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# Preparing Scientists with Intercultural Competence to Work with Global Communities

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# Preparing Scientists with Intercultural Competence to Work with Global Communities

Zachary Koestler and Nicole Stalcar

Representing the  
College of Science, Engineering, and Technology,  
Minnesota State University, Mankato

at the 2019 World Congress on Undergraduate Research  
Oldenburg University, Germany

IRB # 13498123

Big ideas. Real-world thinking.



WELCOME TO OUR  
UNIVERSITY

# Universities Focus on Intercultural Competence

Minnesota State University “believes that a diverse campus is critical in order for our students, faculty and staff to be engaged and productive members of a global society.”



# College of Science, Engineering, and Technology (CSET) Focus

The MSU College of Science, Engineering and Technology “prepares their students for professional careers and advanced study, while connecting with local, regional and global communities.”



# Degrees awarded to 117,591 CSET graduates throughout the USA (2016)

- Degrees awarded:
  - 77.9% Male
  - 64% White
  - 12.5% Asian
  - 4.5% African American

From DataUSA (2019).

<https://datausa.io/profile/cip/engineering>

Note: Graduates did not reflect the demographics of the US population.

# Key Terms

- **Culture:** “the pattern of beliefs, behaviors, and values maintained by groups of interacting people, and passed to future generations” (Hammer, Bennett, & Wiseman, 2003).
- **Inter-Cultural Competency:** "the capability to accurately understand and adapt behavior to cultural differences and commonality" (Hammer, Bennett, & Wiseman, 2003).
- **Diversity:** Real or perceived differences among people with regard to characteristics (such as race, ethnicity, sex, religion, age, physical and mental ability) that affect their treatment, opportunities, and outcomes. Differences may be readily apparent, strong sources of personal identity, and associated with power or dominance relations between groups (Dobbs, 1996).

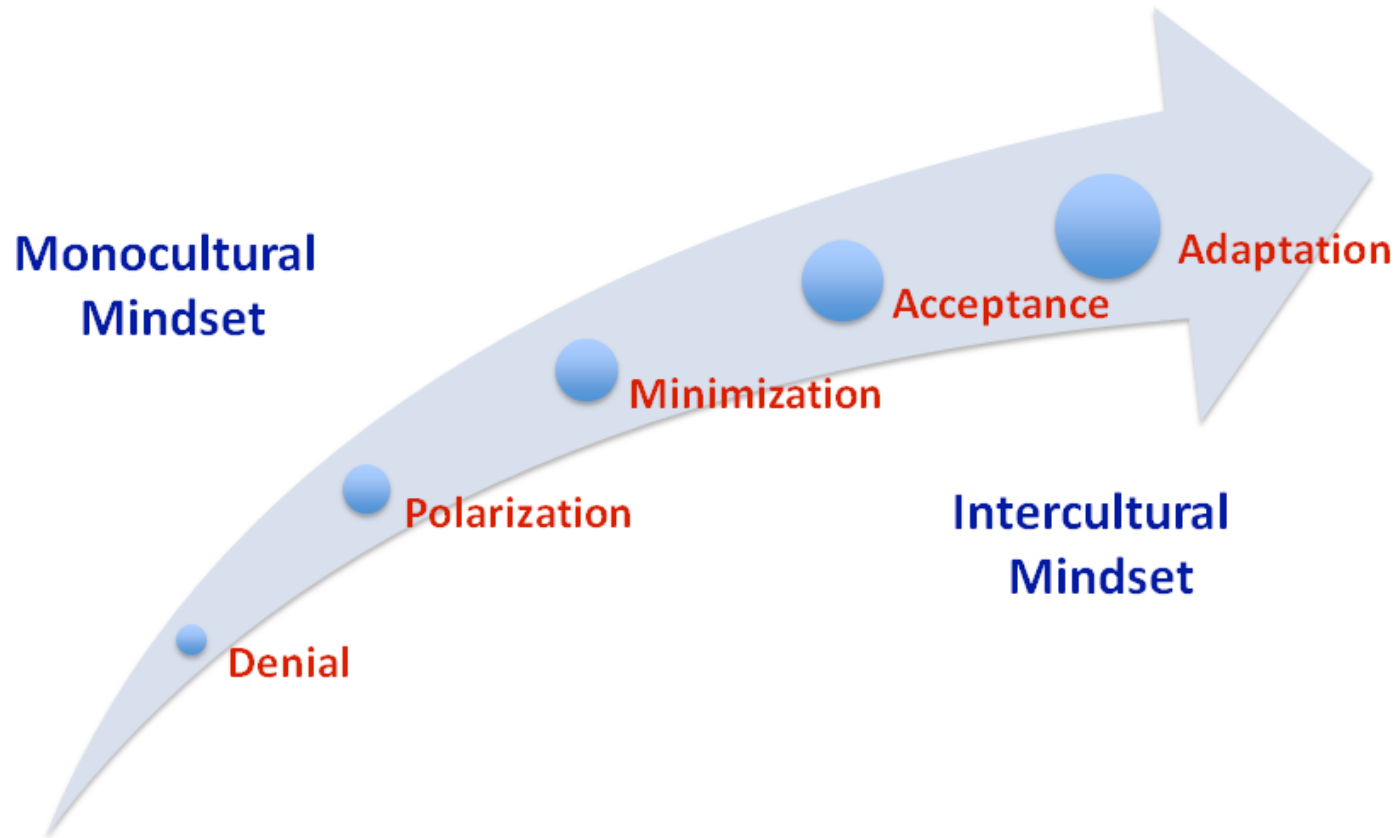
# Past Research Related to Intercultural Development in CSET Disciplines

