The Faculty Role in Creating Inclusive STEM Environments

Susan Keenan, Ph.D.
Marisa Chrysochoou, Ph.D.

This material is based upon work supported by the National Science Foundation (NSF) under Grant No. DUE-1937267. 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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https://aaas-iuse.org

*Please note: The discussion break-out groups following the presentations will NOT be recorded.*
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Blog Authors and Workshop Presenters

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The Faculty Role in Creating Inclusive STEM Environments

Susan Keenan, Ph.D.
Marisa Chrysochoou, Ph.D.
Faculty Role in Creating Inclusive STEM Environments

Inclusive Excellence Teacher-Scholar Workshop (IETSW)

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Citation for Materials

Recent Publications
Keenan SM, Novak, JD, Bergstrom, CM, Reinsvold, LA and Englert, K. STEM Faculty Professional Development for Creating Learning Environments that Promote Inclusive Excellence in Handbook of STEM Faculty Development Editors: Linder S, Lee, C and High, KA. IAP Publishing (2022)


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The IETS Program: Participants and Outcomes

- 68% Identified as Women
- 15% Identified as Faculty of Color
- 35% First-Generation
- 90% Program Completion

To what extent do you have the confidence to fully participate in activities that advance equity?

- To no extent: 24%
- To a small extent: 24%
- To some extent: 6%
- To a moderate extent: 6%
- To a great extent: 47%

To what extent do you continue to modify your classroom practices based on what you learn about equity-minded practices?

- To no extent: 0%
- To a small extent: 18%
- To some extent: 6%
- To a moderate extent: 29%
- To a great extent: 47%
The Inclusive Excellence Teacher Scholar Program

Development model designed to help faculty build inclusive classrooms

- Academic spaces are not neutral—race, gender, class, able-bodied, etc.
- Faculty change—knowledge, perspectives, and practices
- Student asset (not deficit) perspective
- Equity minded lens

Goal of equity and justice

Source: "Addressing Imbalance," by Tony Kok for the 2019 Design: InTech Report 05

https://cue.usc.edu/files/2020/01/Equity-Minded-Gears.png
The IETS Program: Structure

- Academic year-long program
- Cohort-based (10 faculty)
- Faculty receive a stipend for participating

**Quote**

"the (University) culture has changed, and I think it is time that I shift my thinking too. This course has helped me change that perspective but in a good way. Instead of feeling like I have to change because I am being forced to change, I feel like I am changing my thoughts and perspective because I am understanding it better (IETSW participant)"
Who We Are
- Equity, Equity-Mindedness, and Equity Language
- Race & Racism
- Bias & Microaggressions
- Privilege & Dominant (Exclusionary) Narratives
- Ally as a Verb
- Faculty Growth-Mindset

How We Teach
- Equity-Minded Syllabus
- Equitable Classroom Participation and Interactions
- Culture and Conflict
- Culturally Responsive Teaching
- Grace, Respect, High Expectations, Caring For
- Collaborative Work

What We Teach
- Choice
- Relevancy of Content
- Deconstructing Whiteness
- Social Justice
- Departmental Change

How We Assess
- Equitable Assessment Strategies
- Disaggregated Data and Identifying Disparities
- Zero-Based Grading
- Metacognition

The IETS Program: The Four Pillars
The IETS Program: Basic Structure of a Workshop

<table>
<thead>
<tr>
<th>Type</th>
<th>Pre-Workshop</th>
<th>Session Structure</th>
<th>Post-Session</th>
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<tr>
<td>Type 1</td>
<td></td>
<td>Initial Engagement</td>
<td>Extend Engagement; Implementation</td>
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<tr>
<td>Type 2</td>
<td></td>
<td>Initial Engagement</td>
<td>Extend Engagement</td>
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<tr>
<td>Type 3</td>
<td></td>
<td>Initial Engagement and Implementation</td>
<td>Continue Implementation</td>
</tr>
</tbody>
</table>

Type One Session
Racial Oppression

Type Two Session
Grace in Teaching and Reframing

Type Three Session
Equity Syllabus and Demystifying
Our Work Today: Investigating Session Types

Racial Oppression

Session Type 1: The initial engagement happens in the session

- A Black student in a math class engaged in excessive nodding to show that they understood the lesson (even when they do not):

  ‘[In my mathematics class] sometimes it seems like they are watching me to make sure I get it or that I belong. It’s like they are waiting for me to [#$%] up. So I just nod no matter what. ...Then at an inconspicuous hour I go find the TA [teaching assistant]’


• A Black student in a math class engaged in excessive nodding to show that they understood the lesson (even when they do not):

‘[In my mathematics class] sometimes it seems like they are watching me to make sure I get it or that I belong. It’s like they are waiting for me to [#$%] up. So I just nod no matter what. …Then at an inconspicuous hour I go find the TA [teaching assistant]’

McGee & Martin (2011).

