# Faculty Senate Minutes
## 1/31/2019
9-10 a.m.
SUB 113AB

Attendance: Scott Risser, Charie Faught, Phil Curtiss, Miriam Young, Atish Mitra, Ron White, Abishek Choudhury, Dan Autenrieth, Katherine Zodrow, Michele VanDyne, Chad Okrusch, Stella Capoccia, Courtney Young, Laura, Larry Smith (for Diane Wolfgram), David Reichhardt (for Mary North Abbott), Scott Coguill (for Peter Lucon), Ulana Holtz, Kishor Shresta

**I.**   Welcome and Minutes (https://www.mtech.edu/facultystaff/facultysenate/minutes/index.html)

December 11, 2018 still not available on the website, will be presented next meeting.

Jan 16, 2019 **Motion to approve and seconded. Motion passes.**

**Action Items**

II. Emeritus Applications:

    a . Dr. Frank Ackerman- see attachment as presented by Phil Curtiss.  Started in CS department in 2006 and retired fall 2018. He helped develop software engineering degree, where he used information from his time at Bell Labs. Also had tremendous input into service courses that are part of ABET accreditation. Very dedicated instructor and in the department at all hours. Worked with capstone and senior design in software engineering, such as robots. Also participated in regional and national programming contests. Planning to write a book regarding programming knowledge.
    **Motion to forward recommendation for Emeritus Status and Seconded. Motion passes.**

    b. Dr. William Gleason- see attachment as presented by Courtney Young.
    **Motion to forward recommendation for Emeritus Status and Seconded. Motion passes.**

III.   CRC Recommendation - Establish Core courses for Petroleum Engineering major. See attached document.

Change in core classes that have to be taken at Montana Tech and cannot be transferred in. Petroleum has the first proposal to make changes. Some students have tried to bring in PET 404 and PET 426. Some students also try to have course substitutions, but think that these are core courses. Students transfer in from Canada and elsewhere in the world.
One course is an elective, some students try to transfer in an elective from elsewhere. A list of approved electives are also available that students can take at Tech. Two technical electives exist, along with two petroleum electives, of which one has to be taken at Tech.
Transfer of courses occur in the department based on an evaluation. Professor teaching the class makes the determination. There have been a couple of times when there has been a debate on whether the course covers the requirements (the faculty usually win).
Is this a solution to a problem or trying to make it more simple? What is the rationale of making the change? Response that simplifies and clarifies the process. Also says that when the degree is from Tech, that it represents Tech. Have been able to accomplish without this in place, but will help to simplify the process. Comment that it helps to control quality of graduates from Montana Tech. Also have the same approach in nursing. Mechanical engineering has the same philosophy. Helps to lessen the work in advising and making the transfer.
Does this "handcuff" the department, with response that can still do course substitution as part of the process for an exception. Not sure how hard the new method will be adhered to.

Concern that this is coming from the dean and not from the faculty. Since not a faculty member, should not lead the process. Response that potentially an option (as opposed to a requirement). For high enrollment programs, can be useful to reduce paperwork. Still have requirements of how many credits that a student has to take at Tech. The courses are very specific, would be hard to find online to fulfill the requirements.
One of the benefits is for ABET accreditation, which is tied to establishing necessary skills and requirements. Did pull two transfer students as one accreditation visit.

**Motion to accept curriculum changes as presented and seconded. Motion passes.**

IV. Committee updates:
   a.   Teaching Community
   No one present at this time.
   b.   Research Mentors
   Sigma Xi having another meeting in the next two weeks to see who will lead the research mentors group. If anyone wants to volunteer, let Katherine Zodrow or Ron White know. Have not received strong support from faculty at this time. Have sent out two e-mails to try to start a mentorship programs. Working to get this started.


   c.   Budget

   Budget committee has met twice since last meeting. Representative only available for the first hour of the meeting. The first meeting was still about the fee schedules and moving forward with changes. We have the highest tuition and fees. Discussion hovers around a total of a 3% increase in mandatory fees such as technology and health. Anything over would require a more detailed justification. Prepared a printout of all the documents, which are available upon request to Chad Okrusch.

   Chair pulled a document from the MUS website and presented (see attached). Given to deans and to CLSPS department heads. UM and MSU have the same total for resident undergrads. Montana Tech is several hundred dollars more expensive. Several faculty and administrators have expressed extreme concern, as students do pay close attention. Suggestion that faculty senate should weigh in on any fees. Often decisions such as a building bypasses faculty senate. Can consider requesting from budget committee what fees will be recommended to send to the Board of Regents.

   Question on who sends the recommendations. Since we made a change in administration, not sure, but often the chief executive officer. Question regarding who is our chief financial officer, can make a request. Comment in times of quick decisions, may need to look at long term and does it need to be re-advertised.

   When talked with business office, concerned about lack of transparency on the fees. Would like to see a way to see all of the fees. For instance, nursing has it on the fact sheet, but may not be directly on the Montana Tech website.

   Engineering charges $400 per semester and nursing is $650 per semester, but some go back to general fund. May be unfair to engineering and nursing students. Lack of transparency and where is the funds going? Nursing program fee was set to pay for extra nursing faculty who has to supervise clinicals based on licensure and required student to faculty ratio.  Proposing using student fee to honorariums to preceptors who help those doing the work in the field. Takes a lot of work if having twenty students in the field for six weeks.

   Certain programs are more resource heavy and need more money. Concern that money should go to where it is needed. Why is nursing for instance having to pay more for others? Sim lab requires maintenance, including computers. Right now ahead of the curve in simulation but need resources to keep it up.

Point is the transparency. Right now may not know where money went. Evident that it is not transparent. Comment that someone knows where the money goes. Response that new group looking at the numbers. All of the budget is coming to light. Some money is not being touched, some money being spent in other ways.

Two issues, either not transparent or not known how it works.

**Motion to request of administration who is presenting budget to the BOR and who is the CFO. The faculty senate requests transparency and how fees are being spent, with an explanation and justification of future fees**. **Motion seconded and a third (since motion came from the chair).**

Comment that want to know how fees are being spent. Right now no great oversight within Montana on how fees are spent. Representative willing to keep going. Request that someone with an accounting background to attend.

Question the legality of the fees of the nursing and engineering fees and the way it is spent. If request money for a specific capacity should be used in this way. Response that MSU has similar program fees, wondering how it is being spent.

Not clear that fees include specific program fees, or university wide fees. Attachment is an average of fees. Interpretation that program fees may be added on top of MUS submission. Response from representative that program fees may not be listed. Engineering fees listed on the MUS document (listed on OCHE website).

Would like to understand fee structure and how they are used.

Asking for transparency.

**Motion passes.**

Leadership team has not responded to the last request.

Comment that can ask Vicki Petritz as an accountant to see if she wishes to participate in budget meetings.

Legislative committee and audit committee can ask for these items. Response that we are frequently audited.

d.   Campus committee Assessment

None given at this time, will discuss at a future meeting.

e.   Chancellor Search Advisory Committee

57 applicants received. February 14 will try to narrow it down to 8-12. Then in March will interview in Bozeman, then narrow down then bring to Butte. Finally will make a recommendation.

When will public list appear? Response that becomes public once they accept a campus visit (3-5 group). Committee will not discuss applicants.

Question about organization that is doing the search and are they providing value? Response that organization that helping with the search is not looking at individual, except for red flags. Specifics are up to the committee, with each applicant being reviewed as compared to a matrix that the committee develop. Voiced that organization could have done a better job at narrowing down the matrix. Will be hard to determine until the individuals are met in person.

**Discussion Items**

VI. Other Items

Questions regarding workload and workload equality. See attachment. Studies and research on biases towards women and new faculty. Recent article in Higher Ed with a study in trying to have transparency and equitable work. Questions regarding equitable workload across departments and campus. Questionnaire developed about transparency and workload. If there is an interest, this would be one way to measure. Should campus and senate to tackle the issue, including the study and performing an analysis.

