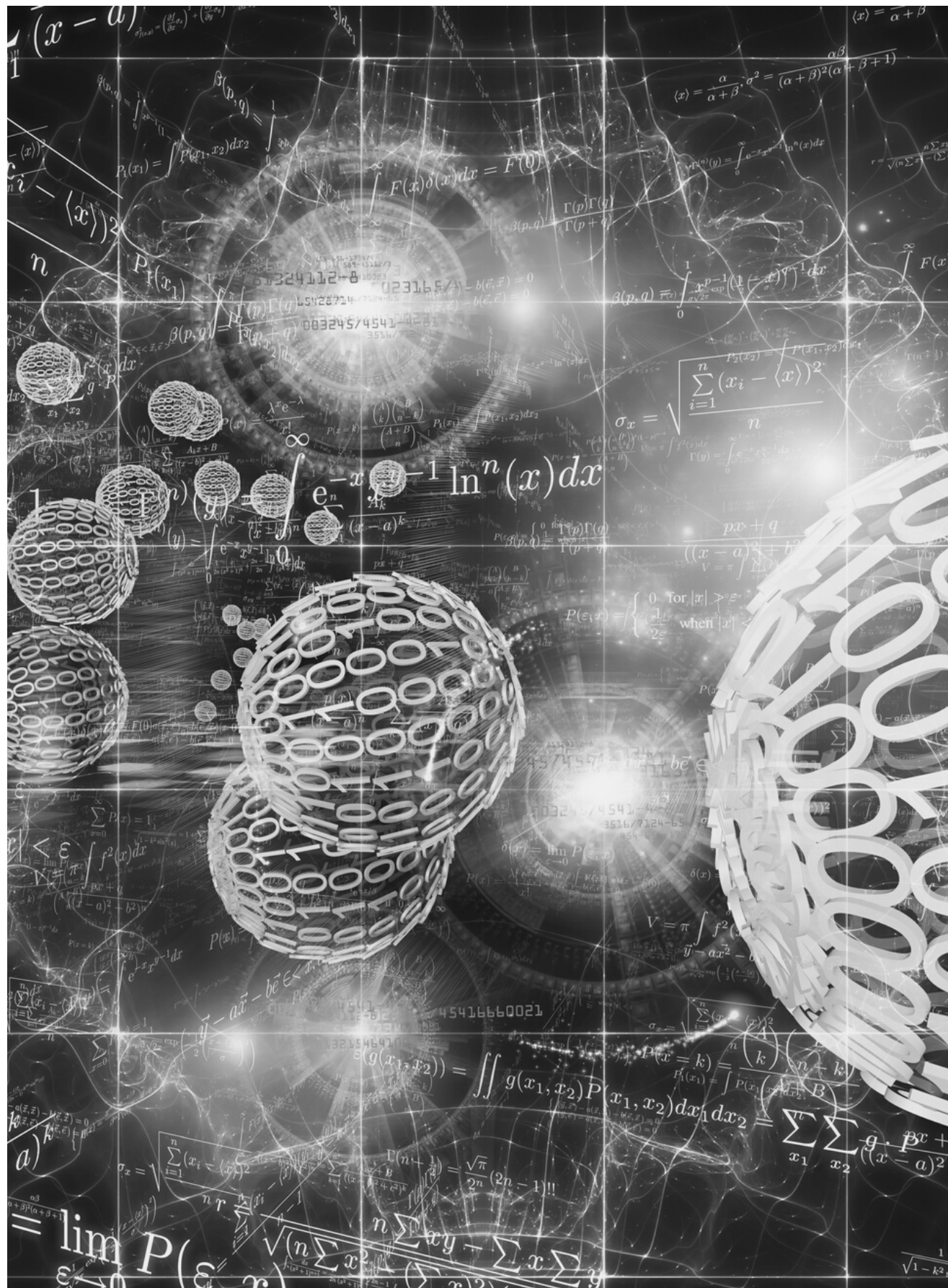


# STEM **EDUCATION** CENTER TO STEM **EQUITY** CENTER: MEANINGFUL WAYS TO INCREASE INCLUSIVITY AND ACCESS

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# ORGANIZATION

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Setting of the MSEC at Appalachian

STEM: Finding shared language

STEM center contexts and connectivity

Tensions to acknowledge

Tensions to Transformation

*All images from canva.com or contributed by the presenter.*

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# THE MSEC AT APPALACHIAN



## CREATED BY LEGISLATIVE MANDATE

the MSEC was created as part of a state-wide initiative, the Mathematics and Science Education Network, in the 1980s. It is one of several remaining centers, each of which has taken on its work in slightly different ways.