• Write 1-2 sentences that interpret an aspect of this scenario from the Black student’s point of view.

• Identify and write 1 or 2 sentences about 1 or 2 burdens this situation places on Black students that White students don’t generally experience.
Investigating a Type 1 Session

- Interpret the Black student’s experience from their point of view
  - The student interprets being watched as a negative and as a sign that they need to prove they belong.
  - The student nods at the teacher because it seems they do not want to provide a wrong answer because they are concerned that the teacher will take a wrong answer as evidence that they don’t belong.

- Identify the burdens this places on black students that white students don’t generally experience
  - Black students may hide what they don’t understand and not ask questions as part of proving that they belong. White students can ask questions without fear that their intelligence will be questioned or that they will be seen as not belonging in the class.
  - Black students have to seek help from sources other than their instructor, which places an additional burden on them to find those resources, and it likely takes more time to get that support. White students are free to seek support from their instructors, both in and out of class.
The *Whys and Hows* of this Session

- Racial oppression is hard for most White people to see.
- Using student voices is powerful
- Learning together makes the topic more accessible

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**Session specifics**
- Analyze a series of vignettes using specific prompts
- Provide sample responses after participants have time to reflect and discuss

**Facilitation guide**
- Session facilitation details
- Recommended background prep with references
- Explanations of some facilitation choices
Continued Engagement

- **Teaching experiments vs reflection activity**

- Participants report with written or verbal recorded response to prompts

- Purpose: formalize the practice

Participants chose three articles from a list of options related to privilege and oppression. They were asked to be reflective about the content they chose and reflexive about their reactions and responses. For both, we provide a list of prompts to consider.
I think idea that even behaviors that we see as positive indicators could be problematic.

I feel as though I am getting better at seeing things from a different perspective and questioning my own initial thoughts.

That there may not be answers to problematic interactions but acknowledging that they are problematic is at least a step in the right direction.

I would like more examples from some of the larger minoritized groups represented at UNC.
Citation for Materials

Recent Publications
Keenan SM, Novak, JD, Bergstrom, CM, Reinsvold, LA and Englert, K. STEM Faculty Professional Development for Creating Learning Environments that Promote Inclusive Excellence in Handbook of STEM Faculty Development Editors: Linder S, Lee, C and High, KA. IAP Publishing (2022)


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In IETS, we challenge assumptions and norms in the classroom through an equity lens. What are some ways we should challenge norms in:
• Assessment
• Classroom interactions

Share an additional example:
• Equity-minded syllabus: Demystifying
Our Work Today: Investigating Session Types

Equity-Minded Syllabus: Demystifying

Session Type 3: Initial Engagement and Implementation in the Session

Approaches to an Equity-Minded Syllabus

**Academic Success**
- Identify and Explain Jargon
- Use Structure to Demystify and Support Success

**Academic Care**
- Verbal Immediacy
- Supporting and Normalizing Struggle
- Clarifying Policies

**Connection**
- Relevance of the Curriculum
- Deconstructing the White Male Norm
Type Three Session: Initial Engagement and Implementation in Session

Step One: Introducing the Concept with Examples and Brainstorming

“All students, but especially minoritized students benefit from full disclosure of the terms of success.”

- What order is the information in? Patrioting content earlier in the document stresses its importance.
- Use graphics, color, and formatting to highlight important information and help students navigate.
- Consider adding a table of contents to help students navigate.
- How do you describe your grading policies? Can you make the information easier for the students to decipher?
- Consider providing students with an overview of what you plan to accomplish in class each day—what the topics, relevant readings, homework, etc. clearly listed.
- Could you list required materials more explicitly with how to use or get the bonus? If material is optional—why might a student choose to purchase the materials, how will they be used? Are the materials on reserve at the library? If so, what does that mean?

Step Two: Time for Reflection, Planning, and Implementation

- What opportunities are there in your syllabus to demystify and more clearly explain the how and the why?
- List one or two opportunities for change that you plan to incorporate in your syllabus revision.
- Plan the structural changes you will include in your syllabus revision.
- How will you present the syllabus to the students the next time you teach the course?
Our Work Today: Investigating Session Types

Step One: Introducing the Concept with Examples and Brainstorming

Demystifying Jargon

Office Hours
MWF: 10-10:50am; TR: 9:30 -10:30 am
2480 Ross Hall
Professor.email@unco.edu, 970 351 XXXX

Office (Student) Hours
If you have questions, I invite you to stop by my office (2480 Ross Hall) during office hours which is time I set aside specifically for your questions and concerns: Mondays (M), Wednesdays (W), and Fridays (F) from 10-10:50am and Tuesdays (T) and Thursdays (R) from 9:30 to 10:30am. You are also welcome to contact me outside of class and office hours—email me at Professor.email@unco.edu, or call me at 970 351 XXXX

What other jargon is in your syllabus? (Brainstorm in chat)
Our Work Today: Investigating Session Types

Step Two: Time for Reflection, Planning, and Implementation

Defining jargon and explaining the relevance of the terms is an important step in creating an inclusive syllabus. In your workbook, list some of the terms you heard in the discussion and highlight a few terms that you will come back to as you work to eliminate undefined jargon from your syllabus.

