



A 314 Wick Science Bldg.,
St. Cloud State University,
St. Cloud, MN 56301

P +320-308-2013
+320-308-2011

W web.stcloudstate.edu/aslee/index.html
aslee@stcloudstate.edu

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St. Cloud State University is located on the traditional and treaty land of the Dakota people, who along with the Ojibwe are the Indigenous peoples of this land, Mnisóta Makhóche or Minnesota.*



Scientist | Artist | Indigenous Scholar

Department of Physics and Astronomy
College of Science and Engineering
St. Cloud State University
January 31, 2021

2021 | PROMOTION PORTFOLIO

Annette S. Lee

Ph.D.

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UNIVERSITY of the
WESTERN CAPE

LETTER OF COMPLETION

ISSUED BY THE
UNIVERSITY OF THE WESTERN CAPE

The University of the Western Cape is a Public Higher Education institution established and regulated by the Higher Education Act, No. 101 of 1997 (Republic of South Africa), with the language of instruction being English

This is to confirm that

ANNETTE LEE

Completed the following programme

Programme name : **Doctor of Philosophy: Physics [3961]**
Date of completion : **17 June 2020**

Programme Duration : **3 years, full time**

and will be conferred the degree,

**DOCTOR OF PHILOSOPHY
PHYSICS**

at a ceremony that will be held on

Date To Be Confirmed

in accordance with the Act, Statute and Rules of the University

Yours sincerely

REGISTRAR
UNIVERSITY OF THE WESTERN CAPE



UNIVERSITY OF THE WESTERN C
PRIVATE BAG X17, BELLVILLE
STUDENT ADMINISTRATION

25 JULY 2020

This document contains a qualified electronic signature and date stamp. To verify this document contact Student Administration Department of the University Western Cape at helpdesk@uwc.ac.za.

TO ACTION THROUGH KNOWLEDGE.

Contents

Intro	02
Criteria 1 - Teaching	03
Criteria 2 - Research	07
Criteria 3 - Continuing Prep & Study	11
Criteria 4 - Student Focus	13
Criteria 5 - Service	15
It's Time Alignment	17
Statement	19
In Closing	20



Annette S. Lee is an astrophysicist, artist and the Director of the Native Skywatchers research and programming initiative. She has over three decades of experience in education as a teacher, university instructor, teacher educator, program administrator, professional visual artist, and researcher.

This work portfolio is based on the cumulative work record of Annette S. Lee since being awarded tenure July 1, 2014 by unanimous support. This report will demonstrate a cumulative record of professional performance and high achievement appropriate to the rank of Full Professor and consistent with the goals and objectives of the university/college/department/program.

1. Teaching

Demonstrated ability to teach effectively and/or perform effectively in other current assignments. The universities of the Minnesota State Colleges and Universities (MnSCU) are teaching institutions where scholarly and creative activity informs and connects disciplines and student learning.

Near 100% Enrollment

Courses taught by Assoc. Prof. Annette S. Lee have been wildly popular over the past decade. There is simply no other way to state this fact. In spite of consistent University enrollment declines each year, all of her assigned courses have been at an overall average of 98% capacity (Sp'18-Sp'21). Her teaching excellence is clear. With a focus on college level introductory astronomy courses her list of regu-

larly taught courses includes: Concepts of the Stars and Universe (ASTR 107 at 200 students), Concepts of the Solar System (ASTR 106 at 60 students), Archaeoastronomy (ASTR 120 at ~35 students), and Astrobiology (ASTR 105 at ~35 students). These courses span not only Goal 3- Natural Science, but Goal 2- Critical Thinking and Goal 8 - Global Perspectives. Relevant and high quality syllabi, content, and curriculum are just a few reasons why students gravitate and excel in these courses. Final course average grades are typically 80% or 'B'. Multi-layered paths for engagement and assessment are woven throughout to create a positive learning experience where relevance and rigor go hand-in-hand. Students excel.

Science Engagement

"The AAAS Early Career Award for Public Engagement with Science recognizes early-career scientists who demonstrate excellence in their public engagement with science activities. This year, we honor Annette S. Lee, Associate Professor at St. Cloud State University in Minnesota. Lee has created inclusive, impactful astronomy projects that are community-driven and feature dialogue and co-development between scientists, institutions and native peoples. These projects also provide templates for scientists who want to do similar public engagement."
- Association for the Advancement of Science (AAAS)

Culturally Responsive ASTR 101

Associate Professor A. Lee is a leading expert in Culturally Responsive Astronomy. Her teaching pedagogy includes: 'Traditional (T)' teaching methods as those designed to be instructor centered, lecture-based, passive for the student learner, teach by telling (Freeman et al. 2014) (i.e. lectures and exams which were multiple choice and fact-based). 'Interactive Engagement (IE)' instructional methods where students were actively engaged in their own learning, student centered, constructivist versus expository (Freeman et al. 2014), interactive, heads-on (always) and hands-on (usually) activities (Hake 1998) and most importantly 'Culturally Responsive (CR)' methods that contain content and approaches based on culture as a dynamic system of beliefs most of which are unconscious, but are the philosophical pillars of our identity. Examples include ethnicity or indigeneity and more like mainstream culture, millennial culture, Midwest culture, pop culture, etc.

Dear Colleagues,
As demonstrated by my class enrollment, anonymous surveys, and average class grades I have excellent student success in my classes. For example, 97% of students report a positive approval rating of my introductory astronomy classes.

(Data 2015-2019, 893 respondents.)

I have taught college courses for 15 years in rubrics spanning: astronomy, science education, physics, geology, geography, anthropology, computer science, mathematics, and art. For the past decade I have taught mostly undergraduate introductory astronomy (large lecture classes for non-STEM majors).

In addition, I have taught classes in science education both at the upper-division and lower division, including seminar-based classes. I have always had a strong tendency to approach these discipline-based courses in an interdisciplinary way, in order to avoid stifling learning. I have built my classes on innovation.

I believe in student-centered learning and I am constantly exploring how to better support the success of diverse learners. In a national STEM study, (PCAST 2012), an advisory council to the president reported that the U.S. needs one million more STEM professionals in the next decade in order to remain at the forefront of research and development. Fewer than 40% of intended STEM majors actually graduate with a STEM degree. Reasons that students give for migrating away from STEM are: uninspiring introductory courses, difficulty in math, and an unwelcoming academic culture in STEM especially for under-represented groups. I am committed to active engaged learning, particularly in regards to broadening participation in STEM. We are living at a time where issues like: colonization of Mars, space tourism, asteroid mining, digital immortality, and global climate change are unfolding. My passion about these issues and ideas prevent me from offering another 'boring lecture class'. I believe the ideal class should have a balance of critical thinking and creativity. The big picture matters. Ethics matter. In 2015 I was able to work through the university curriculum committee to gain approval of Liberal Education Goal 2 -Critical Thinking for one of the introductory astronomy classes I regularly teach (~200 students). I strive for a relevant, dynamic, conversational class that creates and upholds a positive learning community in a multicultural, multi-worldview environment.

I have completed a discipline-based PhD in Astronomy Education Research (AER) with a dissertation entitled, "The Effects on Student Knowledge and Engagement When Using a Culturally Responsive Framework to teach ASTR101" (June 2020) at the University of the Western Cape. Evidence of my scholarship in both U.S. educational



issues, particularly in indigenous science education and international indigenous educational issues and perspectives is strong.

My dissertation research presented culturally inclusive strategies and curriculum based on fifteen years of teaching at the post-secondary level. Using a multi-layered assessment design, including both qualitative and quantitative research methods, based on nationally developed assessment instruments such as the Classroom Observation Protocol for Undergraduate STEM, COPUS (Smith et al. 2013) in a semi-experimental nonequivalent group research design both science learning gains and engagement gains were surprisingly exceptional. Results showed that students enrolled in an introductory astronomy course with increased cultural relevancy (CR) learned 30% more science and experienced 12% greater engagement than their peers in the control course.