## LOCATED AT A RURAL MASTERS COMP. INSTITUTION

Our campus is located in a fairly rural, racially non-diverse region of the state that has been geographically isolated for most of its history. The region is reliant on agriculture and agri-tourism, tourism, and service industries after many decades of reliance on tobacco and furniture production.

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# POWER AND STEM

## A HISTORICAL PERSPECTIVE

Without a historical context, it can be easy to forget the role that mathematics and science have played in conveying power by:

- driving the navigational knowledge that made sailing for colonial purposes possible.
- creating arms races in which the nation with the "best science" had the "best toys" and posed the biggest threat
- contributing to the massive increase in food production available through agricultural technology but also contributing to the economic models driving food inequity
- developing a western-focused evaluation of mathematical and scientific rigor that devalues indigenous ways of knowing or non-western approaches



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# PERPETUATING POWER AND MATHEMATICS

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ACCESS TO "HIGHER" LEVEL  
MATHEMATICS & SCIENCE



OFFERING OUTREACH  
THAT IS INACCESSIBLE



PERPETUATING NARROW  
PERCEPTIONS OF STEM



DECONTEXTUALIZING  
STEM LEARNING

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# THE MANY FACES OF STEM

## ACRONYMS, POLICY, & MORE

Many of our colleagues only know STEM through recent pushes in workforce development, trendy children's toys, and themed nights at schools. There is a history of STEM to share with colleagues so that we begin from common assumptions.

- STEM as an acronym doesn't have a single interpretation nor its conceptualization a single origin, although NSF began to commonly use the acronym in the 1990s.
- Although STEM is often used to refer to workforce development initiatives and integrated, hands-on learning, it also represents an integration, negotiation, and conceptualization of multiple disciplines, each with its own history, definitions of rigor and quality, language and representation, signature pedagogies, and more.



