

Increasing Retention and Graduation Rates for Women in STEM

Ms. Annette L. Pilkington, Colorado School of Mines

Annette Pilkington is the Director of the Women in Science, Engineering and Mathematics (WISEM) Program at the Colorado School of Mines. She has a BA in Elementary Education from the University of Northern Iowa and a M.A. in Curriculum and Instruction from Columbia University Teacher's College.

Dr. Amy E Landis,

Dr. Landis joined Mines in August 2017 as the first Presidential Faculty Fellow for Access, Attainment, and Diversity. Previously, she was a full professor at Clemson University from 2015 through 2017 as the Thomas F. Hash '69 endowed chair in sustainable development. There, she served as Director for Clemson's Institute for Sustainability, which brings together interdisciplinary research, education, and business for sustainability. Dr. Landis spent her Associate Professor years at Arizona State University's School of Sustainable Engineering in the Built Environment from 2012 to 2015. Dr. Landis began her career as an Assistant Professor at the University of Pittsburgh after having obtained her PhD in 2007 from the University of Illinois at Chicago under the supervision of Dr. Thomas L. Theis.

Dr. Landis has developed a research program in sustainable engineering of bioproducts. Her research ranges from design of systems based on industrial ecology and byproduct synergies, life cycle and sustainability assessments of biopolymers and biofuels, and design and analysis of sustainable solutions for healthcare. In addition to building and maintaining a successful sustainable products research group, Dr. Landis has spent her career promoting and supporting women and underrepresented minorities in STEM. Like many of her predecessors, her early work was voluntary and informal. She began encouraging women in STEM through volunteer and outreach programs as a graduate student, and took on informal leadership roles as an Assistant and Associate Professor. Some of her early efforts included negotiation workshops, networking events, work-life balance discussion groups, and an impostor syndrome workshop. At Clemson University, Dr. Landis served as the Thomas F. Hash '69 endowed chair in sustainable development and Director for Clemson's Institute for Sustainability. In this role, Dr. Landis contributed in a formal capacity to improve opportunities for women and underrepresented students through the Institute. She established numerous successful programs in her short time at Clemson, including an undergraduate research program for underrepresented students, a graduate professional development program, and a workshop on communicating engineering for women. At Mines, Dr. Landis leads the President's Council on Diversity, Inclusion, & Access, whose mission is to establish a strategic plan for access, attainment, inclusion, and diversity at Mines.



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Dr. Amy Landis, Faculty Fellow for Diversity, Inclusion and Access, Professor
Annette Pilkington, Director Women in Science, Engineering and Mathematics Program



WOMEN IN SCIENCE, ENGINEERING AND MATHEMATICS
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SLIDE 1 Notes: This presentation will review the efforts of Mines Women in Science and Engineering and Mathematics (WISEM) program, and share best practices that have resulted in outstanding support and outcomes for women at Mines. Highlighted programs will include: Evening with Industry, Networking Reception, Girls Lead the Way Leadership Conference, SWE Mentoring Program, Florence Caldwell Scholarship Program and the Vanguard Community of Scholars Program. Additionally, we will explain how the WISEM office provides professional staff support and advising for SWE and the student lead events ensuring consistent high quality programs and professional development for student leaders.

Colorado School of Mines is a post-secondary institution primarily offering STEM degrees. Founded in 1873, Mines has a long history of delivering high quality degrees. Mines students were recently ranked 4th brainiest in the Nation. While Mines is the number one ranked mineral and mining school in the world, Mines is also well-known for degrees focused on the great challenges society faces today—particularly those related to the Earth, energy and the environment. As a STEM institution, Mines historically struggled with enrollment and retention of women. The first woman, Florence Caldwell Jones, graduated from Mines in 1898. The next three women would graduate between then and 1949. Today, however, things are drastically different. Despite the well-known challenges facing women in STEM, Mines has developed unique programming with astounding results for women. Women at Mines have better retention rates than the general population. Women graduate faster than the general population. And despite making up only 31% of the population, women hold more leadership positions on campus. This presentation will review the efforts of Mines Women in Science and Engineering and Mathematics (WISEM) program, and share best practices that have resulted in outstanding support and outcomes for women at Mines. Highlighted programs will include outreach, recruitment and retention, including: Evening with Industry, Networking Reception, Making the Connection, Girls Lead the Way Leadership Conference, SWE Mentoring Program, Florence Caldwell Scholarship Program and the Vanguard Community of Scholars Program. The WISEM office provides professional staff support and advising for SWE and the student lead events ensuring consistent high quality programs and professional development for student leaders.