One of my strengths as an educator is developing curricula that is strong in science content, interdisciplinary, and relevant. I recently co-taught Science Methods at Fond du Lac Tribal & Community College (Fall 2017). In a small class of about fifteen mostly Native students, co-instructor G. Langhorst (Maya geologist/astronomer) and I shared a curriculum that contained both active learning and Indigenous STEM.

As demonstrated by my class enrollment, anonymous surveys, and average class grades I have excellent student success in my classes. For example, 97% of students report a positive approval rating of my introductory astronomy classes. (Data 2015-2019, 893 respondents.)

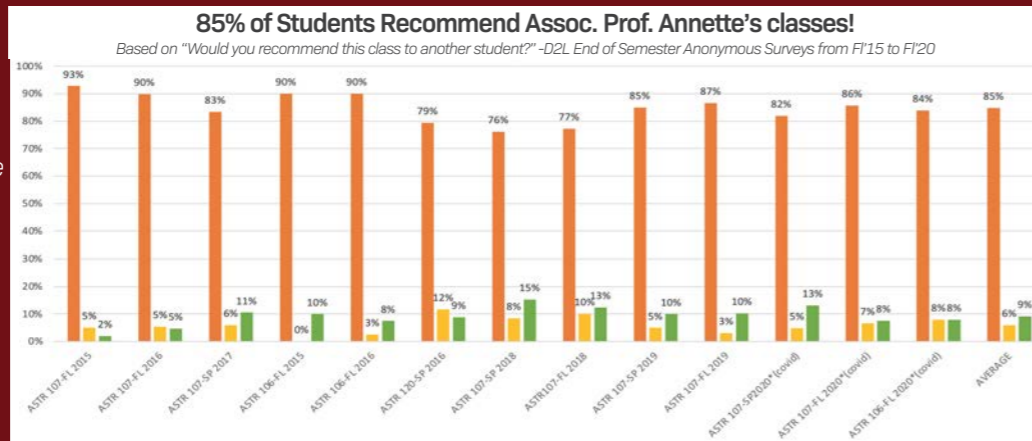
Einstein himself said, "The most beautiful thing we can experience is the mysterious. It is the source of all true art and science." My work strives for equity, diversity, and inclusion in STEM by embracing the mysterious, by weaving in our humanity back into STEM education, followed by strong assessment and evaluation methodologies.

Teaching Highlights

"Absolutely loved the class! If I ever get to take a class with you again, I would :) " - ASTR 107 student

STUDENT RECOMMENDED COURSES

"I loved the pace of this class, and I never once felt too overwhelmed by the amount of stuff we were learning. I think the professor did a really good job of explaining all of the stuff in a easy to understand way. I loved the in-class activities and the current night star maps. I never go a night without looking to see if I can find anything I know in the sky! A lot of the information learned this semester I have retained, which is surprising." - Anonymous ASTR 107 Student



ENROLLMENT IN COURSES 98% AVG



As seen in the SCSU MnSCU Course Registration records (<https://eservices.minnstate.edu/faculty/public/secure/courses/index?campusid=073>) Assoc. Prof. A. Lee has a solid enrollment trend of classes being 98% filled to capacity from Spring 2018 to Spring 2021.

This is impressive given the declining overall SCSU enrollment trends, "St. Cloud State University enrollment dropped more than 25% in 2019 compared to 2010. That's more than any other university in the system." (Hertell 2019) and a 14% enrollment drop across MnSCU in the past decade or 2010-2019 (Hertell 2019).

ASSESSMENT OF STUDENT LEARNING

Progress Report Received

Thank you for submitting your progress reports as part of this retention effort. This will assist our students, and empower student support services to better serve them in addressing barriers to their success. Your efforts have a significant impact on our ability to identify and support at-risk students at St. Cloud State.

End-of-Semester Survey

This activity stirred my curiosity. Strongly Disagree Strongly Agree

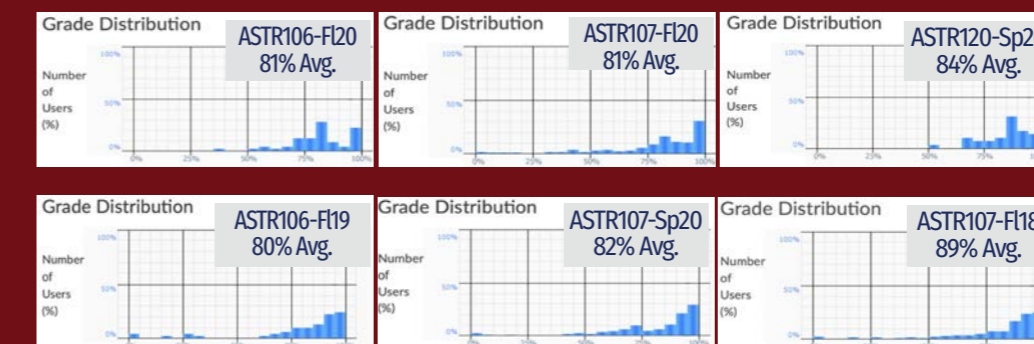
During this activity, I was busy doing other tasks. Strongly Disagree Strongly Agree

During this activity, I was focused on the things that we were learning most of the time. Strongly Disagree Strongly Agree

Extra Credit Activity --Will replace a lower grade-anonymous participation.

No matter how good we think our teaching content, curriculum, and delivery is... the real test is what the student thinks. Shown here are just a few examples of the various assessment tools that Assoc. Prof. A. Lee uses regularly in her courses. This includes customized Qualtrics Surveys, student interviews, D2L anonymous student surveys, and ongoing conversations and questionnaires throughout the course. Ongoing, real-time formative assessment and flexible, clear, summative assessment.

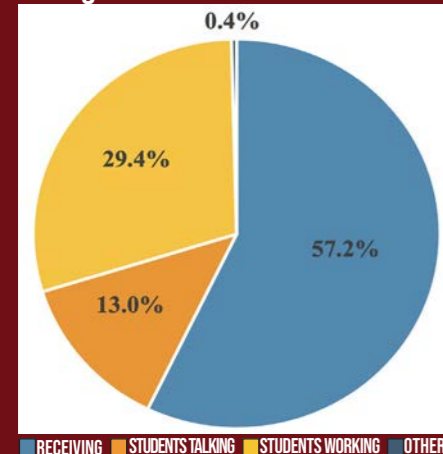
'B' AVERAGE GRADES ~ 80%



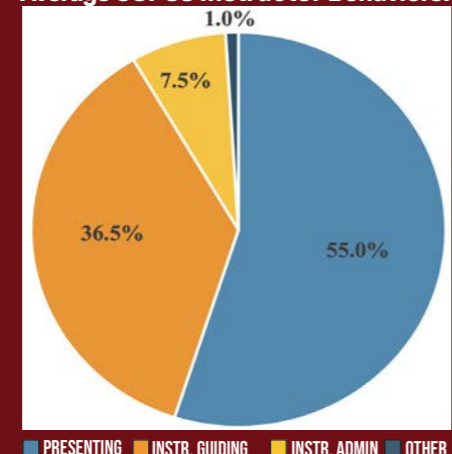
Courses taught by Assoc. Prof. A. Lee feature a combination of science content learning and inquiry based learning. Students encounter a high level of participation and 'hands-on activities'. Average final course grades are ~80% or a 'B' letter grade. Drop, Withdraw, Fail (DWF) rates are below 10%. Ref- D2L Final Course grades from F1'18 to F1'20. Selected semesters shown on left.