With enhanced instruction, a single engineering course could enable and maximize gains in cross-cultural competence...to promote participation and enhance impact among especially resistant populations (Jesiek, Shen, and Haller, 2012).

Engineers from different cultures actually view the same problems differently. When those different views are coordinated, the results may encourage even more creative responses to those problems (Downey, Lucena, Moskal, and others, 2005).



# Intercultural Development Continuum



# Our Research Questions

Q1: What is the starting level of inter-cultural competence among undergraduate students in CSET at MSU?

Q2: Are there any differences among the ICC of undergraduate students in CSET compared to students in other colleges at MSU?

# Measurement Instrument: Intercultural Development Inventory

- Developed by Hammer, Bennett, & Wiseman (2003).
- Based on the Developmental Model of Intercultural Sensitivity.
- Generates a score to indicate an individual or group orientation to cultural differences.
- Easily administered on-line.
- Demonstrated validity and reliability with an extensive study by the instrument's authors with more than 5,000 respondents (Hammer, 2011).

# Intercultural Development Inventory: Example Questions

Orientation to Other Cultures		Sample Item
1	Denial (55-70)	Society would be better off if culturally different groups kept to themselves.
2	Defense (70-85)	People from other cultures are not as open-minded as people from my own culture.
3	Minimization (85-100; 100-115)	People are the same despite outward differences in appearance. (Break in ethno-centrism and ethno-relativism)
4	Acceptance (115-130)	It is appropriate that people from other cultures do not necessarily have the same values and goals as people from my culture.
5	Adaptation (130-145)	When I come in contact with people from a different culture, I find I change my behavior to adapt to theirs.

# Methodology

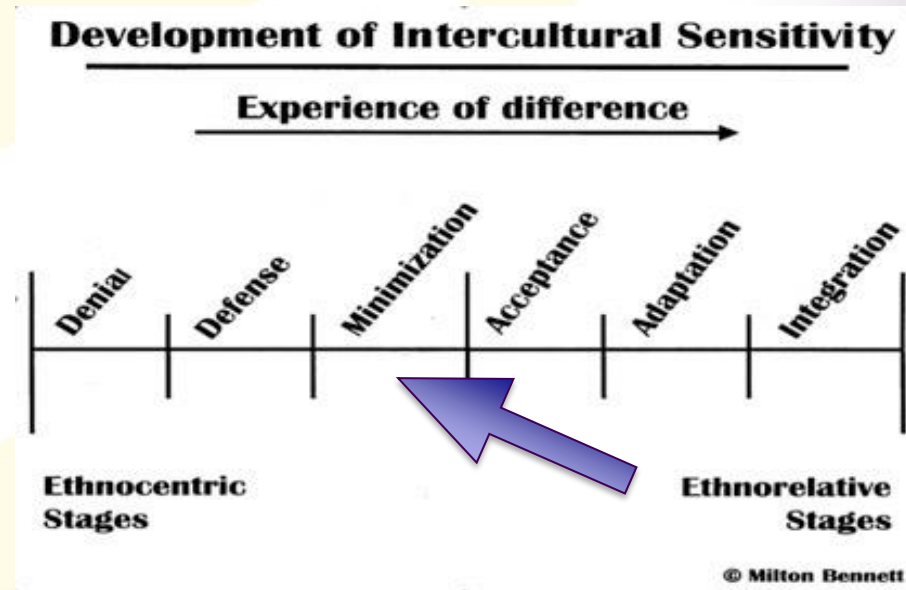
- **Population:** undergraduate students who major in CSET disciplines at MSU, Mankato.
- **Subjects:** 17 students in a general education course, “Our Natural World” (BIOL 100).
- **Independent variables** - the instructional strategies implemented by the instructor within the course.
- **Dependent variable** - student intercultural competency.
- **Instrument** - Intercultural Development Inventory (online administration).
- **Procedures** - During a face-to-face course at the beginning of the semester.
- **Data Analysis:** using SPSS and t-tests to compare significant among students in six colleges.

