Designing Curriculum for Pre-Service Teachers and Teacher Leaders

Jeremy Zelkowski, Ph.D.
Paige K. Evans, Ed.D.
Jacqueline Ekeoba, M.A.
Ramona Mateer, M.Ed.

This material is based upon work supported by the National Science Foundation (NSF) under Grant Numbers DUE-2041597 and DUE-1548986. Any opinions, findings, interpretations, conclusions or recommendations expressed in this material are those of its authors and do not represent the views of the AAAS Board of Directors, the Council of AAAS, AAAS’ membership or the National Science Foundation.
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_Please note: The discussion break-out groups following the presentations will NOT be recorded._
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About ARISE

- AAAS ARISE network collects and shares information about topics and strategies for research and evidence-based approaches to:
  - prepare STEM teachers for the future
  - assess efficacy in STEM teaching
  - understand effective ways to recruit, train, and retain a quality STEM teacher workforce

https://aaas-arise.org  AAAS ARISE Network  @NoyceProgram
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AAAS – Designing Curriculum for Teacher Leaders (Noyce Track 3)

Jeremy Zelkowski, Associate Professor, Secondary Math Education, PI-NSF Noyce Track 3 #1849948
Introduction / Presentation Goal

• Alabama’s Practitioner Leaders for Underserved Schools in Mathematics
  • A-PLUS in Math, NSF Noyce Track-3 MTF, #1849948, 2019-2025
  • Project Website: https://aplusinmath.ua.edu/

• The Team
  • Co-PI, Jim Gleason, UA College of A&S, Mathematics, (2005 – present)
  • Co-PI, Bill Bergeron, UA College of Ed, Educ Leadership, (2020 – present)*
  • Co-PI, Martha Makowski, UA College of A&S, Mathematics, (2017 – present)
  • Doctoral GA, Cha Gooden, UA College of Ed, Secondary Math, (2021 – present)

• Planning Curriculum for an NSF Noyce Track-3 Competitive Proposal
  • Planning project goals within teacher population for which you will recruit
  • Meeting with teachers & stakeholders
  • Sequencing Curriculum to meet project goals, considering
    • Data Collection Plans
    • Incentivizing long term benefits (teachers & schools)
Project Goals  (6-9 months before submission)

• Develop your team’s goals of your MTF Track-3
• Include as part of introduction to project
  • Intro, Intellectual Merit, & Broader Impacts
• One-pager for teacher & stakeholder meetings
  • A-PLUS in Math website home page https://aplusinmath.ua.edu/
  • It will change (for the better) as proposal takes shape
• Be prepared to change
  • You can do what teachers can’t fully engage
  • Understand how the University←→School will/can operate
  • Teacher/Admin buy-in
    • The planning / proposal preparation phase
Teachers & Stakeholders (1-2 months total time)

- Have meetings present/discuss goals with teachers
  - Multiple opportunities to hear from different teachers
  - Know your potential participant population well
- Present your team’s five-year MTF timeline (visual)
  - Connecting goals and curricular activities (over 5 years)
  - Ask, “what is not reasonable”, “what would you change”
  - Survey attendees (good data helps you write the proposal)
- Finalize what works for goals & teachers
  - Meet with partner district leaders for buy-in
  - Sell the teachers’ input & district long-term benefits
  - Get their letters!
Writing the Project Curriculum (2-3 months)

• MTFs are/should/have:
  • Strong applicants to meet NSF Noyce Objectives
  • Future teacher leaders (if not already, those w/potential)

• Questions we considered:
  • What experiences (e.g. graduate coursework, PD, workshops) will be designed to advance knowledge/ability of teachers?
  • What sequential aspects are critical to the goals?
    • Consider teacher backgrounds from your meetings...
      • Strong early career teacher vs the 20-year veteran?
      • Middle school vs high school teachers?
      • Teacher preparation pathway, local PDs, non-traditional
      • Long-term paybacks beyond the grant period
Writing the Project Curriculum (2-3 months)

