Nurturing an identity-conscious community of practice through focus on disciplinary texts, tasks, and talk

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How do we empower students to persist in STEM fields?
How do we empower faculty to embrace more active, inquiry-based, culturally responsive practices?
Our approach to change: Communities of Practice
Why community of practice?

- Modeling, engagement, guided practice
- Active, inquiry-based, social learning
- Sustained learning and sharing
“Identity conscious” community of practice

Assets-based
Appreciative inquiry

Social capital, Funds of knowledge, Tacit knowledge

Embodied experience Evolution
We know that learners need:

- To have their prior knowledge engaged
- To understand and organize knowledge in the context of a conceptual framework
- To take a metacognitive approach to their own learning.

National Academy of Sciences, Engineering and Medicine, How People Learn, 2000
“Without becoming conversant with the academic language used within and across content areas, students cannot readily engage in the type of deep learning that will enable them to go beyond the memorization of facts” (143).

---National Academy of Sciences, Engineering and Medicine, *How People Learn II*, 2018
3.2 Difficult Problems in Coding Theory

Let us recall that a linear binary code $C$ of length $n$ and dimension $k$, is a vector subspace of of dimension $k$ of $GF(2)^n$. The weight of an element $x$ of $GF(2)^n$ is the number of non zero coordinates of $x$. The minimum distance of a linear code is the minimum weight of any non-zero vector of the code. For any code one can define the scalar product $x.y = \sum_{i=1}^{n} x_i y_i$. A generator matrix $G$ of a code is a generator basis of a code, the dual of code $C$ is defined by $C_{\text{perp}} = \{ y \in GF(2)^n | x.y = 0, \forall x \in C \}$. Usually a generator matrix of the dual of a code $C$ is denoted by $H$. Remark that $c \in C \iff Hc^t = 0$. For $x \in GF(2)^n$, the value $Hx^t$ is called the syndrome of $x$ for $H$.

The usual hard problem considered in coding theory is the following Syndrome Decoding (SD) problem, proven NP-complete in [3] in 1978.

**Problem:** (SD) Syndrome decoding of a random code:

**Instance:** A $n-k \times n$ random matrix $H$ over $GF(2)$, a non null target vector $y \in GF(2)^{n-k}$ and an integer $\omega$.

**Question:** Is there $x \in GF(2)^n$ of weight $\leq \omega$, such that $Hx^t = y^t$ ?

This problem was used by Stern for his protocol [24], but in fact a few years later a variation on this problem called the Minimum Distance (MD) problem was also proven NP-complete in [27]:

**Problem:** (MD) Minimum Distance:

**Instance:** A binary $n-k \times n$ matrix $H$ and an integer $\omega > 0$.

**Question:** Is there a non zero $x \in GF(2)^n$ of weight $\leq \omega$, such that $Hx^t = 0$ ?

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[Buffalo Bill ‘s]

By E. E. Cummings

Buffalo Bill’s

defunct

who used to

ride a watersmooth-silver

stallion

and break onetwothreefourfive pigeonsjustlikethat

Jesus

he was a handsome man

and what i want to know is

how do you like your blue-eyed boy

Mister Death
The Reading Apprenticeship Framework
Advice from *How People Learn, II*

- Set norms; Surface and value all voices (141)
- Identify and leverage “individual strengths, experiences, and goals” (137)
- Focus on PROCESS (141)
- Model thinking, reading, problem solving, and engage students in guided practice (145)
- Engage with multiple disciplinary texts (147)
- Design collaborative, relevant and inquiry based instruction
Talking about disciplinary texts is a high leverage strategy to bridge what faculty know and what students know.
Focus on literacy to focus on equity problem solving sense of belonging decoding the discipline
Project Goals

Create an “alive” community of practice for STEM instructors as literacy champions

Improve retention and success for CSU and CCC students

Transform the status quo in CSU and CCC STEM teaching to active learning rather than lecture
Learning Community Details

10 Months Learning Communities (Year 1 or Year 2)
Integrated into your teaching

Monthly Canvas assignments and Zoom Workshops
Building knowledge, building relationships, “Making it Real” by designing and trying text-based activities
Project Highlights

Participation:
- 180 unique faculty
- 20 CSUs
- 43 CCCs
- 37 STEM disciplines

Project Website:
- 685 unique users
- 1841 sessions
- 3957 page views
- 34 states, 5 countries

Evaluation:
- Professional knowledge
- Intercultural awareness
- Feasibility
- Value creation
Participating CCCs and CSUs:

- American River College
- Antelope Valley College
- Bakersfield College
- Butte College
- Cabrillo College
- Chabot College
- Chaffey College
- College of the Canyons
- College of the Desert
- College of the Redwoods
- Compton College
- Crafton Hills College
- Cypress College
- DeAnza College
- El Camino College
- Fresno City College
- Glendale Community College
- Irwindale Valley College
- Long Beach City College
- LA Mission College
- LA Trade Tech College
- Madera Community College
- Merced College
- Merritt College
- Mira Costa College
- Mission College
- Monterey Peninsula College
- Mokelumne Hill College
- Mt San Jacinto College
- Orange Coast College
- Orange College
- Palomar College
- Pasadena City College
- Riverside Community College
- Sacramento City College
- San Diego Mesa College
- Santa Barbara City College
- Santa Monica College
- Shasta College
- Sierra College
- Skyline College
- Ventura College
- West LA College

STEM LEARNING COMMUNITY

Bakersfield
Channel Islands
Chico
Dominquez Hills
East Bay
Fresno
Fullerton
Humboldt
Long Beach
Los Angeles
Maritime Academy
Monterey Bay
Northridge
Pomona
Sacramento
San Bernardino
San Diego
San Francisco
San Jose
San Luis Obispo
San Marcos
Sonoma
Evaluation

Wenger, et al
Value Creation Framework

- Identify types of value or benefit to a community
- Identify conditions and activities that support creation of that value
- Identify data that measure whether the value was created
- Identify the strategic effect of the value for individuals and institutions
Findings

Immediate Value
Robust sense of community

Potential and Realized Value
Changes in practice and course design

Transformative Value
Transformed understanding of role of text
We welcome your feedback and questions!

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For a Google doc with slides and resources, scan the QR code.