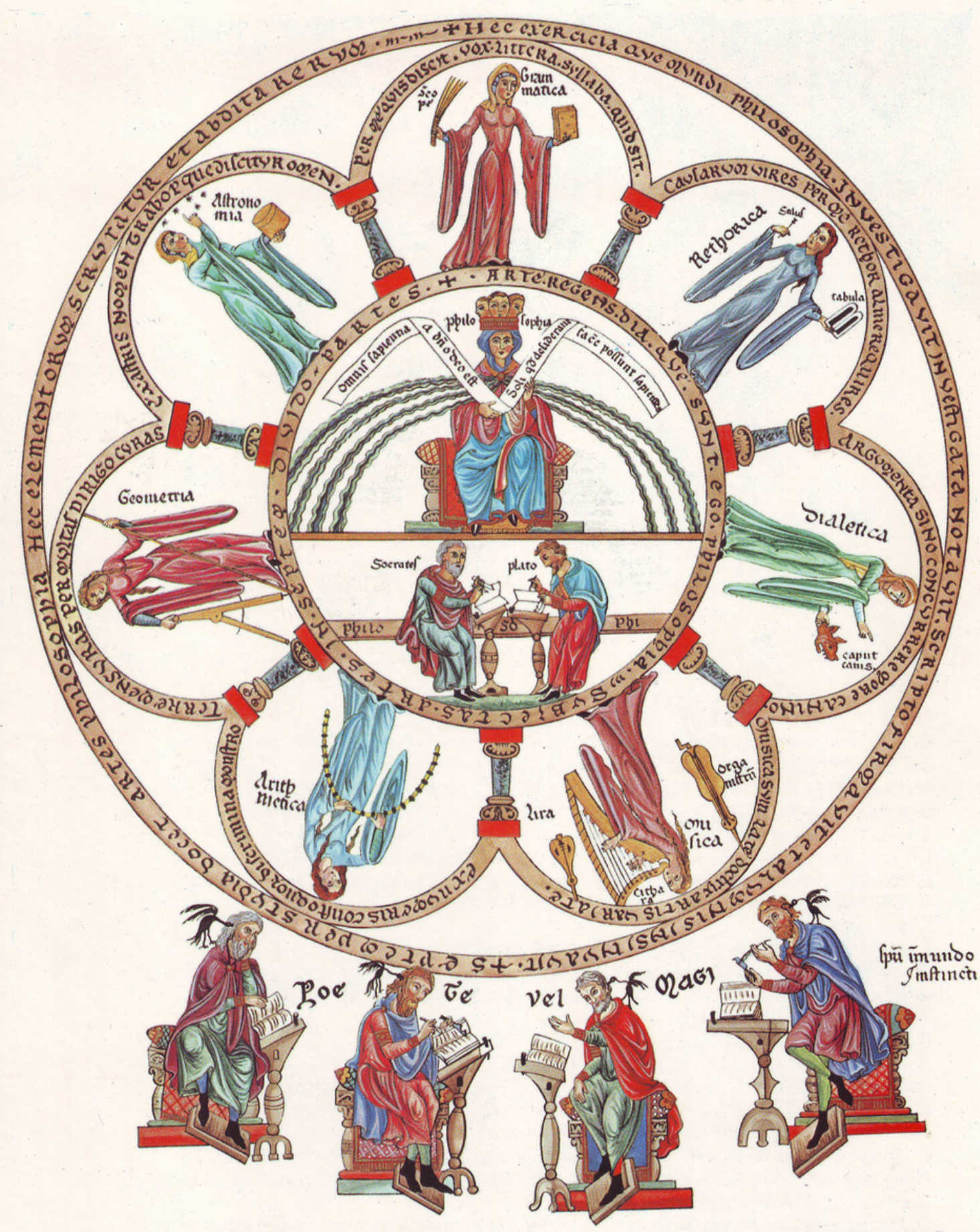
# EARLY INTEGRATION OF DISCIPLINES

## THE LIBERAL ARTS IN HORTUS DELICIARUM

An example of an earlier interpretation of the liberal arts, this particular visualization includes Philosophy as the Queen around whom are Socrates and Plato and the seven liberal arts:

- Grammar
- Rhetoric
- Dialectic
- Music
- Arithmetic
- Geometry
- Astronomy

Herrad of Landsberg, *Hortus deliciarum*, Public Domain





# STEM IN HIGHER ED

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Unfortunately the nature of our institutions, funding structures, partners, and policies create even more complexity to defining STEM.

Should STEM be defined according to its most basic disciplinary interpretations?

By NSF Classification of Instructional Programs (CIP) codes?

By faculty preparation?

By unit location of a program or faculty member?

Who decides how to define STEM and who is engaging in it on a university campus?





# STEM CENTERS IN THE LANDSCAPE

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STEM centers often represent connection points across multiple boundaries, including across programs, across partners, across institutional units, across policy application, and more.

We represent *translation* and *transformation* points in the boundaries. Being aware of how those boundaries shift across time and recognizing when and where boundary crossing points begin, change, or end are vital components of what might be called *boundary-crossing leadership*.

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# TENSIONS TO ACKNOWLEDGE

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Our classrooms, schools, contests, and outreach may serve to promote or privilege western notions of mathematics and science without recognizing or integrating indigenous or other cultural ways of knowing.

Office of Indigenous Initiatives, Queen's University

# TENSIONS TO ACKNOWLEDGE

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Our classrooms, counseling, and outreach may promote "white collar" STEM disciplines over those that are "blue collar."

Brookings Institute Report, *"The Hidden STEM Economy"*

# TENSIONS TO ACKNOWLEDGE

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Our classrooms, textbooks, library materials, and physical spaces may tell the stories of white, male mathematicians and scientists without sharing the stories of others.

