states
  - New Pressures on STEM higher education, especially the “Non-Lab” (theoretical and computational) compartments
  - Use of social media mixed with on-ground demonstrations in resisting tyrannical actions

SaveUFCISE: Before

- Hindrances to organizing Engineering Faculty and Students
- “Unions are for underperformers”
- University needs the Indirect Cost generated by Principal Investigators, i.e., managers (who also happen to teach)
- No culture of cooperation (only individualized competition), both among students and faculty
- Boss-Employee relationship between PIs and students who need the research assistantship

SaveUFCISE: Before

New Pressures on CS Higher Ed

Extreme Skills Shortages especially for CS

Push for 2-year polytechnics especially on CS (online, as cheap as possible)

Engineers (physcially based) do not understand CS (abstract, needs to be separated from the physical platforms)

Backdrop

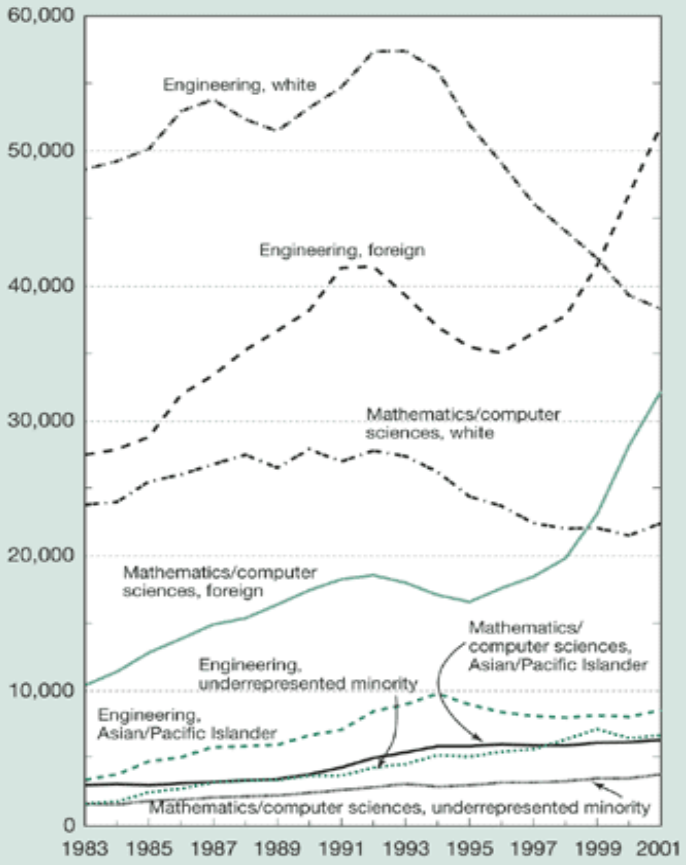
- Skills shortages
- College Completion rates
- Cost of higher education
- Peter Thiel and Pink Floyd

Backdrop: Skills shortages

- Blamed on
  - (Lack of) Education
  - (Lack of) Specialized Training
  - Corporate Squeeze

What is Diversity in STEM disciplines?

Figure 2-6
Graduate enrollment in mathematics/computer sciences and engineering, by citizenship and race/ethnicity: 1983–2001



NOTES: Foreign citizen includes temporary residents only. Race/ethnicity groups include U.S. citizens and permanent residents. Underrepresented minority includes black, Hispanic, and American Indian/Alaskan Native.

SOURCE: National Science Foundation, Division of Science Resources Statistics, WebCASPAR database system, http://caspar.nsf.gov. See appendix table 2-12.

- STEM labor is increasingly Asian
- H1 B visas in demand
- Over half of Tech Startups by Asians – employ 0.5M (*Wadhwa 2006*)

Backdrop: Skills shortages

- Blamed on
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  - Specialized Training
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Backdrop: Skills shortages

- Blamed on
  - (Lack of) Education
  - (Lack of) Specialized
  - Training
  - Corporate Squeeze
  - not hiring; want
  - skilled labor glut;
  - pay too little; H1B c ant labor

Backdrop

- Cost of higher education
  - Suggested solutions:
  - Vocational diplomas
  - Online diploma

Backdrop: Skills shortages

- Blamed on
  - Education
  - (Lack of)
  - Specialized Training
  - Corporate Squeeze

After a decade of scrimping on education funding, the nation found itself crippled by skills shortages. People fell over a lot too.