OBSERVATION OF TEACHING PRACTICES

Average COPUS Student Behaviors:

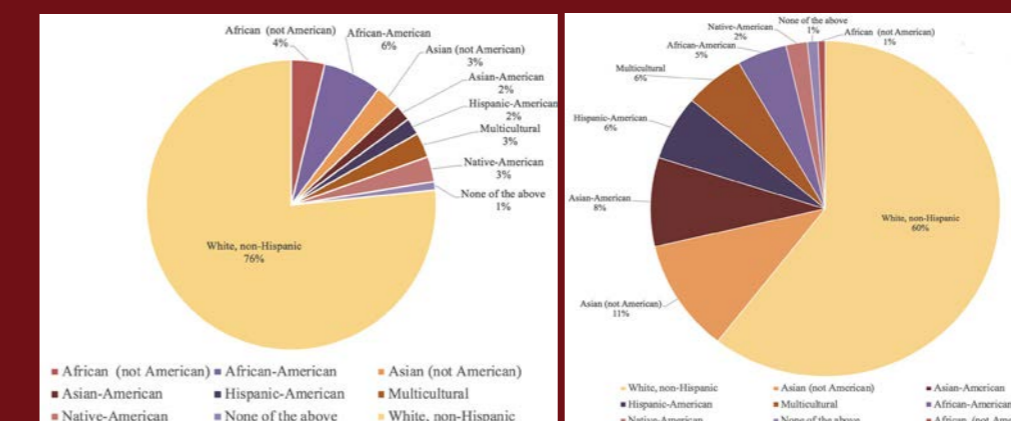


Average COPUS Instructor Behaviors:



Using COPUS, The Classroom Observation Protocol for Undergraduate STEM (Smith et. al 2013) profiles were created for A. Lee's introductory astronomy courses. Results found that students were "Active" (talking or working) 43% of the class time (on average) and the Instructor (A. Lee) was "Presenting" (like traditional lectures or exams) only 55% of a typical class. Note that more than half of university nationally are still lecturing 80% of the class time or more Stains et. al 2018).

MULTICULTURAL PERSPECTIVES



68% & 32%
White non-White

Assoc. Prof. A. Lee knows the demographics of her students. This allows her to better practice multicultural, anti-oppression, and/or inclusive perspectives in teaching methods, assignments, and the framework of the course. Shown here are two typical courses ethnicity distributions (based on ADT v2.0, 2018-2019). SCSU overall student population is: 69% White and 31% non-White (IPEDS-NCES 2017).

2. Research

Annette S. Lee is an Associate Professor of Astronomy in the Department of Physics and Astronomy within the College of Science and Engineering at St. Cloud State University. Assoc. Professor A. Lee researches Indigenous Astronomy, Astronomy Education Research (AER), Art and Science, Informal Science Education, and the History & Philosophy of Science

Assoc. Prof. A. Lee has decades of experience in Astronomy Education Research particularly related to the role of culture in teaching and learning science, culturally responsive pedagogy, Indigenous Knowledge Systems, and evaluation/assessment. In addition to the PhD in Physics, Annette holds a MFA in Visual Arts. As an interdisciplinary scholar and researcher Annette works closely with museums. Recent work includes: co-curator for a permanent and lead curator of an international traveling exhibition on Indigenous Astronomy and Indigenous Design Advisor (Canada's Museums of Science and Technology-Ingenuim).



Two-Eyed Seeing
NASA & Indigenous Astronomy

NASA covid-response grant awarded Summer 2020 to Assoc. Prof. A. Lee based on her credentials & networks as a 'STEM Influencer'. Seven monthly webinars, Indigenous led in collaboration with K-12 schools. "Seeing with both eyes for the benefit of all..." (Marshall, 2012)



Traveling Exhibit
Indigenous Astronomy

Co-curator a permanent Indigenous Astronomy exhibit (Nov. 2017). Lead curator for an international traveling exhibit (May 2022). Indigenous team of twenty global collaborators, including elders & Indigenous Knowledge holders based out of Canada's Museum of Science and Technology-Ingenuim.



Staff Training
Native Skywatchers

How do institutions such as science museums and planetariums begin to integrate Indigenous astronomy into their programming? How to be inclusive and build relationships with the Indigenous Knowledge Holders. A. Lee designed and led this ongoing collaboration.



Educator Workshops
2012-current

Designed by Annette S. Lee (2007), the *Native Skywatchers* initiative seeks to remember and revitalize Indigenous star and earth knowledge. We aim to improve current inequities in education for native young people, to inspire increased cultural pride, and promote community wellness.



Indigenous Star Knowledge Gathering

A. Lee works corroboratively with a committee to lead and design the Indigenous Star Knowledge Symposium: A series of local and international gatherings, on the land and online. Four meeting held, on solstices and equinoxes with focus on: Protocols, Storytelling, Education, and Future Networks.



Keynotes & Plenary Speaker Invites

Increasingly Assoc. Prof. A. Lee has been invited to give Keynotes, Plenary talks, and multiple conference invited speaker request. The venues include: International Dark Sky Association (IDA), the American Astronomical Society (AAS), the Canadian Space Agency (CSA), the Conference for Undergraduate Women in Physics (CUWIP), the MN Earth Science Teachers Conference (MESTA), the Adler Planetarium-Webster Lecture...and more!



Collaborative Research
Indigenous Star Maps

Since the first two native star maps were completed in 2012 (Ojibwe and D(L)akota) more requests have come in. This collaboration is meant to help Indigenous Knowledge Holder, Carola Knockwood (Mi'kmaw from Cape Breton Nova Scotia) and her team of elders to research and collaboratively create a sky map. Also working on a Dene-Sahtu Star Map project.



MN State Arts
Community-based Projects

Awarded five state arts grants since 2015 including Art Learning, Arts Tour MN, and Creative Support. Programming to inspire interdisciplinary (art-science-culture) practice of art and wellness. Community based, Indigenous led.

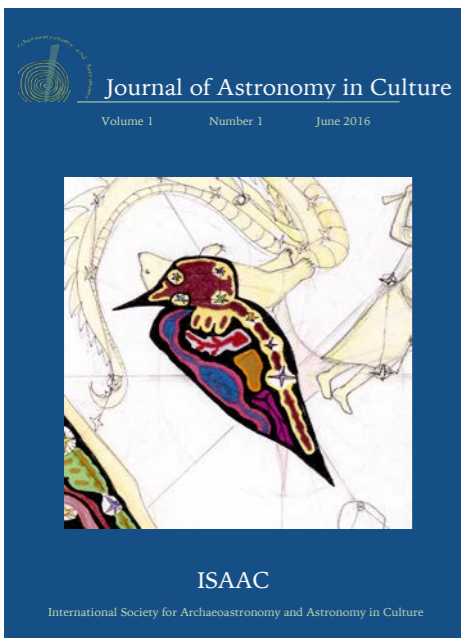
● Indigenous Astronomy

Assoc. Prof. A. Lee works closely with Native American and First Nations communities in the U.S. and Canada, particularly with Ojibwe and D/Lakota communities to revitalize Indigenous star knowledge. Importantly this work and research has led to strong international collaborations with Indigenous knowledge keepers and researchers in Aboriginal Australia, Maori New Zealand, Hawaii, South Africa, Mexico, Alaska, and South America.



