Collaborative Digital Bioscience Career Awareness Curriculum and Teacher Professional Development

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Our overarching goal

High School Students → Increase performance, engagement and career awareness by Bringing authentic life-relevant science into the classroom

How?
By partnering teachers with scientists
Bridging the bioscience STEM gap: challenges

• Building career awareness, interest and goal setting

• Building competencies - teamwork and critical thinking in the context of biosciences
  – Formulating questions
  – Designing experiments
  – Interpreting data
Integrating career awareness and experimental design by collaborative digital case study learning

1) Create teams and assign roles of actual bioscience careers

- Animal Care Technician
- Toxicologist
- Research Associate
- Research Scientist
- Clinical Nurse
Integrating career awareness and experimental design by collaborative digital case study learning

2) Each team then participates in an HIV drug design project that spans:

- Select a Drug Compound for HIV
- Test Efficacy & Toxicity
- Phase 1 Clinical Trial
- Phase 2 & 3 Clinical Trials
Joint development and PD by collaborative curriculum design

Scientists
Novel content knowledge, evidence-based reasoning, authentic scientific practice “know-how”

Teachers
Pedagogical content knowledge, assessments, direct relationship with students

Technology development
Curriculum Development

Increased Student Outcomes expectations, Self Efficacy
STEM Career Interest and Goals
Joint development and PD by collaborative curriculum design

Year

1

6 Co-design teacher partners: Boston (4), Brookline, Medford MA
Design and Pilot at Tufts
Student led interviews
Reflect and re-design

2

Classroom Pilots
Reflect and re-design
Training teacher cohort 2 at Tufts
Student led interviews

3

Classroom Pilots
Design New Case Topics
Training teacher cohort 3 at Tufts
Student led interviews
PD by Modeling for Fidelity

- **Best practices for teacher professional development:**
  - Extended duration
  - Contextualized rich in content
  - Sustained mentor interactions

- **Modeling for Fidelity** supports and training:
  - Downloadable materials
  - In person trainings
  - Online trainings
  - Real-time mentoring
## How do we measure success?

| High School Students | 1. Performance:  
| | ▪ Content mastery, problem solving  
| 2. Engagement  
| | ▪ Attitudes, self efficacy – (Health Literacy)  
| 3. Career awareness  
| | ▪ Efficacy, outcomes expectations  
| Teachers | 1. Content knowledge  
| | ▪ Content mastery, problem solving  
| 2. Career awareness  
| | ▪ Efficacy, outcomes expectations towards students  
| 3. Confidence  
| | ▪ Teaching efficacy  
| 4. Change in classroom practices  
| | ▪ Self-reporting of practices, observation  
| Scientists | 1. Knowledge of teaching  
| | ▪ Inquiry based pedagogical approaches  
| | ▪ Curriculum design and evaluation  
| 2. Training of Scientist Educators |
Questions and thoughts?

http://sites.tufts.edu/greatdiseases/

Acknowledgments

CTSE Center for Translational Science Education
Providing practical solutions to bring benchtop and bedside to desktop

Tufts Collaborates!

Richard Lounsbery
Supporting students in designing experiments and interpreting data: **QMDC**

<table>
<thead>
<tr>
<th>Question</th>
<th>Experimental Design</th>
<th>Communication</th>
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<tbody>
<tr>
<td>What question do you want to address?</td>
<td></td>
<td>What question does the experiment address?</td>
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<tr>
<td>Method</td>
<td>What method(s) can you use?</td>
<td>What method(s) are used?</td>
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<tr>
<td>Data</td>
<td>Predict what your data will look like.</td>
<td>Describe the data.</td>
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<tr>
<td>Conclusion</td>
<td>What conclusions can you draw from your predictions?</td>
<td>What conclusions can you draw from the data?</td>
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