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Backdrop: Cost of higher education

- Suggested solutions:
  - Vocational diploma mill

Backdrop: Cost of higher education

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Backdrop

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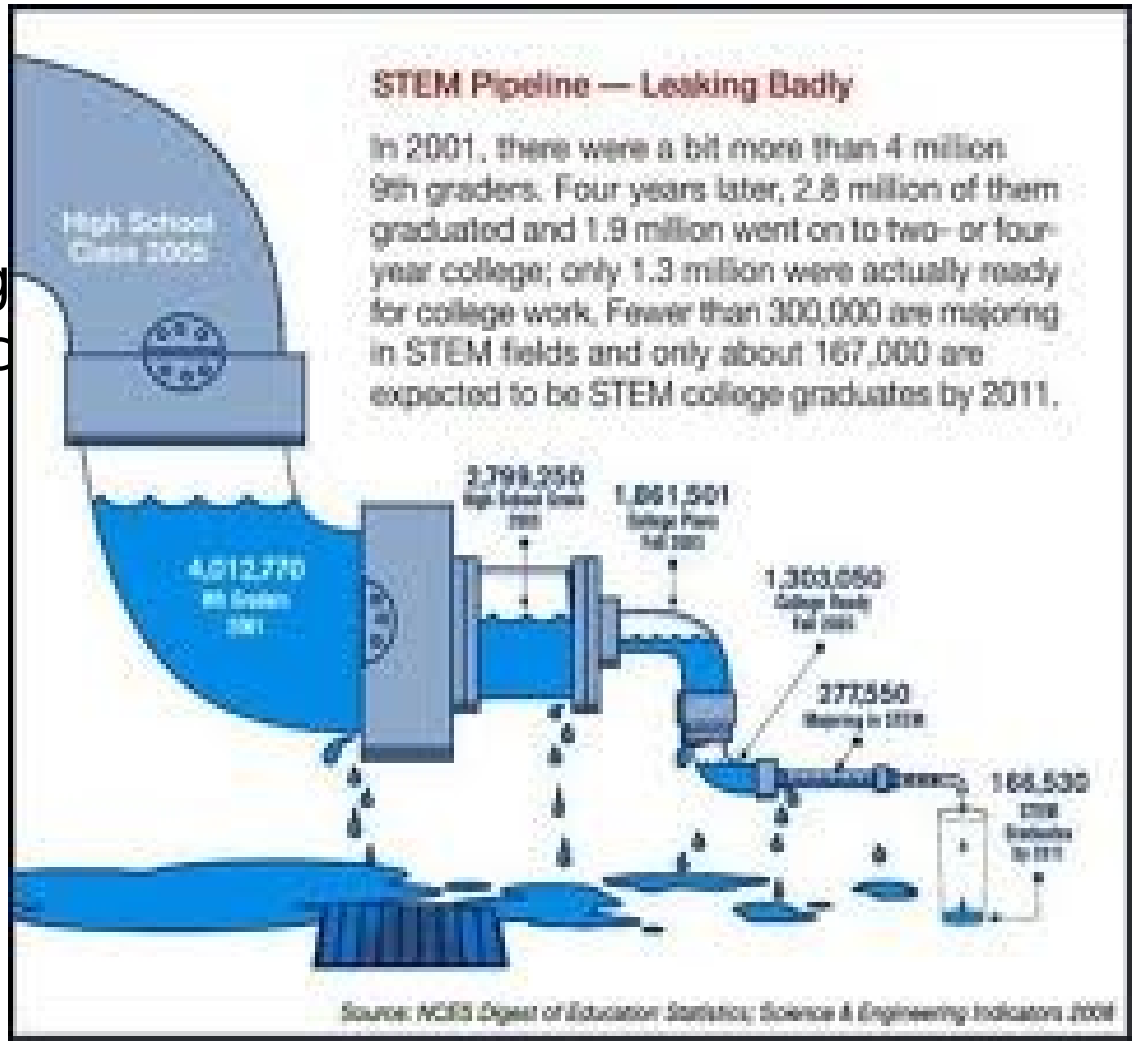
We don't need no education... Hey teacher! leave them kids alone - Pink Floyd, The Wall

I'll pay you to drop out and become a start-up entrepreneur – Peter Thiel

CSTEM Pipeline

- **C**omputer
  - **S**cience
  - **T**echnology
  - **E**ngineering
  - **M**athematic



Online Education Positives

- Animated textbook
- Exercises as Games
- Increased access to interaction with worldwide peers and experts
- Open/Crowd sourced development and improvement of a searchable database of instructional material for standardized courses of study
- Large scale student response data (in easily analyzable format) for understanding how people learn
- Flipping the classroom

Online Education Types

- Four types

- Web-based textbooks with web assignments
- MOOC (Massive Online Open Courseware)
- *Coursera, Khan Math, Udacity* :
- Noninteractive online content (audio + text/video)
- Interactive robot-graded exercises
- Peer to peer chat forum/discussion board with/without expert moderator
- MOOC with phone-in instructor help
- *Florida virtual school*
- Socratic style interactive distance lectures on chatblazer, delivered by one instructor and two helpers, to a class of 30, and 4 hand-graded project assignments.
- *Art of problem solving*

Online Education Issues

- *Without* the standard level of support in large face-to-face courses (An expert prof to run the course and one TA for every 30 or so students)
    1. What are the student/content characteristics needed to ensure quality?
    2. How are the students to be authentically evaluated and certified at a distance without a proctor?

Online Education Issues

- Answer to Question 1
  - Student: well above average resourcefulness, discipline, self-confidence to self-assess learning effectiveness without hand-holding
  - Course content: entry level, not requiring depth of conceptual understanding, course just provides some practice and experience (course not major / minor in)
- Answer to Question 2
  - Difficult, unsolved research problem