Building a Scholastic Community That Supports the Advancement of Underserved Students Into the Careers of Medical and Biomedical Research

Duluth Campus Celebrates 50th Anniversary in 2022

1978 - 2003

MEDICAL SCHOOL
UNIVERSITY OF MINNESOTA
Driven to Discover®
DULUTH CAMPUS

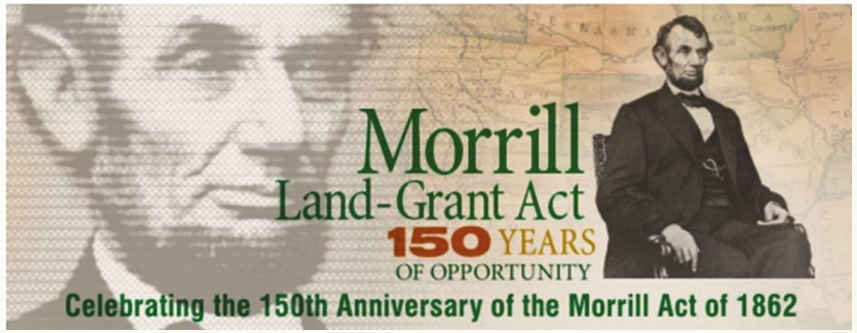
2003 - Present

Dates and historical excerpt provided by the UMD KAM Library Archives:
Long Range Planning Analysis, 1972. "Lester Gorsline Associates, December 1971."

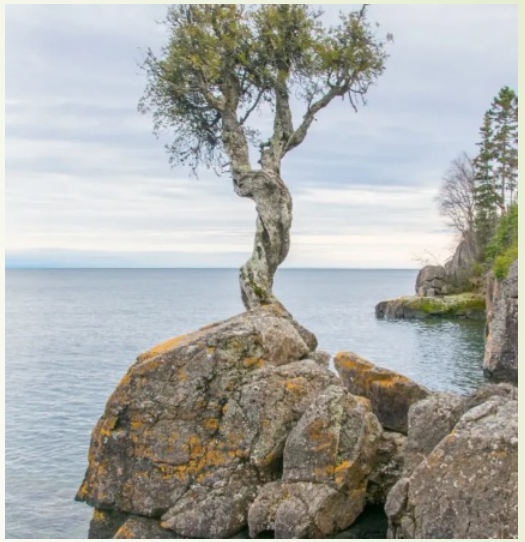
OUR MISSION

The University of Minnesota Medical School, Duluth campus was founded in 1972 with a mission to be a leader in educating physicians dedicated to family medicine, to serve the needs of rural Minnesota and Native American communities.

Sesquicentennial of the Morrill Land-grant assigned a tripartite mission by the federal government to teach, conduct research and provide service to communities



Land Acknowledgement



I acknowledge that the University of Minnesota Medical School, Duluth is located on the traditional, ancestral, and contemporary lands of Indigenous people. The University resides on land that was cared for and called home by the Ojibwe people, before them the Dakota and Northern Cheyenne people, and other Native peoples from time immemorial. Ceded by the Ojibwe in an 1854 treaty, this land holds great historical, spiritual, and personal significance for its original stewards, the Native nations and peoples of this region.

Northern Minnesota

Table 1. Social and Economic Factors for the Northern Minnesota and Wisconsin Region

State	County	Population 2010	Native American (%)	African American (%)	Hispanic American (%)	High School Graduation (%)	Some College (%)	Median Family Income	Income Inequality (Gini Index) (1)	Children in Poverty (%)
Minnesota		5,303,925	1.2	5.2	2.4	81	67	$56,869	4.4	15
	Aitkin[a]	15,821	2.4	0.35	0.9	79	65	$58,290	4.4	24
	Carlton[a]	35,386	5.9	1.4	1.4	88	67	$48,406	4.2	14
	Cook[a]	5,168	7.59	0.29	0.75	93	71	$47,132	4.7	16
	Lake[a]	11,058	0.7	0.1	0.57	83	69	$46,980	4.4	15
	Pine[a]	26,530	3.1	2.0	2.4	79	52	$44,058	4.2	25
	St. Louis[a]	200,528	2.03	0.85	0.8	82	73	$47,134	4.8	20
Wisconsin		5,754,798	1.0	6.3	2.2	88	67	$52,893	4.3	18
	Douglas[a]	44,159	1.82	0.57	1.41	89	70	$50,730	4.2	21

[a] Categorized as rural. (2–4)

- Arrowhead Region
  - 6 counties
  - 18,222 square miles
  - 322,073 (2000 US Census)
  - 3.4% are Native American, most reside on four reservations, Bois Forte, Grand Portage, and Fond du Lac; reservations in proximity are Lac Courte Oreilles Milles Lac, Leech Lake and Red Lake
- Region has a lower family median with a financial incomes
- Economy has historically depended on mining and forestry, and has experienced an economic downturn over the previous 60 years

Training Programs at the Duluth Campus
1978-1990

- I Come to Learn
  - Middle School Summer research Camp
  - NASA
- Native Americans into Marine Sciences
  - Undergraduate Research
  - Minnesota Sea Grant
- Ni Shou Gabawaag
  - High School apprenticeship for Fond du Lac Reservation Students
  - Minority Biomedical Research Support
- Howard Rockefeller Program
  - High School apprenticeship program
- Indians into Research Careers,
  - Undergraduate Research
  - NIGMS-Minority Access to Research Careers
- Native Americans into Marine Sciences
  - Undergraduate Research
  - Minnesota Sea Grant

Training Programs at the Duluth Campus
Shift in emphasis to Medical Student Training

- Center for American Indian and Minority Health
- Native American Center of Excellence
- Native American Research Center for Health