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Outline

1. Intro (2 minutes)
2. **Community Building (14 minutes)**
 1. Best Practices
 2. Mines Examples
 1. SWE
 2. Caldwell Scholars
 3. Think Pair Share
3. **Professional Development (14 minutes)**
 1. Best Practices
 2. Mines Examples
 1. SWE Weekly Meetings, Executive Office Board
 2. Development through outreach and event planning (EWI, NR, GLtW, GoTR, GSED)
 3. Think Pair Share
4. New Initiatives (5 minutes)
 1. Mentoring Program – Best Practices (Amy), Mines Program (Annette)
 2. Vanguard Scholars – Best Practices (Amy), Mines Program (Annette)
5. Questions/Close (5 minutes)





Mines snapshot

- **Degrees**

- 18 undergraduate majors
- 34 Graduate Programs

- **Characteristics**

- 6268 undergraduate, graduate and non-degree students
- 31 average ACT score
- \$65.89 million in research awards in FY2018
- 30.7% women students, 33% new freshmen women

- **Points of Pride**

- Ranked #4 in Lumosity's Brainiest College Ranking
- #1 best value college in Colorado
- #1 public university in the West with highest salaries after 10 years (WSJ)
- #1 in mineral and mining engineering (QS Global Ranking)

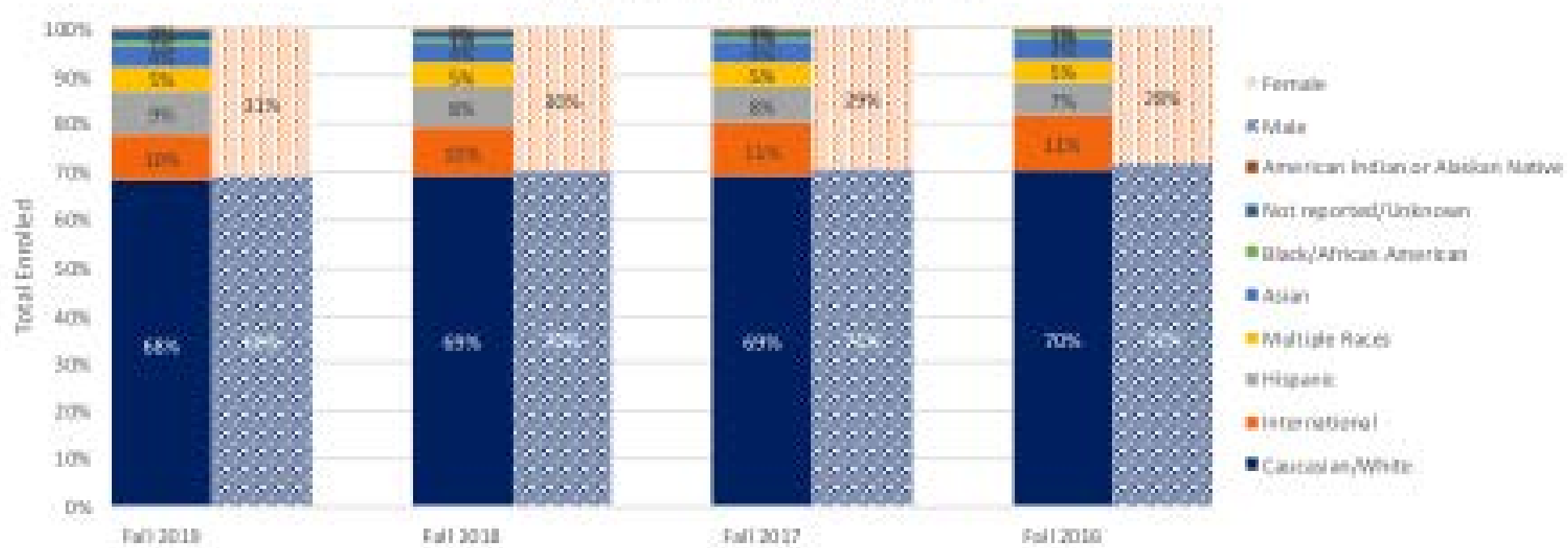


Notes: Recruitment challenges include limited scholarships for women students. Our state institution competes with two other major state schools that cost less to attend than Mines and both have strong engineering and STEM programs.



