CU BOULDER Teach

Science•Engineering•Math

Opportunities for STEM faculty to support our joint mission of improving K-20 STEM Education

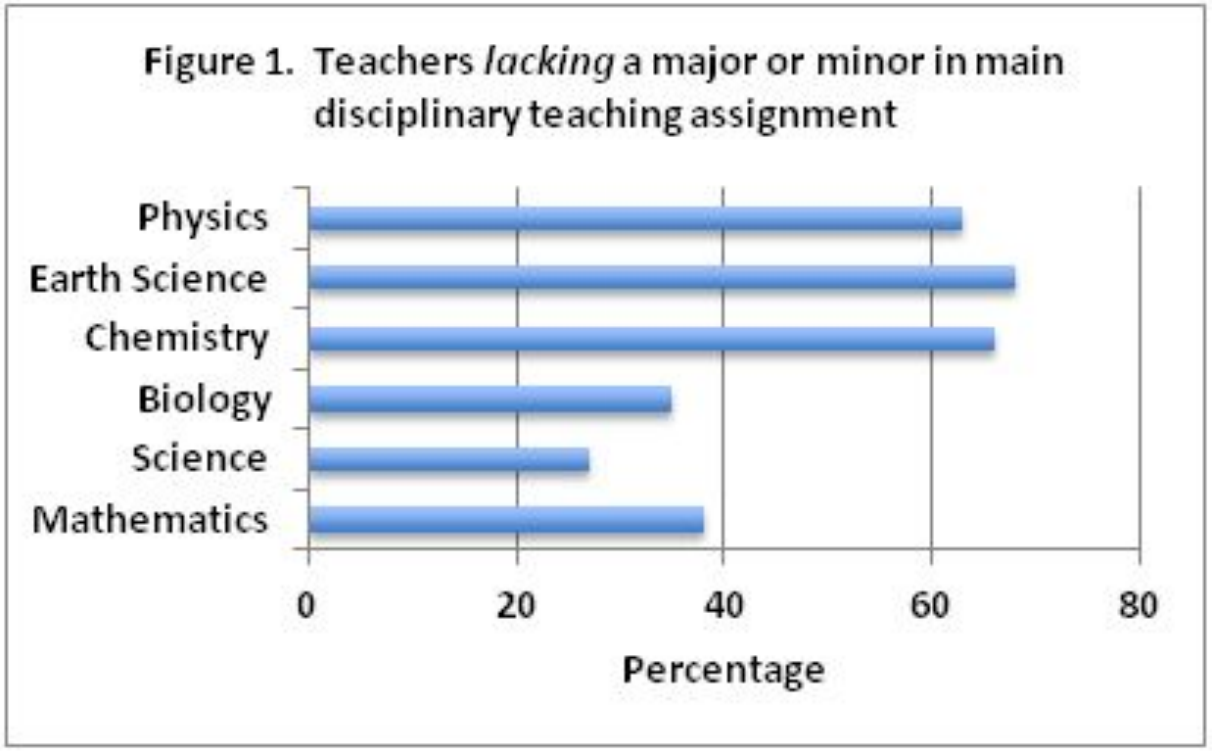
Presentation to DBER

November 25, 2018

Julie Andrew and Jeff Writer

Persistent shortage of qualified secondary mathematics and science teachers

- **Critical need** for great STEM teachers for **ALL** students
- Impacts the **quality of CU's incoming Freshman class** and consequently CU's ability to successfully address societal challenges
- Colorado Department of Education and Colorado Department of Higher Education have called for Colorado universities to **develop strategies** to address the STEM teacher shortage



Marder M., Brown, C.R., and Plisch, M. (2017). Recruiting teachers in high-needs STEM fields: A Survey of Current Majors and Recent STEM Graduates, American Physical Society Panel on Public Affairs (January, 2017), http://www.aps.org/policy/reports/popa-reports/stemteachers.cfm

Production of licensed secondary math and science teachers in Colorado (Colorado Department of Education)

University	Rank	Total # (last 3 yrs)	2016	2015	2014
Colorado State University	1	97	35	38	24
University of Northern Colorado	2	96	24	35	37
University of Colorado (CU Teach)	3	85	35	29	23
Metro State	4	68	23	20	25
UC Denver	5	50	12	19	19
University of Denver	6	47	12	21	14
UC Colorado Springs	7	45	10	19	16
total		488	151	181	158

CU Teach Coursework and Student Persistence toward Math/Science Teaching License

CU Teach Course progression	% of students persisting
Step 1 → Step 2 (recruiting courses)	~40% (~50% for STEM majors)
Step 2 → Classroom Interactions (enrolled in licensure program)	~70%
Classroom Interactions → Student Teaching	~100%

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Introducing the STEM Education Certificate
(New this semester!)

- ***Supporting students*** - improve STEM majors ability to communicate STEM concepts and work effectively with others in a variety of collaborative environments.
- ***Service opportunities*** for STEM majors teaching STEM in local schools and communities.
- ***Recruiting*** STEM majors to CU Teach (as well as facilitate opportunities to get their secondary math/sci teaching license)
- **Appears on students transcripts**

Student Eligibility: Degree-seeking students majoring in Math, Science, or Engineering (through Engineering Plus) are eligible to enroll in the STEM Education Certificate. Students must have an overall GPA of 2.75, and maintain at least a 3.0 GPA in the STEM Education Certificate courses.

Courses included in the STEM Education Certificate are also applicable to the curriculum for obtaining licensure in secondary math or science; thus, students who decide to pursue a STEM secondary teaching license will be able to do so in a timely manner (~2 additional semesters + student teaching).