The chair will send out the reference of the survey.

Ten contact to 23 contact hours per semester. Overload pay has been denied. Faculty may be exploited because policy is not clear. Response to see if this is a campus wide phenomenon. A single case can be grieved, a campus issue has other ways of being addressed.

The Highlands CBA is very specific. The faculty handbook used for everyone, not necessarily in every CBA. Difference between how many teaching on paper versus actual teaching load. Question on is this an issue across campus, or just individual departments. Dean can also make exceptions.

**Motion to adjourn and seconded to adjourn.**

**December 17, 2018**

**ITEM  XXX-XXXX-XXXXX**
**Authorization to Confer the Title of Professor Emeritus of Computer Science upon A. Frank Ackerman; Montana Technological University**

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**THAT**

Upon the occasion of the retirement of A. Frank Ackerman from the faculty of Montana Tech, the Board of Regents wishes to express its appreciation for his service to the Montana Tech, the Montana University System, and the people of the State of Montana.

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**EXPLANATION**

Dr. Ackerman has tirelessly worked for the Computer Science Department since he started at Montana Tech in 2006. During his tenure here, he has developed and delivered at least two courses from scratch (ESOF 411, Verification and Validation, and CSCI 114, Programming in C#). He has been the primary faculty person for the Software Engineering degree program and as such has refined all of the courses for that degree. In the process. Dr. Ackerman has spent countless hours writing and perfecting a set of software engineering standards for use by our students both within and outside their coursework. When it comes to teaching, Dr. Ackerman spends a great deal of effort developing course content and materials, and takes the time to make sure students understand the concepts he is presenting. He has a particular interest in helping novice programmers learn the craft.

When Dr. Ackerman first came to Tech, he initiated, coached and sustained the ACM International Computer Programming Competition, and has since passed on that torch to other faculty. As a result of his initial efforts and those that have followed, Montana Tech is now a regional ICPC contest site for the Rocky Mountain Region. Our student teams generally perform well in these competitions, and their participation also increases their skills in problem solving. Without Dr. Ackerman's initial efforts, this avenue of student participation would not exist. In his work with students for our Senior Design capstone course, Dr. Ackerman has participated in many student projects, including the robotics team (Mars Miner), using humanoid robotics (NAO) for recruiting, and many student game development projects. Dr. Ackerman has spent much of his time here at Tech. Evenings and weekends, students count on him being here and often ask for his assistance on projects. He is always glad to help, even when the projects are for courses outside his own. He was instrumental in the original development of requirements and specifications for our AbOut ABET outcome assessment software which was highly regarded by evaluators on our last ABET visit. Dr. Ackerman has always been a willing participant in departmental service activities and has provided service to Montana Tech in his committee work on the Instructional Improvement Committee, the Library Committee, and the Moodle Committee.

Dr. Ackerman does not intend to retire idly - he has an interest in using his time to author a book on software engineering and has expressed continuing interest in helping novices learn programming concepts. It is hard to imagine Frank not maintaining a presence in the department. We as a faculty would very much like to maintain that relationship through emeritus. For these and other contributions, the Board of Regents of Higher Education is pleased to confer upon A. Frank Ackerman the rank of Professor Emeritus of Computer Science at Montana Tech together with all the rights, privileges, and honors thereto appertaining.

**ATTACHMENTS**
None

# Professor Emeritus Status for Professor William "Bill" Gleason; Montana Technological University

**THAT:** Upon the occasion of the retirement of Professor William "Bill" Gleason from the faculty of Montana Technological University (Montana Tech), the faculty wish to express their appreciation for his 15 years of dedicated and valued service to the Department of Metallurgical & Materials Engineering, Montana Tech, the Butte Community, and the State of Montana by recommending the rank of Professor Emeritus be conferred upon him by the Board of Regents of the Montana University System.

**EXPLANATION:** William Gleason was born and raised in Butte, Montana. He prefers to simply be called "Bill", even by the students. Bill earned his B.S. and M.S. degrees in Metallurgical Engineering from Montana Tech in 1986 and 1989, respectively. Afterwards, he promptly went to work in industry. He worked for Kennametal in Fallon, NV as a Metallurgical Engineer until 1991 where he managed thermal spray powder and welding rod production as well as direct comminution and dust recovery circuits. His broad education also allowed him to be the Personal Computer (PC) Coordinator for managing personal computers, software and training during the time that PC's were hitting the public domain. In 1991, Mr. Gleason started working for Rhone-Poulenc in Silver Bow, Montana as a Project Manager. While there, his duties included analyzing the plant to suggest capital projects, justifying necessity and cost expenditures, and then bid and manage projects with crews ranging from two to seventy personnel. When they halted operations in 1995, Bill became Process/Project Engineer and Network Manager for KB Alloys in Malaga, WA. In these capacities, he analyzed plant data, supervised experimental procedures, suggested improvements based on cost/benefit analysis, and managed small scale capital projects. He also upgraded, troubleshot and managed computer and telecommunication networks, supervised a staff computer training program, and constructed and managed an ISO 9000 compliant laboratory database. He worked there until 1999 but, during this time, saw his first action on the educational side; in this regard, he worked as a Part-time Instructor for Wenatchee Valley College teaching Construction Law and Construction Estimating.

Because Bill thoroughly enjoyed that teaching experience, he started pursuing other academic positions. He landed his first fulltime position at The University of Montana as an Associate Professor of Welding Technology where he taught Metallurgy, Steel Fabrication, Industrial Codes, Management and Supervision, Shielded Metal Arc Welding, Flux Core Arc Welding, and Occupational Safety. In 2006, Bill became Visiting Professor in Mechanical Engineering at Montana Tech where he taught Strengths of Materials Laboratory, Fluids Laboratory, and Introduction to Engineering. A year later, he became an Associate Professor and Newmont Mining Lab Director in Metallurgical & Materials Engineering. Bill has been the "go-to" guy in the Department by always making himself available to pick up courses that others just could not fit in their schedule. In this regard, he has taught Chemistry I, M&ME Workshop/Seminar, Senior Seminar, Intro to Mineral Processing, Mineral Processing Labs I and II, M&ME Safety and Health, Advanced Mineral Processing, Materials Characterization (undergraduate and graduate), Casting and Solidification, Polymers (undergraduate and graduate), Ceramics, Composites, and Hazardous and Toxic Species Remediation.

Simply put, Bill is a hero, having been there for the M&ME Department throughout and, in the process, always putting its students first. He is the consummate faculty member and will be missed.

During his eight years with The University of Montana (UM), Bill started pursuing his PhD in the Interdisciplinary Studies under the direction of Dr. Ed Rosenberg and with co-advising from Dr. Courtney Young at Montana Tech. Dr. Gleason completed his PhD in Chemistry/Metallurgical Engineering in 2007 just before he started teaching as an Associate Professor/Lab Director. Dr. Gleason investigated Silica Polyamine Composite (SPC) materials to treat process waters as well as clean contaminated waters for his dissertation. The work so impressed Dr. Rosenberg that he suggested to then UM President George Dennison that Montana Tech should have its own PhD Program. This was in approximately 2006 and served as the initiation of Montana Tech's first-ever PhD program. It would take Dr. Gleason, Dr. Young and Dr. Rosenberg, with the help of Dr. Jerry Downey, seven years for the MatSci PhD to be proposed as a collaboration with UM and MSU-Bozeman in 2013 to the MUS Board of Regents. Today, the MatSci PhD Program has seen research grow into a multimillion dollar effort at Montana Tech and the first three graduates obtain their doctorates in May 2018. Dr. Gleason is proud to have had a big hand in initiating the program and seeing the inaugural class through completion.