RECENT PUBLICATIONS

- Lee, Annette S., Nancy C. Maryboy, David H. Begay, Wilfred Buck, Yasmin Catricheo, Duane W. Hamacher, Jarita C. Holbrook, et al. "Indigenous Astronomy – Best Practices and Protocols for Including Indigenous Astronomy in the Planetarium Setting." International Planetarium Society Conference Proceedings Journal, August 2020.
- Lee, Annette S., Sally Brummel, Kaitlin Ehret, Sarah Komperud, and Thaddeus LaCoursiere. "Building a Framework for Indigenous Astronomy Collaboration, "Native Skywatchers, Indigenous Scientific Knowledge Systems, and The Bell Museum." International Planetarium Society Conference Proceedings. Edmonton, Alberta, Canada (virtual), 2020.
- Lee, Annette S., William Wilson, Jeff Tibbetts, Cark Gawboy, Anne Meyer, Wilfred Buck, Jim Knutson-Kolodzne, and David Pantalony. "Celestial Calendar—Paintings and Culture-Based Digital Storytelling: Cross-Cultural, Interdisciplinary, STEM/STEAM Resources for Authentic Astronomy Education Engagement." In EPJ Web of Conferences, 200:01002. EDP Sciences, 2019.
- Lee, Annette S. "The Cosmos as Viewed Through the Lens of a Native-American Astronomer-Artist." In Imagining Other Worlds, edited by Nicholas Campion and Chris Impey, pg. 203-220. Gresham College, London,: Sophia Centre Press, 2018.
- Lee, Annette S. "Ojibwe Giizhiig Anung Masinaaigan and D(L)akota Makoče Wicarihpi Wowapi: Revitalization of Native American Star Knowledge, A Community Effort." Journal of Astronomy in Culture 1, no. 1 (2016). <https://escholarship.org/uc/item/58m4f9pq>.
- Lee, Annette S., "Native Skywatchers: Kapemni. As it is Above, It is Below...A Hands-On STEM + Art + Culture Experience", Astronomical Society of the Pacific Conference Series, ASP Conference Series, Vol. 500, Communicating Science, 2015, p. 155-166
- Lee, Annette S., and Jim Rock. "Native Skywatchers and the Makoce Wicarihpi Wowapi—D(L)akota Star Map—Building Community Around Native Star Knowledge," Astronomical Society of the Pacific Conference Series, ASP Conference Series, Vol. , Communicating Science, 2014-15

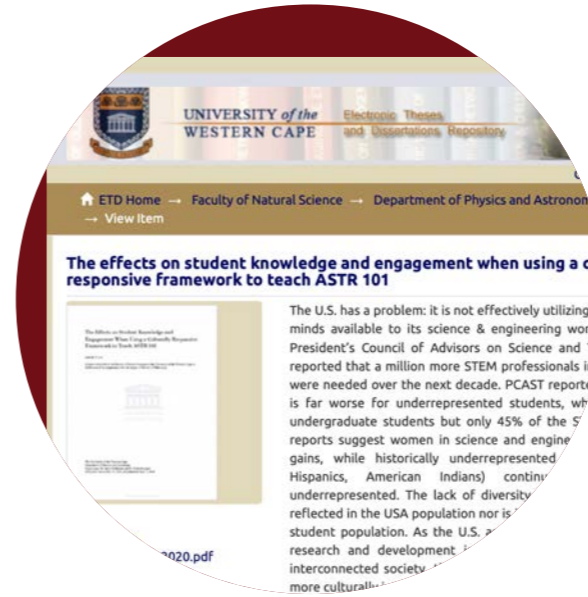


RECENT INVITED TALKS

- International Dark Skies Association, Keynote Speaker, "Wicarihpi Oyate Under One Sky", Global Conference 2020
- Canadian Space Agency-Women in Space Conference, Keynote Speaker, Saint-Hubert, Quebec, Canada 2020
- American Physical Society, Conference for Women in Physics, Univ. of Minnesota, Invited Speaker 2020
- Stars over Wiikwemkoong, Manitoulin Island, Assiginack, Ontario, Canada, Invited Speaker 2020
- Sophia Centre for Cosmology in Culture Conference, "Stories of Sky", Lampeter, Wales, Invited Speaker 2020
- NSF-Western Regional Noyce Conference, University of Portland, Keynote Speaker, Oregon 2020
- American Astronomical Society (AAS) 234th Meeting, Plenary-Invited Speaker, St. Louis, Missouri 2019
- Am. Assoc. for the Advancement of Science (AAAS), Dialogue on Science, Ethics & Religion, Invited Talk 2019
- Adler Planetarium, Webster Distinguished Lecturer IAI, Invited Talk, Chicago, Illinois 2019
- Minnesota Geoscience Teachers Conference, Keynote Speaker, Minneapolis, Minnesota 2019
- Invited Speaker, International Expert Meeting, Astronomical Heritage & Sacred Places, Gran Canaria, Spain 2018
- Invited Colloquium Speaker, Department of Astronomy University of Toronto, Ontario, Canada 2018
- Keynote Speaker, Maamwizing Indigenous Conference, Laurentian University, Sudbury, Ontario 2018
- Keynote Speaker, Environmental Education Association of Oregon, Portland, Oregon 2018
- Invited Speaker, Public Talk, US Embassy Scholar, Univ. of Southern Queensland, National Science Week 2018
- Invited Colloquium Speaker, US Embassy Scholar, Univ. of Southern Queensland, Centre for Astrophysics 2018
- Invited Speaker, American Indian/Alaskan Native Working Group Lead, NASA Science Mission Directorate 2018
- Invited Speaker, NASA Office of Education, Minority University Research & Education Project (MUREP) 2017

● Astronomy Education

Annette's work in astronomy education research (AER) includes a PhD in Physics and Astronomy with a dissertation entitled, The Effects on Student Knowledge and Engagement When Using a Culturally Responsive Framework to Teach ASTR 101. Results found that students in the course with increased cultural relevancy experienced a 30% increase in the science learning content and underrepresented minority students were eight times more likely to earn an 'A'. Culturally responsive ASTR101 curriculum and strategies, both anchored in Indigenous knowledge systems (IKS) have been developed over the past fifteen years.

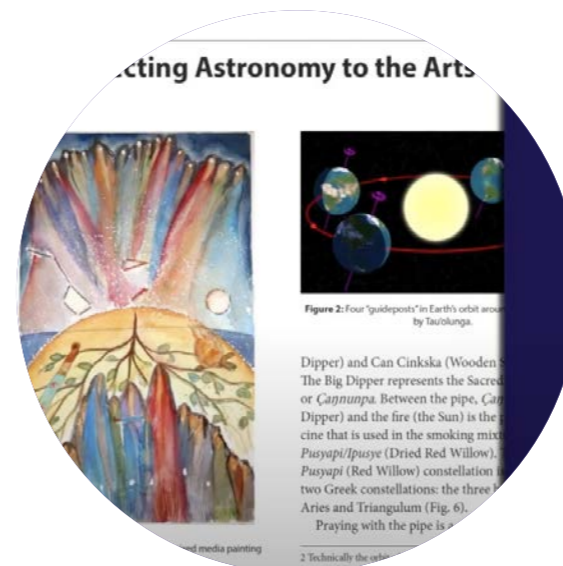


Currently Annette is an Associate Professor of Astronomy & Physics at St. Cloud State University (SCSU), Director of the SCSU Planetarium, and Honorary/Adjunct Associate Professor at the University of Southern Queensland (USQ) in the Centre for Astrophysics, Distinguished Lecturer-Archaeological Institute of America (IAI)-Webster Lectureship, and an American Astronomical Society (AAS) Shapley Lecturer. Annette is mixed-race Lakota and her communities are Ojibwe and D/Lakota.



● Art - Science - Culture

Annette's work as a visual artist lives at the nexus of art, science, and culture. Receiving an MFA from Yale School of Art (2000) with a focus on painting and a thesis show entitled "Star Medicine", the work has since grown into mixed media, digital media, and curating museum exhibits. Annette co-curated an exhibit at the National Museum of Science and Technology-Ingenuum called "One Sky-Many Astronomies" (Nov. 2017). Currently she is lead curator and indigenous design advisor for an indigenous astronomy traveling exhibit, "One Sky-Many Worlds: Indigenous Voices in Astronomy" (opening May 2022).



3. Continuing Prep

Assoc. Prof. A. Lee is a life-long learner and a passion for ideas that leads directly into continuing preparation and study. Highlights including completing a Ph.D. in Physics and Astronomy at the University of the Western Cape (June 2020) in Astronomy Education Research entitled, "The Effects on Student Knowledge and Engagement when Using a Culturally Responsive Framework to Teach ASTR 101".