Castaneda, Aguilar, Gómez-Blancarte, Romo-Vázquez, Lezama-Andalón, Miranda-Viramontes,  
*Representation of Mathematicians in Lower Secondary Mathematics Textbooks*, 2019

And just look around ...

# TENSIONS TO ACKNOWLEDGE

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Our policies and instructional strategies may perpetuate the *Pedagogy of Poverty*.

M. Haberman, *The Pedagogy of Poverty versus Good Teaching*, Phi Delta Kappan.

# TENSIONS TO ACKNOWLEDGE

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Our policies and programming may unintentionally disinvite students and community members.

Chang, Wang, Mancini, McGrath-Marher, & Orama de Jesus, *The Complexity of Cultural Mismatch in Higher Education ...* 2020.

# TENSIONS TO ACKNOWLEDGE



## IN THE CHAT ...

What are your initial responses to these tensions? In what ways are you aware of these tensions? To what extent do you use your own leadership in the classroom, school, profession to counter these tensions?

## NOTE TO YOURSELF ...

Grab a post-it, a virtual note, or a piece of paper and give yourself a note right now of at least one of these tensions that you'd like to consider further in your own context.

# TENSION TO TRANSFORMATION

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Western science  
and  
Indigenous/cultural  
ways of knowing

- How can we engage with social justice frameworks to update our ecosystems and align with partners?
- In what ways are indigenous or cultural ways of knowing represented in our materials collections, outreach, or other activities?
- How diverse are our stakeholders, including our staff, advisors, and partners?
- Is there space for diverse ways of thinking?



# TENSION TO TRANSFORMATION

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"White collar" STEM  
and  
"Blue collar" STEM

- How can our programming engage a variety of STEM disciplines, careers, and perspectives?
- How can we challenge common notions of who “does” STEM?
- What partnerships allow us to promote blue-collar STEM careers and pathways?
- How can we challenge the “pipeline to degree” mentality?
- How can we challenge classist assumptions in the collar metaphor?

# TENSION TO TRANSFORMATION

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Primarily white, male  
perspectives of math  
and science

- What materials can we add to our collections to diversify the perspectives and stories presented?
- Whose voices can we bring to evaluating our physical spaces for their accessibility and inclusivity?
- How do we integrate non-Western mathematics into our classrooms in ways that aren't trivial or dismissive?
- How diverse are the faculty and mentors that our students see during instructional and outreach opportunities?

# TENSION TO TRANSFORMATION

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## Pedagogy of Poverty

- How do we inventory our implicit biases and counter them?
- What professional development and policy analysis can we initiate to counter the Pedagogy of Poverty?
- In what ways do our pacing guides or other materials reflect an implicit (or explicit) adherence to the Pedagogy of Poverty?
- How do we embed the disassembly of Pedagogy of Poverty ideas in instructional evaluations?

# TENSION TO TRANSFORMATION

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## Disinvitation of Participants

- How do our programming structures and communications reflect our intended audiences?
- Whose voices can we bring to evaluate how we market and coordinate our programming?
- To what extent are our programming opportunities achieving diversity of participation?
- In what ways must we redesign programming so that we expand participation?



# EXAMPLE OF BOUNDARY CROSSING LEADERSHIP

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On our campus, residential programming was primarily a revenue-generating venture, with expensive fees and no consideration for the residential needs of some students or the language needs of diverse families.

We *translated* the needs of the community into information that the Office of Conferences and Camps could understand.

We *transformed* the promotion of programming and policies related to bedding and toiletry provision for participants.

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# EXAMPLE OF BOUNDARY CROSSING LEADERSHIP

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Teacher recruitment initiatives have frequently been disconnected from the work of increasing diversity among STEM faculty in higher education. However, we have advocated that expanding diversity among faculty in STEM is crucial to increased diversity among teacher candidates.

*We translated* the literature to demonstrate that faculty diversity benefits the success of students, which contributes to their choosing STEM majors and possibly of choosing to teach.

*We transformed* the ownership of these initiatives by providing a point of contact across multiple units.

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# CONTACT INFO

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