Throughout his career at Montana Tech, Bill has been an excellent teacher. His teaching style was a favorite among the students because it was unique. Students learned by application and were often challenged by purposefully saying things wrong and getting on their case when they did not correct him. Students had to come to class prepared. He has also been service-oriented having been on at least three committees at any given time with the Campus Access, General Education, and Safety Committees being his forte's throughout. He also served stints on the Chancellor's Advisory Committee and Library Committee as well as the Faculty Senate. Dr. Gleason was also active in research, not only taking care of his own students examining such topics as Hydrogen Fuel Cells, Rare Earth Element Leaching and Recovery, Indigenous Recycling, and Biomaterials Synthesis for Water Remediation. He has published and presented 25 papers and worked on projects totaling nearly $9M in funding.

Dr. Gleason loves chemistry and its applications in Metallurgical & Materials Engineering. His enthusiasm is second to none. He is a pleasure to talk to and always has a story, often funny, for the subject at hand. He has been invaluable across the board and shared generously with everyone throughout the years at Montana Tech.

With this recommendation goes sincere gratitude for over 12 years of invaluable teaching, service and research. The industrial experience that he brought into the lab and the classroom were premiere. To Dr. William "Bill" Gleason: congratulations on your retirement and best wishes for the future.

# Undoing disparities in faculty workloads: A randomized trial experiment

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## Abstract

We conducted a randomized control study to improve equity in how work is taken up, assigned and rewarded in academic departments. We used a four-part intervention targeting routine work practices, department conditions, and the readiness of faculty to intervene to shape more equitable outcomes over an 18-month period. Our goal was to (a) increase the number of routine work practices that department faculty could enact to ensure equity, (b) enhance conditions within the department known to positively enhance equity, and (c) improve the action readiness of department faculty to ensure equity in division of labor. Post intervention faculty in participating departments were more likely than before the intervention to report work practices and conditions that support equity and action readiness in their department, and that teaching and service work in their department is fair. Participating departments were significantly more likely than control departments to report practices and conditions that support equity and greater action readiness to address issues of workload equity in their department. Finally, participating department faculty were more likely than control department faculty to report increased self-advocacy and were more likely than control department faculty to report that the distribution of teaching and service work in their department is fair.

## Introduction

Across STEM and non-STEM fields, women faculty spend more time on service, undergraduate teaching, and mentoring, while men spend more time per week on research [1–5]. The small numbers of faculty women and faculty from underrepresented minority groups in STEM fields exacerbate unequal and unrecognized service and mentoring loads, especially for women of color [1, 6–8]. Institutional housekeeping and campus service activities are often devalued in academic reward systems [1, 9–11]. Given the importance of research products, funding, and visibility for advancement in STEM fields, spending less time on research, and more on service, teaching, and mentoring is especially problematic. Systemic inequities in

workload have been identified as central to STEM women's lower tenure and promotion rates, longer time to promotion to full professor, and greater career dissatisfaction [1, 12, 13].

The consequences of organizational dynamics that constrain faculty workload and rewards in academic careers are significant, particularly for STEM faculty women and members of underrepresented groups. The conditions in most academic departments where teaching and service work is taken up, assigned, and rewarded among members make this challenge seem intractable. Rather than a single pivotal decision, disparities in faculty workload are the result of a series of many decisions being made in departments where the division of labor is also changing and evolving over time. To address this challenge, we designed an intervention aimed at creating greater workload equity within departments. This randomized experiment provides evidence that it is possible to create fairer faculty workloads.

Research in behavioral economics and social psychology on diverse populations worldwide spotlights the irrational, biased, and unconscious way people tend to make decisions, but also how such limited thinking can be disrupted or reshaped through behavioral design or "nudges" [14–18]. The challenge for higher education institutions is to apply the lessons learned from this behavioral work to reduce biases as they might appear in the thorniest academic spaces and situations, such as the division of labor in academic departments.

Behavioral design research explains how to redesign the "choice architecture" around important decisions by changing the context within which people make decisions [18]. For example, common tools in choice architecture are changing the order in which options are presented, setting a more desirable default option, framing the decision differently, providing information or feedback, and creating incentives [19]. Iris Bohnet observes "there is no design free world" [14]. How we currently make decisions, including how we divide collective work in departments, is not neutral. Organizational members must decide how to assign and reward work critical to the department that is not particularly desired or advantageous to academic careers. Given the likelihood of inequitable workloads, "why not design a bit more thoughtfully?" [14].

We drew on choice architecture to guide a randomized control study aimed at improving equity in how work is taken up, assigned, and rewarded in STEM academic departments. Our study employed the National Science Foundation definition of STEM [20] which includes mathematics, natural sciences, engineering, computer and information sciences, and the social and behavioral sciences–social psychology, economics, anthropology, sociology, and political science. As such, we delimited our work to focus only on departments that NSF defines as STEM, rather than a more diverse group of departments.

Our intervention targeted routine work practices, department conditions, and the readiness of faculty to intervene to shape more equitable outcomes. Routine work practices might be thought of as default valves or levers of the machine that order the "choice architecture" of how work is taken up [19]. Department conditions are the backdrop of assumptions, priorities, knowledge, and informal operating procedures that shape workload allocation. Action readiness is the degree to which faculty in a department feel they are able and willing to act to ensure fairness in equitable workload allocation [21–23].

We aimed to improve: transparency in what faculty are doing, accountability, clarity in roles and expectations, and flexibility to acknowledge different contexts. Transparency increases sense of accountability and trust between members and leaders, facilitates perceptions of procedural and distributive justice, and leads to greater organizational commitment [24–27]. Departments that routinely make data on faculty activities accessible are likely to promote perceptions that workloads are transparent and fair [28].

In addition, research shows that inequity and biases operate more in environments with ambiguous evaluation criteria [29–31]. Women and members of URM groups are more likely

to be disadvantaged when standards for faculty evaluation are "foggy" [32, 33], not receiving the same benefit of doubt with regard to performance that groups in the majority receive. Alternatively, environments with concrete, objective evaluation criteria, "mitigate the operation of prejudices" and inequity [33]. Clear criteria, uniformly applied, enhance confidence in procedural and distributive justice [25]. Thus, departments with clear benchmarks for performance and accountability for meeting them are likely to see more equitable workloads.

Equity-minded departments often have shared rotation of time intensive, less promotable, but necessary work, as well as rotation of more preferred roles. Faculty do not volunteer, or opt in; rather, they have to opt out, which is more difficult to do. This ensures that everyone does their fair share of a group's collective work, facilitating equity norms, social responsibility norms, and norms of reciprocity [34]. Planned rotations send the message that everyone has to chip in and help avoid "free-riding" wherein one group member or more fail to do their fair share of the work and others compensate [35–37]. Such practices can change the conversation from, "why would I agree to do that?" to "how can I argue that I alone should not have to do this?" Such practices facilitate more equitable workloads in departments.

Finally, equitable systems acknowledge differences in contexts [38]. Faculty work under structural, social, and cultural contexts which make experiences and workloads distinctly different. Teaching the department's only service-learning course and supervising students in community placements may be more time intensive than teaching a large lecture with TAs. Reward systems can either recognize such differences by using modified workload plans, or make them invisible [39]. Rousseau found that personalized employment arrangements are often an important part of equity and acknowledging difference [40]. However, co-worker acceptance of these deals can affect these arrangements. Departments interested in fairly dividing different kinds of work need to develop well-established benchmarks and procedures to ensure employees recognize these arrangements as reflecting procedural, interactional and distributive justice [41].

We designed a set of interventions, informed by research on choice architecture, to enhance department workload equity. We hypothesized that academic departments randomly assigned to our interventions would see department conditions, work practices, and action readiness among department members increase, compared to departments with no intervention. Theory driven randomized control trials with faculty as participants are rare in higher education research [42], and we are not aware of any study like ours focused on faculty workload equity specifically, though other studies have tried to shape more equitable workloads as part of overall department climate [43–46].