• What did we do?
  • Option for stellar teachers to earn an MA if they don’t have
  • Integrate that staggered with post-MA teachers
    • One year MA only group, join year later MA degree holding teachers

• Three phases of our curriculum
  1. Setting the foundation (18 graduate hours, 4 semesters)
    • MKT – Two content focused courses
    • PCK, TPK, TPACK – three education courses
    • Leadership – one course on PLCs/PLGs and leadership
  2. National Boards pursuit (two years w/ leadership by teachers)
  3. Leading as a teacher (two years)
    • Finishing post-MA degree (optional)
Writing the Project Curriculum (2-3 months)

- Data collection within the curriculum
  - What data can produce intellectual merit?
  - What data will allow on-going analyses?
  - What data do you want, but would be hard to get?
    - Evaluator partnership to leverage
    - Blinding the teachers for PIs
    - Use of doc students

- How can you make this seamless but within curriculum?
  - Design within all curricular aspects (courses, PDs, leadership)
  - Explicitly state MTF requirements up front in contractuals
  - External Evaluator is a team member!
Incentivizing Long Term Participation Benefits

• Teachers
  • Beyond the MTF stipend/salary supplement
    • Advanced degree / graduate credit → pay scale
    • National boards → pay scale
  • Leading professional development
  • Leading textbook adoption in school/district
  • Leading curricular decisions
  • Hosting university teacher candidates
  • Instructional Leadership after the MTF time period

• Schools
  • Administration relying on teacher leaders
  • MTFs working with other teachers
  • Changing/improving school culture
  • Future leadership (LEA/school) by MTFs
  • Keep teachers in the field longer
Additional Proposal Tips about Curriculum

• Talk with other Track-3 recipients
• Talk with former/current MTFs
• Learn from others!!! Helps to eliminate proposal holes that reviewers will see through since reviewers tend to be previously or currently funded PIs/Co-PIs and maybe an MTF
• Build a team of experts & partners beyond PIs
  • Contracted personnel
  • Advisory panel
teachHOUSTON AND NSF NOYCE GRANT INITIATIVES

Paige Evans, Ed.D., University of Houston
Jacqueline Ekeoba, M.A., University of Houston
Ramona Mateer, M.Ed., University of Houston

Funded by NSF Noyce Grants: 1240083; 1557309; 1759454; 1950036
Presentation

- Overview of teachHOUSTON
- Grant Initiatives
- Culturally Responsive Pedagogy
- Classroom Management
teachHOUSTON
Established in 2007

Combat STEM teacher shortage
First of 46 replication sites of the UTeach Program
Collaboration: NSM + COE + Local School Districts (10+)

STEM Majors + Education Minor in 4 Years
Research based approaches to teaching STEM
Classroom teaching experiences + student teaching

Informal Learning Experiences
Solution: A new generation of highly qualified STEM teachers
Highly Qualified STEM Teachers

Ignite enthusiasm and confidence in STEM

Better prepared students majoring in STEM at UH and other universities

More students completing STEM degrees
Two pathways for STEM teacher production

Traditional Program
- Undergraduate STEM Majors
- Teacher Certification for capstone or minor
- No time or cost added to degree

Accelerated Pathway (2019)
- Career Changers or nearing graduation
- 9 months
- Teacher Certification only
teachHOUSTON is Experienced Based

Future STEM teachers work *SIDE-BY-SIDE* with mentor teachers in actual classrooms.

Future STEM teachers work with *ACTUAL STUDENTS* to hone their teaching styles and skills.

Faculty have public school teaching experience.
415 Certified STEM Teachers
teachHOUSTON Diversity

Creating a Diverse Teacher Workforce: tH vs. Texas vs. U.S.