(~5 minutes)
The **Whys and Hows of this Session**

- The syllabus is a tool through which we can help demystify academic success for students.

- The syllabus is also the first impression students have of us and our courses.

- The approach of initial engagement and implementation enables participants to engage in content (identifying jargon or demystifying through structure) and make specific plans/adjustments while exploring their own syllabus.

- The workbook provides a structure for the session, and a roadmap for changes post session.
Participant Responses

QUOTES

That I have been thinking about my syllabus from my own lens, and not considering my students' perspectives - which goes against my pedagogical practices.

I plan to share what I learned about transforming syllabi with my colleagues. I had never thought of the "R" being a mystery to students or that they did not understand what I meant by my office hours. There were many other statements made by the facilitators that I jotted down so I can incorporate them into my classroom community.

Working to develop a more inclusive/equity minded syllabus and practices in my courses. I think we are called to make these changes to our teaching so that we really can support our students in being successful within our courses and beyond.

Using more inclusive language in syllabi, and everything else for that matter. I'm actively sharing everything from this program with my department so that we can all grow and be better people and educators.
Creating Inclusive STEM Environments for Neurodiverse Students

Acknowledgements: This material is based upon work supported by the National Science Foundation under IUSE/PFE:RED Grant No. 1920761. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Our Agenda:

1. Neurodiversity: What is it?
2. INCLUDE Project
3. Teaching and Learning
Part I: Neurodiversity: What is it?
Neurodiversity: What is it?

"A TERM COINED IN 1998 BY AUSTRALIAN SOCIOLOGIST JUDY SINGER AND POPULARIZED BY JOURNALIST HARVEY BLUME"

"A SOCIAL JUSTICE MOVEMENT THAT GREW OUT OF THE AUTISM ACTIVISM DURING THE 1990S"

"NATURAL VARIATIONS IN THE HUMAN GENOME THAT RESULT IN DIFFERENCES IN BRAIN STRUCTURE AND/OR FUNCTION"
Some examples of the cognitive variations that fall under the neurodiversity umbrella are:

- Anxiety
- Autism Spectrum
- ADHD
- Depression
- Dyslexia
- Dyscalculia
- Dyspraxia
We use a broad definition of neurodiversity that includes differences in:

- Sociability
- Learning
- Attention
- Mood
- Other mental functions that are sometimes related to health diagnoses.
ADHD

Strengths
- Risk-taking
- Creativity
- Hyperfocus

Challenges
- Focus
- Memory
- Motivation
Austism Spectrum (ASD)

**Strengths**
- Systems thinking
- Attention to detail
- Unique abilities

**Challenges**
- Communication
- Social interaction
- Sensory sensitivity
Dyslexia

**Strengths**
- 3-D Visualization
- Holistic thinking
- Creativity

**Challenges**
- Working efficiently
- Reading & writing
- Short-term memory
Keep in mind...

Neurodiverse students from minoritized backgrounds, such as Black, Latinx, Asian and Pacific Islander or multi-racial students are less likely to receive a diagnosis and access supports than their white peers.

Women are often UNDER- or MISdiagnosed

LGBTQIA+ students ALREADY experience a “chilly” climate and often experience feelings of isolation within STEM
How to start the conversation...

Stick to observable behaviors. Don’t ask about diagnoses.

Ask general questions to find out areas of challenge.

Ask about passions, interests, strengths, unique talents.