We designed and empirically tested over an 18-month period a four-part intervention aimed at improving faculty experience of workload equity in STEM academic departments. This randomized control trial was meant to understand the efficacy of our intervention to improve faculty satisfaction and experience of equitable workloads. Control-treatment studies are the gold standard in determining whether interventions are effective [47]. The few studies that have been done to assess the efficacy of diversity related interventions with higher education faculty tested interventions aimed at improving inclusive hiring practices [48–50] and they likewise used a control-treatment method to ensure confidence that their interventions were efficacious and should be replicated.

A call for participation went out to all provosts and STEM department chairs at four-year public institutions in Maryland, North Carolina, and Massachusetts. These states were selected based on proximity to the Project PI's and project leadership. Thirty academic departments from a range of different institutional types were then enlisted in the research study. Our goal was to (a) increase the number of routine work practices that department faculty could enact to ensure equity, (b) enhance conditions within the department known to positively enhance

equity, and (c) improve the action readiness of department faculty for ensuring equity in division of labor. Interventions are discussed in more detail in supplementary materials. They included a workshop on how implicit bias can shape faculty workload allocation, guidance to collect and share transparent annual faculty work activity data (a "dashboard"), showing how the dashboard could identify equity issues, providing a variety of sample organizational practices that address equity issues, and department development of a "Department Equity Action Plan," adopting organizational practices that they thought would solve the equity issues their dashboards had revealed. In addition, faculty members took part in an optional 4-week individual time management and planning webinar.

The research questions guiding this study were: Do departments that participate in an intervention to improve equitable department workloads report stronger department work practices, conditions, action readiness, and greater fairness in workload pre to post intervention? Do departments that participate in an intervention to improve equitable department workloads report stronger department work practices, conditions, action readiness, and greater fairness in workload than matched control departments?

## Materials and methods

We designed a cross sectional survey to collect needed data to examine our research questions, compare control and participating departments to each other, and understand the influence of the intervention in participating departments over time (Table 1 describes measures). We considered the ethical implications of withholding treatment to the control group but felt it was appropriate for two reasons. First, although there was good evidence in our literature review that these 4 interventions would be successful in shaping workload equity there was no previous study to prove that was the case as this is the first study of its kind. As such, we were not withholding a proven treatment. Second, we made an agreement with control departments that they would receive all of the tools and resources from the project that the treatment departments received at the project conclusion and that they could participate with us in a subsequent implementation.

**Table 1. Survey items descriptive statistics.**

| Constructs | Survey Item | Post-Survey | | % Agree/ Strongly Agree | | Standardized item loading |
|---|---|---|---|---|---|---|
| | | Mean | Std. Dev. | Pre-Survey | Post-Survey | |
| Department Conditions | There is awareness of implicit bias | 2.04 | .80 | 20.9 | 35.3 | .753 |
| | There is a commitment that workload be fair | 2.48 | .75 | 24.2 | 64.6 | .787 |
| | The most important work is credited | 2.30 | .86 | 28.5 | 60.6 | .842 |
| Work Practices | Transparent work activity data is published | 2.04 | .85 | 45.8 | 63.5 | — |
| Action Readiness | Faculty know strategies to improve fairness | 3.60 | 1.28 | 41.5 | 59.1 | .798 |
| | Faculty have concrete steps to ensure equity | 3.37 | 1.32 | 37.2 | 49.5 | .852 |
| | Faculty can use data to initiate discussions about workload | 2.92 | 1.26 | 57.7 | 63.8 | .507 |
| | Faculty can create benchmarks for work activities | 3.11 | 1.23 | 68.5 | 71.3 | .642 |
| Perception of Fairness | Distribution of teaching and service work is fair overall | 2.09 | .70 | 72.8 | 77.2 | — |
| Self-Advocacy | Faculty feel they can say no to requests | 3.35 | 1.05 | 41.0 | 50.8 | .900 |
| | Faculty feel comfortable protecting time | 3.86 | 1.37 | 47.4 | 65.3 | .698 |
| | Faculty feel comfortable asking for additional resources | 3.70 | 1.37 | 42.6 | 59.9 | .841 |

*Pre- to post- percent is based on pre- to post- matched respondents

https://doi.org/10.1371/journal.pone.0207316.t001

The survey was approved by the University of Maryland Institutional Review Board (Approval number [738322–3] Faculty Workload and Rewards) and participants signed an electronic informed consent form before completing the survey. Although measuring changes in actual workload over time would have been revealed important data about the efficacy of the interventions, such changes can take several years to emerge and appear small in departments with very low numbers of faculty. Given that faculty perceptions of workload equity are associated with overall faculty satisfaction and intent to leave [51,52] self-reported measures and experiences are also an important measure and appropriate way to see if interventions have had intended effects [22].

The *work practices* and *perception of fairness* were analyzed as single-item constructs. The *work practices* construct captures the presence or lack of organizational practices such as transparency of data. *Department conditions* were measured as having awareness of biases, workload fairness and work recognition. *Action readiness* was operationalized as knowing strategies and taking action to ensure fairness and equity, and the extent to which department faculty were confident about using workload data and creating more transparent benchmarks. Self-advocacy was assessed as having the confidence in protecting faculty time, asking for resources and saying no to requests. These items were measured using a 5-point Likert-type response scale (e.g. 1-strongly disagree, 2-disagree, 3-neither agree nor disagree, 4-agree 5-strongly agree), and the mean of the items was used as the overall measure of the constructs. We analyzed the variables of gender (male = 0, female = 1), race (White = 0, Faculty of Color = 1), rank (dummy coded with assistant professors as the referent group), and discipline (dummy coded with natural sciences as the referent group).

We received 30 applications from 16 institutions: one baccalaureate institution, six masters, and nine doctoral/research institutions. All departments completed the pre-survey. Pre-survey invitations were sent out to 658 faculty. Of 658 invited faculty, 70.5% (n = 464) responded to the pre-survey. Due to the diversity of the departments in the study and our desire to have fair comparisons, we created matched pairs prior to random assignment, to take into account the key potentially confounding characteristics. Each department in each pairing had an equal chance of being randomly assigned to receive the treatment. After accounting for geographic location, a logistic requirement to facilitate delivery of the intervention, departments were matched on four key characteristics, which included: a) whether the department was at a Doctoral granting/Research institution, a Master's granting institution, or a Baccalaureate granting institution, b) whether the department was in the Natural Sciences or Social Sciences disciplines, c) whether the department was small, medium, or large in size (0–15, 16–30, and 31–60, correspondingly), and d) whether the representation of women faculty was low, medium, or high (1–34%, 35–50%, and 51–100%, correspondingly).

As institutional type and disciplinary group were considered the most important characteristics, all pairings had to match at least on these two. Likewise, size of department was determined to be a key characteristic and the majority of pairings were matched on it. Presence of women, while important, was determined to be less potentially confounding so was less important in matching the pairs. In order to balance geographical constraints we needed to allow four more departments into the study as participating, we added them to pairs where their characteristics matched. Generally, one department from each matched set was randomly selected to participate in the treatment. However because of the matching criteria listed above, there were four treatment departments that had to be matched with an already matched control department. This led to 17 participating and 13 control departments total.