Mines snapshot

Census Enrollment for All Students







Community Building Best Practices

To support retention

- Bridge programs
- Formal mentoring (peer and otherwise)
- Living-learning communities
- Affinity groups (e.g. SWE)



SLIDE Notes: Research tells us that a sense of community can increase retention. Community can be built through a variety of practices (listed on slide)



Community Building at Mines

Society of Women Engineers

Florence Caldwell Scholarship



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Community Building Best Practices Mines Examples:

The Mines student section of the Society of Women Engineers (SWE) is the largest student organization on campus and the largest student section in the nation with almost 800 registered, paid members. To build community, the group holds a Welcome Barbeque each fall semester to welcome new first-year students to campus and allow current members to reconnect with friends after the summer break. Weekly Wednesday lunch meetings follow the barbeque and include speakers on a variety of professional development topics as well as social meetings allowing students to learn and network over lunch provided by the section. Each year, all members receive a t-shirt, designed specifically for SWE depicting the year's theme. Members are easily identifiable around campus when they wear their SWE shirts throughout the year.

SWE created a mentoring program last year and currently has 45 mentors and over 135 mentees. The program is designed to vertically integrate new women students into their major with upperclass students in their same intended department as well as involve them in clusters of mentor/mentees to allow them to get to know other new students. A variety of activities are provided including guided snowshoeing in the mountains off campus and other social events, "how to" sessions such as helping new students navigate the course scheduling process, along with social networking events.

SWE hosts a variety of outreach and recruitment events, providing members interaction through purposeful mentoring and teaching of younger girls. Volunteering at events such as Girl Scout Engineering Day for 4/5th grade students, Girls on the Rise for junior high girls and Girls Lead the Way Leadership Conference for high school girls. These events require a large number of volunteers the day of the event and involve a team of leaders who make plan and implement the event. Providing students with these impactful volunteer opportunities ensures women students are engaged with others and the campus mission. It also provides them with the ability to see themselves as an engineer – and leading others in science. Identifying as an engineer helps students persevere through to graduation and into their desired field.



Notes continued: Florence Caldwell Scholars program is a cohort of 12 women students, three in each graduating class. Each student receives a full-tuition scholarship and is expected to participate in the community, volunteer at two events per year, uphold their GPA requirement and join the Mines section of the Society of Women Engineers. The vertically integrated group of scholars participate in a welcome event to meet the three new first-year scholars and enjoy a formal dinner late in the semester. Outside of official channels, they advise and support each other socially and academically because of their unique bond with each other as a Florence Caldwell Scholar.

Challenges have included competing for students' time to get them to attend events. We try to focus on high impact, high quality events to ensure students get the community networking and professional development that will help them succeed at Mines and beyond.

Although not the focus on this presentation, Mines offers Making the Connection Program sponsored by Halliburton where accepted women students come to campus to connect with current students and faculty as well as other accepted women. This program received the Women in Engineering Initiative Award from WEPAN (Women in Engineering ProActive Network) in June of 2016 for an outstanding project or initiative that serves as a model for other institutions to promote Women in Engineering. The visit program takes place three times a year and results in higher yield (67.53%) than our regular campus tours (39.9%) or other visit programs (Preview Mines 53.7% and Discover Mines 55.8%). Participants are enthusiastic about the program. Feedback frequently includes comments such as:

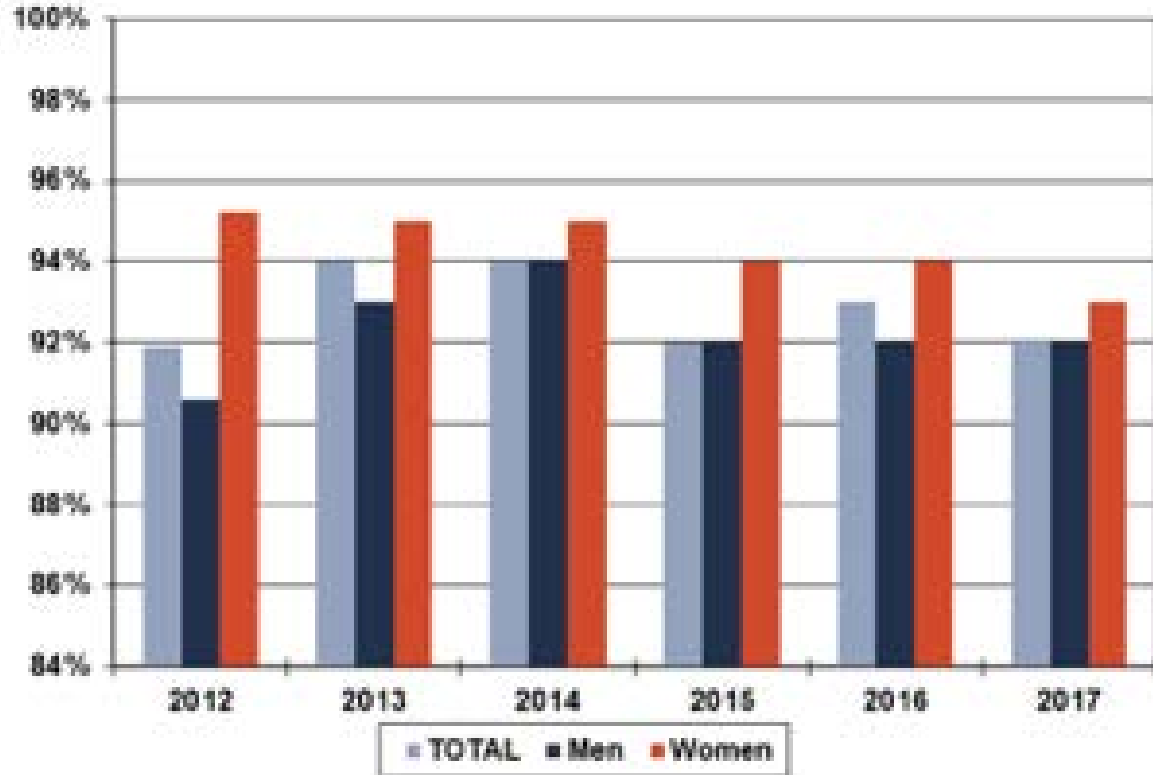
Amazing! Mines is definitely a great school with many things to offer and that definitely came across in the program."

"I love it. I officially committed this afternoon, partly thanks to the Making the Connection Event."