1. Coursework

Course Title	Course Number	Credits
Step 1: Inquiry Approaches to Teaching *Or* Becoming a Learning Assistant	EDUC 2020 EDUC 4610	1 2
Step 2: Inquiry-Based Lesson Design	EDUC 2030	2
Knowing and Learning in Mathematics and Science	EDUC 4050	3
(any two) Teaching and Learning Biology Teaching and Learning Chemistry Teaching and Learning Earth Systems Teaching and Learning Physics Teaching Design Teaching K-12 Mathematics: Geometry and Measurement Teaching K-12 Mathematics: Probability and Statistics Perspectives on Mathematics	 EDUC/MCDB 4811 EDUC 4822 EDUC 4833 EDUC/PHYS 4460 GEEN 4400 EDUC 5830 EDUC 5840 EDUC 5317	 3 3 3 3 3 3 3 3
Total		**12-13 credits**

2. Additional 15 hours of STEM outreach in informal settings

(Science Discovery, Fiske Planetarium, WOW! Children's Museum, Science Fair judging, etc.)

How Did you Find Out about CU Teach?
(~3000 student responses from 2009-2018)

Friend / CU Teach student	18%
CU Teach Website	13%
Advisor (major, dept)	13%
Professor / Instructor	13%
Advisor, SOE	8%
Lecture Visits	6%
Flyer (on campus)	5%
Parent or Sibling	4%
Letter from CU Teach	5%
LA Program	4%
Other	8%

CU Teach Students by Major (2015-2018)

Step 1 (n= 342)			**Step 2 (n= 185)**	
Integrative Physiology	19%		Math	27%
Engineering	17%		EBio	15%
Math	16%		Engineering	12%
EBio	14%		Integrative Physiology	8%
Physics	7%		MCD Biology	7%
MCD Biology	6%		Physics	7%
Astronomy	5%		Astronomy	6%
Chemistry	5%		Chemistry	5%
Biochemistry	4%		Biochemistry	3%
Environmental Studies	3%		Neuroscience	3%
Geology	3%		Geology	2%
Neuroscience	2%		Environmental Studies	2%
			ATOC	1%

Opportunities for STEM faculty

- ***Support the CU Teach program***
  - Recruiting STEM majors into secondary teaching licensure programs
  - Increasing visibility/status of CU Teach to STEM majors on campus
  - Training pre-service secondary STEM teachers and maintaining content-rigor of the program

  - Collaborating to provide Professional Development for inservice teachers (as service to Mentor teachers)

Opportunities for STEM faculty

- ***Participate as content experts*** in negotiations with districts
  - In development of curricula aligned with **NGSS** that are both relevant to today's issues in STEM fields and able to prepare students for CU Boulder introductory courses
  - In aligning with industry partners to help teachers establish occupational experience

- ***Support the CU Teach mentor teachers*** and Colorado Teachers in obtaining a Master's Degree in a Science Content, Mathematics or Engineering.

Opportunities for STEM faculty

If you would like to be more involved in the CU Teach program, please let Jeff or Julie know.

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Any other Suggestions?

Questions for Discussion

- The goals of CU Teach are congruent with the Academic Futures report - are there opportunities to leverage this opportunity?

- How can we support the CU Teach program in
  - Recruiting STEM majors into secondary teaching
  - Training secondary STEM teachers
  - Providing Professional Development for inservice teachers (as service to Mentor teachers)
  - Supporting Districts in development of Pathways for high school students to enter STEM programs at CU Boulder
  - In development of curricula aligned with NGSS

The Future of CU Boulder as a Public University:

Embracing the Core Mission of Furthering the Public Good

Report of the Academic Futures Committee

Released October 1, 2018

Questions for Discussion

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- How do we support the CU Teach mentor teachers and Colorado Teachers in obtaining a Master's Degree in a Science Content, Mathematics or Engineering?

Extra Slides

Note: I saved some original slides, before I edited them, so if we want to revert to them, they are below.

Notes from Valerie to Julie are at the end

STEM-endorsed high school diploma

The endorsement extends Colorado's recently revised high school graduation requirements, enabling students to prove their proficiency in STEM-related subjects and concepts, rather than simply getting credit for time spent in their seat. Students obtain the STEM endorsement through four requirements, through their local school district:

1. Complete the school's high school graduation requirements at a high level of proficiency
2. Complete a coherent sequence of at least four STEM courses
3. Achieve a minimum score on one of several specified mathematics assessments, and
4. Successfully complete a final capstone project that demonstrates a high proficiency level of mastery

Notes to Julie

In questions for discussion, what does this mean, "Training secondary STEM teachers"? Does it mean STEM (as in integrated STEM) or as in preparing math, biology, chemistry, physics, earth science, teachers?)

Response from Julie: Great question. I think I mean both integration as needed for NGSS and for content specific areas, especially if we are thinking about supporting the dual enrollment ideas.

https://www.cde.state.co.us/cdeprof/cteworksheets/stem

NOTES on Slide number 3 (Questions): I changed some of the "support districts" language because A&S and CEAS will see this as a SoE thing and not their business. I feel that we need to help them understand the undergraduate impact and the fact that SoE does not have the content chops to do the work. Thus, I reworded slightly.

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CTE STEM endorsement for teachers

Schools receive additional state funding if they have teachers with the CTE STEM endorsement

1. Content Knowledge (post-secondary coursework, industry license, PLACE/PRAXIS scores)
2. Occupational Experience (non-teaching experience in content area)