We worked with the 17 participating departments for 18 months on the four interventions. Each department created a team of between 3–5 members. Although department teams were the primary participants in interventions, all of the information shared in workshops and with

department teams were also made available to all members of departments. The teams regularly updated their departments on what they were gaining and planning. We met department teams for ½ day workshops four times over those 18 months and held several check-in calls between those meetings. During the first workshop we provided an experiential workshop on implicit bias and the research on how it shapes divisions of labor in colleges and universities. We also shared aggregate reports with department teams of their pre-survey data. During the second workshop we provided department teams training, tools and resources to create their work activity dashboards. During the third workshop we shared evidence-based policies and practices departments could use to proactively shape equitable workloads. Examples include such polices as credit systems, rotation policies for time intensive roles and differentiated workload policies. Department teams then began creating Department Equity Action Plans (DEAP), which were 2 page descriptions of the data they had reviewed from their own department, the equity issues they wanted to address, and the policies and practices they would put in place (pending consensus from their departments) to ensure greater equity moving forward. Over the course of the following months the teams worked with project leadership to further refine their DEAPs over monthly check-in calls. During a fourth workshop departments from all 3 states shared their DEAP's with each other in a final capstone event. In addition, treatment department faculty members took part in an optional 4-week individual time management and planning webinar which was for their own professional development, not connected to the other three initiatives.

All departments were represented at each of the four interventions. There were a few transitions of individuals on and off teams because of leadership changes, parental leaves or illness. However, all departments received all 4 interventions. These four interventions were intended to work synergistically to improve conditions, practices, action readiness and perceptions of workload fairness. Treatment departments were asked to keep all project materials within their department.

Researchers had no contact with control departments after the pre-survey was completed. At the completion of the project, we sent a post-survey to control and participating departments. We sent 635 post-survey invitations to department faculty and 472 agreed to participate (demographic characteristics of the sample can be found in Table 2). Some faculty members had retired or left their departments; others had been hired over this period. The post-survey response rate was 74.3%; we matched 326 participants (69% of all respondents) from control and participating departments who took both pre and post surveys.

First, to reduce the data into larger composites we conducted Principal Component Analysis (PCA) using oblique (non-orthogonal) factor rotation method (Direct Oblimin with Kaiser

**Table 2. Respondent demographics, post-survey.**

| Rank | Assistant Professors | 21.2% |
|---|---|---|
| | Associate Professors | 29.8% |
| | Full Professors | 28.9% |
| | Non Tenure-Track Faculty | 20.1% |
| | American Indian or Alaska Native | 0.7% |
| Race | Asian | 9.6% |
| | Black/African American | 10.7% |
| | White | 75.1% |
| | Multi-Racial | 3.9% |
| Gender | Female | 45.8% |
| | Male | 52.5% |
| | Other | 1.8% |
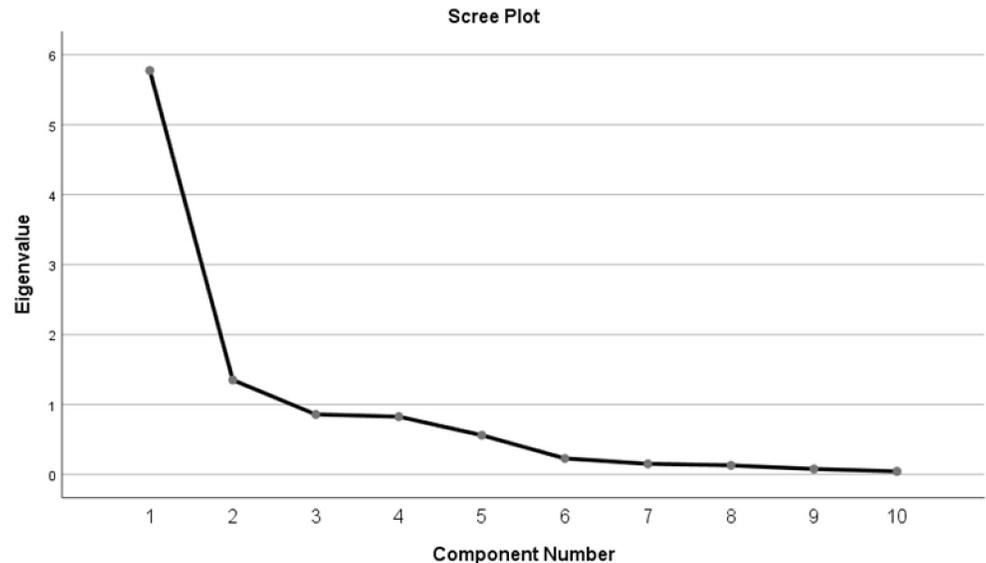
**Fig 1. Cattell's scree plot of eigenvalues in PCA analysis.**

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Normalization). Based on Cattell's scree plot (Fig 1.), Kaiser-Guttman rule of eigenvalues greater than one and item loadings in pattern matrix we extracted three factors in addition to the two single item constructs of perception of fairness and work practices: department conditions, action readiness, and self-advocacy. We tested the construct validity of the identified latent factors using Confirmatory Factor Analysis (CFA) [53]. We retained items with standardized loadings of 0.5 and higher (Table 1). For descriptive purposes Table 1 also includes means and change in pre- to post- survey responses on the selected items.

Next, we ran regression analyses on the determined factors controlling for gender, race, rank, discipline and interaction of gender and race. For the purposes of verification of regression results we conducted Hierarchical Linear Modeling (HLM) that accounted for department clustering of the data. As outcome variables, we used department conditions, work practices, action readiness, perception of fairness and self-advocacy. As level-1 predictors we used group-centered variables of gender, race and rank. As level-2 predictors we used discipline, department size and gender composition in the department. The fully unconditional HLM model is presented below:

Level-1 Model: $Y_{ij} = \beta_{0j} + r_{ij}$

Level-2 Model: $\beta_{0j} = \gamma_{00} + u_{0j}$

The model specifies that a survey response score $Y_{ij}$ of a faculty member $i$ in department $j$ is a function of the mean response score across departments $\gamma_{00}$, the random effect of department $u_{0j}$ (variation between departments), and the random effect of a faculty member $r_{ij}$ (individual variation).

## Results

### Differences between participating and control departments over time

Comparing participating to control departments, we have clear evidence that the interventions made a difference (Table 3). Controlling for gender, race, interaction of gender and race, discipline and rank, regression analyses on change scores in pre- to post- matched responses

**Table 3. Results from multiple linear regression models, effect of participation pre- to post- change scores, matched respondents, by constructs.**

| Variable | Department Conditions | | | Work Practices | | | Action Readiness | | | Perception of Fairness | | | Self-Advocacy | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Beta | SE | p-value | Beta | SE | p-value | Beta | SE | p-value | Beta | SE | p-value | Beta | SE | p-value |
| White Men | .018 | .118 | .783 | .053 | .144 | .457 | .148 | .157 | .026 | .163 | .104 | .012 | .143 | .158 | .038 |
| White Women | -.012 | .120 | .851 | .199 | .147 | .004 | .359 | .156 | < .001 | .224 | .107 | < .001 | .159 | .160 | .016 |
| Minority Men | .018 | .220 | .755 | -.041 | .271 | .526 | .148 | .285 | .013 | .155 | .189 | .008 | .148 | .300 | .017 |
| Minority Women | -.143 | .184 | .018 | .142 | .229 | .032 | .026 | .250 | .670 | .124 | .168 | .035 | -.023 | .255 | .714 |
| Associate | .003 | .126 | .964 | -.042 | .166 | .635 | -.104 | .168 | .169 | .157 | .113 | .033 | .024 | .170 | .761 |
| Full | .176 | .129 | .020 | .092 | .166 | .303 | -.050 | .171 | .513 | .191 | .115 | .011 | .090 | .175 | .260 |
| Non Tenure-Track | .095 | .163 | .148 | -.085 | .206 | .266 | -.173 | .210 | .011 | -.012 | .145 | .856 | .026 | .221 | .709 |
| Natural Sciences | .025 | .100 | .668 | -.040 | .121 | .532 | .037 | .131 | .523 | .031 | .089 | .593 | .040 | .133 | .513 |
| Adjusted $R^2$ | .034 | | | .041 | | | .114 | | | .076 | | | .030 | | |