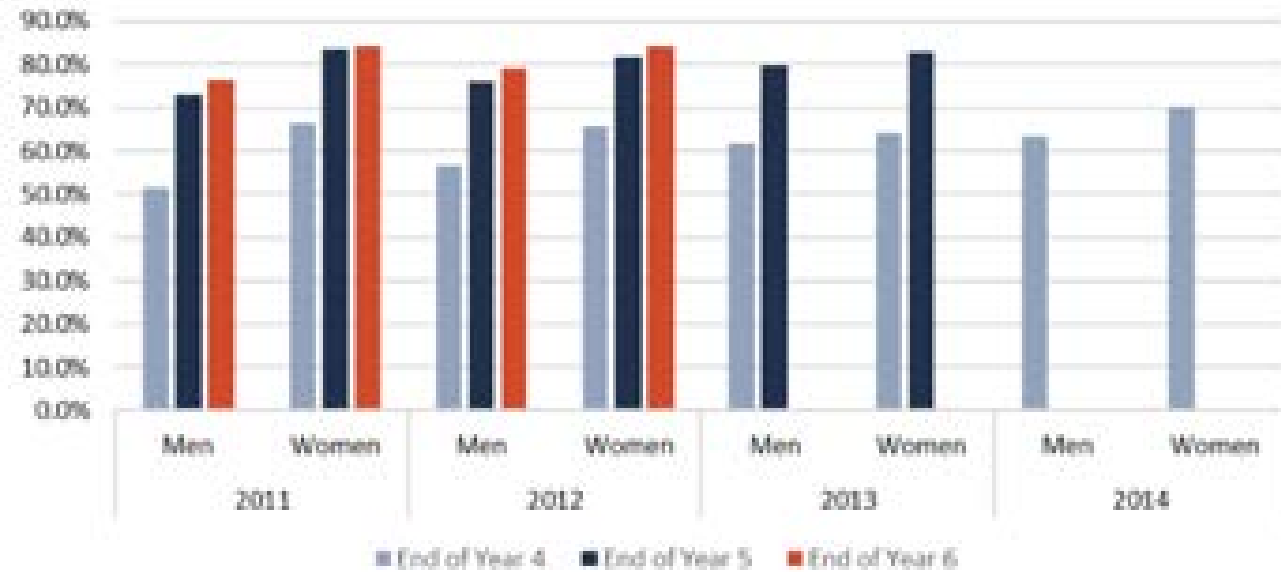




FRESHMAN TO SOPHOMORE PERSISTENCE RATE



Graduation Rates - Freshman Cohort



Our women have higher than average persistence and graduation rates.

Community Building Think Pair Share

What are the community building programs at your institution?

Share the most effective program at your organization.



Participants jot down the community building programs at their institutions, and share what they think their most effective one is with a small group of 2-3 people.



Professional Development Best Practices

- Clearly articulate expectations for the program & available resources to incoming students
- Invite role models as speakers; ensure representation in events
- Research experiences for undergrads
- Performance evaluations for student jobs

Several types of PD:

- Impostor syndrome
- Scicomm
- Technical writing
- Resume writing
- Professional presentation/interviews/networking



Professional Development at Mines



SWE Weekly Meetings



Outreach Events



Career Development

Professional Development Best Practices Mines Examples:

The Officers SWE lunch meetings take place every Wednesday at noon. Lunch is provided by corporate sponsors and the speakers are representatives from the sponsoring organizations or others who are not affiliated with a company (Mines faculty, non-profit representatives, etc.) Speakers are selected and invited by student officers. This gives control of the topics to the students and responsibility to the SWE officers to network with prospective speakers and corporate donors. Mastering these skills prepares students for the workplace and helps them build an affinity to SWE and Mines.

SWE is set up with a 12 member officer structure that mimics a corporate board. Student leaders learn how to run meetings, delegate tasks, work in teams, supervise others and report up the chain of command. The SWE faculty advisor is a .5 FTE paid staff member with the responsibility of training and overseeing the board. Each role has a training manual for their position, is trained by the outgoing officer and then meets with the SWE Faculty Advisor to discuss their goals and strategy for the year. The officers are accountable to the President and the other officers and guided by the faculty advisor. Students learn to motivate, praise, teach, handle problems and censure each other when needed, under the watchful eye of the advisor. SWE Officers organize and participate in an overnight weekend retreat prior to the school year, then meet weekly throughout the year to plan and assess initiatives and events.

Students develop professionally when they organize and implement outreach events such as Girl Scout Engineering Day (GSED) for 4/5th grade Girl Scouts, Girls on the Rise (GOtR) for junior high girls, and Girls Lead the Way (GLtW) Leadership Conference for high school girls. They learn to market their events, work with external partners, plan and work within a budget, interact with faculty and staff throughout the campus, collaborate with peers, interact with participant parents, and serve as leaders and role models for the girls at the events.





Professional Development
Think Pair Share

What are the professional development programs at your institution?

In your group of 2-3 people, share your most effective program.

Participants jot down the PD programs for women at their institutions, and share what they think their most effective one is with a small group of 2-3 people.



Colorado School of Mines New Initiatives

Mentoring

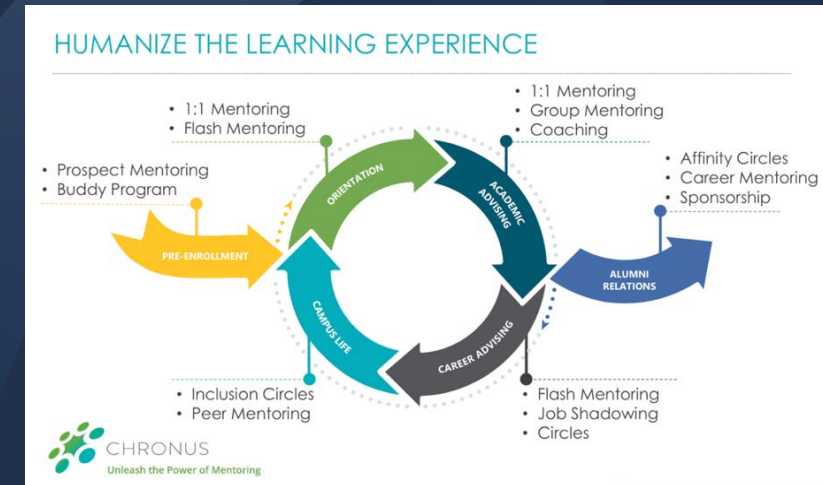
Best Practice (Amy)

Mines Program (Annette)

Vanguard Community of Scholars Program

Best Practice (Amy)

Mines Program (Annette)



Mentoring Best Practices - Amy

We know that formal mentoring, with purposeful planning, curriculum, and regularly scheduled checkins are important for retention and advancement. Especially since research tells us that women typically have less access to mentoring when left informal. Research also tells us that 'formal' mentoring programs that simply consist of assigning a mentor and then providing no guidance, training, expectations, or curriculum often fails. So we introduce our formal mentoring program using the Chronus mentoring software.

SWE mentoring program – Annette

Spring of 2017 SWE Officers wanted to create a mentoring program to ease the transition to college for new women students. Officers and WISM Director spent summer designing the program, preparing training for mentors, crafting marketing materials and planning activities. The first year, 2018, there were 47 mentors and 105 new freshmen mentees. This year, 2019, there are 51 mentors and 135 mentees. Each mentor was assigned two mentees and they were then grouped into clusters within their intended major. The goal was for the upper class students to be in a position to advise and mentor the new students on topics such as course selection, careers within the major, etc. A variety of full group social activities and advisory events were offered to the participants and the small group clusters and mentor/mentee pairs were expected to meet on their own. Activities included a guided painting night, bullet journaling, tie-dyeing, hiking, a snow shoe trip to the mountains, and meetings with tips on registering for classes and making summer plans (housing, internships, summer courses, employment) and other advice for navigating college.



Notes continued:

Vanguard Scholars Program – Best Practice – Amy

Mines has been hovering around 30% women for too long. We are barely moving the needle. We have been using gender neutral strategies in our recruitment and yield forever, and realize that we must do something different in order to make bigger strides. Thus, scholarships are part of a new vertically integrated community of scholars.

Vanguard Scholars Program – Annette

The Vanguard Community of Scholars Program began in fall of 2019 as a tool to recruit highly motivated women students to Mines. Currently there are 29 students in the inaugural cohort. The group is enrolled together in CSM101, the freshman transition course, instructed by Mines President Paul Johnson and Dr. Amy Landis. The opportunity to take a class from prominent members of the Mines faculty is a draw for the program. Special professional development seminars with Mines women faculty are an additional component of the program. Concierge student support provided by the WISEM Director and other faculty members helps ensure students receive opportunities in their areas of interest such as research, campus employment, leadership opportunities and community service. The students receive a \$5000 scholarship/year for four years of the program. Social events are organized for the students as well, to ensure a sense of belonging to the community and to the school.



The background features a light blue and white color scheme with several gears of varying sizes. A large, semi-transparent gear is on the left, and a smaller one is in the center. A large orange question mark is positioned in the middle of the page. The overall aesthetic is clean and technical.

Questions



Resources

Colorado School of Mines Institutional Research Reports 2019
2018-2019 Colorado School of Mines Viewbook