Thank them for sharing!
Part II:
INCLUDE
Project
Project goals

- Recruitment of neurodiverse students
- Building an inclusive community
- Transforming engineering courses
- Advising & support
- Career preparation & industry outreach
Part III: Teaching & Learning
Our approach aims to:

1. Move beyond the current system of disability services and accommodations
2. Incorporate a strengths-based approach to neurodiversity
3. Personalize and enhance the learning experience for all students
Key features:

- Strength-based language
- Personalized inclusion statement in syllabus
- Student choice in learning and assessments
- Universal Design for Learning (UDL) principles
- Accessible materials and learning activities
Strengths-based approach (SBA)

- Rooted in principles of positive psychology
- Identify, develop, and apply strengths
- Enhance overall wellbeing and help students thrive
- Niche construction
Set the tone

1. Consider adding a personalized inclusion statement to your syllabus or first class

2. Use strengths-based language to emphasize that you recognize neurodiversity as an asset

3. Invite students to discuss any accommodations, challenges, or strengths
Model inclusion statements

• I aim to create an inclusive learning environment in which all students can thrive. Emphasis is given to providing a strength-based approach to education that encourages students to identify, develop, and leverage their unique abilities to address complex engineering problems. This course was designed to address the diverse ways of thinking and learning that neurodiverse students possess. Several pedagogical innovations will be implemented in this course including, but not limited to peer-learning, alternative examination modalities, project-based learning, etc.

• I believe in creating an inclusive learning environment for all students and I value my students’ unique ways of thinking and learning. If you are experiencing difficulties for any reason, or if you would like to talk about ways that we can help you to succeed in this course, please contact me or your TA.
Examples: I-Course Interventions

- Strengths survey (i-clicker quiz, Google Forms)
- Strengths-based projects (Problem solving track, Creativity track, Course Materials)
- Grading flexibility (options to improve grades and reduce anxiety), built-in extended test time
- Alternate exam modes (written, oral, take-home, design project)
- Student reflections and feedback
**Strengths-based Projects**

- Students contribute to the class materials by completing a project relevant to Mechanics of Materials topic and from areas of their strength

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**Strength Based Project Tracks**

<table>
<thead>
<tr>
<th>Creative</th>
<th>Analytical/Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Photography</td>
<td>• Sports gear</td>
</tr>
<tr>
<td>• Film making/Animation</td>
<td>• Playground</td>
</tr>
<tr>
<td>• Computer programming</td>
<td>• Toys</td>
</tr>
<tr>
<td>• Game design</td>
<td>• Fishing</td>
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<tr>
<td>• Crafts</td>
<td>• Planting</td>
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<tr>
<td>• Reading</td>
<td>• Caring for animals</td>
</tr>
<tr>
<td>• Woodworking</td>
<td>• Musical instruments</td>
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<tr>
<td>• Standup Comedy</td>
<td>• Cooking/baking gadgets</td>
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<td></td>
<td>• Fashion</td>
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<tr>
<td></td>
<td>• Astronomy</td>
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<td></td>
<td>• Lego Building</td>
</tr>
<tr>
<td></td>
<td>• Yoga</td>
</tr>
<tr>
<td></td>
<td>• Pottery</td>
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</tbody>
</table>

https://sites.google.com/view/mechanicsofmaterials-strengthb/home
Some examples of submitted projects

To begin with this class
We have to go back to the basics
Review last years statics
Then proceed with mechanics

Free body diagrams
Will make you a problem solving hero
Label the angles and axes
The sum of the forces is zero

Indeterminate’s no good
It means we don’t have enough info
More unknowns than equations
It almost seems sinful

Moments have a force
That cause a rotation
Strain is delta/L
It means deformation

I don’t mean feeling anxious
When I talk about stress
There’s normal, bearing, and bending
Know P/A for the test!
Major Observations

Implementation of strengths-based projects (SBPs) resulted high levels of student participation and engagement.

SBPs enhanced feelings of belonging, engagement, comprehension of concepts, class participation, and skill in applying concepts.

Some challenges were reported by faculty related to the amount of time related to implementing SBPs and alternate assessments.

Students reported reduced stress and improved learning.

Flexibility and choice in assessment modality reduced student anxiety.
Jamboard:
What are some of the ways you can support and empower neurodivergent/neurodiverse students?

https://jamboard.google.com/d/1NXKOgJ3WkTPNPKu1pqzDhRycblXljjPZYdTJHE6YvAA/viewer?f=1
Learn more!

https://www.neurodiversity.engr.uconn.edu
Please follow us on social media:

@neurodiversity.at.uconn

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If you have any questions about the INCLUDE program, please contact us:

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Facilitated Breakout Rooms

Dr. Susan Keenan

• In IETS, we challenge assumptions and norms in the classroom through an equity lens. What are some ways we should challenge norms in:
  • Assessment
  • Classroom interactions

Dr. Marisa Chrysochoou

• How is neurodiversity currently approached/addressed in the context of your institution? Your department? Your classroom?
• How might you integrate inclusive teaching practices for neurodiverse students (for example, multiple modes of teaching/learning, strength-based approach, flexibility, accessibility)?
• How can you move beyond support/accommodation and EMPOWER neurodiverse students to use their unique strengths?
Thank you for attending!

Slides and recording will be available in the coming days.

We value your feedback, please take a few minutes to complete the survey.