*Note*: Assistant professors and non-participants are referent groups

showed that participation in project activities was a significant, positive predictor of equitable work practices, action readiness, perception of fairness and self-advocacy, though not on department conditions. For example, participating white women (*Beta* = .199) and minority women (*Beta* = .142) faculty, post intervention, were more likely than control groups of white women and minority women non-participants to report equitable work practices being in place in their departments. Participating white men (*Beta* = .148), white women (*Beta* = .359), and minority men (*Beta* = .148) faculty, post intervention, were more likely than control department faculty to report having increased action readiness. Participating white men (*Beta* = .163), white women (*Beta* = .224), minority men (*Beta* = .155), and minority women (*Beta* = .124) faculty, post intervention, were more likely than control department faculty of the same groups to perceive the distribution of teaching and service work in their department as fair. Participating white men (*Beta* = .143), white women (*Beta* = .159), and minority men (*Beta* = .148) faculty, post intervention, were more likely than control department faculty of the same groups to report an increase in self-advocacy. Interestingly, minority women faculty did not experience increased perceptions of action readiness and self-advocacy after the treatment (Table 3).

Overall, participating department faculty, post intervention, were more likely than control department faculty to report transparent information about faculty work activities for all department faculty to see in their department (*Beta* = .138). Participating department faculty, post intervention, were also more likely than control department faculty to report having a good understanding of implicit bias and how it shapes faculty workload (*Beta* = .142). Post intervention, participating department faculty were also more likely than control department faculty to report multiple measures of *action readiness* to address issues of workload equity in their department, such as strategies they can use to improve the perception and reality of fairness in how work is assigned, taken up, and rewarded in their department (*Beta* = .165), having identified several concrete steps they can take to ensure greater equity in their department workload (*Beta* = .181), using data to initiate a dialogue within their department about putting practices in place to ensure the teaching and campus service burden is shared by all (*Beta* = .251), and working with colleagues to create more transparent benchmarks such as advising loads and committee assignments (*Beta* = .142). Participating department faculty were also more likely to report increased self-advocacy such as being able to say no to additional requests (*Beta* = .189), and feeling comfortable asking for additional resources (*Beta* = .133). Participating department faculty were more likely than control department faculty to report that the

**Table 4. Effect of participation on pre- to post- change scores, matched respondents.**

| Constructs | Survey Item | Standardized regression coefficients |
|---|---|---|
| Department Conditions | | -.011 |
| | There is awareness of implicit bias | .142* |
| Work Practices | Transparent work activity data is published | .138* |
| Action Readiness | | .265*** |
| | Faculty know strategies to improve fairness | .165** |
| | Faculty have concrete steps to ensure equity | .181** |
| | Faculty can use data to initiate discussions about workload | .251*** |
| | Faculty can create benchmarks for work activities | .142* |
| Perception of Fairness | Distribution of teaching and service work is fair overall | .228*** |
| Self-Advocacy | | .164** |
| | Faculty feel they can say no to requests | .189** |
| | Faculty feel comfortable asking for additional resources | .133* |

Regression analysis was performed on survey items and constructs controlling for gender, race, rank, and discipline. Significant items at $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

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distribution of teaching and service work in their department is fair overall (*Beta* = .228) (Table 4).

Table 5 provides descriptive statistics for interaction of gender and race included in the regression analysis.

HLM analysis showed that participation in the intervention was a significant positive predictor of evaluation of equitable department practices ($\gamma_{01}$ = .303, SE = .127, $p$ = .025), perception of fairness in workload distribution ($\gamma_{01}$ = .326, SE = .123, $p$ = .013), and action readiness ($\gamma_{01}$ = .622, SE = .150, $p$ < .001) (Table 6). Gender, race and rank did not have significant fixed

**Table 5. Change in means for pre- to post- matched participating faculty.**

| Constructs | Survey Item | Women | | Men | |
|---|---|---|---|---|---|
| | | White | Minorities | White | Minorities |
| Department Conditions | There is awareness of implicit bias | .29 | .21 | .26 | .20 |
| | There is a commitment that workload be fair | .63 | .21 | .76 | .93 |
| | The most important work is credited | .54* | -.25* | .59 | .53 |
| Work Practices | Transparent work activity data is published | .45 | .37 | .16 | -.17 |
| Action Readiness | Faculty know strategies to improve fairness | .94** | < .01** | .40 | .93 |
| | Faculty have concrete steps to ensure equity | 1.03* | .19* | .40 | .93 |
| | Faculty can use data to initiate discussions about workload | .78* | -.10* | .39 | .71 |
| | Faculty can create benchmarks for work activities | .36 | .45 | .08 | .21 |
| Perception of Fairness | Distribution of teaching and service work is fair overall | .22 | .18 | .16 | .37 |
| Self-Advocacy | Faculty feel they can say no to requests | .37 | .09 | .43 | .33 |
| | Faculty feel comfortable protecting time | .59 | .14 | .34 | .86 |
| | Faculty feel comfortable asking for additional resources | .71 | .20 | .70 | 1.07 |

Significant items at $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

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**Table 6. Results from final 2-level HLM models.**

| Variable | Department Work Practices | | | Action Readiness | | | Perception of Fairness | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | S.E. | *p*-value | Coefficient | S.E. | *p*-value | Coefficient | S.E. | *p*-value |
| *Fixed effects* | | | | | | | | | |
| GENDER, $\gamma_{10}$ | .243 | .152 | .120 | .133 | .152 | .389 | -.008 | .103 | .938 |
| RACE, $\gamma_{20}$ | -.061 | .193 | .754 | -.149 | .290 | .611 | -.126 | .154 | .419 |
| PARTICIP, $\gamma_{01}$ | .303 | .127 | < .025 | .622 | .150 | < .001 | .326 | .123 | .013 |
| *Random effects* | | | | | | | | | |
| | Std. Dev. | Variance Component | *p*-value | Std. Dev. | Variance Component | *p*-value | Std. Dev. | Variance Component | *p*-value |
| GENDER slope, $u_1$ | .355 | .126 | .059 | .152 | .023 | .187 | .058 | .003 | .175 |
| RACE slope, $u_2$ | .038 | .001 | >.500 | .835 | .698 | .079 | .121 | .015 | >.500 |
| Variance within departments, $r$ | .874 | .764 | | .978 | .956 | | .692 | .479 | |

or random effects meaning that they did not contribute to department variation in the outcomes.

## Discussion

We tested a theory-driven intervention that involved (a) a workshop on implicit bias and how it can shape divisions of labor, (b) arming department teams with tools to create and display faculty workload activity dashboards, (c) using dashboards to identify equity issues and sharing work practices and policies to mitigate bias and proactively design for equity, and (d) an optional professional development webinar series on aligning time and priorities as a faculty member. At the conclusion of this 18-month project, the intervention measurably improved one work practice associated with workload satisfaction—having transparent data on faculty work activities available for department faculty, and likewise improved several conditions related to workload equity such as awareness of implicit bias and commitment among faculty to work being fair. The intervention also improved participating members' action readiness for ensuring equity in divisions of labor. We believe there was a spillover effect from department member's putting the a transparent dashboard in place. In other words, as participants saw members of their department were serious about improving equity in division of labor, and recognized their workload relative to others due to the transparent dashboards, they felt greater permission to likewise self-advocate and take steps to ensure their own workload was fair.