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<th>Race</th>
<th>teachHOUSTON</th>
<th>Texas</th>
<th>U.S.</th>
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<tr>
<td>Other</td>
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<td>2%</td>
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U.S. vs. Texas vs. teachHOUSTON
Making an Impact

- 90% Graduates enter teaching
- 95% Teaching in the greater Houston area
- 80% Teaching in high need schools
- 88% Teaching beyond 5 years
- 290k Total number of students taught
Recruitment, Preparation and Retention of STEM Students as High School Teachers: 2012 – 2017

Physics Inquiry Course: PHYS 4342

Noyce Summer Internship

Internship Institute

Camp Counselors

Teaching Assistants

DUE 1240083: Noyce Track 1
Learning through Informal and Formal Experiences (UH-LIFE): 2017-2021

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<tr>
<td>Provide paid summer internships</td>
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<td>Noyce Professional Development and Mentoring Institute</td>
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<td>Biology and Chemistry Inquiry Courses</td>
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<td>82 STEM Teachers</td>
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<table>
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</table>

DUE 1557309: Noyce Track 1
Leading through Equity and Advocacy Development (UH-LEAD): 2018 - 2024

- 29 Master Teacher Fellows
- Master's Degree: STEM Education
- 10,000 Salary Supplements
- Professional Development and Leadership: CRP
- Policy Advocacy
University of Houston – Advancing Cultural and Computational Engagement in STEM Scholars (UH-ACCESS): 2020 - 2025

Targets Physics, Computer Science, and Technology Majors

Computer Science Inquiry Course

Teacher Interest Group

DUE 1950036: Track 1
Culturally Responsive Pedagogy: Our Journey

- Attended 2017 Western Regional Noyce Conference and Summit
- Began infusing CRP across program courses and informal STEM initiatives.
- Implemented a Noyce Track 3 Grant in 2018 to present.
- Continued development of CRP across our undergraduate and alternative certification pathways.
Culturally Responsive STEM Teaching

Teach
Teach in a way students can understand & see relevant connections between rigorous STEM concepts and their shared cultural and life experiences

Involve
Involve students as active participants in reasoning and sense-making through student-centered stories, vocabulary, and examples.

Explore
Explore issues that are important to and impact students and their communities.

Summary of 3 tenets of culturally responsive pedagogy (Ladson-Billings, 1995)
Programmatic Considerations

**Goal:** CRP awareness
Sample Activity: What is culture?

**Goal:** CRP application
Sample Activity: The tale of Noras; Lesson Plan Analysis

**Goal:** CRP synthesis
Sample Activity: Video and Lesson Plan Analysis; Implement in PBL

**Goal:** CRP Implementation
Sample Activity: Lesson Plan Integration and Reflection; Observe CRP lessons

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**Intro to STEM Teaching**

**Classroom Interactions**

**Multiple Teaching Strategies**

**Student Teaching**

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**Bloom’s Taxonomy**

- Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create
CRP across the classes – 2 Semester Path

**Semester 1**
- Intro to STEM Teaching (CUIN 2300)
- Knowing and Learning (CUIN 3350)
- Classroom Interactions (CUIN 3351)
- Multiple Teaching Strategies (CUIN 4350)

**Semester 2**
- Classroom Management (CUIN 4375)
- Student Teaching (EDUC 4314)
- Student Teaching Seminar (EDUC 4315)
Notable CRP-focused Activities

- Daily Check in activities
- Perception activity
- Deficit vs. Resilience Thinking activity
- 8 Nouns Web
- Tales of Two Noras (Hogan, 2008)
- Global collaborative project (iEARN)
- Community Conversations (book study)
- Model Inquiry-based social justice lesson (Gutstein & Peterson, 2005)
- Design culturally responsive ADI or PBL modules using global collaboration
Community-building: 8 Nouns
Community-building: 8 Nouns
Culturally Responsive Mathematics Teaching Rubric