# Convenience Sample from Biology 100

N	%	Demographic Information
12	71%	Female
17	100%	18 – 21 years old
17	100%	US citizens
6	35%	Ethnic minority in the US
17	100%	Childhood in North America
17	100%	Never lived out of US
2	11%	Second year (33 – 64 credits)



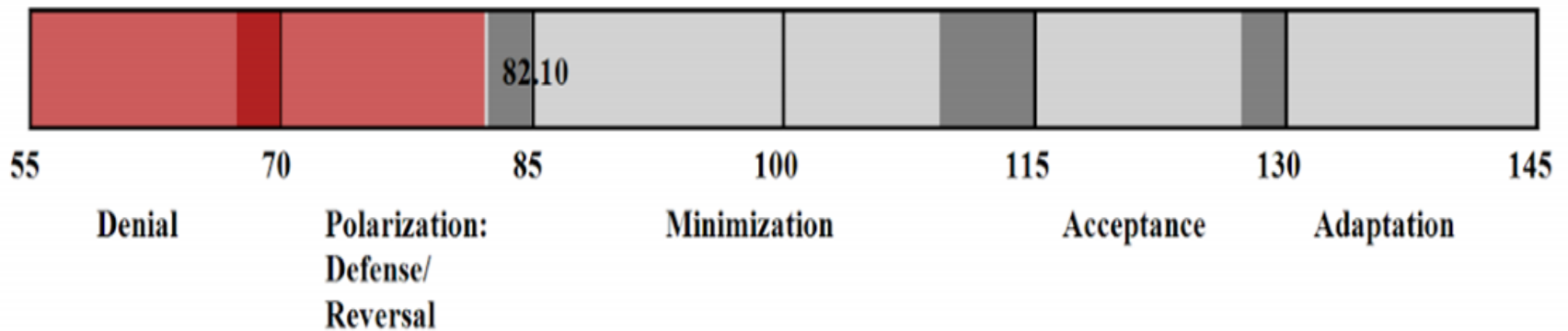
The starting cultural competency level for students in BIOL-100 will be in the ethnocentric minimization stage.





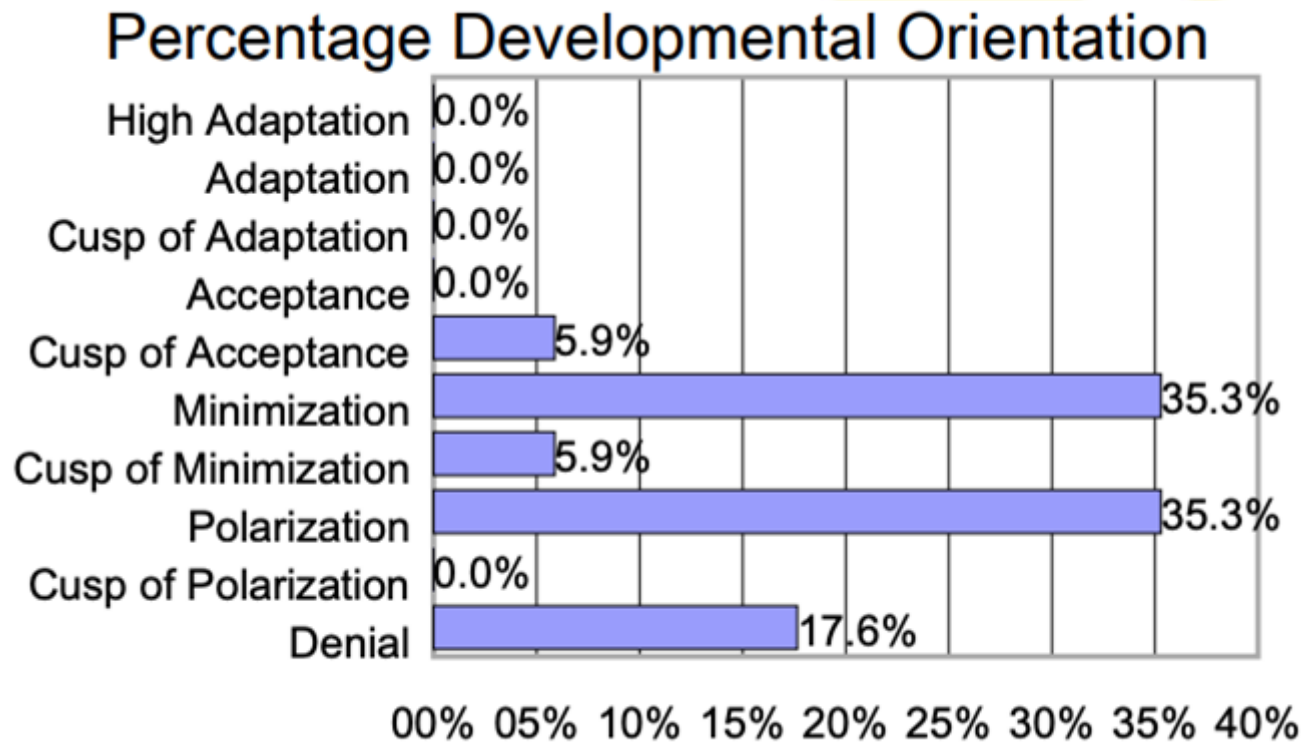
# Results: Group Mean Developmental Orientation

Developmental Orientation (DO)





# Results: Distribution of Developmental Orientation to Cultural Differences



# Results: Comparison of Mean Scores Among Six Colleges

Course	N	Perceived Orientation	Developmental Orientation
CMST 203 (CA&H)	20	119.50	88.23
EEC 222 (CE)	67	117.81	86.25
MRKT 210 (CB)	41	117.71	84.01
DHYG 100 (CAHN)	26	118.73	88.02
SOWK 212 (CSBS)	35	121.05	93.36
BIOL 100 (CSET)	17	116.28	82.10

# Analysis: Descriptive Statistics for Cross-College Sample

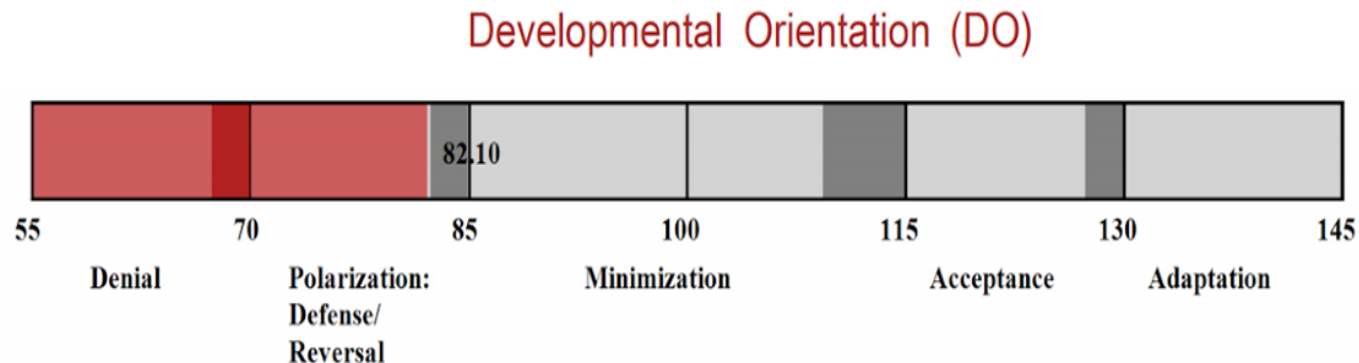
Variable	N	Minimum	Maximum	Mean	Std. Deviation
Developmental Orientation	202	48.32	123.57	86.99	15.50

# Analysis: Results of Multivariate Tests

Effect	Value	F	Hypothesis df	Error df	Sig.
Wilks' Lambda	.883	1.650	15.000	535.950	.057

# Q1: Starting ICC @ CSET

The developmental orientation was in the Polarization (Defense/Reversal) stage, which means the students tended to think that their culture was the only one or more significant than the cultures of others.



## **Q2: Differences among students in various colleges**

There were no statistically significant differences in beginning scores related to intercultural competency among more than 200 students in 6 colleges.



# Recommendations to Foster ICC

- **Students** - Practice self-reflection, e.g., write your cultural autobiographies.
- **Students** - Take a multicultural course to gain knowledge and experience for your future!
- **Students** - Participate in service learning projects with persons from other cultures.
- **Students** - Meet with a cultural partner regularly.
- **Faculty** - Incorporate this into instruction.
- **Everyone** - Read books!
- **Everyone** - Allow time to grow. This Takes Time!

# Acknowledgements

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*Thank  
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# Questions?