Ph.D - Physics & Astronomy
University of the Western Cape

"The effects on student knowledge and engagement when using a culturally responsive framework to teach ASTR 101", June 2020. Measures student gains, examines the role of culture in STEM learning.



Equity, Diversity, Inclusion
International Astronomical Union (IAU)

Collaboratively wrote, "Springboard to action: Recommendations for improving equity, inclusion, and diversity in Astronomy", Strategic Plan, 2020-2030, International Astronomical Union (IAU) Aug. 2020.



Participant
Culturally Responsive Pedagogy

Professional development cohort offered by MnSCU/Minn State. Led by Cathy Crea, Kimberly Johnson, and Robin Bowden based at Century College in partnership with Minnesota State, Spring 2019.



University of Melbourne
Indigenous Scholar In-Residency

A/Prof Lee brings a rare and highly regarded combination of expertise in astrophysics (PhD), visual art (MFA), and personal experience as a First Nations woman in academia. She is a leading global expert in Indigenous astronomy and the inclusion of Indigenous Knowledge and perspectives into physics and astronomy undergraduate curricula.



Honorary/Adjunct
Centre for Astrophysics

Assoc. Prof. A. Lee led workshops on culturally responsive STEM and Indigenous astronomy at the University of Southern Queensland and shortly thereafter was awarded Honorary/Adjunct Assoc. Professor for collaborative work with Assoc. Prof. Duane Hamacher.



Digital Arts
Adobe Creative Cloud

Assoc. Prof. A. Lee creates original visual graphics and translates research into visually stimulating and intellectually engaging infographics. Proficiency using the Adobe Creative Suite, with an emphasis on InDesign, Dreamweaver, and Photoshop

& Study

In addition to her expertise in Culturally Responsive Astronomy/STEM, Assoc. Prof. A. Lee is at the cutting edge in Indigenous Astronomy and Art|Science|Culture community-based initiatives as seen by her attendance at 60 conferences since July 2014. There is a enormous breadth of knowledge and professional networks here that span the spectrum from astronomy to art; from archaeology to astrobiology; from informal science education to graphic design!

Visiting Scholar
U.S. Embassy Visiting Scholar-University of Southern Queensland (USQ), Centre for Astrophysics, 2018

Visiting Lecturer
American Astronomical Society (AAS) - Shapely Visiting Lecturer, 2019-current

Distinguished Lecturer
Distinguished Lecturer 2018-19 Archaeological Institute of America (AIA)

Keynote Speaker
Canadian Space Agency, Women in Space conference highlights the achievements of women researchers, discusses challenges and offers opportunities...2021

Plenary Speaker
American Astronomical Society's 234th Meeting, "From Native Skywatchers to ASTR101... New Designs for Interdisciplinary, Multidisciplinary, and Transdisciplinary engaged Learning"

Grant Awarded
AAS Education and Professional Development, "Skywatchers: Bringing Together Cultural and Scientific Knowledge of the Stars", Led by A. Lee (SCSU) & D. Scalice (NASA)

Keynote Speaker
NSF-NOYCE Western Regional Conference, University of Portland, Oregon, National Science Foundation. 2020

Invited Speaker
CUWiP-University of Minnesota, APS Conferences for Undergraduate Women in Physics (CUWiP) a 3-day regional conferences for undergraduate physics majors. Jan, 2020

Grants Awarded
MSAB-Minnesota State Arts Board, Arts Learning, 2014-2015 (FY15), "Native Skywatchers - Earth Sky Connections", (FY17), Arts Touring (FY17), Creative Support (FY21)

4. Student Focus

Evidence of student growth and development can be seen throughout Assoc. Prof. A. Lee's work. Simply put, she has a passion for teaching and learning that cannot be understated. She cares and is willing to constantly be challenging both herself and her student to excel. The classroom environment created is extraordinary because in spite of being in a fixed seating lecture hall, there is a tremendous amount of active learning and engagement happening. This is especially impressive in her courses that have 200 enrolled students. Infused into all areas of professional activities examples include: developing student-centered culturally responsive curricula, academic and career advising, contributing to student retention and graduation, supervising both undergraduate and graduate student-based research, assist students in finding jobs and opportunities...



Student-Centered

Assoc. Prof. A. Lee's courses use evidence based pedagogies such as: culturally responsive teaching, active learning, growth mindset, sense of belonging, sense of caring, metacognition....all woven together with rigour and warmth to humanize the learning experience.

Internships

Assoc. Prof. A. Lee frequently supports student applications for internships, REUs, jobs, and graduate schools. Exciting examples include: the Summer Program at STScI (Space Telescope Institute), NASA-Marshall Space Flight Center, NASA- Servir Mission, Russian Space Exchange Program, and the Hubble Space Telescope.

Retention

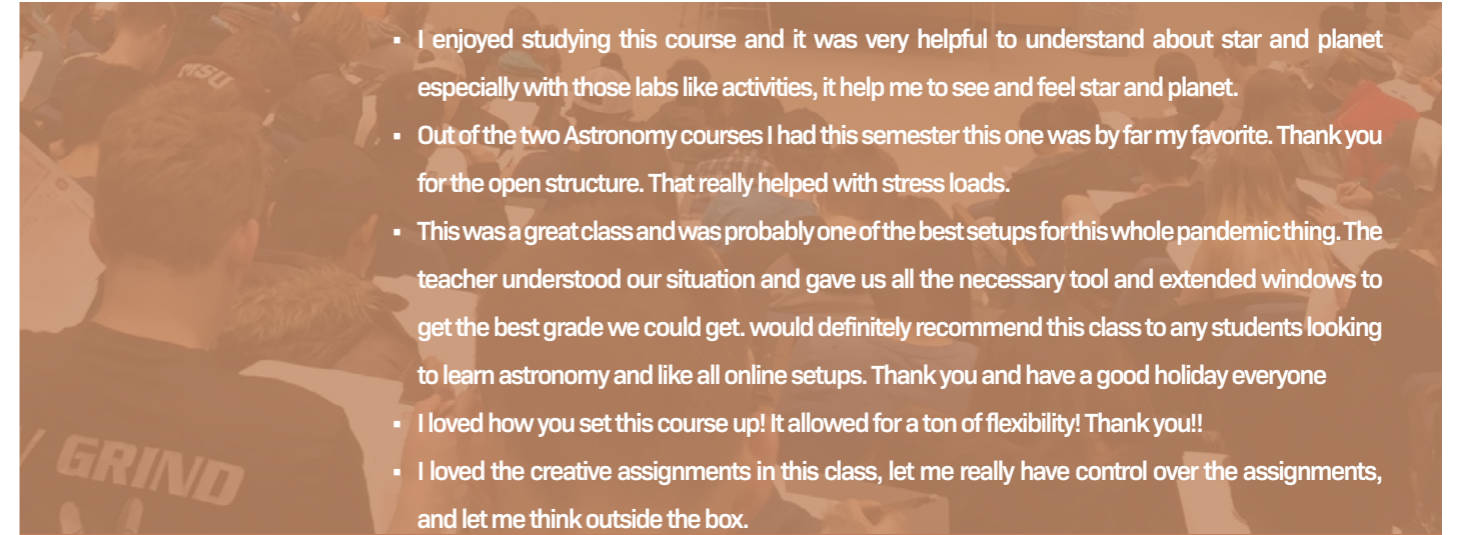
Assoc. Prof. A. Lee demonstrates constant efforts to support recruiting, retaining, and graduating SCSU students. Work includes collaborations with the SCSU American Indian Center, the SCSU Women's Center, and the Multicultural Resource Center. Role models matter.