CRMT Rubric (Aguirre, & del Rosario Zavala, 2013)
- Shared by Cal State University, Fullerton
- Focuses on six key categories
- May be modified to use for science lesson plans

The authors suggest three strategies for use:
1. Analyze a videotaped lesson using the tool.
2. Analyze a lesson plan using the tool.
3. Have a peer use the tool to give feedback on an observed lesson.
## Field Experiences
- Focus is inquiry lesson development and implementation
- Classroom management is embedded in field-based courses
- Theory taught in Knowing and Learning

## Student Teaching
- Internalized in student teaching
- Repeated requests for classroom management support in seminar
- University Supervisors
  - Concerns surfaced
  - Mentor teacher vs research-based practices

## teachHOUSTON graduates
- Provided many resources
- Primary post graduate request
- Classroom management assistance
teachHOUSTON Response –
Culturally Responsive Classroom Management

- Concurrently with student teaching
- Identify culturally responsive practice, personal classroom management philosophies and relate them to the classroom environment
- Explore the role of brain development in student behaviors
- Study multiple foundations of classroom management
- Identify and practice current management strategies to support inquiry in the STEM Classroom
- Develop a culturally responsive classroom management plan
Culturally Responsive Classroom Management

- Learning theory and cognitive approach
- Teacher commitment
- Prior learning mindset shift
  - Develop awareness
  - Explore teacher/student learning partnerships
- Understand information processing
- Create an intellectual and safe learning environment
- Helps students build intellectual capacity for self-management to rely on in future classes.
Analyzing student behaviors and teacher roles
Students exploring community...

What is a community?

A community is a place where people can feel connected by similar interests, and can make trustworthy friends for life. Everyone benefits from participating in a community.

A group that shares common characteristics or interests.

Can someone feel discomfort in a community?

A community is a place to unwind, and be yourself.

A place of comfort perhaps as well.

What kind of characteristics besides location could people have in common?

Gender expression, language, etc

Ethnicities, Locational, and Socioeconomic

A group of people with similar interest.

A group of different people who come together to talk about or practice on thing they all have in common.

Example?

2 or more people could also be a community.

Possibly centered around a shared dislike of something.

Oh shared dislike is a really good one too!
Samples

Students exploring community...

What is the value of a community?

A community is a group of people that have a common connection, ideas, and knowledge.

Gives people the chance to express themselves

Common arena for discourse based on a shared background

Approval

environment where you can be able to put aside your differences

The ability to learn from your community members.

Sometimes someone won't know there are others who have gone through similar experiences until they are part of the community

Opportunity to develop your values

Comes together and works toward a common goal, while bettering everyone in the process.

Physically, Virtually, or Spiritually

Maybe emotionally or spiritually as well?

Everyone could be at the same level, or experience level

create a safe environment

The value of a community comes from the cooperation and growth within the group.

Common experiences/back stories

Gain knowledge from others.

Give knowledge to others.

Have a place that is common and to turn to.

The value of a community is important because it provides opportunity for people to learn from each other.
I didn't believe it until I tried it.
Now I do it every class and my toughest student is coming around.

I am still nervous but now I know it is a journey and I have to be the driver.

When we started, the only rule I needed was for my students to bring their best self.
I now know that is not possible if I don't help them find who that self is.

It is amazing how just changing the rules to norms and stating them in a positive way made my students take notice.

Every student should take this course. I use my journal all the time!

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Impact on the Future

- teachHOUSTON STEM Interactive 2020 - YouTube
Acknowledgments


Breakout Rooms

1. Navigate to the bottom of your screen and click “Breakout Rooms” button
2. Self-select into your breakout group based on your topic interest (you can switch back and forth between groups as well)

*Note: If you do not see the Breakout Rooms button, please post in the chat or unmute yourself to ask to be placed in a breakout room.*
Breakout Room Recap

Jeremy Zelkowski
Paige Evans, Jacqueline Ekeoba, & Ramona Mateer
THANK YOU!

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