There were four limitations. When creating dashboards, project leaders allowed some variation in the levels of transparency provided at the request of faculty and department leaders. As such, some department faculty were potentially "treated" with more or less transparency related to the work activity of colleagues. However, this was mitigated by the fact that all departments were required to provide data in such a form as to allow department members to be able to benchmark their own effort against others, and to see the range of activity within the department. In other words, all treated departments created a basic level of transparency that had not been present before. Second, levels of commitment to the project varied; some departments had five faculty on teams, others had three. There were leadership transitions and unanticipated absences on some teams due to illness, parental leave, and retirements. It is also worth noting that the *optional* time management activity materials were made available to members of all participating departments and many participating members shared materials and discussions with colleagues in the department. However, engagement varied across the participating departments in levels of participation in this one activity. Third, the process of discussing equity issues sometimes evoked negative experiences among colleagues, due to

generational differences in the faculty role or frustration that implementing policy reforms took time.

Fourth, the intent of this project was to compare departments that received the 4 treatments to control departments that did not. As such we measured experiences before the project began and shortly after it ended. We do not have data on participants and their behaviors, or conditions several years after the intervention was complete, although we intend to collect another round of data. However, this diversity intervention was in operation 1.5 years, much longer than most diversity interventions which often are measured in a single day at the beginning and end of a workshop and typically try to measure gains in knowledge or attitude [22]. Mechanisms that impact department faculty experience of conditions, practices and action readiness for workload equity are complex. Eighteen months was not long enough for our participating department faculty to experience all potential benefits of new work practices and conditions. When we ended the study, some work practices and policies were just being adopted. Interventions that had more time to take root in departments, such as the implicit bias workshop and dashboard, had the greatest impact. As such, our future research will explore the impact of all four interventions after more time has passed. Likewise, subsequent implementations will tease apart the efficacy of each of the 4 interventions as opposed to examining the effects of all four together on outcomes.

Challenges notwithstanding, our 18-month intervention was successful. We are the only intervention that we are aware of that specifically attempted to and succeeded in changing aspects of the choice architecture of how academic departments allocate workload. One unanticipated finding is that the process of collecting transparent workload data, examining different policy and practice options, and communicating a desire for equity may signal to faculty that others care about equity issues, and in and of itself increase some aspects of satisfaction with workload, independent of actually putting new work practices in place.

Although this study focused on the impact of the four interventions together on outcomes, not the relative value of one or the other, and the importance of their order, there have been a number of other equity and diversity minded interventions that began by having departments collect data together as a necessary precursor to and readying the ground for more concrete policy and practice changes [54]. In addition, efforts to initiate policies and practices to shape workload equity depended heavily on having good data to rationalize policy changes. As such, we believe there is evidence, supported by the literature, to support the order of at least the three main interventions (e.g. implicit bias training, creation of work activity dashboards, and putting in place policies and practices) as best implemented in this order. We will explore this, and other factors such as the value of department chair leadership, in future research.

A diverse faculty is the focus of funding agencies and governments across the world. While much of this effort has involved strengthening the pipeline to scientific careers [55], hiring [50], and interventions to increase awareness of implicit bias and how it affects academic careers more generally [23, 56], increasingly focus has been on retention of women and underrepresented minority faculty members [57, 58]. Departments are at the center of retention efforts because departments are where faculty are hired, take up or are assigned work, and are rewarded. Most decisions to leave academe and institutions can be traced back to experiences within academic departments [59, 60]. Data from national surveys and exit interviews repeatedly show women and underrepresented minority faculty dissatisfied with workload [5, 51, 61] and facing negative career consequences as a result of differential allocation of time to teaching, mentoring, research, and campus service [1, 12, 13]. Our findings contribute tangibly to efforts to understand and change divisions of labor to be more equitable. Departments where faculty experience workload as fair are likely to be places where all faculty are better retained, satisfied, and productive.

## Supporting information

**S1 Text. Supporting information.**
(DOCX)

**S1 Table. Survey items descriptive statistics, all post-survey respondents.**
(DOCX)

**S2 Table. Respondent demographics, 2018.**
(DOCX)

**S3 Table. Mean differences between pre- and post-survey data, matched faculty participating in intervention.**
(DOCX)

**S4 Table. Regression results on change scores for participating vs. control departments, pre- to post- matched respondents.**
(DOCX)

## Acknowledgments

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**Protocol**: The department requesting curriculum change holds a discussion at the departmental level, and if agreed upon by the department head, discuss with the Dean for approval. Forward the completed form along with supporting information to the CRC chair after approval from the department head, dean, and graduate council if necessary. Final changes are then made by the registrar after faculty senate approval. Guidance: https://www.umt.edu/provost/faculty/curriculum/default.php.

**Date**    11/26/18
**Dept.**        Petroleum Engineering                              **College**  SME
**Program:**     BS Petroleum Engineering
**Description of Request/Summary:**
   1)   Change pre- and co-requisites for PET 201, to add writing course requirement and change the level of math required.

**Current Course Program Information:**

**Per 02/20/18 CRC Request approved in Spring 2018:**
PET 201 – Elements of Petroleum Engineering
Prerequisites: M 171, CHMY 141, CHMY 142 and EGEN 101.
Corequisites: GEO 101, M 172 and PHSX 234.

**Proposed Change (Attach syllabus or curriculum for new course or curriculum changes.)**

| Course # Name | Credits | Pre-req. |
|---|---|---|
| **PET 201 – Elements of Petroleum Engineering**<br>**Change pre- and co-requisites as shown below.**<br><br>**Prerequisites:  CHMY 141, CHMY 142, EGEN 101, M 151 and WRIT 121 (or 101).**<br><br>**Corequisites:  GEO 101 and M 171.** | | |

**List of supporting documentation attached:**
Not applicable.

**Assessment Leading to Request**
   1)   In keeping with the changes by SME to the Freshmen Engineering Program from two semesters to one semester last spring, the change to the math pre- and corequisites will allow more freshmen to take this course in their first year (second semester) at Montana Tech. A number of FEP students start in M 151 rather than M 171, so this would allow them to take the PET 201 without having to wait until their sophomore year.
   2)   The addition of the writing course prerequisite is in response to problems with students not being able to write simple sentences and articulate their ideas in a complete and coherent manner. There are a number of homework assignments, along with quiz and test questions, that require students to write in complete sentences and currently, many of the students are not up to that task.

**Anticipated Impacts to "Other" Programs:**  None.

**Impact on Library:**  None.

**Date to take effect:**  Fall 2019

**LEVEL of Request**
Please indicate the type of request(s) by selecting *all that apply*:
*Faculty Approvals (directly to CRC, then Faculty Senate):*
   ☐   Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
   X    Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.

☐   Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor

☐   New degree certification of 29 credits or less

☐   Other:

*Campus Approvals (must be approved by the VCAA prior to CRC submission):*

☐   Placing a postsecondary educational program into moratorium

☐   Withdrawing a postsecondary educational program from moratorium

☐   Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more

☐   Establishing a B.A.S./A.A./A.S. area of study

☐   Offering an existing postsecondary educational program via distance or online delivery

☐   Other:

*OCHE Approvals (must be approved by the VCAA and Chancellor prior to CRC submission):*

☐   Re-titling an existing postsecondary educational program

☐   Terminating an existing postsecondary educational program

☐   Consolidating existing postsecondary educational programs

☐   Establishing a new minor where there is a major or an option in a major

☐   Revising a postsecondary educational program

☐   Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years

☐   Other:

*Level II (must be approved by the VCAA and Chancellor prior to CRC submission):*

☐   Establishing a new postsecondary educational program

☐   Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11

☐   Forming, eliminating or consolidating an academic, administrative, or research unit

☐   Re-titling an academic, administrative, or research unit

☐   Other:

**APPROVALS**

**Department Head Approval** _____*ok*_____ Date _____

**Dean Approval** _____*ok*_____ Date *12-17-18*

**VCAAR Approval (see above)** _____ Date _____

**Chancellor Approval (see above)** _____ Date _____

**Graduate Council Approval** _____ Date _____

**CRC Approval** _____ Date *12/6/18*

**Faculty Senate Approval** _____ Date _____

**Protocol:** The department requesting curriculum change holds a discussion at the departmental level, and if agreed upon by the department head, discuss with the Dean for approval. Forward the completed form along with supporting information to the CRC chair after approval from the department head, dean, and graduate council if necessary. Final changes are then made by the registrar after faculty senate approval. Guidance: https://www.umt.edu/provost/faculty/curriculum/default.php.