"Hello Professor Lee, I wanted to let you know quick that I will not be in class today... I also wanted to say that I have enjoyed your class, there were a lot of interesting topics and conversations. And who knows, maybe we will one day find other life out there! You are very knowledgeable and passionate about what you do, which definitely makes a class more enjoyable! I hope to be that way in my own classroom someday. Thanks for a good experience, Tara (ASTR 107 Student)"

100% Multicultural, Inclusive Pedagogy

Student-made ASTR 101 - 2 min Video Projects, "Astronomy in Your Life". (Top)-Center for Astronomy Education, Workshops attendee, Use of Resources in Courses; (Bottom)-Discussion Framework SCSU Professional Development Opportunity: Dr. Saundra McGuire, "Metacognition is the Key!" Critical reading and discussion activity, relevant cultural issues in science & society.

Here's what students are saying ...



- I enjoyed studying this course and it was very helpful to understand about star and planet especially with those labs like activities, it help me to see and feel star and planet.
- Out of the two Astronomy courses I had this semester this one was by far my favorite. Thank you for the open structure. That really helped with stress loads.
- This was a great class and was probably one of the best setups for this whole pandemic thing. The teacher understood our situation and gave us all the necessary tool and extended windows to get the best grade we could get. would definitely recommend this class to any students looking to learn astronomy and like all online setups. Thank you and have a good holiday everyone
- I loved how you set this course up! It allowed for a ton of flexibility! Thank you!!
- I loved the creative assignments in this class, let me really have control over the assignments, and let me think outside the box.
- This course is really good, I will recommend it to my friends.
- I felt like I learned a lot more from the Big Picture activities. I really enjoyed that part of the class and the discussions. keep doing that. The book was informative and had a lot of information but I like the hands on approach. I really enjoyed this class and with that we were not in a pandemic because I would like to be in person for a class like this. overall I had a great experience. Thank you.
- This class was very informative and I feel like I've actually learned something, especially with the pandemic and online class, I would definitely recommend to a friend!
- For an introductory course I liked the fact that we looked into many different topics.
- Great class that I highly recommend to peers.

"I loved this class! Makes me want to consider switching my major to astronomy."

- Love the teaching style
- I would like to give a lot of credit to the professor, she made it very enjoyable, interesting, fun, and her passion for astronomy made me want to learn more.
- I loved the class its very clear to see that you love your work and love to teach it and help your students fully

understand the work the class was very balanced in work and lectures

- Thank you for the course! It was definitely one of my favorite classes this semester
- Very great professor and really nice one of my favorites!
- I liked the comments of the professor about recent stuff.
- Wonderful job amidst the pandemic; I applaud you
- I loved your class.
- Great introductory course to Astronomy, learned a lot of the fundamentals
- Overall this class is very interesting especially because the instructor shared the knowledge of the current discoveries.
- I learned a lot from this class and I thought it was very interactive and interesting
- Loved how you could tell the professor loves what she does. The passion was a 10/10
- Love your class! I love your passion for astronomy! This class is so fun and interesting!

5. Service

Recruiting, Retaining, and Graduating Students is a top priority. Serving on regional, national and international professional bodies, providing community presentations and outreach, developing and supporting international programs, partnerships with universities, and organizations, working with community on multicultural efforts are all part of Assoc. Prof. A. Lee's natural instinct, giving back to community is part of Indigenous identity.



SCSU Committees & Governance

Assoc. Prof. A. Lee continues to serve on numerous departmental, college, and university committees. Examples include the SCSU Faculty Senate, COSE Assessment Committee, Advisor, Science Teaching, Unit Assessment Committee, Astronomy Assessment



MN Department of Education K-12

Serving on regional, national and international professional bodies, providing community presentations and outreach, developing and supporting international programs, partnerships with universities, and organizations, working with community on multicultural efforts



Delivering Educator Workshops

In collaboration with the MN Department of Education, *Native Skywatchers Educator workshops* have been designed and delivered by Assoc. Prof. A. Lee annually since 2012. Huge interest & demand.



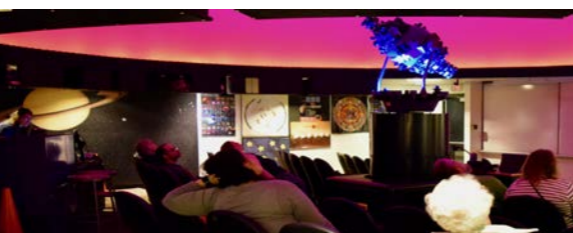
Fostering Alumni Relations

Receive numerous emails (like shown on page 16) from SCSU alumni and community members, who offer generous praise and support of my community-based work and research.



Community Organizations

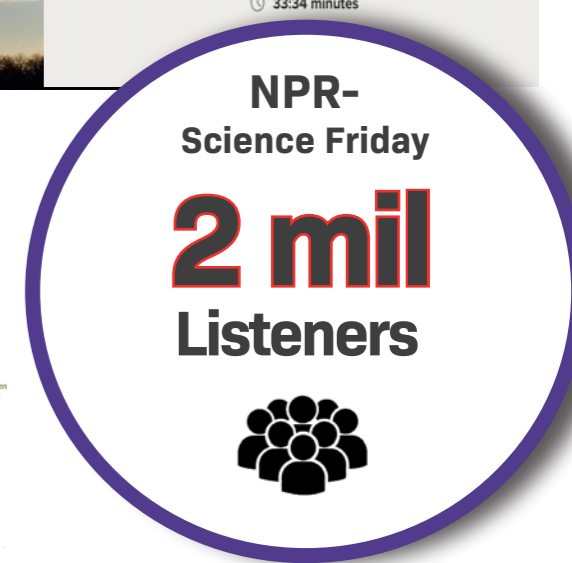
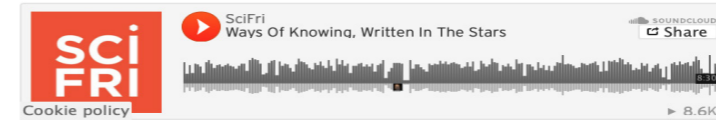
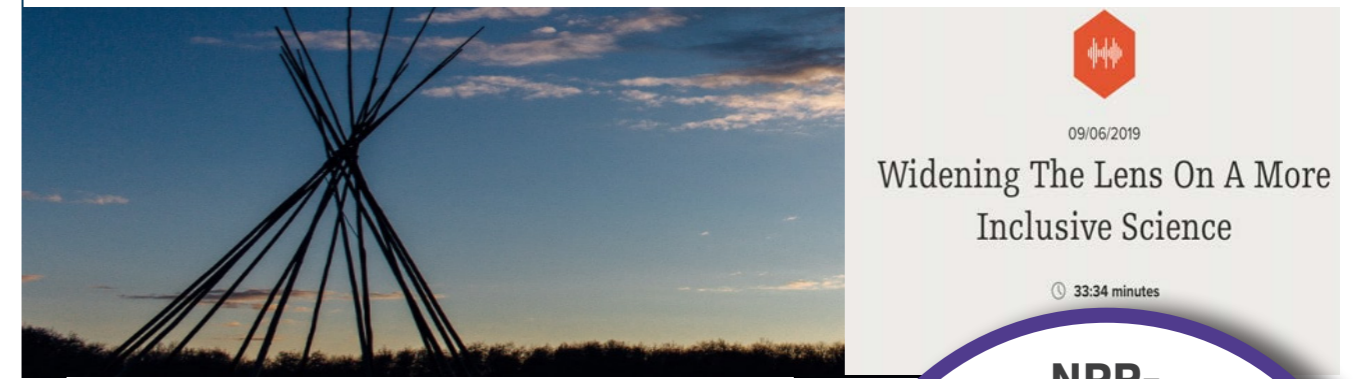
Invited to illustrate children's books like *Forever Sky* by the Minnesota Historical Society, later awarded the NE MN Book Award. Collaboration with a broad range of cultural institutions in the region: Stearns History Museum, St. Cloud Public Library, Paramount Theater, Red Wing Historical Society, and the Bell Museum.



Mentoring & Collaboration

Collaboration and training with SCSU colleagues like Rachel Humphrey (AHS), Darlene St. Clair, Jim Knutson-Kolodzne, and multiple fixed term astronomy instructors like T. Vaccaro, alumni, current students, and community members to take part in outreach event like Public Nights and SCSU Planetarium programming. Retention, recruitment, & graduation!

The work and research of Assoc. Prof. Annette S. Lee was featured on NPR-Science Friday, Fall 2019...



Hello!

I am SCSU Alumni '98 and I just listened to your Science Friday Podcast! I was so impressed and surprised to hear someone from the astronomy department at SCSU. You sounded great, way to go!! I actually helped run the planetarium as an independent study class for a couple of semesters back when I was at SCSU and graduated with a teaching degree in General Science and Earth Science. That was with the old star ball which I assume has been replaced? I still have friends and family in Minnesota and actually visited the campus this last summer. Visiting the planetarium didn't even cross my mind and I regret that now! It was kind of on a whim and with COVID I wasn't hopeful on how much things would be open anyways.

When I was at St. Cloud from 1993-1998 I also was very involved in the lacrosse club there which also brought some fascination with the native culture and a possible relationship with the American Indian Center. We didn't have any native players, until we had a student arrive from the Mohawk Nation from Akwesasne who was an amazing lacrosse player. My dream of connecting the two organizations wasn't enough though as the relationships between the two didn't work out or amount to much. I don't think that the lacrosse club is even currently active anymore. I kept on playing though and have coached 4 high school teams in Minnesota and Colorado!

Your story resonated with me and how I can incorporate more culture into my astronomy curriculum. I currently teach Earth Sciences at Alameda International Jr/Sr High School in Lakewood, Colorado which is a part of the Jefferson County School District. I actually started the Astronomy class in 2006 at Alameda and have been teaching that class as well as other sciences for the past 21 years. I recently won a Earth Science teacher of the year award from the Rocky Mountain Association of Geology. I think it is time for me to focus more on astronomy!

I will continue to look into some of your projects, events, and any curriculum that you might have on your personal website and the Native Skywatchers website to see how I can incorporate any Native astronomy in my teachings.

My goal with this message was just to reach out and say hello and congratulate you. It truly is a small world and you have inspired me to expand my astronomy curriculum to include Native stories and star maps. I welcome any other information that you can share with me that could assist me in expanding my students knowledge of the night sky.

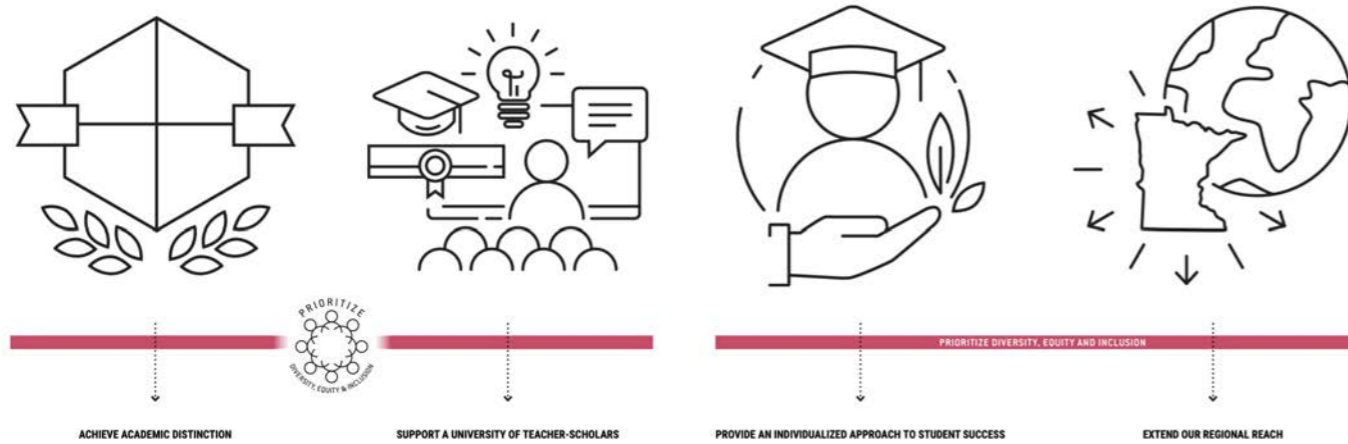
Thank you for all that you do.

Go Huskies!

Matt Thomas
Science Teacher
Alameda International Jr/Sr High School



It's Time Alignment



Assoc. Prof. Annette Lee's teaching and research aligns perfectly with SCSU's "It's Time Initiative"

- ✓ Academically Distinct
- ✓ University of Teacher-Scholars
- ✓ Individualized Approach
- ✓ Regional Reach
- ✓ Prioritize Diversity, Equity & Inclusion

Academic Distinction- Assoc. Prof. A. Lee is a regionally, nationally and globally recognized leader.

Just like St. Cloud State University sets itself apart from other regional universities, Assoc. Prof. A. Lee sets herself apart from other astronomers and science educators. Her career is dynamic, just like we are preparing our students for dynamic careers. There is always room for learning more, exploring cutting edge issues of our day, asking and solving the tough questions that we face in science and technology and society today. Her work is rooted in Indigenous Knowledge Systems and that means the human experience. Experiential learning, compelling coursework, connections with alumni and industry, are always a top priority.

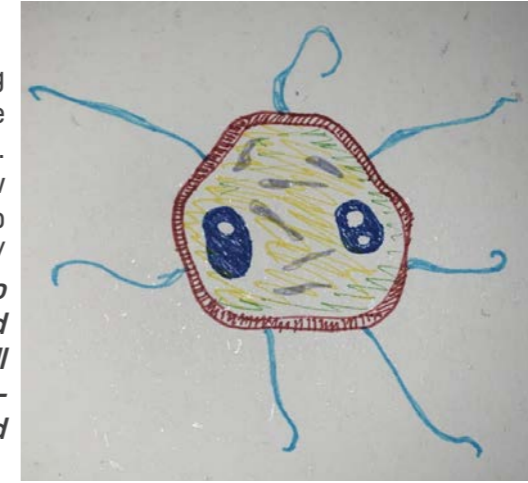
Diversity, Equity & Inclusion

As an Indigenous woman in STEM, as a mixed-race Lakota astrophysicist and educator the issues of 'Diversity, Equity & Inclusion' (DEI) is not a new initiative, but a lifetime initiative. Assoc. Prof. A. Lee has earned five university degrees: three graduate degrees, two undergraduate degrees. Her academic credentials span Astrophysics to Mathematics; from Visual Arts to Painting. This is the epitome of an interdisciplinary scholar and learning. This is a person with a passion for the values rooted in DEI, and who has worked intentionally to address systemic inequities especially in STEM education. Her research and programming initiative, *Native Skywatchers*, is known locally, nationally, and globally for cutting edge work in Indigenous STEM revitalization work especially in K-12, community, and informal science education.