CAIMH Alumni- 158 MD

Native Americans 5.2 million
Native American Physicians 3,400, 0.4% of the physician workforce
-American Medical Association 2019

https://www.ama-assn.org/delivering-care/health-equity/native-americans-work-grow-their-own-physician-workforce

- Steppingstones into Health Careers, Indian Health Services
  - K-12 activities to promote health professions
- Upward Bound Vision Quest, US Department of Education
  - Low-income HS students

Training Programs in Biomedical Research
1994-Present

- **Bridges to the Baccalaureate Degree**

  Undergraduate Research Assistantships, NIGMS
- **Bridges to the Doctoral Degree**

  Graduate student support, NIGMS
- **Indians into Research Careers, Minority Access to Research Careers**

  Undergraduate Research Assistantships
- **Pathways to Advanced Degrees in the Life Sciences,**

  Undergraduate Research Assistantships

Significance of Biomedical Training for Native Americans

- Recruiting Native American to enter medicine or biomedical research is challenging
- Barriers include poverty, substandard housing, exposure to violence, substance-abuse and high rate of suicide
- Drop-out rates exceed 50% on reservation
- Small population
- Role models
- Family and community support

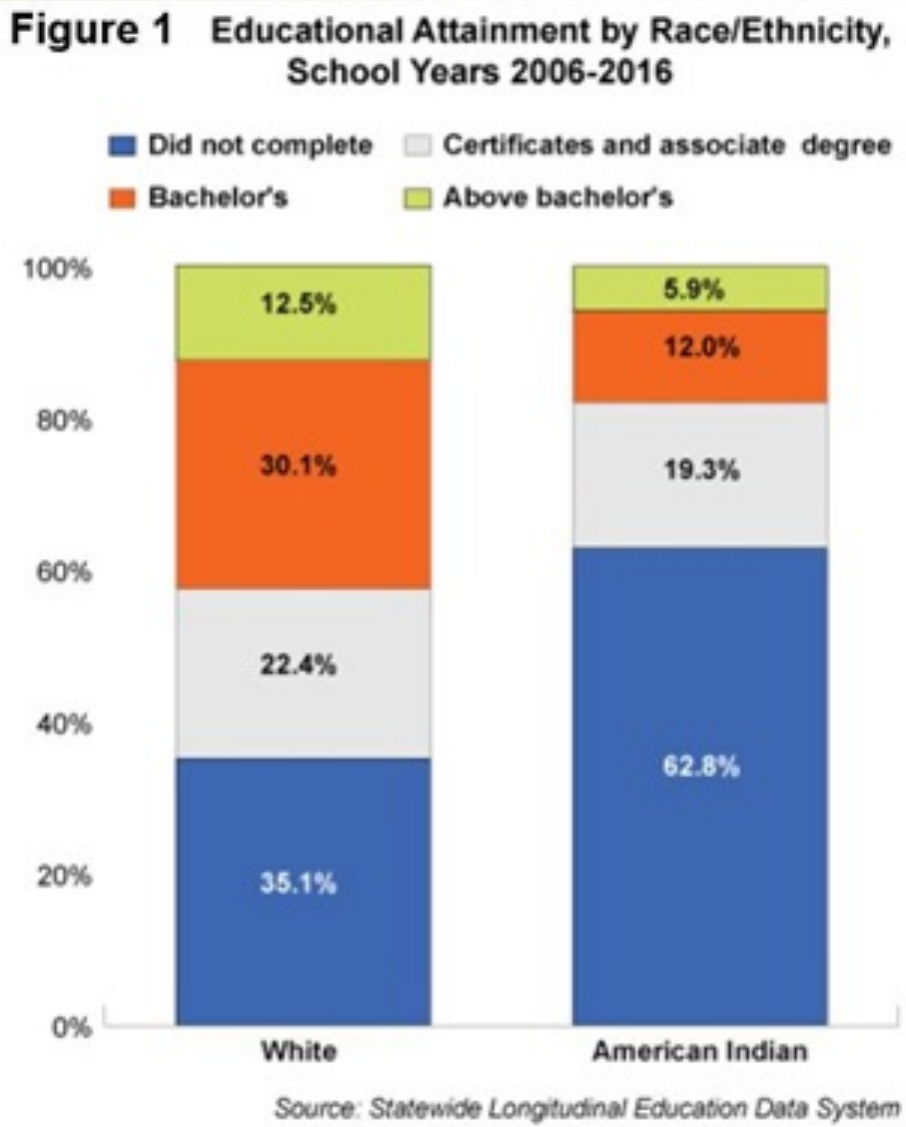
- Only 9% of medical schools have more the 4 Native American students
- 43% of medical schools have no Native American students
- As of 2016- 481,753 total faculty in 141 allopathic medical schools
  - 62.4 % were white (300,642)
  - 0.11 % were Native American (530)
  - Brodt E (2018) doi.org/10.1080/10872981.2018.1508267

Increase the number of Native Students Entering Medicine and Research

- Low numbers of Native American STEM students
- Increase visibility of careers
- Mentors and role models
- Community outreach

- Reach out to regional schools and communities

Minnesota has significant racial disparities



- 2nd best for "highest educational attainment"
- 48% of the adult population has an AA or higher degree
- 2006-2016, whites graduated with a BA/BS 2.5 times more the Native Americans
- 1 in 4 Native Americans dropped out of high school, 6 times greater then for whites
- Many Native Americans return to obtain a GED, reflects a 3-year lag in median age entering college compared to whites.

Table 2
Demographics of Counties surrounding metropolitan Duluth

County Data for 2019	Educational attainment AA or higher (%)	Population	Medium family income ($)	People of Color (%)	Recipient's Financial aid (%)	Indian Scholarships awarded
St. Louis	50	199,922	50,936	9	41	62
Carlton	44	35,655	58,874	12	44	56
Pine	28	6,685	47,285	10	52	10
Aitkin	38	15,821	45,860	6	49	10

Figure 2
Reservation located in Minnesota

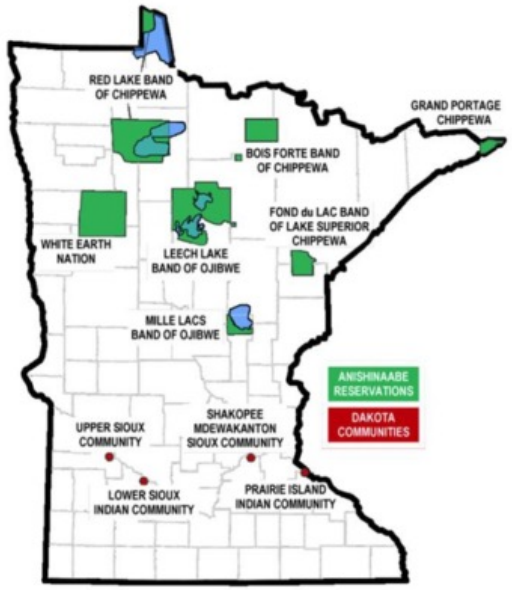


Figure 3
Location of minority populations in Minnesota

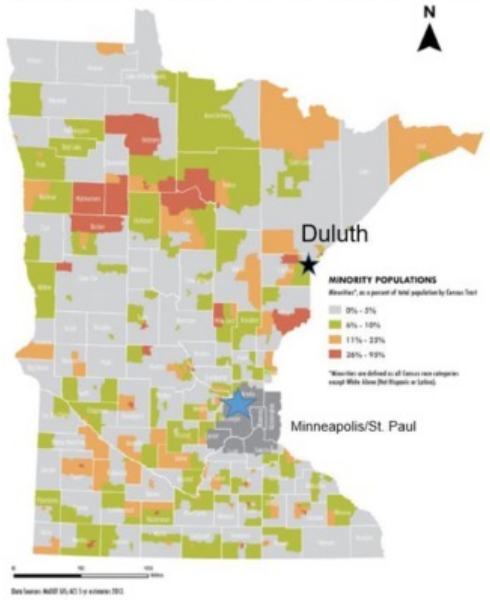


Table 1
High School and Post-Secondary School Characteristics 2000-2016

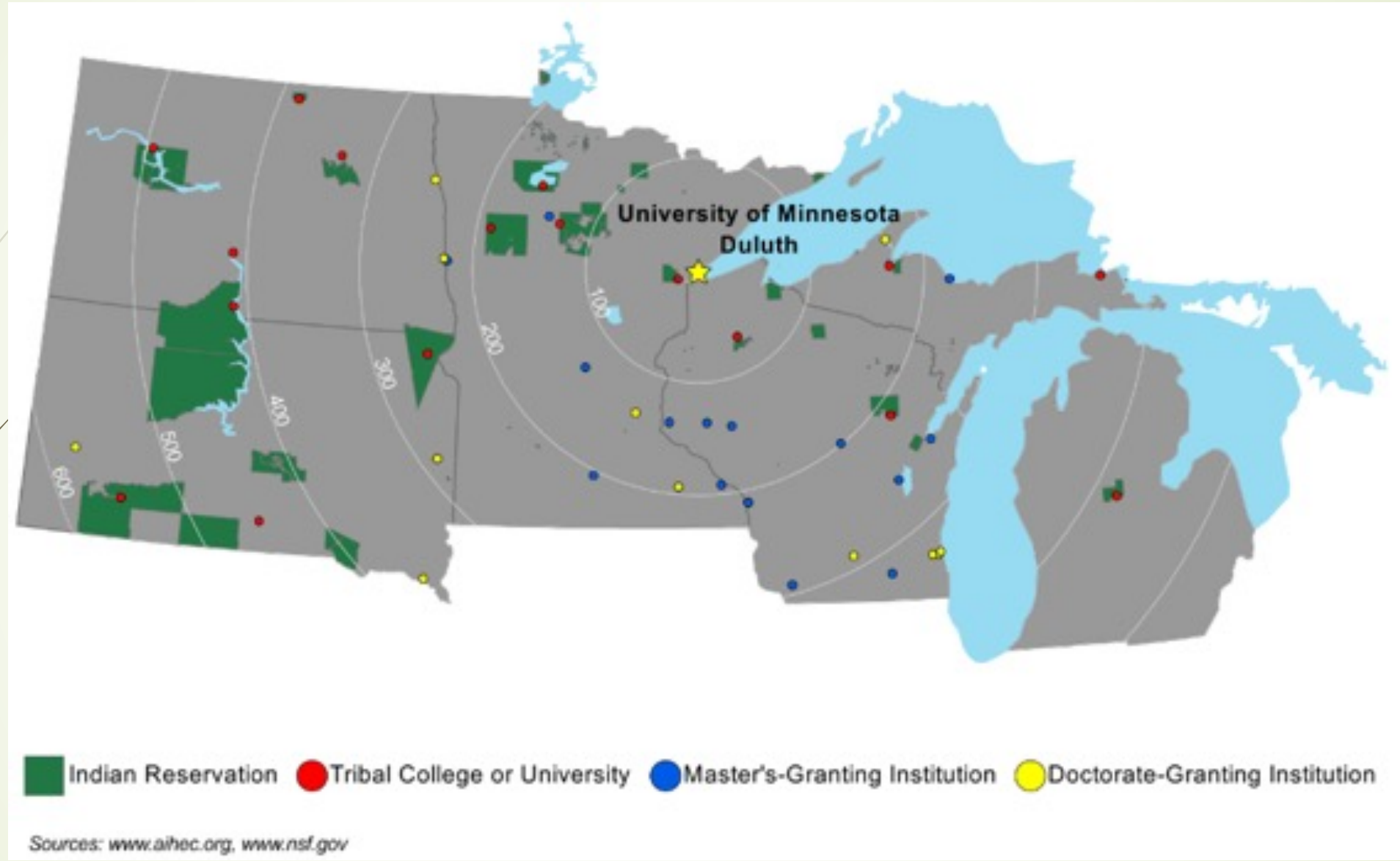
Table 1. High School and Post-Secondary School Characteristics 2000-2016						
Race*	**Number of Students Enrolled from 2006 to 2016**	**Women**	**With Permanent Residence Outside Minnesota****	**Median Age at Enrollment**	**Percent Who Dropped Out of High School (including GED Completers)**	**Enrolled in a Post-Secondary School Outside the Twin Cities*****
American Indian Alone or with other races except Hispanic/Latino	12,050	59.1%	8.8%	24	23.3%	60.9%
White non-Hispanic	641,317	55.6%	11%	21	4.2%	49.8%

