We Were Never Taught to Teach: Knowing Better and Doing Better

Shirley M. Malcom, Ph.D.
Born and Raised in Birmingham, Alabama
A Long Line of Educators – Me Too?

Aunt Bessie
A Long Line of Educators – Me Too?
Lewis School
Context Matters – Civil Rights and Sputnik
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Mr. Smoot and Miss Goddard

- All eyes on Sputnik: Using the “race to space” as motivation
- Encouraging our interests in science
- Emphasizing excellence
- Supporting us via peer learning
- Helping us to become independent learners
Carver High School: No Prom, Martial Law and the Children’s March

University of Washington: Culture Shock
UW: Avoiding a Quick Exit

- Social/cultural adjustment: being “the only”
- Where are the young women in science classes?
- Where are the Black students ANYWHERE?
- Ignoring my counselor’s lower expectations
- Ignoring my English teacher’s surprise that I could write
- Ignoring other students’ comments
- Almost failing chemistry lab (there is nothing wrong with seeking help)
Finding a Place

- Alan Kohn

https://www.biology.washington.edu/people/profile/alan-j-kohn

- Bob Paine

Graduate School(s)

- Catching up on coursework
- Learning how to think like a scientist
- Coming late to actual research
- Learning how to be a researcher
- Serving as a teaching assistant, BUT never learning about teaching
Observing Faculty/Becoming Faculty
(Prof. Doe’s Seminar vs His class)

- Teaching as we were taught
- Becoming dissatisfied with teaching as we were taught
- Where is the “help desk?”
- Going back to my roots
Reflecting on Prior Experience

- Mother’s 3rd grade class in which EVERY child learned to read
- Mr. Smoot’s drawing on contemporary events to inspire as well as to teach us how to reflect on the problem solving that preceded going into space
- Miss Goddard’s focus on collaboration and helping us learn how to learn
- The “Methods of Teaching” class at UCLA that I took as part of my own “Plan B”—teaching high school
Learner Centered Teaching

- Learners do not come as blank slates (not just prior courses but also prior life experiences)
- Do not assume what learners do or don’t know (just because they had it doesn’t mean they understand it)
- There is often the need for explicit skill instruction
- There are advantages to collaborative learning in a diverse environment
- The more real, the better!
Teaching and Learning/ Diversity and Inclusion

- *Talking About Leaving: Why Undergraduates Leave the Sciences* (Elaine Seymour and Nancy M. Hewitt, 1997); TALR (coming soon)
- The role of introductory courses
- How the courses are experienced by learners
- The disproportionate impact on women and members of minority groups that under-participate in STEM
Theories, Practice and Policies

- Discussion of quality of teaching in STEM elevated to the highest policy levels
- How to address a “local” problem
- AAU Undergraduate STEM Initiative (2011)
“Traditional teaching methods have trained many STEM professionals, including most of the current STEM workforce. But a large and growing body of research indicates that STEM education can be substantially improved through a diversification of teaching methods.”

From Engage to Excel
Barriers and Opportunities: How We Can Stop Losing STEM-Interested Students
Understanding Why People Leave

- Policies may not align
- Students may get lost in the maze of requirements
- Financial barriers

“Environments may not be welcoming.....the teaching may be uninspired”
Humpty Dumpty, physics major
Humpty Dumpty, leaving physics
Is it attrition?
Or failure to retain?
Sometimes Humpty Dumpty is pushed!
A Mystery Solved?

“When I first heard that Humpty Dumpty fell off the wall, I immediately wondered: Did he fall or was he pushed?”

P.D. James

I was not the only one who suspected “foul play!”
Teaching

- PCAST Report: *Engage to Excel*

“The reasons students give for abandoning STEM majors point to the retention strategies that are needed. For example, high-performing students frequently cite uninspiring introductory courses as a factor in their choice to switch majors.... “
The Class Environment

- PCAST Report: *Engage to Excel*

  “Moreover, many students, and particularly members of groups underrepresented in STEM fields, cite an unwelcoming atmosphere from faculty in STEM courses as a reason for their departure.”
Knowing Better?
Anatomy of STEM teaching in North American universities

Lecture is prominent, but practices vary

A large body of evidence demonstrates that strategies that promote student engagement and collaborative learning, such as project-based learning, are more effective than traditional lecture-based instruction. However, many educational institutions have not fully adopted these strategies, which can result in a lack of engagement and student disengagement. This methology allows for a more interactive and student-centered approach, which can lead to improved student outcomes and enhanced learning experiences. This approach involves a combination of lecture-based instruction, group work, and individual projects, which can help students develop critical thinking and problem-solving skills. The effectiveness of this approach has been supported by multiple studies, including those conducted at universities across North America. The key to success in implementing this approach is to ensure that faculty are well-prepared and supported, and that the institutional culture is conducive to innovation and change.
Characterizing STEM Instructional Practices

- Observation of over 2000 classes taught by over 500 STEM faculty members across 25 institutions
- Used Classroom Observation Protocol for Undergraduate STEM
- Three broad instructional profiles: didactic; interactive; student centered
- Didactic practices prevalent throughout undergraduate courses despite evidence of limited impact; such practices are prevalent independent of class size or classroom layouts
The Culture of STEM

- **Barriers and Opportunities**

  “....shared patterns of norms, behaviors and values of STEM disciplines that manifest themselves in the way courses and taught and the classroom is experienced.”
The Culture of STEM

- Impact on many students’ interest, self-concept, sense of connectedness and persistence
- How students connect their personal identities to their academic domains and view themselves as learners in those domains subsequently affecting efforts and achievement
- Faculty setting the academic tone (what they convey—what they allow to be conveyed in classroom peer interactions)
- Focus on “natural ability”
- “The extent to which professionals in STEM fields believe that innate talent is required for success is a strong predictor of representation of women and blacks in that field” (Leslie, et.al)
- Bias in classroom interactions: small numbers and assumptions about “fit”
The Culture of STEM
Field-Specific Ability Beliefs (Women)

http://internal.psychology.illinois.edu/~acimpian/reprints/LeslieCimpianMeyerFreeland_2015_GenderGaps.pdf
Field-Specific Ability Beliefs (African Americans)

https://internal.psychology.illinois.edu/~acimpian/reprints/LeslieCimpianMeyerFreeland_2015_GenderGaps.pdf
Gender stereotypes about intellectual ability emerge early and influence children’s interests

Lisa HanL,1 Joseph Jan Lai2,L,1 Andrei Galimzyanov1

Common stereotypes associate high-level intellectual ability (brilliance, genius, etc.) with more men than women. These stereotypes undermine women’s pursuit of many prestigious careers, that is, to women are unrepresented in fields where men’s numbers, chemistry, physics, and engineering, exceed that of women’s. In fact, the number of men who are identified with scholarly achievement is similar to the number of women, even girls, who are not likely to be in careers that require these abilities. (see Table 1) When young girls interpret these data, they come to believe that they are not likely to succeed in these careers. These beliefs are then reinforced by other stereotypes, such as the idea that women are not leaders or innovators. As a result, girls are not encouraged to pursue these fields, even though they have the ability to do so. The result is a self-fulfilling prophecy, in which the lack of women in fields of science is compounded by the belief that women are not likely to succeed in these fields. This, in turn, leads to a further reduction in the number of women in these fields, and so on. The cycle continues until it becomes impossible for women to break into these fields, even though they have the ability to do so. The result is a self-fulfilling prophecy, in which the lack of women in fields of science is compounded by the belief that women are not likely to succeed in these fields. This, in turn, leads to a further reduction in the number of women in these fields, and so on. The cycle continues until it becomes impossible for women to break into these fields, even though they have the ability to do so. The result is a self-fulfilling prophecy, in which the lack of women in fields of science is compounded by the belief that women are not likely to succeed in these fields. This, in turn, leads to a further reduction in the number of women in these fields, and so on. The cycle continues until it becomes impossible for women to break into these fields, even though they have the ability to do so.
The Culture of STEM

- Ways of knowing and discourse in STEM
- Lower expectations of faculty and peers
- Difficulty in finding community and cultivating a sense of belonging
- Undervaluing women and minorities in STEM
- Stereotypes and stereotype threat
- Deficit thinking (what students do not bring rather than what they do)
Understanding the Forces that Shape STEM: A Case Study
Understanding the Forces that Shape STEM

What Happened To Women In Computer Science?

% Of Women Majors, By Field

- Medical School
- Law School
- Physical Sciences
- Computer science

Source: National Science Foundation, American Bar Association, American Association of Medical Colleges
Credit: Que cherrytail/AAAS
Understanding the Forces that Shape STEM

- What happened between 1972 – 1975?
- What drove the increases after 1975?
- Why did computer science go down after 1984?
- Why has computer science not recovered nationally?
- Why are women’s presence in computer science much higher than average in some institutions and not in others?
“For he would rather have at his bed's head
Some twenty books, all bound in black and red,
Of Aristotle and his philosophy
Than rich robes, fiddle, or gay psaltery.
Yet, and for all he was philosopher,
He had but little gold within his coffer;
But all that he might borrow from a friend
On books and learning he would swiftly spend,
And then he'd pray right busily for the souls
Of those who gave him wherewithal for schools.
Of study took he utmost care and heed.
Not one word spoke he more than was his need;
And that was said in fullest reverence
And short and quick and full of high good sense.
Pregnant of moral virtue was his speech;
And gladly would he learn and gladly teach.”

--Geoffrey Chaucer