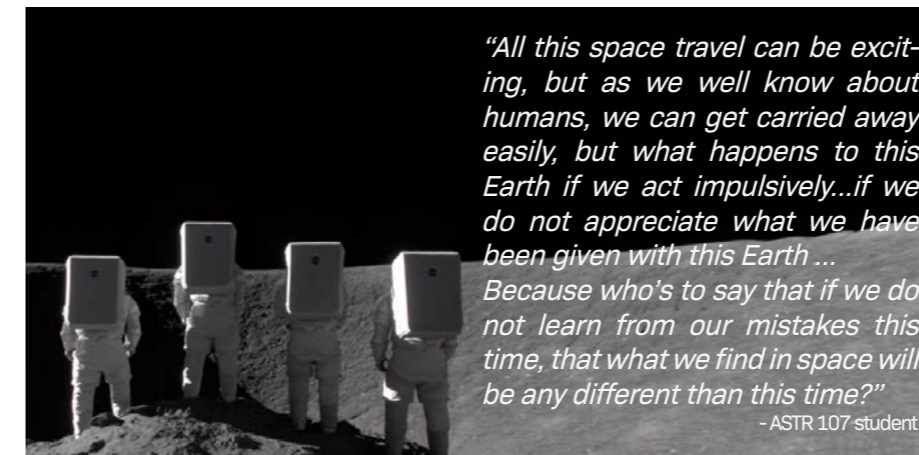
University of Teacher-Scholars

Creativity and adaptability in teaching and learning will fuel the energy we need to move our institution forward. So many of our faculty are breaking new ground in their research, scholarship and creative work. For our "teacher/scholars," we will support faculty *who integrate research, scholarship and creative work with instruction. We will develop a culture of innovation to design new approaches to teaching and learning.*



"This organism I drew is a lot like a combination of a plant and animal cell. I know next to nothing about biology, but I do believe that the cells we find, if any, will be more advanced or just as advanced as the first single celled organism on earth. This cell has two nuclei, and advanced probing devices lining the outside. The devices can detect what environment it is in, and with the power of not one but two nuclei, it will be able to adapt, form and destroy cell walls, to its environment. It will also have organelles that we do not find on earth, that help it survive through its harsh conditions. This cell will be living on a planet with water, but a planet that is closer to the sun than earth and twice the size. It will be extremely hot on this planet, and one of the organelles in its system will be able to transfer heat directly into energy. A planet that I found that could possibly have this life on it is the planet 51 Pegasi b." - ASTR 107 student

"I had tremendous fun doing this assignment! Alien life has always been a fascination of mine! Also my drawing is terrible, please don't mind the horrendous art skills!" - ASTR 107 student



"All this space travel can be exciting, but as we well know about humans, we can get carried away easily, but what happens to this Earth if we act impulsively...if we do not appreciate what we have been given with this Earth ... Because who's to say that if we do not learn from our mistakes this time, that what we find in space will be any different than this time?" - ASTR 107 student

Individualized Approach
Our access mission means we must lean in and embrace higher education's role as the great equalizer that creates unparalleled opportunities for economic and social mobility for our students. We must pivot from a one-size-fits-all approach to a set of academic, social and financial support services that **meet students where they are and engages them in achieving their personal and professional aspirations.**

Regional Reach

EXPANDED RECRUITING AREAS

While we will continue to recruit in Minnesota, we will also expand our recruiting areas beyond Minnesota in response to changing demographics. More broadly, we will expand our recruitment efforts in the Midwest region and select areas in the United States and internationally.

GLOBAL COMPETENCY

Our commitment to being "stewards of place" means that we will continue to serve the students and workforce needs of Central Minnesota. We also recognize that our social, economic, health and cultural landscape increasingly requires our students, faculty and staff to attain a global perspective to remain competitive and relevant in a connected world. We will actively advance local, state, and global partnerships and connect the assets and expertise of our campus community to address local and global needs.

"It was fun to participate in something like this. I am saddened that there are a lot of galaxies that are just circles, but still nice to help identify them...I was surprised by just how little spiral galaxies there seemed to be. I would definitely recommend this website to any of my friends who have an interest in space." - ASTR 107 student



It's Time

Statement

Hau Mitakuye Oyasin, To all my Relations, my name is Annette Lee, I am mixed-race Lakota, family name *Wanbli Luta*, my communities are Ojibwe and D/Lakota. I am speaking to you from the land we call *Mni Sota Makoce*, the Land where the Water Reflects the Sky or Minnesota.

I am an Associate Professor of Astronomy at St. Cloud State University, and an Honorary Adjunct Associate Professor at the Centre for Astrophysics at the University of Southern Queensland.

My work is in large part about culture... the role of culture in teaching and learning STEM, the value of Indigenous culture as a comprehensive knowledge system rooted in history, living practice, and connected deeply to human survival and quality of life.

Culture is more than the superficial customs around holidays. Culture is the system of beliefs and worldviews that is mostly unconscious...like the air we breathe, it surrounds us, is part of us, it is dynamic. It is the philosophical pillars of our identity as human beings going through this uniquely human experience.

As the U.S. will become majority minority sometime in 2040, it is my hope is that we acknowledge that science is embedded with culture and with our humanity. Then, we can begin to practice cultural responsiveness and cultural agility in STEM.

Now it is time to widen the lens and acknowledge that all cultures have a contribution. Only by including a diversity of perspectives can we begin to tackle the most pressing issues of our day...covid, climate change, gene editing, AI, space travel. Public engagement with science and technology is not a 'feel good add-on'. It is critically important to our human survival. Science belongs to everyone.

Pilamaya, Miigwech, Thank you.

“...the role of culture in teaching and learning in STEM”



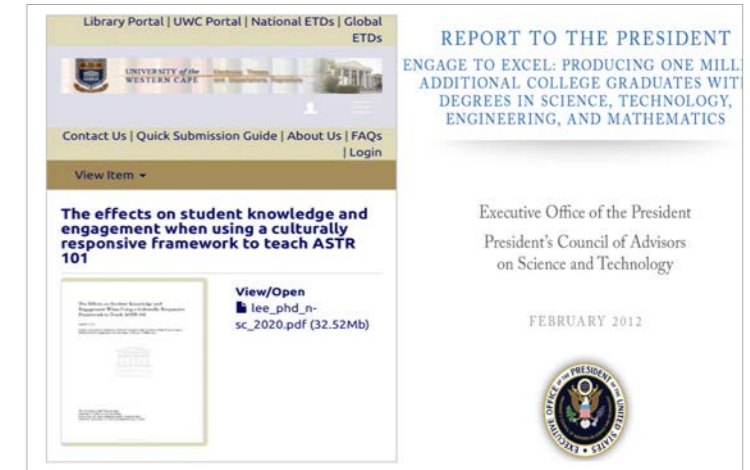
Annette S. Lee

In Closing

Annette S. Lee is Associate Professor of Astronomy in the Department of Physics and Astronomy within the College of Science and Engineering at St. Cloud State University. Assoc. Professor A. Lee researches Indigenous Astronomy, Astronomy Education Research (AER), Art and Science, Informal Science Education, and the History & Philosophy of Science.

Astronomy Education Research The role of culture in teaching and learning

Annette's work in astronomy education research (AER) includes a PhD in Physics and Astronomy with a dissertation entitled, *The Effects on Student Knowledge and Engagement When Using a Culturally Responsive Framework Inspired by Indigenous Knowledge Systems to Teach ASTR 101*. Results found that students in the course with increased cultural relevancy experienced a 30% increase in the science learning content and underrepresented minority students were eight times more likely to earn an 'A'. Culturally responsive ASTR101 curriculum and strategies, both anchored in Indigenous knowledge systems (IKS) have been developed over the past fifteen years.



Indigenous Astronomy A comprehensive knowledge system rooted in history, living practice, and quality of life

Designed by Lee (2007), the Native Skywatchers initiative seeks to remember and revitalize indigenous star and earth knowledge. The over-arching goal of Native Skywatchers is to communicate the knowledge that indigenous people traditionally practiced a sustainable way of living and sustainable engineering through a living and participatory relationship with the above and below, sky and earth. We aim to improve current inequities in education for native young people, to inspire increased cultural pride, and promote community wellness. We hope to inspire all people to have a rekindling or deepening sense of awe and personal relationship to the cosmos.



Visual Artist Embracing the complexity of our evolving human experience, a change-maker

Annette's work as a visual artist lives at the nexus of art, science, and culture. She creates a transformative community responding to and generating paradigmatic shifts at the intersection of art-science-culture. Very few people in the world have this skill set and the courage to make these connections. Annette's work embraces the complexity of the human experience and seeks to empower, especially students and communities of color. In this way, art is a both parallel to spiritual practice but also through critical study and creative practice questions centers of power. Digital storytelling to social justice, art encapsulates all.



NATIVE SKYWATCHERS-EARTH SKY CONNECTIONS
Founded by Annette S. Lee, 2007 Contact: aslee17@gmail.com