* Mixed-race individuals who reported being American Indian in combination with Black, Asian, or Pacific Islander were excluded from the definition of American Indian in this analysis. Individuals who predominantly self-identified as American Indian and occasionally also reported being white or Latino, with Latino being a race category, not an ethnicity category, in our datasets, were for the most part included.

** International students who were not yet naturalized U.S. citizens at the time of enrollment were excluded.

*** Includes three tribally run colleges and universities

Source: Statewide Longitudinal Education Data System


University of Minnesota
Duluth
100
200
300
400
500
600
Indian Reservation
Tribal College or University
Master's-Granting Institution
Doctorate-Granting Institution
Sources: www.aihec.org, www.nsf.gov

Research opportunities for the underserved undergraduate students

- NIGMS places strong emphasis on diversity and inclusion in biomedical research
- Provide opportunities for underserved and underrepresented groups from northern Minnesota

- First round of training programs
- Bridges to the Baccalaureate
- Indians into Research Careers
- Bridges to the Doctorate

Bridges to the Baccalaureate

- Original program
  - Research Assistant position

  Fond du Lac Tribal and Community College (23.8 miles)

  Lake Superior College (6.2 miles)

  Lac Courte Oreilles Ojibwe College (87.3 miles)

  Leech Lake Tribal College (136 miles)

- Bridges to the Baccalaureate, NIGMS (1995-2022)

- Current Program

  Fond du Lac Tribal and Community College

  Lake Superior College

Bridges to the Doctoral Degree

- Fellowship support for MS level graduate studies
- 1995-2000
- Bridges to the Doctorate, NIGMS
- UM Duluth students
- Transition to UM-Minneapolis
- 9 MS degrees
- 3 Ph.D.
- 2 MD
- Phased out with unitary accreditation for the Medical School in 2000

Indians into Research Careers

- Undergraduate Fellowships; tuition and stipend
- 2002-2007
- Minority Access to Research Careers, NIGMS
- UM Duluth Undergraduate students in STEM
- 8 Trainees
- 6 graduated with Baccalaureate degree
- 2 MS
- 2 received PhD
- 2 dropped out

Outcomes for 1995-2000
Targeted to Native Americans

- Bridges to the Baccalaureate
  - 50 Trained
  - 32 Associates Degrees
- Bridges to the Doctorate
  - 8 Trained
  - 8 MS degrees
  - 3 PhD
  - 1 MD
- Indians into Research Careers
  - 8 Trained
  - 6 BA/BS
  - 3 PhD

Lessons learned

- Cohort size is important
- Distance from home is a major barrier
- Communication Skills improves confidence
- Family and community are important considerations
- Screening for admission was too stringent of traditional criteria, need to shift to a Holistic Admissions Criteria
- Critical Reasoning
- Develop a community within the cohort, faculty and staff
- Confidence, a sense of belonging

Reassessment of the program strategy

- Native American trainees felt isolated
- Baccalaureate Bridge trainees drop out of the program during the first year
- Intimidation towards learning laboratory procedures at the bench
- Selection into the MARC program was too stringent, lost opportunities
- Timetable imposed by the MARC program was toward graduation was formidable, must maintain GPA>3.5 with full time course load at 15 credits per semester
- Gatekeeper coursed were the biggest challenge

Do introductory courses disproportionately drive minoritized students out of STEM pathways?

Hatfield N, PNAS Nexus (2022) doi.org/10.1093/pnasnexus/gpac167

- **Women earned 58% of all BA/BS degrees, but women only earned 36% of the STEM degrees**
- **Black, Hispanic and Native Americans (URM) are 30% of the US population**
- **34% of incoming STEM undergraduates are from URM**
- **Only 18% continue to complete the STEM degree**

- **Concern raised by NSF, NIH and HHMI about potential structural barriers**
- **Explore alternative approaches to the current trend of Bridge Programs, Remedial and Developmental Courses, Undergraduate Research Experiences**

Relative numbers of students from the survey

Sex	White	Asian	Black	Hispanic/ Latinx	Native American
Female	41,868	2,452	3,613	3,487	480
Male	47,679	3,258	2,465	3,387	442
Total	89,497	5,710	6,078	6,863	922

Total number of students matriculated 109,070
Native Americans 922 (0.85%)

Native Americans are less then 2% of the population, but only 0.85% in STEM curriculum

Gatekeeper Courses

- URM population, in particular Native Americans are small numbers
- A more robust sampling of student data was obtained from MIDFIELD, (Multiple Institution Database for Investigating Engineering Longitudinal Development)
- R1/R2 scholastic records
- 6 schools were selected with sufficiently complete records.
- Compared Graduation and record of DFW (D or F grade and Withdrawal)

- White students with 1-2 DFWs are just as likely to graduate with a STEM degree as a Black student with 0 DFWs
- For academically prepared students passing all introductory STEM classes
  - 48% of white male students will graduate with the STEM degree
  - 35% of the URM female students will graduate with a STEM degree

Figure 5
Pathway to Identify as a Biomedical Scientist

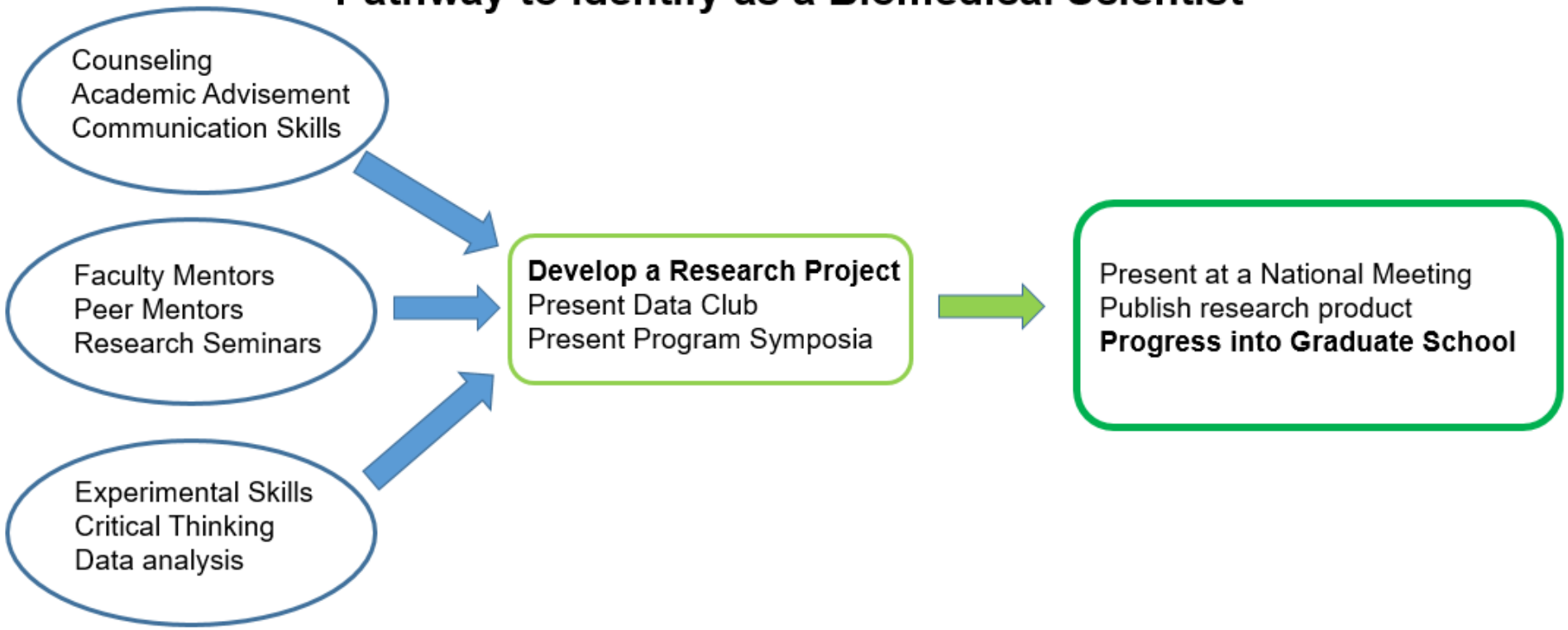


Table 3. Demographics of Pathway Project Colleges (7–10)

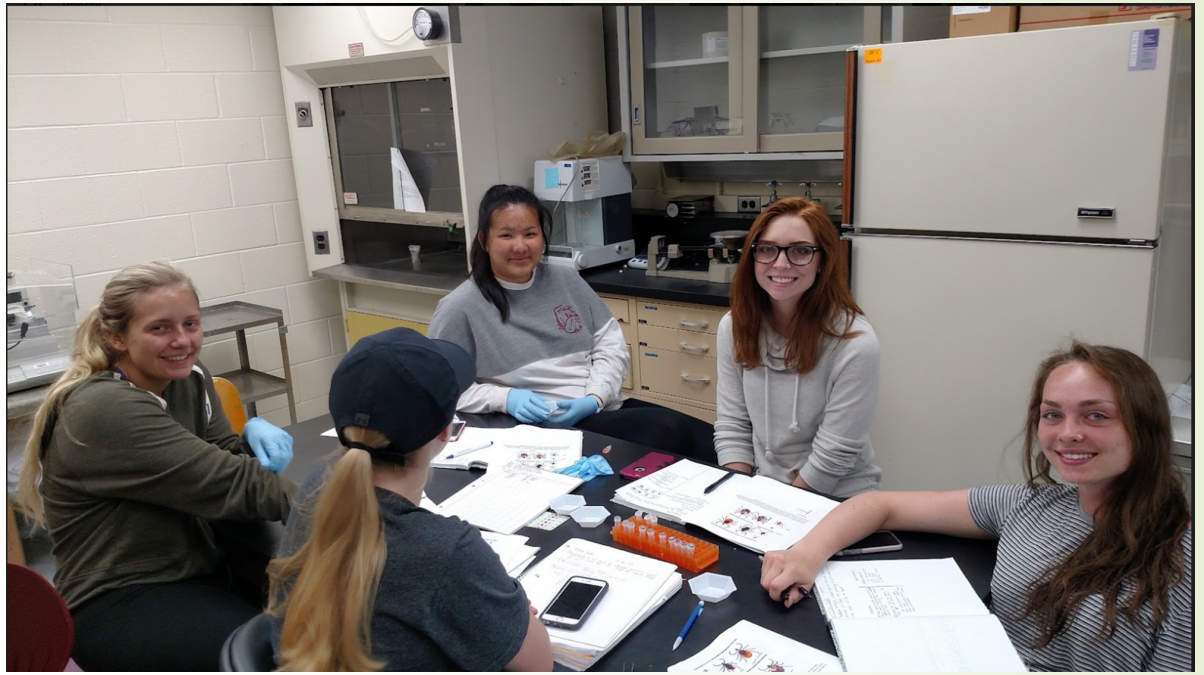
School	*Total Enrollment*	*Full-Time Enrollment*	*25-64 Years (%)*	*Female (%)*	*Native American (%)*	*African American (%)*	*Hispanic American (%)*	*Full-Time Retention Rate (%)*	*Graduation Rate (%)*	*Transfer Rate (%)*	*First Time as Undergraduate (%)*
LSC	5394	2140	38	57	2	3	2	53	29 (associate's degree)	22	28
FDLTCC	1727	419	29	59	16	8.5	2.8	62	20 (associate's degree)	20	36
UMD	9239	8890	10	47	0.6	2.2	2.5	78	36 (four-year BS/BA)	N/A	82.5

Table 3
Profile of UMD Students in the SCSE

Group	SCSE	% Total SCSE	UMD	% Total UMD
Originate from Minnesota	2748	84.7	9194	84.7
Originate from Midwest	389	10.0	1087	10.0
American Indian	47	1.4	256	2.4
African American	94	2.6	280	2.6
Hispanic/Latinx	100	2.8	308	2.8
Pacific Islander	5	0.1	23	0.2
Asian	204	6.1	516	4.8
International	115	3.4		3.4
White	2751	82.1	8198	75.5
Undetermined	35	9.4	1036	9.5
19-20 year olds	1295	33.4	3867	35.6
21-23 year olds	1121	30.9	3360	30.9
Young Adults (19-23 year olds)	2416	66.6	7227	66.6
Male	2252	67.2	5538	51.0
Female	1099	32.8	5298	48.9
Unknown gender	1	.03	22	3.0
Total population	**3352**	**100.0**	**10858**	**100.0**
Disabilities	110	3.3	N/A	NA
Under-represented	**246**	**8.0**	**867**	**7.3**

Thriving in the Research Environment

- Professionalism
- Critical Reasoning
- Communication Skills
- Bench Skills
- Teamwork



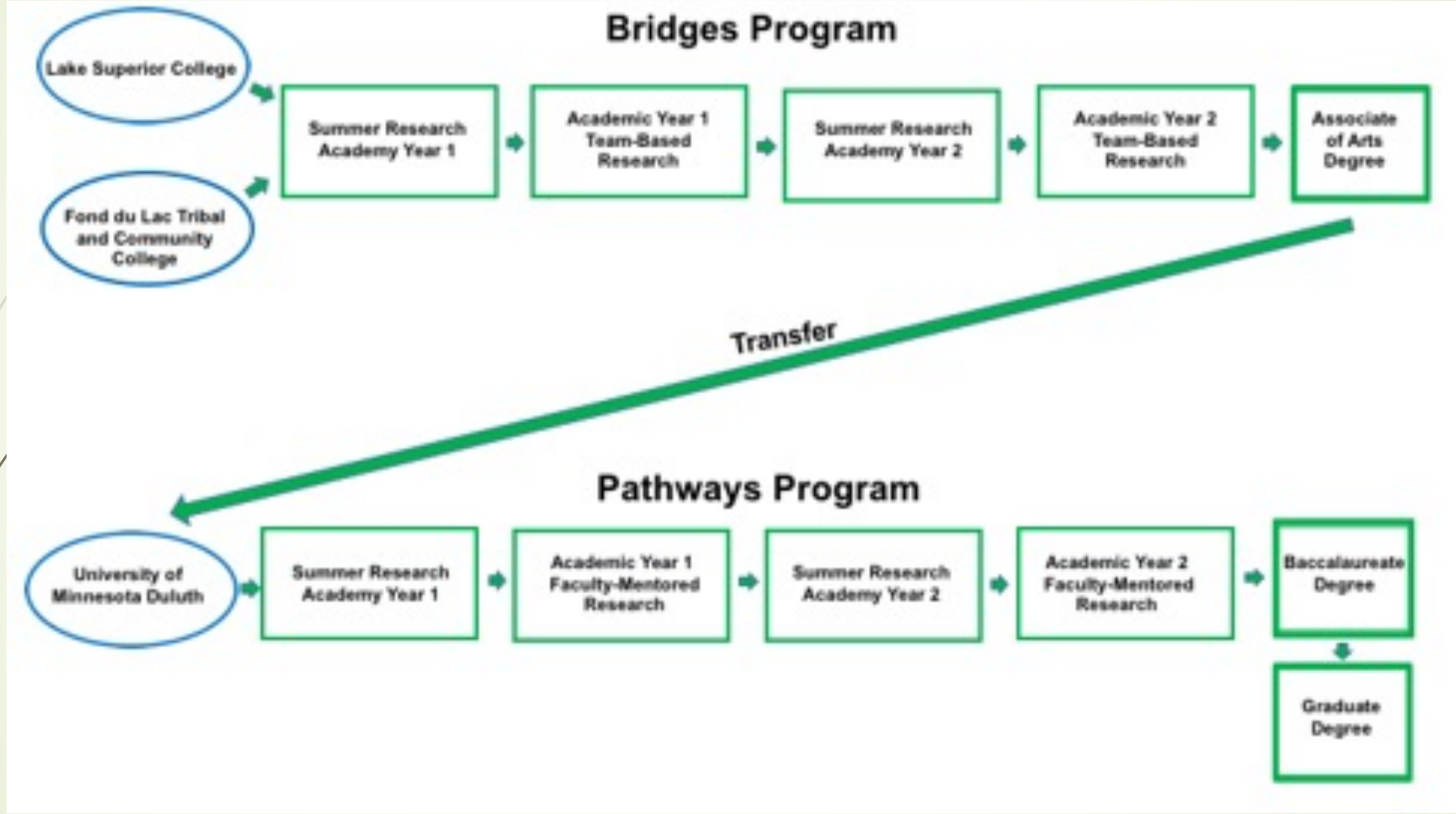
Build a community within the cohort

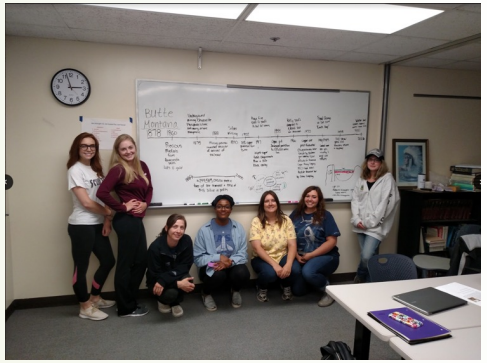
Shared experiences

Meet with faculty and staff in group meeting to lower social barriers

Pathways to Advanced Degrees in the Life Sciences (PADLS)

- Change the approach to incorporate active learning, team science and public speaking
- Expand the number of trainees to include URM, first generation and low income
- Resources
  - Teaching laboratory
  - Study and conference area
  - Increase staff and faculty from the NIGMD
- Funding (NIGMS)
  - Bridges to the Baccalaureate
  - Initiative for Maximizing Student Development


Bridges Program
Lake Superior College
Fond du Lac Tribal and Community College
Summer Research Academy Year 1
Academic Year 1 Team-Based Research
Summer Research Academy Year 2
Academic Year 2 Team-Based Research
Associate of Arts Degree
Transfer
Pathways Program
University of Minnesota Duluth
Summer Research Academy Year 1
Academic Year 1 Faculty-Mentored Research
Summer Research Academy Year 2
Academic Year 2 Faculty-Mentored Research
Baccalaureate Degree
Graduate Degree



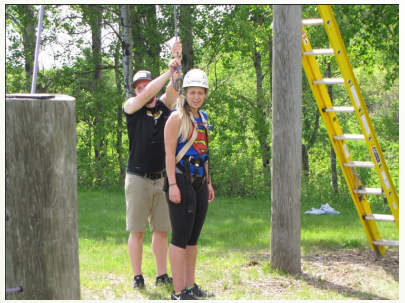


Table 4. SRA Activities

SRA Year	*Program*	*Competency*	*Training Activities*
1	Bridges and Pathways	Academic skills and career planning	Academic self-assessment Book club Preparation for graduate school
1	Bridges and Pathways	Interdisciplinary research skills	Safety and appropriate behavior in the laboratory Research techniques Keeping a laboratory notebook Computer programming
1	Bridges and Pathways	Responsible conduct in research	Ethical behavior Research integrity Research subjects protection Reproducibility of data
1 and 2	Bridges and Pathways	Communication	Public speaking sessions Debates Research presentations
1 and 2	Bridges and Pathways	Critical thinking	Problem-based learning Self-directed learning Concept mapping
2	Bridges	Team-based research	Interdisciplinary collaboration Presentation at Bridges & Pathways symposium
2	Pathways	Faculty-directed research	Develop ownership of research project Presentation at Bridges & Pathways symposium

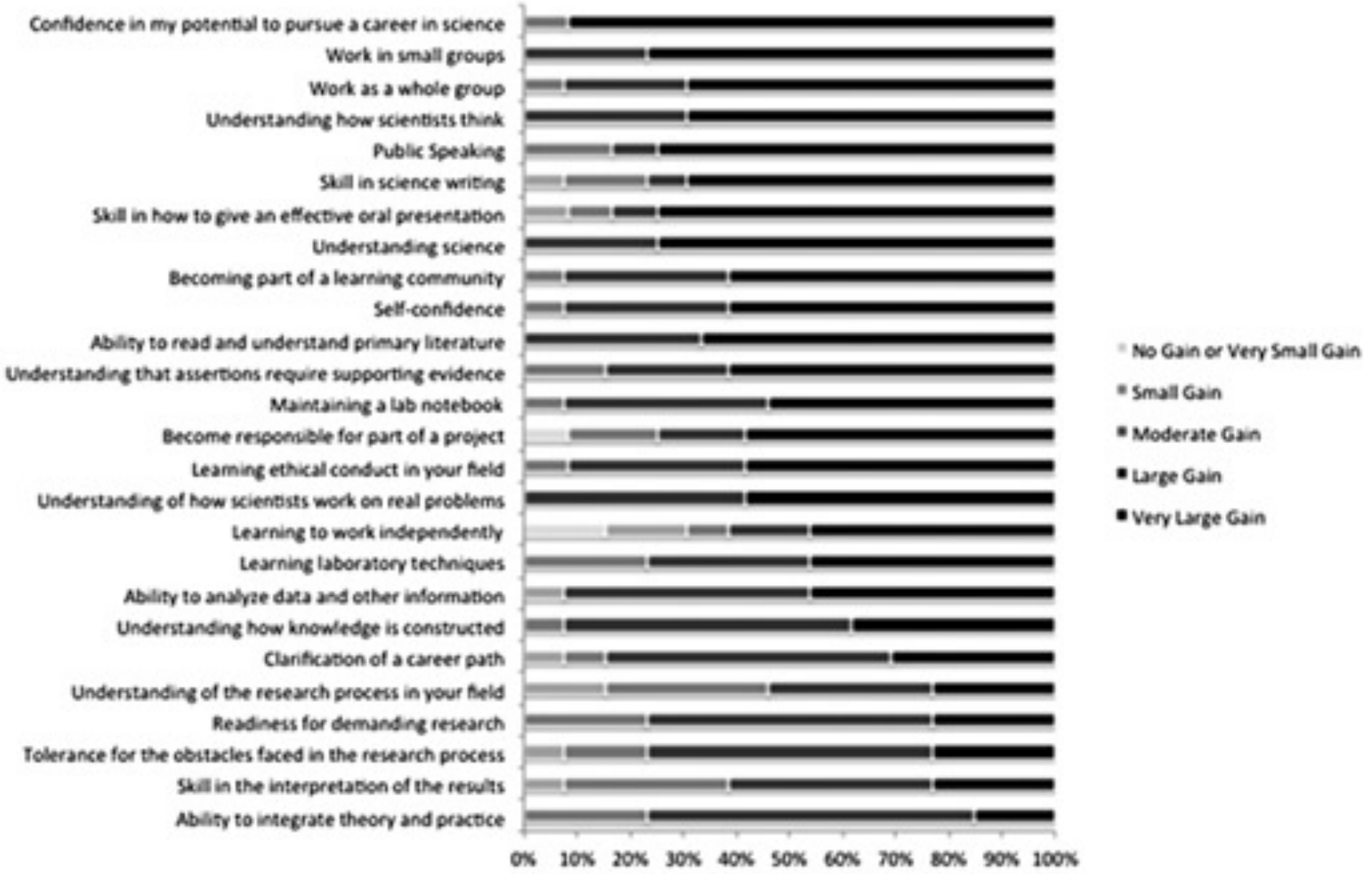


FIGURE 1. Reported gains on the SURE after participation in Bridges and Pathways programs. Students reported whether they had experienced no gain or very small gain, small gain, moderate gain, large gain, or very large gain on an online survey. Questions were reordered such that areas of very large gain are at the top.

Table 5. Program Outcomes from 2009-2019

Program	*No. of Trainees*	*No. Completed the Program*	*No. Awarded Degree*	*No. Transferring to Baccalaureate Program*	*No. Enrolled in Postgraduate Program*
Bridges	51	39	43 (Associate)	27	6
Pathways	60	49	49 (Bachelor of Arts, Bachelor of Science)	Not Applicable	29

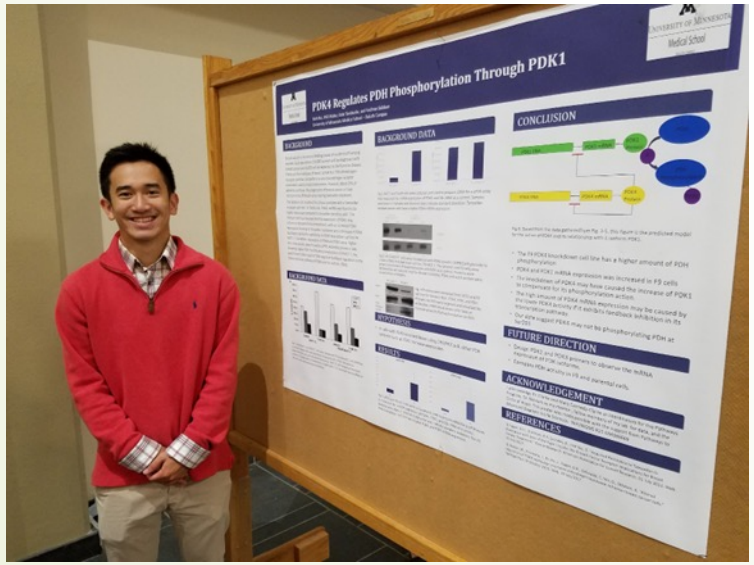


Table 6. Career Progression from 2009-2019

Program	*BA/BS Degree Enrolled*	*BA/BS Degree Awarded*	*MS Degree Enrolled*	*MS Degree Awarded*	*Ph.D. Degree Enrolled*	*Ph.D. Degree Awarded*	*Professional Degree Enrolled*	*Professional Degree Awarded*
Bridges	24	17	2	1	2	0	2	1
Pathways	60	49	10	7	12	6	7	3

Transfer rate from Bridge was 52.9
- **LSC 22%**
- **FDLTCC 20%**

Graduation from the Pathways was 87% within 2-years of program completion

Peer reviewed publications 14
National Presentations 67
Student research award at ABCRMS 1

Support

- Mary Cannedy-Clarke
- Mick Gillespie (FDTCC)
- Andy Wold (FDTCC)
- Terrance Wilcox (LSC)
- Pete Willemsen (Comp Sci)
- Phyllis Lindberg
- Amy Prunuske
- George Trachte
- Larry Wittmers
- Raj Karim

- Faculty
  - Medical School
  - School of Pharmacy
  - NRRI
  - EPA
  - Biology
  - Chemistry
  - Chemical Engineering
  - Psychology

Thanks

- Ruth Myers (MBRS and CAIMH)
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- Dennis Clayton (UM Graduate School)
- Josie Johnson (UM VP Diversity)
- Jack Briggs (President, FDTCC)
- Steve Hedman (UMD Graduate School)