**Date** 11/26/18

**Dept.** Petroleum Engineering                          **College** SME

**Program:** BS Petroleum Engineering

**Description of Request/Summary:**

1) Previously, the course was taught by PTC faculty. Last spring, a professor from the PTC Department worked with petroleum faculty to design the course and taught two of the four sections. Currently (Fall 2018 semester), the course is being taught by Petroleum Engineering Department.

2) Change the former COMX 225-Presentation of Technical Information in Petroleum to PET 225-Presentation and Professionalism because it will be taught by Petroleum Engineering faculty to petroleum engineering students.

3) Professionalism topics have been added to the course, per discussion and recommendations from our Industrial Advisory Board members and petroleum industry recruiters.

4) Add prerequisites of PET 201 and WRIT 121 (or 101) to ensure students have knowledge of the petroleum industry and basic knowledge/skills in technical writing.

**Current Course Program Information:**

**SPRING 2018: COMX 225 - Present Tech Info in Petroleum:** 2 credits (Hrs.: 2 Lec) Emphasizes organization, purpose, and visual communication as the key principles of presentations in petroleum engineering. Participants learn to persuade, inform, and convey data successfully by focusing on the needs of the audience. They learn software skills to support these principles and methods using PowerPoint. Short speeches every other week help students gain practice and comfort presenting to an audience while building their skills. Reading and written homework emphasize research-proven communication principles. Students' accumulation of skills culminates in a 10-12 minute final presentation at the end of the term.

**FALL 2018: PET 291 (temporary-assigned course number) - Presentation and Professionalism:** 2 credits (Hrs: 2 Lecture/Lab). Emphasizes organization, purpose, and visual communication as the key principles of presentations in petroleum engineering. Participants learn to persuade, inform, and convey data successfully by focusing on the needs of the audience. They learn software skills to support these principles and methods using PowerPoint. Short speeches every other week help students gain practice and comfort presenting to an audience while building their skills. Reading and written homework emphasize research-proven communication principles. Topics relating to professionalism will also be taught in this course. The first five to ten minutes of each class session will consist of a presentation by the course instructor on professionalism in the petroleum industry.

**Proposed Change (Attach syllabus or curriculum for new course or curriculum changes.)**

| Course # Name | Credits | Pre-req. |
|---|---|---|
| **PET 225 - Presentation and Professionalism:** 1 credit (Hrs: 2 Lab). Emphasizes organization, purpose and visual communication as the key principles of presentations in petroleum engineering. Participants learn to inform and convey data and technical information successfully by focusing on the needs of the audience. They learn software skills to support these principles and methods using PowerPoint. Students will have the opportunity to speak in front of the class every week, which will help them gain practice and comfort presenting to an audience while building their skills. Students will have reading, viewing and written homework assignments and will give several formal presentations. Topics relating to professionalism are also taught in this course. The first five to ten minutes of each class session will consist of a presentation by the course instructor or guest speaker on different professionalism topics in the petroleum industry. <br><br> **Prerequisites: PET 201 and WRIT 121 (or 101).** | | |

**List of supporting documentation attached:**

Course syllabus

## Assessment Leading to Request

1) Previously, the course was taught by PTC faculty. Last spring, a professor from the PTC Department worked with petroleum faculty to design the course and taught two of the four sections. Currently (Fall 2018 semester), the course is being taught by Petroleum Engineering Department.

2) Change the former COMX 225-Presentation of Technical Information in Petroleum to PET 225-Presentation and Professionalism because it will be taught by Petroleum Engineering faculty to petroleum engineering students.

3) Professionalism topics have been added to the course, per discussion and recommendations from our Industrial Advisory Board members and petroleum industry recruiters.

4) Add prerequisites of PET 201 and WRIT 121 (or 101) to ensure students have knowledge of the petroleum industry and basic knowledge/skills in technical writing.

## Anticipated Impacts to "Other" Programs: None.

## Impact on Library: None.

## Date to take effect: January 2019

## LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

*Faculty Approvals (directly to CRC, then Faculty Senate):*
- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- X Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification of 29 credits or less
- ☐ Other:

*Campus Approvals (must be approved by the VCAA prior to CRC submission):*
- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

*OCHE Approvals (must be approved by the VCAA and Chancellor prior to CRC submission):*
- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

*Level II (must be approved by the VCAA and Chancellor prior to CRC submission):*
- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

**APPROVALS**

**Department Head Approval** _____ Date _____

**Dean Approval** _____ Date _12-17-18_

**VCAAR Approval (see above)** _____ Date _____

**Chancellor Approval (see above)** _____ Date _____

**Graduate Council Approval** _____ Date _____

**CRC Approval** _____ Date _12/6/18_

**Faculty Senate Approval** _____ Date _____

# Montana Tech

**Date** 11/28/2018
**Dept.** Mining Engineering
**Program** N/A

**College** School of Mines & Engineering
**CRC Representative** Paul Conrad

## Description of Request:

Change pre-requisite course requirements of EELE 201 and EGEN 202 for the MIN 305 Unit Mining Operation course to be co-requisites.

## Current Course or Program Information:

**MIN 305 Unit Mining Operation**                                        *4 Cr.. (Hrs.:..:3 Lec., 3 Lab)*

Covers hoisting, rail haulage and conveyor belts. Auxiliary mining services such as pumping and compressed air distribution are studied. Laboratory sessions present design problems dealing with the material taught in the classroom. **Prerequisites:** MIN 215, EELE 201, EGEN 202, & 335. **(2nd)**

## Proposed Change

| Course # Name | Credits | Pre-req. |
|---|---|---|
| **MIN 305 Unit Mining Operation** | *4 Cr.. (Hrs.:..:3 Lec., 3 Lab)* | |
| Covers hoisting, rail haulage and conveyor belts. Auxiliary mining services such as pumping and compressed air distribution are studied. Laboratory sessions present design problems dealing with the material taught in the classroom. **Prerequisites:** MIN 215, EGEN 335. **Corequisites:** EELE 201, EGEN 202. **(2nd)** | | |

## List of supporting documentation attached:

1. Syllabus attached

## Assessment Leading to Request

At times students have not completed the pre-requisite EELE 201 or EGEN 202 courses to be able to take MIN 305 which is a pre-requisite for some senior level mining courses. To facilitate those students in taking MIN 305 to maintain adequate progress toward graduation, a drop/ad card is used to override the pre-requisite requirements of EELE 201 or EGEN 202 for them to take the course. Making EELE 201 and EGEN 202 co-requisites will eliminate the need to use a drop/ad card. Concepts learned in EELE 201 and EGEN 202 needed to completed homework assignments in MIN 305 are also covered in in the class while developing homework topic concepts. Students who have not already completed EELE 201 or EGEN 202 will be required to take those courses at the same time as they take MIN 305.

## Anticipated Impacts to "Other" Programs

None

## Impact on Library:

No consultation is required since changes are only in the course pre-requisites.

## Date to take effect: Spring Semester 2019

# **Montana**Tech    *Curriculum Change Request Form Dated 6 September 2018*
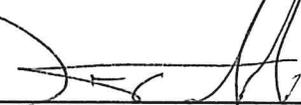
**LEVEL of Request**

Please indicate the type of request(s) by selecting *all that apply*:

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- ☑ <u>Changed course</u>: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

*Campus Approvals (must be approved by the VCAA prior to CRC submission):*

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission):*

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
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- ☐ Other: