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TABLE OF CONTENTS

Collaborative Writing

1st Place Winners:

RYAN MARIZZA, JACOB MELONIS, BIRANNA ROE, ALAN TETT, ERIN SHIMODA

[Developing a Sense of Community in the Mechanical Engineering Department](#) 4

2nd Place Winners:

ETHAN COOB, NARELLE KIPPLE, BRENDAN LYNCH, CHENGCHENG HAN

[Academic Integrity: Analyzing the Culture in Mechanical Engineering](#) 23

3rd Place Winners:

MALLORY HOOVER, ABDUL GHIASY, NOAH LEUTHAEUSER, AZIZ ALOTAIBI

[Engineering Career Services: Student Perceptions of Career Services](#) 33

Diversity

NICOLE MATTSON | 1st Place Winner

[Pathologizing Culture](#) 45

NICOLE SHARPE | 2nd Place Winner

[Medical Schools Lack Cultural Competency for Transgender and Gender Non-conforming Individuals](#) 49

JACKSON DEAKINS | 3rd Place Winner

[Smoke Break](#) 57

First Year (Long Form)

ZACHARY SUN | 1st Place Winner

[Trigger Warning: *Game of Thrones* Controversial Content and Its Potential Benefits](#) 59

CHIARA DART | 2nd Place Winner (tie)

[Voluntourism: Friend or Foe?](#) 66

CLAIRE A. VELDKAMP | 2nd Place Winner (tie)

[The Power to Change](#) 72

Mackison

MATTHEW BURLEY | 1st Place Winner

[U.S Energy Industry Regulation: An Economic Analysis](#) 78

MARK HINKLE | 2nd Place Winner

[Black Box Diagnosis: Why Neural Networks Cannot Replace Doctors](#) 87

MEGAN KEOGH | 3rd Place Winner

[Active Learning Group Work: Helpful for Women in Engineering?](#) 94

BEN MELLINKOFF | Winner in Summer 2017

[The New Age of Human Space Exploration:
An Application of Low-Latency Surface Telerobotics and Reusable Rockets](#) 103

Upper Division A&S

FRANK MUKENDI | 1st Place Winner

[Proposal: Collection of a Lingala-French Parallel Corpus](#) 108

ACKQUELINE FARRELL | 2nd Place Winner

[The Devil's Eucharist: Religiosity in Cormac McCarthy's *'Blood Meridian'*](#) 113

HANA KIEGER | 3rd Place Winner

[I'm On Your Side, But You Need to Listen](#) 118

Upper Division Business

TRISTAN SOBEY | 1st Place Winner

[City of Boulder Municipalization: Recommendation Report](#) 120

BRIANNA HUYNH | 2nd Place Winner (tie)

[Cogs in a Machine: Examining Amazon's Employee Issues](#) 126

PAULINE FLORES | 2nd Place Winner (tie)

[An Evaluation of McDonald's Natural Ingredient Initiatives: Marketing and Advertising Recommendations](#) 136

Developing a Sense of the Mechanical Engineering Department

by Ryan Marizza, Jacob Melonis, Brianna Roe, Alan Tett, Erin Shimoda



Executive Summary

Background

The student population in the Mechanical Engineering Department at the University of Colorado/Boulder has been increasing rapidly over the past years. With now over one thousand undergraduate students, advisors in the department worry there is a lack of community among professors and students. A sense of community in an educational environment is essential to the long-term success of students as well as the department. Without a sense of connection with professors, students may refrain from asking their faculty for help on material they struggle with. Without a support group to study with, students will not be able to develop their understanding by collaborating with and assisting each other. In addition, students are less likely to give back after they graduate if they never felt a sense of belonging to the department. This disconnect between students and alumni will only exacerbate the lack of community.

Project Goals

The goal of this project is twofold: identify the specific nature of the problem and propose a series of possible solutions to combat the lack of community in the Department of Mechanical Engineering. The problem was identified by advisors in the department; however, they were unsure how prevalent the issue

was overall. By reaching out to students, both the extent of the issue as well as the root cause of the lack of community could be determined. Using this information, our team developed solutions which we recommend the department implement to build community among students and faculty.

Problem Prevalence

In order to develop solutions to build community in the Mechanical Engineering Department, we first needed to understand where the problems lay. A survey sent to the students revealed where the communal disconnects occur. The results showed that most students feel there is a sense of community in the department; however, it is not so strong as they would prefer. Students felt their busy schedule was the biggest hindrance to a stronger community. In addition, students felt they didn't have enough opportunities to interact with faculty.

Recommendations

In order to address the issues identified in the survey, we developed a few possible solutions acting on three different facets: building community in-class, outside-of-class, and improving communication.

In efforts to improve in-class community we suggest:

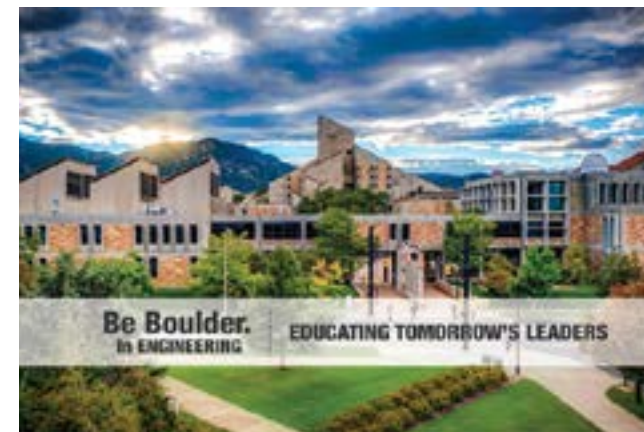
- 2000 level classes include a lab component where students work in groups to complete the projects.
- Mechanical Engineering courses offer homework groups for students to study together, thereby learning the material and becoming closer with each other.

In addition, the department could benefit from outside-of-class events and activities such as:

- Establishing a help room where faculty would be present to answer questions from all courses and students could work together to complete assignments.
- Hosting faculty research talk sessions so students could learn more about their professors and the work they do.

Finally, improving departmental communication will improve the sense of community by

- Organizing all weekly emails into a single comprehensive announcement email so students know exactly where to find information about upcoming events.
- Encouraging students to get connected on a group conversation platform such as GroupMe so they can always be in communication with each other.



Need/Problem/Goal

In the past five years, from 2012 to 2017, the Department of Mechanical Engineering has grown from 600 students to over 1000. This has resulted in increased class size, which has the potential to make it harder for students to develop a community within the department and identify as a mechanical engineer.

The goal for this project is to identify whether mechanical engineering students feel a sense of community and whether they would want to have a greater sense of community. Following those initial inquiries, we want to be

able to gather a set of recommendations that can be used in the future.

Constraints

There are a number of inherent constraints to developing community within the Mechanical Engineering Department. For example, there is a limited amount of space within the location of the Department in the Engineering Center. This limits the size of gatherings that can be held within the Engineering Center. The Idea Forge has more room to hold a large gathering of students, so that has been utilized to accommodate the student growth. Holding events in the Idea Forge has the potential to decrease attendance because some students do not want to go out of their way to go to an event, and the Idea Forge is not near many engineering classrooms or labs.

Another constraint is the time that both the faculty and students have to attend events that can harbor and promote community. The students are weighed down by homework, projects, and tests and often do not have available time to attend events which lowers the attendance rate. Additionally, faculty are busy and attending events may be low priority in comparison to their jobs doing research, teaching, or administrative responsibilities.

The ratio of faculty to students can also inhibit the project goal. There are about 50 faculty in comparison with over 1000 students, so for every faculty, there are more than 20 students. Because there are so many more students than faculty, it is difficult to promote relationships between them. However, a professor-student relationship has the potential to increase community as well as provide students with optimal career opportunities.

These constraints were kept in mind while developing the survey questions and brainstorming recommendations.

Methods and Approach

With the initial problem being a lack of community in the Department of Mechanical Engineering, we began by questioning who would be best to build the foundation of the community. Discussing amongst ourselves, we believe that finding the underlying problem with the lack of community amongst students was the best place to start. We believe that if we build community within the student body, the professors would then be more eager to join in and further build onto the community. Once the students feel supported and like they belong in the Department of Mechanical Engineering, we then believe after graduation the students would be more willing and wanting to give back to their department their department and build further on the community as alumni.

With so many students in the Department of Mechanical Engineering, we decided the best way to receive feedback from the whole student body was by emailing out a survey to every mechanical engineer at the University of Colorado Boulder. The survey offered prizes for random respondents to motivate more students to take and finish the survey. We think adding incentive is especially important because otherwise it has been seen that many students will not allocate any time to take the surveys even when they are predicted to take less than five minutes.

This survey included questions asking the respondent what they think demonstrates great community, which of those traits are being met, and which traits are stopping the community from thriving. A full list of the survey questions can be read further on in the report. With the data we received we then created a list of solutions and changes to be made in the Department of Mechanical Engineering. Using the data, we were able to understand the needs and desires of the students at the University of Colorado/Boulder and through which ways we can best create a strong community in the Department

of Mechanical Engineering. In years to come, we hope these suggestions are taken into consideration and implemented. Once the student body builds a strong community, then they faculty and alumni will strengthen that foundation and expand the community to multiple generations.



Overview of Data and Results

The survey provided the necessary information that was used to formulate recommendations for what should be done to improve the sense of community in the Mechanical Engineering Department.

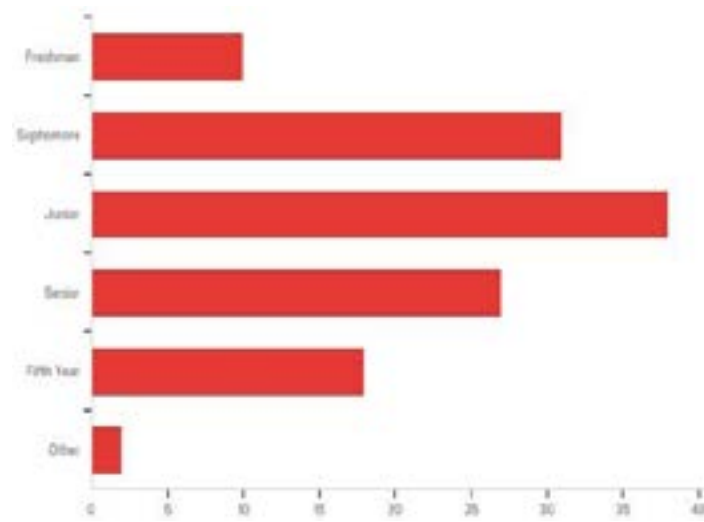
The responses, and their connection to our recommendations, are below.

Response Details

To preface the survey, it is first important to assess whether or not the survey is an accurate representation of the total population (in this case, the total population is all mechanical engineering students). This assessment is done by the number of responses, the breakdown of responses by year, and the breakdown of responses by gender. This is done in order to prove that the results are an accurate representation of the feelings of the mechanical engineering students. Further discussion is needed about the possible presence of survey biasing. This will be touched on briefly later in the discussion of a question that seemed especially to miss its mark (see 'A Sense of Belonging'). Out of the 1050 students in the Mechanical Engineering Department who received a request to complete the survey, a total of 159 students took the survey. Of these 159 students, a few students did not complete all questions, so the operational number of survey responses was 126. Regardless,

the number of responses is greater than 10% of the population of which it represents, therefore, at least by size, it is clear that this data is a statistically significant representation of the community as a whole.

To prove that the data represent the community accurately, it is necessary to prove that students from each school year are each represented in a significant way. To prove this, question 2 of the survey asked students to divulge what year they were. The following figure displays the results of this question:



Question: What year are you?

In the figure above and all following figures, the X-axis demonstrates how many respondents made that specific selection. For this figure the X-axis ranges from 0 to 40 with tick marks incrementing by five. The Y-axis in this figure represents the different academic years, starting with freshman at the top going down to sophomore, junior, senior, fifth year, and then other at the bottom.

It is clear from this chart that sophomores, juniors, and seniors gave more responses than freshman, fifth-years, or other students. As such, one should keep in mind that there is the possibility of underrepresentation of freshman, fifth-years, and/or

other students when analyzing the rest of the results.

The distribution of genders of survey takers is another important piece of information needed to prove proper representation. The survey found that 63.5% of respondents were male and 35% of respondents were female. This fits well with the approximate distribution of gender seen in the total population. As such, it can be concluded that the survey represents the feelings of each gender accurately.

Now that the representative qualities of the survey have been fleshed out, it is time to observe the results!

Current Mood About Community

First off, the following survey question asked students whether or not they currently feel a sense of community in the Mechanical Engineering Department. This question gives a good sense of the starting point causing a communal change in the mechanical engineering department. Here, the data are split up by class, and it is easy to see how students in the department gain a sense of community from their freshman to their senior year:



Question: Do you feel a sense of community in your major?

Again, the X-axis represents the number of responses per selection, this time ranging from 0 to 24 with tick marks incrementing by 2. The Y-axis for the figure, above uses the same labels as the previous figure with the different years starting with freshman at the top ranging to other at the bottom. The different colors represent how each year feels about the community.

Red represents definitely feeling a sense of community, purple somewhat yes, blue indifferent, green somewhat no, and yellow definitely no.

The response choices are as listed:

- Red (top most bar)- definitely
- Purple: somewhat
- Light blue: indifferent
- Green: somewhat no
- Yellow (bottom most bar): definitely no

Factors that Contribute to Community

This question asked students how important they thought different community aspects were. The options given can be seen in the following figure. Of the different aspects, a vast majority of students either strongly agreed, or somewhat agreed, that all of these things were important to their feeling a sense of community:

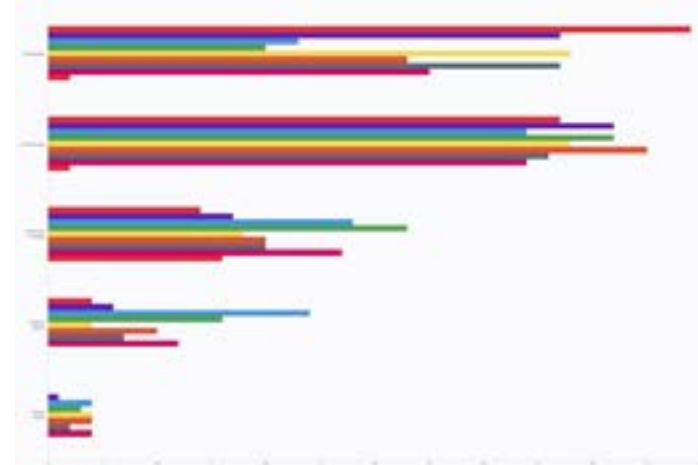
In this figure, the Y-axis represents the factors that students feel strongly contribute to a sense of community on top ranging to factors that students strongly do not contribute on the bottom. The X-axis on this figure ranges from 0 to 90 responses, with tick marks in increments of ten.

The response choices are as listed:

- Red (top most bar): feeling respected by faculty
- Dark blue: respected by other students
- Light blue: opportunities to interact with faculty outside of class
- Green: having department events focused on student/faculty interactions
- Yellow: opportunities within the course structure to work with other students
- Orange: feeling supported in meeting academic goals
- Gray feeling a sense of belonging
- Maroon: having experiences that give you confidence to succeed in engineering
- Red (bottom most bar): other

Factors that are Currently Present

This question plays off the last. This asks students if they think the community aspects (which they agree are important) are currently present. Excitingly, many students do in fact feel that these factors are present in the mechanical engineering department. This result is displayed below.



Question: To what extent do each of the factors below contribute to a strong sense of community?

Question: To what extent are each of the factors present in your experience in the Department of Mechanical Engineering?

The X-axis on this figure again ranges from 0 to 90, with tick marks incrementing by ten. The Y-axis and different color bars are also the same as the above figure. The Y-axis ranges from strongly agreeing these factors are present to strongly disagreeing about these factors being present.

The response choices are as listed:

- Red (top most bar): feeling respected by faculty
- Dark blue: respected by other students
- Light blue: opportunities to interact with faculty outside of class
- Green: having department events focused on student/ faculty interactions
- Yellow: opportunities within the course structure to work with other students
- Orange: feeling supported in meeting academic goals
- Gray feeling a sense of belonging
- Maroon: having experiences that give you confidence to succeed in engineering
- Red (bottom most bar): other.

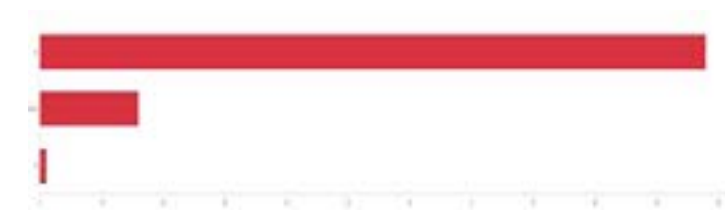
From this question and the last, it can be concluded that students want more opportunities to interact with faculty outside of class. This knowledge inspired a few of our recommendations, including the Mechanical Engineering help room, and the faculty research talks.

It is also interesting to look at how this data break down by class, to see whether freshman feel the same presence of these factors as juniors and seniors. Plots that break this question down by school year can be found in the appendix.

A Sense of Belonging

This is the survey question that was alluded

to in the response details section. It asked the students, “Do you identify as a Mechanical Engineer?” An overwhelming number of students responded positively; however, it is suspected that this question was misinterpreted. It was meant to determine whether students felt a strong sense of belonging in the department, but comes across as an analogous question to “Is mechanical engineering your major?” This is unfortunate, but gives good insight on the effects of phrasing on survey biases. The (likely biased) data is shown below.



Question: Do you identify as a Mechanical Engineer?

The X-axis above still has tick marks incrementing by 10 but ranges from 0 to 110. The Y axis on this graph starts with *yes* at the top, *not yet* in the middle, and *no* on the bottom. The distribution among the years did not change. All years had proportional responses saying *yes*, *not yet*, and *no*.

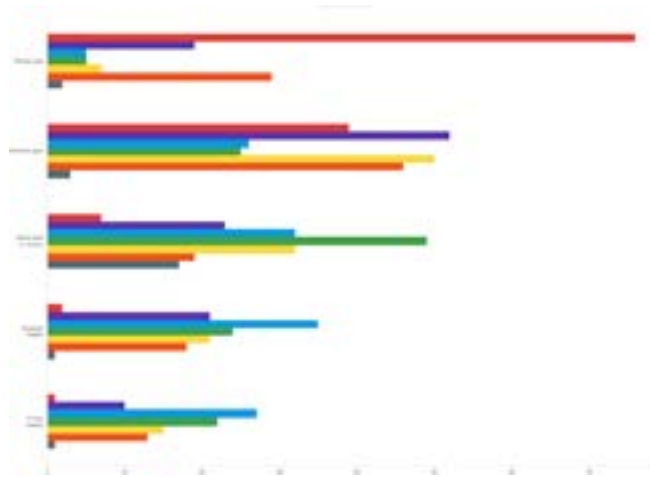
Event Attendance

It was important to know whether students currently attend the events thrown by the department. Therefore, this question asked students whether they attend events hosted by the department. Responses showed that most students responded *sometimes* or *not often*. The range of responses is shown below. Again it is interesting to see how this breaks down by school year; therefore, the data are presented by class in the appendix.

Why Don't Students go to the Events?

The next survey question addresses the factors that prevent mechanical engineering students from

currently attending existing social events thrown by the department. This question gives insight on how students have had success in the past with making friends in the department. The hope of this question was to give an idea of what has been working in the past and how students have been naturally developing their own sense of community in the department before this project.



Question: What factors stop you from attending community building activities hosted by the ME department?

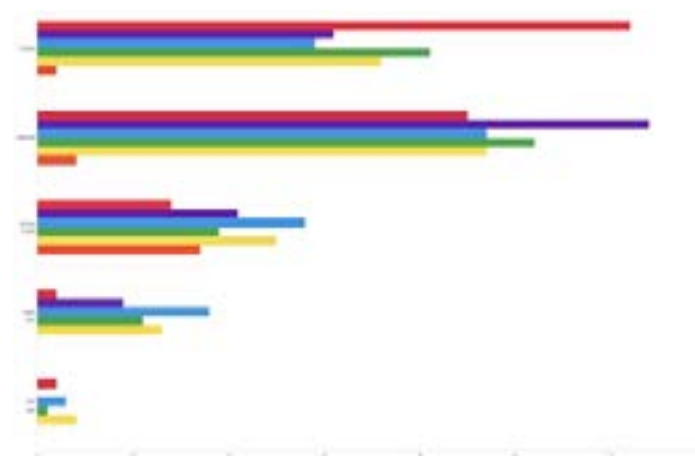
The X-axis on this chart ranges from 0-80 students. The Y-axis represents the factors that students strongly agree keep them from attending events (at the top) to things that the students don't think keep them from attending events (at the bottom).

- Green: inconvenient location
- Yellow: not interested in the event,
- Orange: unaware of events that are offered
- Gray (bottom most bar): other

The conclusion to be drawn from the results is that students mainly don't go to events because they are either low on time or they are unaware of the event. These conclusion motivate some of our recommendations. The conclusion that the students are low on time inspired the recommendation that a mechanical engineering help room be created. That way, students can interact with others in their community while also being productive. The conclusion that the students are unaware of the occurrence of events motivates the recommendation that there be a bulletin board containing events in the department (it could be in the help room!) and the suggestion that email newsletters be updated to be more reader friendly.

Factors that Encourage Attendance

This question asked the students which incentives were the most effective at encouraging their attendance to community building events. The responses show that the most important factor influencing their attendance was free food. They also valued one-on-one time with faculty and networking with alumni and industry personnel.



Question: What factors encourage you to attend community building activities hosted by the Mechanical Engineering department?

The X-axis for this figure ranges from 0 to 70, with tick marks incrementing by ten. The Y-axis represents how strong the student feels the factors encourage them. The top section is strongly agreeing that those factors are important ranging to strongly agree the factors are not important at the bottom.

The response choices are as listed:

- Red (top most bar)- free food/treats
- Purple- one on one time with faculty
- Light blue- meeting other ME students
- Green- Network with alums or industries
- Yellow- resume building/career help
- Orange (bottom most bar)- other

How Students Make Friends

The results from this question show that current students have made most of their friends in the department either through their classes (sitting next to friends, working on homework together, etc.) or through group projects.



Question: How did you meet the friends you have in your department?

The X-Axis of this plot ranges from 0-35 responses. The Y-axis places freshman responses at the top, then sophomores, then juniors, then seniors, then fifth years, then and finally 'other' students at the very bottom.

The response choices are as listed:

- Red (top most bar): in class
- Purple: group projects
- Light blue: residence halls/where I live
- Green (bottom most bar): other

Free Response

As the final part of the survey, we included an optional question, which asked students if they had any ideas relevant to the topic of community building in mechanical engineering. Out of the responses to this question, the most insightful are included below. The full list of responses are included in the appendix.

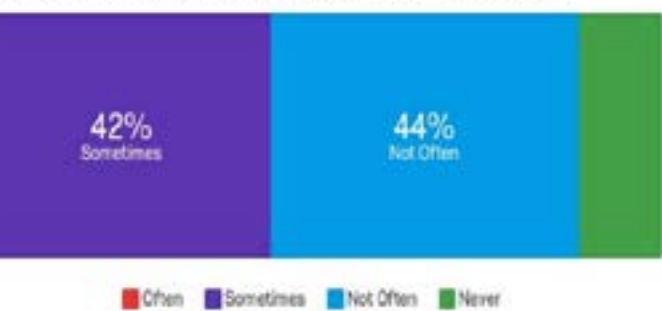
“As a transfer student it was difficult to initially find my spot in the department.”

“A space for all of us to work together would help in switching the paradigm of social interaction within the ME community.”

“A BIG work space for just ME's would be amazing.”

“Encouraging group homework and projects helps build the community.”

Q8 - Do you attend community building activities hosted by your department?



The response choices are as listed:

- Red (top most bar): not enough time
- Dark blue: don't know anyone to go with
- Light blue: don't feel like you belong



Develop Community In the Classroom

When comparing the Mechanical Engineering Department to other departments with successful senses of community, such as the Aerospace Engineering or Business programs, our team recognizes that there is a distinct lack of group work in the coursework of the Mechanical Engineering program. There are two primary forms of group work: lab groups and homework groups. Implementing lab groups to existing classes presents a larger challenge than does the implementation of homework groups; however, we believe lab groups will aid the sense of community more than homework groups will.

The addition of lab groups into the curriculum of the Mechanical Engineering department would address the issue that students feel they have no time to attend social events in the department. Similar to clicker questions and to projects classes, these labs would not be separate courses. They would be companion labs to existing lectures that must be inserted into existing course structures (perhaps taking up one lecture slot per week). Because survey data shows that sophomore year is the most crucial year for community building, we recommend these labs be implemented in the 2000-level courses. These labs would possibly eliminate the need to take Experimental Physics because they will be experimenting in their own department's curriculum instead of that of the Physics Department.

Lab attendance would be required both because of a grade deduction on an individual's lab grade for missing a meeting and, more importantly, because that student is a valuable asset to the team. In lab groups, students in the Aerospace Engineering Department have found to have had some of the more meaningful interactions with fellow classmates. We argue these groups would make a great addition to the curriculum

of the Mechanical Engineering department for their community-building aspects and more.



Furthermore, this idea synergizes with other recommendations. Social media groups are more easily organized if students acquire contact information through lab groups. Also, lab groups could make use of the help room for consulting TAs and professors outside of lab class periods. Plus, lab groups provide students an excellent opportunity to develop team working skills that will be necessary in their future careers.

Drawbacks stemming from the addition of lab groups into the Mechanical Engineering Department mainly include that course structure would have to undergo a wide and deep reorganization of the curricula. This would require time and effort from the entire department to plan, implement, and follow-through with the commitment to adding lab groups to the current curriculum. There would also need to be classroom space for these labs. The ITLL already has a pretty tight schedule of labs, but the Idea Forge may have the resources available to meet this need.

Also, students may feel that lab groups are unwanted due to the difficulty working with some of their classmates. This difficulty will certainly follow them into industry, so it is our reasoning that it is better to experience those struggles now than to be surprised by it later.

Another recommendation we make to improve the sense of community in classes is the

implementation of homework groups. Similarly to lab groups, organized homework groups on a per-class basis would provide students the social interaction with cohorts in the department they may not otherwise get, not to mention that students would have the opportunity to give and receive homework help on assignments instead of resorting to online homework solutions.

The logistics of implementing homework groups may vary on a by-class basis. An example of how one professor might operate these groups is as follows. At the beginning of the course, he could create a google doc and allow willing students to type their name in order to form homework groups. This process would be completely voluntarily and allow students to meet new classmates and get a collaborative approach on figuring out their homework problems.

Only the students who want to work in groups would sign up, optimizing the functionality of the group and integrity of each individual's work. If students participate on a voluntary basis they are more likely to still do their own work and not just copy off of their group mates.

A different approach a professor could have is assigning homework groups. The groups could be organized using a random process, assigning by last name, or even by GPA. There are many different approaches to assign the groups, but the main benefit is that everyone in the class would then have a group to collaborate with. In the previous voluntary option, there could be students that feel they do not know anyone and feel intimidated by working with new faces so they never take the opportunity to collaborate. This option is comforting for those skeptical students because multiple students will be in the same situation and it will then become a norm. Homework groups would indeed synergize with lab groups. For one thing, if homework groups and lab groups were present in the same class, then they could be one and the same.

The first of these responses gives important information about a subclass of students who was not represented by the survey. Transfer students, understandably, have a very hard time meeting new people in their respective departments.

The second and third responses show student interest in a common workspace and help motivate our recommendation to create a Mechanical Engineering help room.

The fourth response shows the desire for more group assignment helps motivate our recommendation to increase the amount of lab work and group homework assignments.

Recommendations and Rationale

Based on the survey results and the feedback from the intermediate design review presentation, our team recommends three distinct areas in which the sense of community in the Mechanical Engineering Department can be improved beyond its current state: in class, outside class, and communication. The corresponding three subsections to follow are broken down into specific ideas for improvement or change in the department.

This way, lab groups could meet outside of class and work on homework instead of labs. Or, in case students find one group harder to work with, the other group would provide a different set of people to work and bond with. Because homework would need to be done regardless of homework groups, this recommendation presents less of an improvement to community than does lab work. There is less incentive to attend homework group meetings or to participate in the homework solutions. Still, this solution has been implemented in the departments curriculum before, so its addition to more classes presents a more simple task than the addition of lab groups.

Fostering Community Outside of Class

The most ambitious idea that we had, which was also brought up by students in the free-response section of the surveys, was the addition of a dedicated Mechanical Engineering Help Room in a convenient location on campus. In this help room, students would be able to talk to professors, TAs, and other students about the homework, projects, and labs that they have been assigned. As the largest department in CU's School of Engineering & Applied Science, it only makes sense for there to be a space for all those involved in the department to congregate in an environment that fosters academic discussion and community building.

There is precedent for a department-specific help room elsewhere on campus. For instance, the Physics Department has a similar help room in Duane. The Applied Math Department holds TA office hours for the core applied calculus courses in "The Blue Room" in the Engineering Center. The Electrical Engineering Department just added a help room in their renovated wing of the Engineering Center (see Help Room Schedule in Appendix C). The Aerospace Engineering Department dedicates a room, aka "The Aerospace Breakout Room," in their wing of the

Engineering Center for this exact purpose. And, with the Aerospace Department's moving to East Campus in the coming few years, there will be prime real estate in that wing of the building. While the room currently used as a help room in the aerospace wing is small even for its own department, it could be used as a starting point for the Mechanical Engineering Help Room—whose success could be used as further evidence towards finding a properly large space for a Mechanical Engineering Help Room in the future.

The Help Room will synergize with every other idea also presented in this report. Ideally, the Help Room will be full of tables and chairs and have walls lined with white boards where homework groups or lab groups can work through problems with professors and TA's. The room would also have a bulletin board for department newsletters, event fliers (such as for faculty talks), and student club meeting information. There could also be room for information on how to join the student-led social media groups whether as printed handouts, bulletin board fliers, or URL's written on the white boards. Survey results also showed that the Idea Forge in Fleming tended to be one walk's time commitment away from being truly a second home for Mechanical Engineering students. Perhaps Fleming would be a good place for a Help Room, at least to begin with. Students seem to need more of an incentive to make the journey to that part of campus what with their already busy schedules. With coursework help scheduled regularly for a familiar location within Fleming/the Idea Forge, students will feel more at home in the building and within the department. A Help Room in this location would allow students to attend Idea Forge events more easily if they are already in the neighborhood. This would also alleviate the need for TAs to hold office hours in scattered locations across campus, which are currently anywhere from the Stadium to the Engineering Center to Fleming itself. During this semester, our group did not have the

chance to talk with those in charge of the Idea Forge and the Fleming building, but we believe there to be a room adjacent to the Idea Forge machine shop that could be used for this purpose.

Faculty research talks were another important survey suggestion that we recommend the Mechanical Engineering Department implement. Talks would improve student-teacher relationships and build community because students would be able to get involved with professors' research opportunities and get to know them outside of course curriculums. These talks could even feature student research assistants presenting in tandem with their professors. Students could be provided extra credit for attending these talks for additional incentive. Precedent does exist for faculty research talks: the Math, Physics, and Ecology & Evolutionary Biology departments all hold these talks to the knowledge of this team. For best results, we recommend the department provide food and drink for speakers and attendees.

These faculty research talks could be held in the proposed Help Room if it the room is big enough. Alternatively, they could be held in lecture halls or even auditoriums around campus if attendance is opened to the public. Speaking of which, high school physics and engineering classes could be encouraged to attend these talks in order to extend the community building to the rest of Boulder.

Communicate to Forge Community

One of the more glaring problems we discerned from the survey results is the amount of information lost in translation between the advisors' emails and the students' calendars. Students found advisors' emails difficult to glean information from, whether because the information presented was unclear or because the emails went straight to the spam folder. We recommend advisors revamp the way they

distribute information to students in the form of emails and newsletters.

According to the survey and according to the general word of mouth within the department, many students are overwhelmed with the amount of emails they get. Therefore, it is our recommendation that advisors send fewer emails so that each one carries more weight.

Upon looking at what email communications work well in our own inboxes, we found that the emails sent by the BOLD Center are the most consistently useful emails we receive (see Appendix B). The Mechanical Engineering Department could benefit from modeling their emails after those of the BOLD Center. For example, emails could be more visually appealing (perhaps with a witty meme or comic¹ at the end of each email) and could be sent out on a more regular basis.

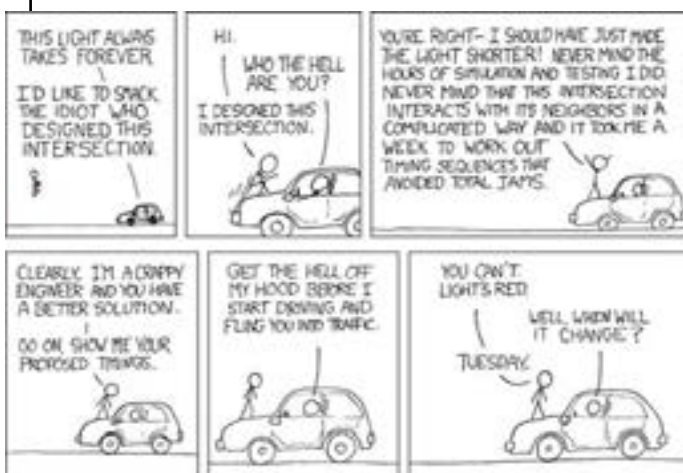
Of course, this much of a rework requires time and energy. Perhaps there is a student employee position ready to be opened for this task. Between the broad scope of emails advertising a smorgasbord of events and the narrow scope of marketing a single event, the work would be cut out for them. There are plenty of visually-oriented students on campus, and even in the department itself, gifted in the art of graphic design who would thrive in position where they get to market the events and happenings within the Mechanical Engineering Department.

Additionally, we figure these emails could also be distributed physically onto bulletin boards around the Engineering Center as well as inside the proposed Help Room. The social media recommendation synergizes with this idea as well because class social media groups provide a great platform on which to disperse information to students. However, there would

¹ There exists a relevant xkcd comic for every situation, particularly in engineering. See comic above.

have to be a student representative or ambassador who is tasked with distributing the information since the social media groups must run independently of the faculty and administration of the department.

Most importantly, the investment of time and energy now to revamp the communication of community in the Mechanical Engineering Department will pay off later on. Much of what will be communicated would cover low-level advising a new format of communication will ensure they lead future Mechanical Engineering students to stay up to date with events by reading the new newsletters.



Lastly, we recommend student-run social media groups be encouraged by department faculty. This idea seems to elicit nervous reactions from faculty members-and rightly so. These groups provide a platform for students to congregate electronically where they can collectively voice complaints, seek homework/project/lab help, organize extracurricular events, relay important information, and provide support for each other when times get tough. They are a means to improve student to student communication, which will absolutely foster a sense of community within the department.

Faculty must not have a hand in running these groups; they must be run independent official department sponsorship so that students feel a sense of free speech, which is one of the most important aspects of a community this large. The role faculty play in the

implementation of these groups is to facilitate their inception at the beginning of the semester as well as have a knowledge of their existence but not their content. Ideally, at the beginning of the semester, a student representative should take a couple minutes out of a lecture to let the class know about the group and the basics of how it works including how to join.

This sort of department-independent social media group has found success mainly in the Aerospace Engineering Department. The group began as a way to get homework help and disperse important announcements such as the time and location of American Institute for Aeronautics and Astronautics student member meetings.

The group for the junior class is currently 174 members strong and is host to daily conversations that have brought the whole class closer together over the course of its eighteen months of existence at the time of this writing. One of the most interesting results of this social media group is that many students get to recognize one another first online and then meet them in real life and continue on as friends. Several different social media platforms would work for this application. GroupMe is the one people tend to be the most familiar with. It comes primarily as a WiFi messaging app on mobile devices but also has a desktop version. It allows 200 members per group by default but additional membership can be requested from the developers. Alternatives include Slack, which offers more administrative options; Facebook, which is even familiar to people; and WhatsApp, which is very similar to GroupMe. Ultimately, it should be up to students which social media platform they use. Each platform allows notifications to be muted so that students are not overwhelmed by buzzes in their pockets.

In this team's experience, these groups tend to self-govern. Any toxic behavior or arguments are usually smoothed out by the majority of members who mediate discussion and generally keep things on topic. If discussion begins to stray off topic too intensely, oftentimes sub-groups will be made for lab/homework groups or groups of friends who want a more personal interaction. We do not recommend that a student administrator be appointed or elected to run the groups. Despite these groups being a platform on which to discuss department politics, they should be independent of any authority against which the group can become antagonized against.

Appendix A: More survey results

Factors that are Currently Present (broken down by class)

Question: To what extent are each of the factors present in your experience in the Department of Mechanical Engineering?

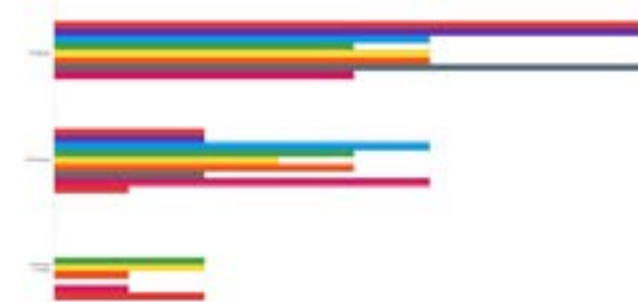
The X-axis on this figure again ranges from 0 to 90, with tick marks incrementing by ten. The Y-axis and different color bars are also the same as the above figure. The Y-axis ranges from strongly agreeing these factors are present to strongly disagreeing about these factors being present.

The response choices are as listed:

- **Red** (top most bar): feeling respected by faculty
- **Dark blue**: respected by other students
- **Light blue**: opportunities to interact with faculty outside of class
- **Green**- having department events focused on student/ faculty interactions
- **Yellow**- opportunities within the course structure to work with other students
- **Orange**- feeling supported in meeting academic

- goals
- **Gray** feeling a sense of belonging
- **Maroon**- having experiences that give you confidence to succeed in engineering

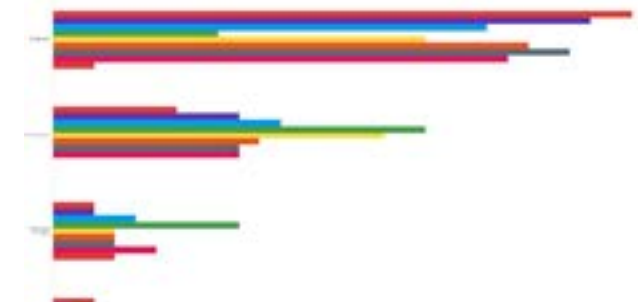
Freshmen



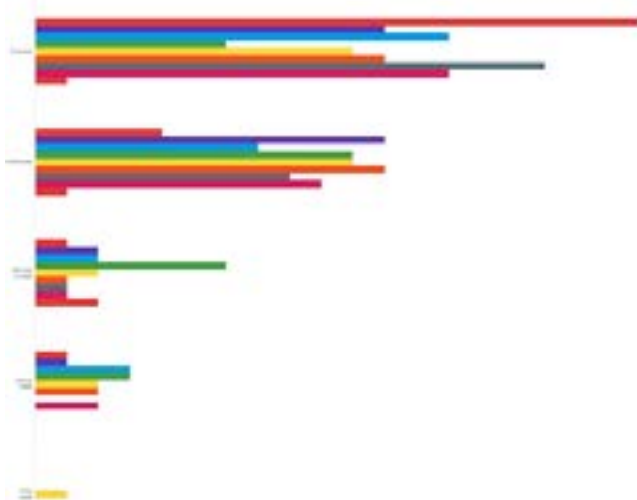
Sophomore



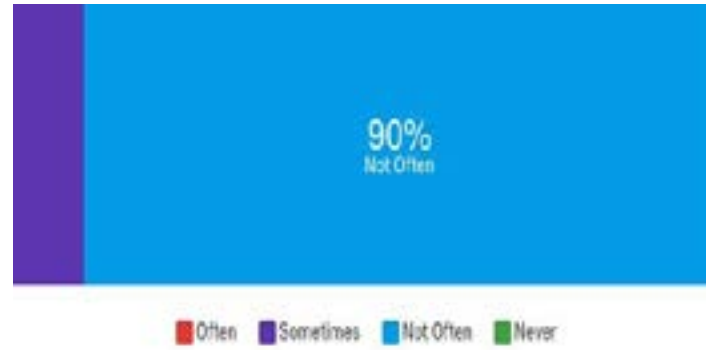
Junior



Seniors



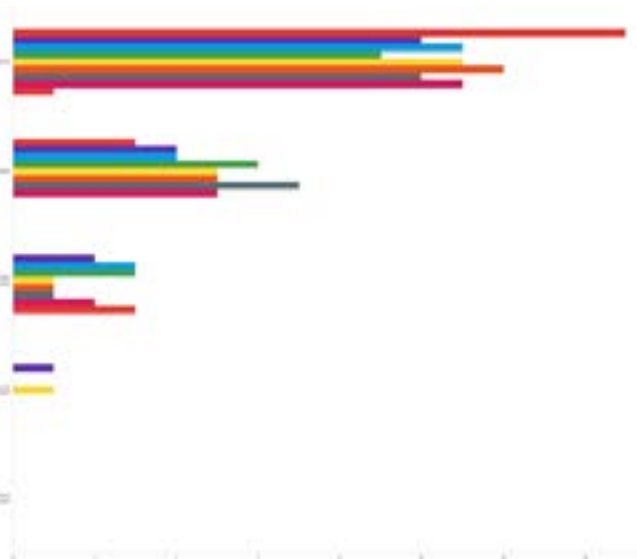
Event Attendance (broken down by class)



Fifth Years



Fifth Year



Sophomore



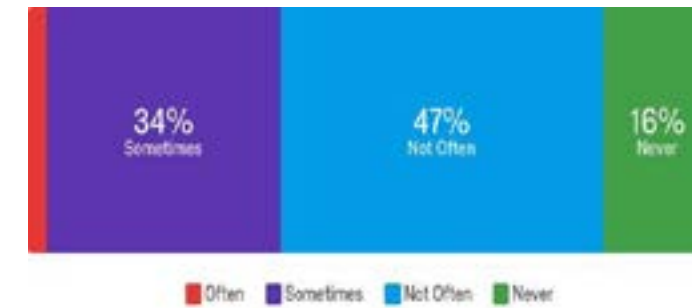
Other



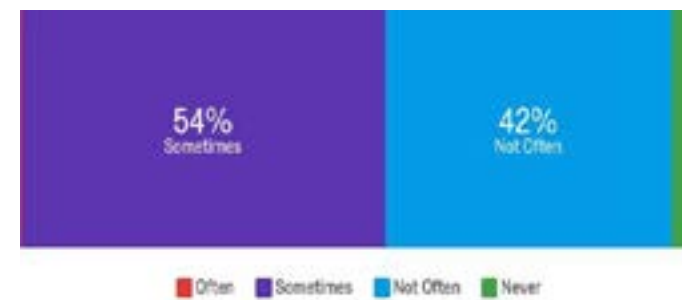
Other



Juniors



Seniors



Free Response

Is there anything else you would like to share on the topic of "Building Community within the Mechanical Engineering Department"?

1. No
2. Not that i can think of right now
3. No, and thank you for addressing this.
4. None
5. I personally am here to get my degree and be done. I am not looking to make friends or work on group projects. What you guys really need to focus on is preparing people for real jobs and how to be successful in the industry, and I don't think this department is succeeding in that.
I think the majority of the faculty has been limited to academic positions for the majority of their careers and they are training students to be scientists and not real

world engineers.

6. Would be nice to be connected with more women both in the school and in the career field.
7. Look into what e+ does.
8. Inclusion is fine. Setting students up for success so they have the free time to go to these things should be a major priority.

9. Nope!

10. Projects over tests

11. No

12. A lot of the time, group projects end up hurting relationships because everyone hates them. This causes people to slack on the project, and it ends up hurting everyone.

13. I think if there was a better way to communicate events more visually, it would encourage a lot of people to go. I do have the mcen-undergrad email subscription, however I often overlook it because nothing exactly catches my eye. If they did more of what the BOLD Center did with their newsletters, I'd be more inclined to read them.

14. Allow time for transfer students to integrate into the community.

15. A BIG work space for just ME's would be amazing. This way we can all share in our struggles of going through the ME department and help each other along the way. There is no place for ME's to congregate currently other than the EC lobby. A space for all of us to work together would help in switching the paradigm of social interaction within the ME community. Because right now it's difficult to make connections and build relationships with my fellow MEs.

16. As a transfer student, it was difficult to initially find my spot in the department. Through out-of-class activities, it would have been much easier. Once I was able to make friends, there was a feeling of comfort and community that involved everyone.

17. Working for the department really helped

18. As a member of the graduate Mechanical Engineering Department, I recommend consulting the graduate advisers and USGS for advice because they have done a fantastic job in making me feel welcome with department events. This even included a department sponsored house /pool party which was a terrific event.

19. Events at times that are more accessible for students to attend. Have them outside class hours. Also, advertise more!

20. More team projects. More events for mechanical students in my year. Closer-knit class room environment

21. I would like to know more about research being conducted by people in the department. Lots of info available online and I have read lots of papers on my own but presentations are harder to come by, especially ones geared towards non-expert students. More presentations for students by researchers on campus and industry alums or otherwise would be beneficial. More events in general are beneficial for community but these are the kinds of events that would draw me.

22. nope

23. I just would prefer to have more interesting students events that are that are well advertised.

24. The sense of community didn't come until the last year or so in the department. This is probably also because I took many classes out of order. Encouraging

group homework and projects helps build the community.

25. Nope

26. I don't think its a community problem I think it is a time problem.

27. Present extra curricular opportunities for ME students that are sponsored by the department and faculty, like: business-related projects, subject-specific projects, panels hosting engineers that thrived in non-engineering careers, etc.

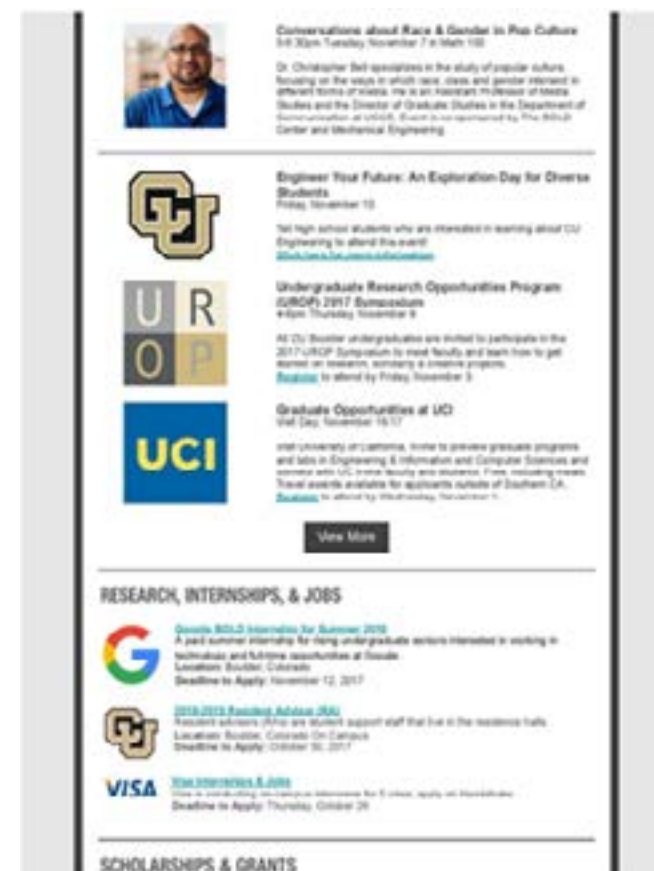
28. I am a non-traditional student that commutes 1 hour each way to get here. I stay on campus the entire day, often from 8:30 am to 7:30 pm. Over the years I have become a member of 3 clubs. Only one of which is with my MechE peers. Most of my social interaction is with students in classes. I find it hard to set up study groups since often they are later in the day and I can't really stay much later. This year I have felt much more community since I am spending more time in the Idea Forge. I think the area foster a sense freshness and openness that allows people more freedom to just say hi. Brain Blurt; how about trying a social experiment. Make a sign that goes on a table in the lobbies. It moves around randomly. It says something like "Rules of this table, If you sit here you must say hi to whoever is at the table and tell them something about yourself. To move this sign you must have the permission of the new table." Just a thought.

29. It's a very competitive atmosphere, which sometimes makes it hard to break the "cliques" that happen. Also, unless involved in a group project or assignment, it is very difficult to build a friend group/ community just based on your classmates.

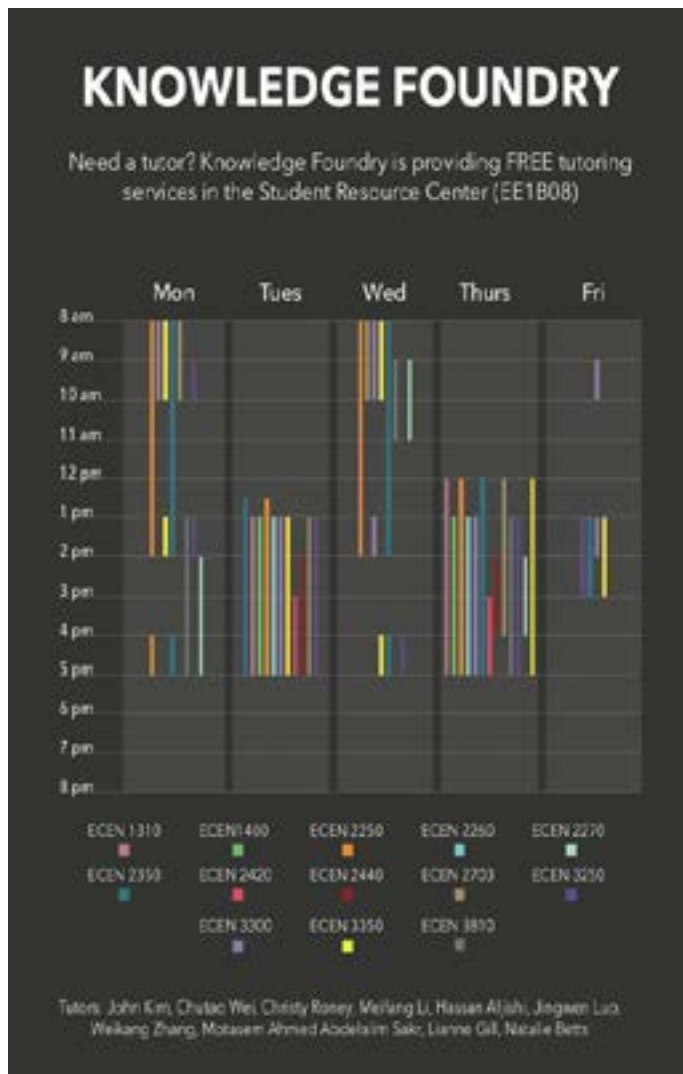
30. Majority of classes are men professors and students would like to see more support and representation of women.

31. I REALLY WANT TO WIN THE T SHIRT!!!

Appendix B: BOLD Center Newsletter



Appendix C: Electrical Engineering Help Room Schedule Example



Our faculty research talk series continues Thursday.

These talks are a great way to learn about the research that is going on in the APS department. Come find out about new areas of research and even see who is looking for students for their research projects. Most weeks, there will be two speakers (each speaking for about 20 minutes). This way we have the opportunity to showcase all of the great work being done in the department in a single semester. First-year graduate students and upper-level undergraduates are strongly encouraged to come but all undergraduates and graduates are welcome. Talks will be informal and will leave plenty of time for questions. Tomorrow we feature:

Mitch Beigelman: "Hypermagnetized Accretion Disks"

Zach Berta-Thompson: "Transiting Exoplanets with Telescopes in Space and on the Ground"

Thursday, Duane E126, 1:00-1:50

See the full schedule at:

<http://www.colorado.edu/aps/faculty-research-talks>

Academic Integrity: Analyzing the Culture in Mechanical Engineering

by Ethan Cobb, Narelle Kipple, Brendan Lynch, and Chengcheng Han

1. Executive Summary

a. Project Scope

In this report, we analyze the culture around academic integrity among students and faculty of the Mechanical Engineering Department at the University of Colorado - Boulder. More specifically, our goal was to understand how cheating is viewed by students within large testing environments and what actions the department can take to reduce the number of Honor Code violations occurring during exams.

b. Methods

In our study of academic integrity, our team first wanted to understand overall perceptions of cheating. We did this by gathering data on what students considered cheating and the habits of students who do cheat. We sent out a short survey to the students in the Mechanical Engineering Department, asking them their perceptions of and reactions to cheating in the hopes of finding the source of the problem.

c. Survey Results

Our results showed that of the students who did admit to cheating, most said they were driven by some sort of internal pressure. Many students also responded saying that even if they noticed another student cheating, they would not report the student to the administration or faculty. This seemed to suggest that integrity of the class as a whole was not important to the students and that it was almost as if the students are, as one student put it, "all just trying to survive".

The survey also revealed some discrepancies

between what students and faculty consider cheating, where many students don't consider using extra materials as cheating while many faculty members would. The most common action that was witnessed during exams and considered cheating by both faculty and students was looking at other student's exams and copying answers.



d. Recommendations

Having looked into these statistics and all of the student responses, we have a few suggestions to make to the Mechanical Engineering department with the hopes of reducing the number of honor code violations and foster a better student-faculty relationship:

- Increase the number of projects that courses offer
- Offer more clear and discrete methods for students to report cheating
- Strategically placing students to make glancing at tests harder

Finally, we suggest an increased focus on growing students academically. As one student mentioned:

"Make the tests fair, stop putting all the emphasis on grades and make it about learning.

I don't feel like I'm learning anything here, just trying to get by with good grades to make it to the next class."

This sentiment is not uncommon, and is a problem if the college is intending to educate students. Encourage teachers to spend time on their course content, creating their own study materials, tests, and offering up more of their time to improve the student's skill set. One way to do this would be to introduce "education professors", professors who focus more on their teaching, classes, and curriculum instead of spending a significant portion of their time within the administration or conducting research.

2. Project Overview

a. Introduction

The Mechanical Engineering Department at the University of Colorado Boulder wanted to investigate the academic climate between faculty and students of the department to assess the culture in the program surrounding cheating, particularly regarding the relationship between students and teachers. Suggestions were made on how to mitigate cheating based off of a student survey and various interviews with faculty around the campus. Below will go into the results of the survey as well as the recommendations to the department.

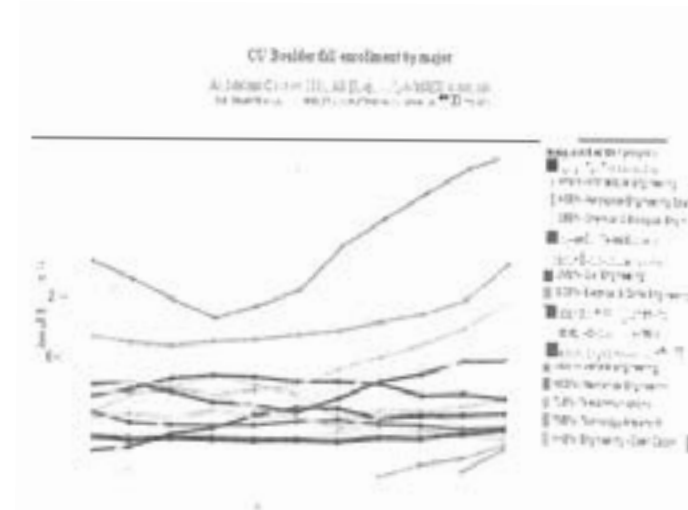
b. Goal

Cheating occurs in a lot of scenarios but our focus for this project is on the in-class testing. Our main mission was to understand the student's perceptions of cheating and facilitate with creating an environment that discourages it. We wanted to know what students defined as cheating and how it differed from the CU Honor Code and the perspective of professors.

Cheating techniques used was also part of our main interests. Our goal was to provide some suggestions that help to change students' experience both inside and outside of the classroom to reduce cheating.

c. Background

The Mechanical Engineering Department in the College of Engineering has grown significantly larger in the past couple years. While the undergraduate student body has more than doubled in the past five years, the number of faculty members and available classrooms on campus remain about the same. It is getting harder for professors to give the same amount of attention to every student as they had before, and it is also more difficult for students to find professors available to help. Along with a growing student-to-faculty ratio, the size of the classrooms are significantly smaller than what they need to given the number of students. For example, holding an exam for a class with a hundred students in a classroom where they are shoulder to shoulder with each other strains the faculty-student relationship, and students are more likely to cheat during exams in order to pass classes.



d. Constraints

There were a few constraints in this project that we were unable to change. The first was the University's Honor Code, which states, "On my honor,

as a University of Colorado Boulder student, I have neither given nor received unauthorized assistance." The Honor Code is something that students on the Honor Board Committee came together to produce and has been around since June 26, 2002.

We also understand that the University has only so much money and resources for each college and department within the University, leading to two large constraints for us. One is being the amount of faculty and teaching assistants they can hire per size of the class. The other is the size of the classrooms on campus. With only one to three faculty to proctor an exam of a hundred or more students, it's hard for them to keep an eye on everyone while simultaneously answering questions, and only three classrooms that can hold over 400 students, allow students to be spaced out for tests is difficult especially with a growing student body.

The last constraint is testing formats. Tests are either multiple choice, open-ended, or a mix of the two. Professors who have larger classes tend to opt for multiple choice exams so they don't take so long to grade whereas if they have smaller classes they have less to grade and therefore can give more open-ended exams.

3. Approach

Once we received our project, Ethan Cobb and Chengcheng Han met with Dr. Ferguson to discuss exactly what she wanted to come from this report. Dr. Ferguson wanted us to focus on the student-faculty relationship and how we can improve it in such a way that would discourage cheating. Based on the information we gained from Dr. Ferguson, we then interviewed high-standing professors and advisors from different departments to find out how much of a problem each found cheating to be. We interviewed:

- Claire Colvin, MCEN Academic Advisor
- Katherine Pickens McConnell, MCEN Academic Advisor

- Anne Dougherty, APPM Senior instructor, Associate department Chair
- Charles Rogers, EPEN Faculty Advisor
- Michael Dubson, PHYS Senior instructor, Associate Chair
- Daniel Bolton, who are professors in the for Physics and
- Thomas Schibli, who is an advisor for the electrical department.

We asked each of them questions to gain an insight into the faculties prospective. We asked:

- How much of a problem do they find cheating to be?
- Current cheating techniques being used by students, and how they as faculty try to combat them.
- If they as faculty have noticed cheating to be more or less prevalent in a certain demographic of students?
- What questions they would like to see in the survey we are creating for students?

From these interviews, we came up with survey questions and produced a survey that was sent to the 1,222 undergraduate students in the Mechanical Engineering Department. We will go into further details about the survey in Section 4. The survey was open for 30 days, and we received 157 responses. Once the survey closed, we analyzed the results. We then presented our findings to Dr. Ferguson and our class, and the following day we gave a presentation to the Mechanical Engineering Department faculty and undergraduate board to gain addition feedback and insight to our survey results. From their suggestions, we came up with recommendations to combat this problem as the mechanical engineering department grows.

4. Results and Analysis

a. Interviews:

- **Claire Clovin:** She is one of the academic advisors for the Mechanical Engineering Department, and her biggest question for students was why they cheated in the first place. She was much more interested in the

reasoning of students and if students felt like cheating to get a better grade in the course was worth it, in other words, to the rewards from cheating outweigh the possible consequences; not just the consequences of getting caught, but the consequence of not truly understanding the material as many classes build off of previously learned concepts.

• **Katherine Pickens McConnell:** As an advisor, she sees only the cases that are reported. She suggested that for the survey, we narrow down how bit of a problem it is and ask the strategies students use and what keeps people from cheating. She also suggested finding a solution that has a balance between being attentive but not overbearing to the students.

• **Professor Anne Daugherty:** Because she works within the Math Department with mostly open-ended response exams with the occasional true or false section, she found that cheating was more prevalent in the homework rather than the exams. She suggested for our survey that we ask what would convince students not to cheat, why they cheat, and what do the gain/lose from cheating.

• **Dr. Charles Rogers:** Dr. Rogers talked mainly about how the Physics Department handles exams and the current techniques they use to prevent cheating. Aside from the basics of not allowing hats and trying to spread out students in the testing environment, the Physics Department also allows a more expanded use of calculators and cheat sheets. He was also curious about student's awareness of the Honor Code/Board and proposed the idea of asking students what they would replace the typical scoring system with.

• **Dr. Michael Dubson:** He noted that cheating during the exams tends to be a more serious problem when the class size is getting significantly larger.

Ways students cheat:

1. Glancing at nearby tests

2. Texting for answer during the tests
3. When the tests are handed back, they change the wrong answer to the right one, go to the graders, and for points back.

To prevent cheating during the tests, physics department is applying the following actions:

1. Print the same test on different color paper
2. Create different versions of test
3. Assign seating based on GPA
4. Scan the test/answer sheet before handing it back

• **Dr. Daniel Bolton:** As Dr. Bolton is also a professor teaching Physics 1. He had many similar responses to that of Michael Dubson. One major perspective that he added is that he saw little correlation between demographics and who cheats. He also added four other ways Physics tries to prevent cheating.

5. Higher weighting on homework in grade.
6. Teacher Assistants wandering the room during tests.
7. Have students spread out.
8. Allow students to have a cheat sheet.

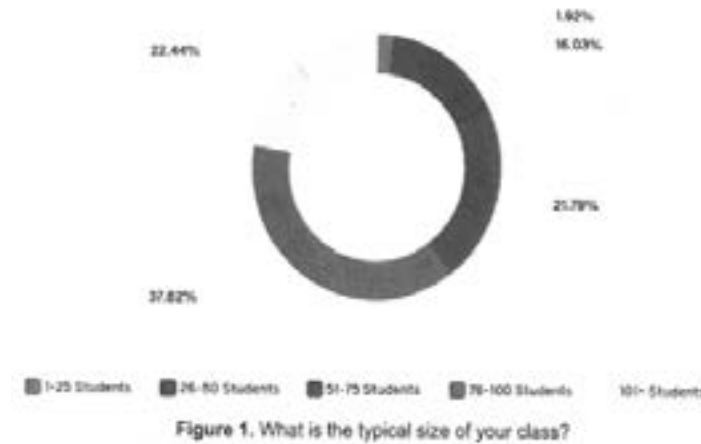
• **Thomas Schibli:** Being a professor for upper division physics course, he recognizes more cheating on projects than during exams. Regardless of where the cheating occurs, students with similar background/identity/race tend to get together and cheat as a group.

b. Survey Results

1. Quantitative Data

Our survey begins with asking students their average class size. The results are as follows:

As can be seen from the above data, a majority or students have average class sizes of 76 students or more. This environment is where it is most reliable for cheating to occur because there is less student-to-teacher interaction, limiting effective relationships from forming as well as limiting a professor's resources to catch cheating.



We wanted to begin by seeing how prevalent cheating is and how students react when students see cheating. First is a graph of the percentage of students who cheat and how often they cheat, with 14% of the students who responded admitting to cheating at some point during the college career.

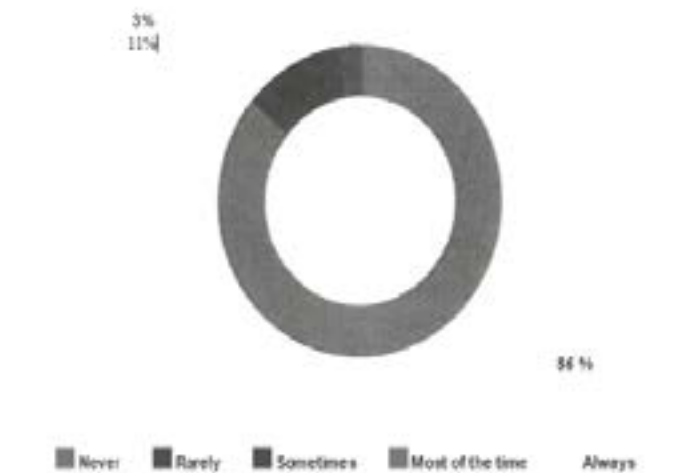


Figure 2. Regarding the testing environment, how often do you cheat?

These results suggest that cheating might not be occurring on a regular basis, but they do affirm that cheating occurs significantly more often than it is caught. With 14% of students admitting to cheating, if these results are accurate and consistent with the entire majority, then they would suggest that out of the approximately 1500 students in the major 210 of them have cheated on an exam.

The following two graphs show how often

students notice their peers cheating and how often they would report another student for cheating.

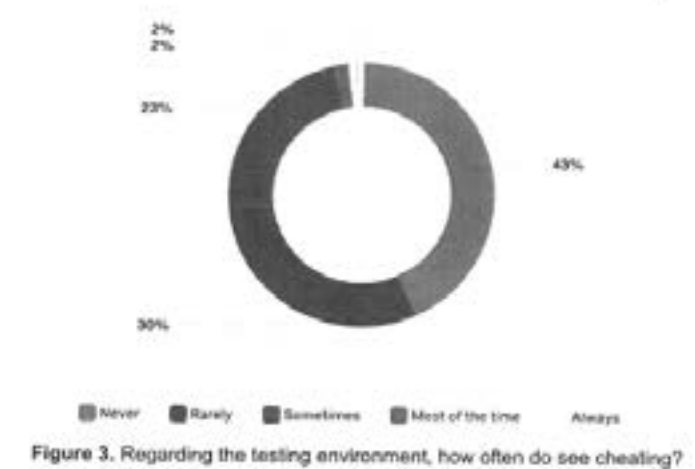


Figure 3. Regarding the testing environment, how often do you see cheating?



Figure 4. Regarding the testing environment, how often do you report cheating, if seen?

These two figures show that while over half of the students have noticed some form of cheating during an exam, 64% of those students who have seen cheating never reported it. This suggests that the students either don't see other students cheating as a problem or they don't know how to report cheating. It also means that many of the cases of cheating occurring are not being reported to the college even when it is observed. This data show a weakness in the department's resources to report cheating.

As for the methods as which students cheat. The graph below shows that, from looking at the graph below it is quickly evident that glancing at another student's test is by far the most popular form.

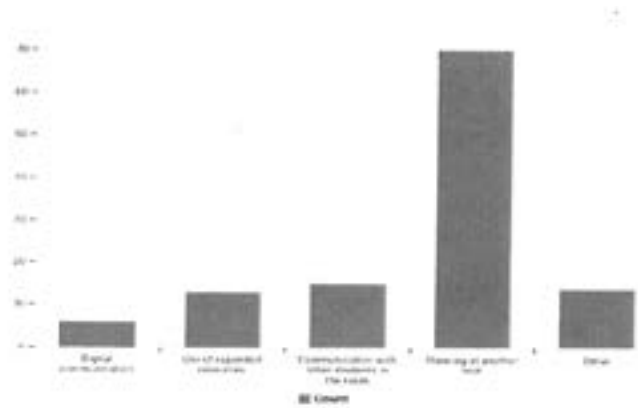


Figure 6. What forms of cheating do you most often see during exams?

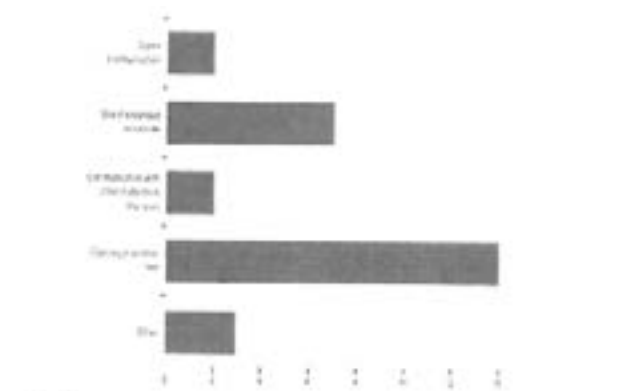


Figure 5. When you cheat, what cheating techniques do you use? (select all that apply) These numbers agree very well with the following graph, which asked students what forms of cheating they most often see during exams.

In the above two graphs, we can clearly see that the single most prevalent method of cheating is glancing at another student's test. From this, we can start a dialogue about methods to help prevent cheating, and focus heavily on how to dissuade students from wanting to look at another student's test. This informs many of the methods for successfully preventing cheating, particularly regarding methods of seating that restrict student's eyesight to another test.

We then wanted to get a glimpse into the reasons why people choose to cheat in the first place, which can give us more insight to how we can approach conversations surrounding cheating. The first figure is a graph of reasons why students choose to cheat, and the second is why students choose to not cheat.



Figure 7. Where does the pressure to cheat come from? (select all that apply)

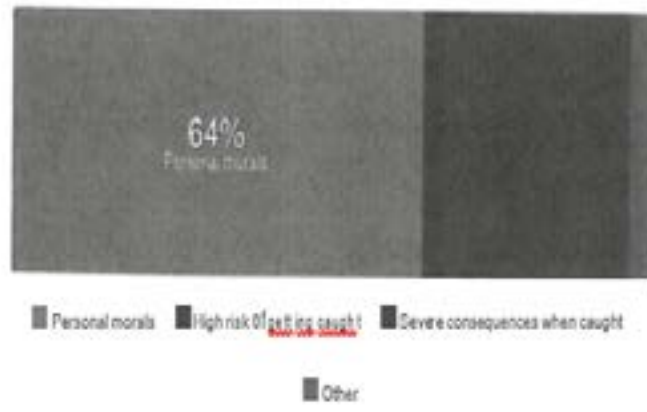


Figure 8. What keeps you from cheating?

From these two data points we can see that in regards to cheating, professors should emphasize that cheating on a test does not help them understand the concepts and will hinder their success in later courses and that the grades are not of merit to obtaining a job and furthering their career. There can also be conversations about the morality of cheating in order to help dissuade students, as well as keeping the severe consequences for cheating, and having these consequences known as widely as possible.

The final discussion of quantitative data is that which identifies the ways in which this data is affected by demographic results. Overall, the results seemed to be consistent within different GPAs and genders. The most significant difference in data was between international students and U. S residents. This was found to differ most when asked whether they would report cheating if they saw it.



Figure 9. US Residents if you noticed another student cheating during an exam, would you report that student?



Figure 10. International Students if you noticed another student cheating during an exam, would you report that student?

As can be seen from these two figures, international students appear to be 16% less likely to report cheating. Some theories for this might be the risk they see in reporting cheating because they pay significantly more tuition and have much more to lose.

2. Qualitative Data

In order to get a better understanding of the perspectives students had of the survey, we asked them about their opinions of what cheating meant to them. The most common answers were related to using answers that they did not reach on their own.

What do you qualify as cheating?

Getting answers that I personally didn't solve

Looking at others individuals tests/quizzes while taking them. Copying homework assignments

Not submitting original work

Claiming work that isn't yours as your own

The most common theme in these responses was claiming someone else's work as your own. This shows that both students and teachers value original work. What is lacking in these responses is using extra resources. Students want to focus more on the application of the concepts and not the memorization.

As for improving the relationship between students and teachers, much of the frustration was with the teacher's inability to spend proper time with students. They wanted much more of their work to be project based, more time spent preparing materials, and original tests were written.

How would you improve the relationship between the students and faculty to reduce the amount of cheating?

The faculty should create their own problems instead of taking problems from the textbooks. I understand that this requires a lot of time, but Professors McNeil and Mitrano accomplish this.

Separation of students in a testing environment or make the tests worthless and projects more so if people don't actually know the answer they can learn it

If professors maintain relationships with students and create fair exams it is very difficult to rationalize cheating

I think the problem lies solely with the student's morals. Faculty does well to communicate the severity of cheating

These responses were more across the board. Some students suggested professors creating more original content or putting less emphasis on test grade, and some said to change nothing at all. There is also a significant portion of the population that believes that cheating is not a significant problem or that the student-teacher relationship does not affect cheating.

Regarding students reporting cheating, there was a fairly consistent reasoning for why students wouldn't. Most students do not report cheating because they either believe it doesn't affect them or they don't want to be the "snitch" in the situation. In general, there seems to be a negative connotation on reporting cheating because of how it negatively affects the perpetrator.

Why would you not report the student?
We are all Just trying to survive.
I am not the cheating police, it is the student's problem if he cheats since he is really cheating himself.
Sympathy.
I don't care that they cheat since it hardly affects me.

We also asked students to give suggestions on how to prevent cheating. Many are already in use by some departments in the college of engineering, such as separating students as much as possible or making homework count for more so that tests aren't as critical. Some other suggestions include making tests more about the quality of work and less multiple choice questions, giving more severe circumstances if caught, and more project based work.

What suggestions do you have to prevent cheating?
--

Again, wuality of work and not the amount. Engineering students that I integrate with are taking on average 16-18 credits a semester. Having faculty that assigns 20 problems a week for 4-6 classes. is overwhelming at times. I can demonstrate a complete understanding one large problem than several smaller oners that end up taking more itme
Strict consequences
Project grades with peer evaluations
Less testing, more projects

We also wanted to see what students might come up with in regards to different ways to assess student's performance so that students don't find test scored as important. Some notable suggestions included focusing more on teamwork and class participation, oral exams, factoring in student work ethic, and more pass-fail courses.

If you could replace letter grade with another form of evaluation, what would that be?
Pass/fail... I also like letter grades but projects I think are a better form of evaluation
Teacher evaluations, similar to actual jobs work. Letter grades are the sole reason students cheat... students are put under too much pressure at this school.
Oral exams, you must explain concepts vocally
I think letter grades are fine, but more emphasis on original homework problems, TEAMWORK, and class participation

5. Recommendations

Our final recommendations include both short-term and long-term solutions considering the constraints the department has, students responses gathered from the survey, and additional input from various faculty members within the Mechanical Engineering Department.

a. Short-term Solutions

During the Exam

- Use TA as monitors
- Seating arranged based on GPA
- Increase students awareness of effect on grade curve when other cheats
- More clear, discreet, and confidential way of reporting

We will first discuss our suggestions for during the exams. One of the most common ways student cheat is by glancing at other people's work. To prevent this, TAs (Teaching Assistant) or TPs (Teaching Apprentice) can be used as monitors during an exam. In a classroom with a capacity larger than 50, it becomes extremely difficult for a professor to watch out for the entire classroom, especially the back row. Ball caps should also be banned. When students are wearing them, it is much more difficult to follow the student's line of sight and determine if they are in fact looking at another student's exam. To reduce the benefit from looking at nearby tests, seating can be arranged based on GPA where students with similar ones are seated next to each other. Of course, students will not know that GPA is the standard for the assigned seating.

Students tend to not report cheating even when they see it during a test. One of the reasons is that they think there is no effect on themselves and so they don't care. It becomes important for the professor to let the students know that when other students do cheat, the grading curve will be skewed.

Their grade and even their GPA can be lowered as a consequence. Another reason for students to not report cheating is the mindset of keeping themselves out of trouble. They don't want to bear the risk of reporting and eventually getting found out by fellow students. Faculty should offer a more clear, discrete and confidential method of reporting cheating. If more students report cheating, the more students report cheating, the department will have a better understanding of what classes cheating occurs most often in and possibly even what material students aren't understanding leading them to feel like they need to cheat to pass the exams.

• Outside the Exam

- Student-faculties relationship
- More thoughts into homework sets

Outside the exams, we need to reduce the feeling of students against faculty. Currently, students tend to feel that professors are there to test students' knowledge and memorization of the material and end up trying to fail 90% of the class. But, in fact, the professors are here to aid in learning. If the students understand the material and are well-prepared before an exam, of course, they won't bother looking at other's work during it.

To start off, we think that professors should put more thoughts into the homework sets. It is easy to simply pull questions directly off the textbook but there are so many solution manuals out there and it is impossible to keep students away from them. But, if the professor can create their own problems sets instead, it becomes a better guarantee that the student will understand the material better by being forced to work at the solution or come into office hours to seek help. It will also help to give students more relevant practice material before an exam such as practice tests from previous years that are made by the same professors. This can help students gain a better understanding on the professore's preference in giving

a test and make the students less panic while entering an exam.

Finally, professors should emphasize that cheating can hinder the student's learning in later courses. Students should be encouraged to understand the material so they can be properly prepared for later course work.

b. Long-Term Solution

- Hire experienced instructors instead of professors
- Current faculties learn more new education techniques

The long-term solutions are more on the department side and will have a fairly high initial cost. One of the complaints that a lot of students have is that some teachers don't quite know how to teach the material appropriately. They simply read off the powerpoint or textbook word by word without going into any further detailed explanations. Many students suggested that they wanted to see the application of the concepts given in the textbooks. We believe that it should be more helpful for the department to hire experienced instructors instead of professors. Instructors are less research-heavy in comparison, and they generally have more time to prepare the material for class and are available for more open office hours. Also, when professors are hired, their previous experience tend to be more industry based and therefore lack the experience of teaching materials to a large group of students who generally don't have any previous knowledge on concepts.

Current faculty should also be keeping up to date with current education techniques and studies done in the field of higher education to better facilitate their lectures.

Engineering Career Services: Student Perceptions of Career Services

by Mallory Hoover

1- Executive Summary

Attending a university is a pivotal decision in anyone's life, and it is considered a prerequisite to the next critical decision you will make in your life: embarking on a career path. As such, Career Services, specifically Engineering Career Services, is the main resource that bridges the gap between these two decisions. Student's perceptions and attitudes of Engineering Career Services are the driving force in helping to create better and lasting solutions for students, both during their college career and more importantly for the transition to life after graduation which depends on getting a job. Properly supporting and informing those life decisions is ultimately Career Services' objective. Career Services wants students to succeed but also wants to provide counselling and opportunities for students that can be utilized on their path to career success.

For Career Services to attain the goal of helping students with their career growth, student feedback is necessary, which is where our group takes action. This feedback is necessary to improve the current offerings provided by Career Services. It is important to note that our team's survey will be the first evaluation of Career Services since the industry model was implemented, as well as the first since Handshake was adopted.

Our team has dissolved this complex task into a two-fold objective of first analyzing student's feelings and opinions of the offerings of Career Services, and then providing a recommendation based

on the data. This analysis was achieved through a robust mixed methods approach, both qualitative and quantitative.

Our team offers a myriad of solutions, falling into 2 categories:

1. Short-term recommendations that can be implemented in a relatively small period
 - Signage outside of BOLD Center
 - More tabling in the Engineering main lobby
 - Setting up Handshake at freshman orientation
 - Providing more informative and eye-popping emails
 - Bookmarks given out by academic advisors
2. Long-term recommendations that more severely impact students in relation to Engineering Career Services but may take several years to implement and improve:
 - Mandatory career advisor meeting
 - Once-a-semester teacher-advisor meetings
 - Growth in Junior/Senior talks across all Engineering departments
 - Mentorship from the Engineering Community
 - Workshop in freshman projects courses
 - Industry event improvements

Because this project lies at the intersection of several fields, we felt it was necessary to give a wide range of recommendations that could potentially impact thousands of students – in engineering and across campus. In doing so, we hope it aids our client's goals at Engineering Career Services to increase

student awareness, involvement, and satisfaction in relation to their career development.

2- Introduction

2.1 Need

The College of Engineering and Applied Science at the University of Colorado/Boulder is the 2nd-largest of seven schools and colleges at one of the nation's top public research institutions. With its competitive top-tier engineer program, the university pushes its students to become highly qualified and industry ready graduates. However, the path towards career preparedness after graduation is filled with obstacles, which is where Engineering Career Services steps in. Engineering Career Service operates as an invaluable resource available to students to turn to for guidance in finding work that's tailored to their interests. For instance, when a student has no clue as to what they want to do with their lives, Career Services helps in the process of discovering a student's strengths and weaknesses. They can also recommend courses that help cement or redefine a student's career goals. Graduating students who want to pursue careers after completing their degrees instead of going on to attain even higher levels of education can also utilize Engineering Career Services' decision-making guidance and career-exploration assistance.

2.2 Problem

A student can have a perfect 4.0 GPA, but that doesn't guarantee a job. Career Services has made large efforts in getting students more engaged and aware of their offerings. However, their main concerns are determining whether students find their offerings helpful and what steps can be taken to make the Career Service's experience more comfortable and impactful over the course of a student's job search. Essentially, there is a strong need for students to evaluate Career Services to supply Career Services with the information needed to improve and grow the services and

opportunities they provide. Thus, this project solicits student's input regarding this issue, and through a mixed methods approach has found solutions to this problem that will be addressed later in the report.

2.3 Goal

Because the primary resource for students wants to connect with employers, Career Services' goal is to increase awareness, engagement and satisfaction among the student body at the university in relation to their career development. Given this goal and the recent changes that have been made to Career Services in the last three years, our group has been tasked with analyzing student input regarding the effectiveness of Career Services for Engineering Students, specifically their perceptions, attitudes, and involvement to create new suggestions to get students more involved.

2.4 Background

Engineering Career Services has numerous opportunities available for students that assist with developing brand recognition with engineering undergraduates and graduate students, faculty, and staff. With Engineering Buff Talks, engineers and technical professionals speak on a topical panel about their careers and provide advice on how to launch into the world of work. There are also Engineering Career Workshops which allow students to receive resume feedback from technical employers and that also offer opportunities to practice networking skills. Plus, there are Career Fairs & Employer Events which Career Services hosts where employers and organizations meet students who could be potential employees in an informal setting.

In addition to understanding the offerings that Career Services provides to students, it is important to consider that Career Services has been through some recent changes that have affected operations. Three important changes have been implemented in the last

three years:

1. There are now eight areas of specialization within the office with an industry-focused model that allows students to delve into career exploration and find their strengths and weaknesses.
2. The Handshake system was introduced, which is an online website resource for students that posts organization's internships, jobs and events in relation to careers.
3. Satellite offices have been added within the Engineering Center next to the BOLD Center.

2.5 Constraints

The nature of this project involves a fair amount of data analysis. Some constraints were specifically encountered from the survey, including the following.

1. The Survey was only distributed to only a limited number of random engineering students (611 students), which may not be fully representative of the entire engineering student population. There are 14 different undergraduate majors within the College of Engineering and Applied Science at the University of Colorado, Boulder and each department has its own structure and accordingly, different academic resources offered for their undergraduate students. Some departments occasionally invite some companies of interest for internship and job opportunities such as the Chemical and Biological Engineering Department. The ChBE academic advisors send emails on a weekly basis about potential employers such as Phillips 66, Chevron, etc. and offer mock interviews with select industry partners. The same departmental structure is not necessarily the same at other departments, especially when the size of the department is taken into consideration.

Given the statistical nature of this project, the team planned around this constraint by distributing the survey to their peers in different classes to gather more

responses since increasing the sample size of survey respondents would help get more concrete conclusions for the survey. Having more responses in the survey increases the chance of having feedback from one of the smaller engineering departments on campus, which was confirmed when the survey results came in and showed that the number of respondents from the smaller departments such as Architectural Engineering and Environmental Engineering increased.

Some measures were taken to resolve the accuracy issues due to this constraint. Distributing the electronic survey to a select number of students in all departments was not a feasible option since the process is randomized, which resulted in having more responses from students in the larger engineering departments as anticipated (Aerospace Engineering at 19.35%, Mechanical Engineering at 16.13% and Computer Science at 12.90%) The response rate from these three departments combined accounts for approximately half of the survey respondents.

2. The survey was optional so the response rate might not be as high as anticipated. Some engineering students can be overwhelmed with exams and papers due to the rigorous engineering curriculum and others simply might not have enough of an incentive to take an optional survey about a topic they deem less important.
3. The issue of digital distraction possibly affects the accuracy and depth of the survey answers. The survey is electronic and not on paper, so a smartphone or a computer is necessary to complete it. Notifications on electronic devices can distract the survey taker from completing the survey or to be less focused on the featured questions. In addition, some students might automatically assign university-related emails to the spam folder or simply skip such emails.

3-Approach

An the initial meeting was held with our clients, Crystal Ligon, the Engineering Program Manager; and Ann Hermann, the Associate Director of Career Services. During the meeting, some of the critical questions concerning this project were discussed, which helped to identify the objective and goal of this project. Key questions included the following.

1. How aware are the engineering students of the services offered by Career Services?
2. How engaged are the students with Career Services and how can we help the students get the most benefit regarding their career prospects post-graduation?
3. How do we gauge the level of satisfaction from students so that Career Services can be improved?

The main objective of this project was gathering feedback about these three questions. After discussing these questions with our clients, it was decided the best way to move forward with this project was to implement a mixed-methods approach, which involved distributing an electronic survey as well as conducting individual interviews with engineering

3.1 Survey Introduction

The survey was made on the Qualtrics website, which was chosen due to its ease of use for survey takers and the powerful tools it provides to help with setting up different questions targeting different areas of interest.

Mainly, the survey featured four questions with short written answers, 30 questions with multiple choice answers of several varieties, including places to select all applicable answers, Yes/No questions, questions based on a 1-10 scale, and strongly agree/strongly disagree scale. The project team met with Beth Myers, the Director of Accreditation and Assessment, who helped with distributing the survey on 10/15/2017 via email to a random sample of 611 Engineering students from different majors in the

College of Engineering and Applied Science at the University of Colorado, Boulder. In addition, the survey was sent to more students to gather more results. The targeted number of survey responses was 40-50 responses, and, as of December 5, 2017, there were 65 finished responses, which corresponds to a response rate of 10.6%. One of the objectives for this survey was trying to relate the experiences of different engineering students based on gender, ethnicity, and academic major. Some statistics were gathered about the survey takers regarding the aforementioned distinctions through embedded questions in the survey. Another objective of the survey was gauging the awareness of the students about the recent changes introduced by Career Services in the last three years, including the industry-focused model, which involves eight areas of specialization as well as replacing Career Buffs with Handshake as an electronic platform for posting internships and job opportunities. Another important change is the satellite office in the Engineering Center, which was established to specifically help engineering students.

The survey was helpful in gathering the attitude and perception of engineering students about these three changes and whether the problem is a matter of awareness or effectiveness for the following questions:

- Does Career Services need to market themselves better so that engineering students are more aware?
- Is the Handshake website under-utilized because it is not promoted properly?
- Was the Career Buffs website easier to use and more user-friendly?

These questions will be answered in the Survey Results section in this report as the project team analyzed the data gathered from the survey.

3.2 Individual Interviews

In order to tackle the digital distraction constraint, the team decided that when implementing

the qualitative method of individual interviews it is important to complement any limitations from survey and to have a more personable and in-depth discussion about Career Services. Five individual interviews were conducted by project team members to receive feedback about the awareness, effectiveness, and recommendations regarding Career Services. This feedback was different than the responses from the survey results because we could have one-on-one time with engineering students we knew and they could give us their honest opinion on how Career Services could improve in the future.

Similar questions were asked to interviewees in these personal interviews to those that were asked in the survey, but the questions required more in-depth answers and suggestions. While some recommendations and complaints resonated with some of the short answers on Qualtrics, there were two recommendations not mentioned in the survey that will be explained in the Interviews Results section (Section 4.2).

4 - Results

4.1 Survey

The survey instrument and full set of data can be found in the appendix (Section 6). For all images and figures in this section, the x-axis denotes number of respondents and the y-axis denotes the different answers for each question. The first major question in the survey asked participants which Career Services offerings they were aware of, and which Career Services offerings they had used before (Fig. 1).

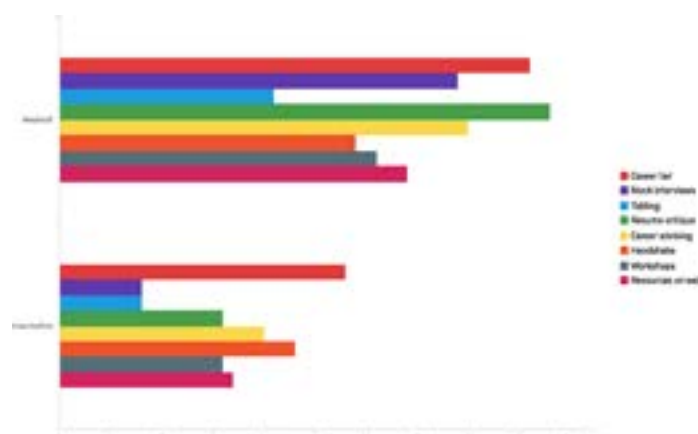


Figure 1 - Career Services offers several different events and opportunities. Check all you are aware of or have used before

The strongest offerings for awareness were resume critique, career fair, mock interview, and career advising, with around 75% or higher awareness for participants. The lowest awareness event was tabling, with around 33% of participants aware of tabling. This lower percentage may be related to usage of the term tabling, because some students may be aware of the actual event but not know the correct term. The most used offerings were the career fair, Handshake, and career advising. The usage and awareness generally followed the same trend for offerings, but there were some significant drops between awareness and usage. Specifically, around 66% of participants were aware of mock interviews, but only around only 10% have used them; and around 70% of participants were aware of resume critiques but around only 25% have used them.

We were also very interested to see how participants have been hearing about events and services offered by Career Services (Fig. 2).



Figure 2 - How have you heard of offerings from career services? Check all that apply

Most participants receive information about information from Career Services via email, either from an academic advisor or directly from the office of Career Services. Around half of participants also received information from word of mouth, and

between 30%–40% of participants had heard of Career Service directly from the website or from a flyer on campus. In the Other category, participants mentioned hearing about Career Services events from professors or other speakers in class.

For students who have not used Career Services, we were interested in finding out why (Fig. 3).



Figure 3 - If you have not used Career Services, please indicate the reason(s) why

Most respondents who have not used Career Services cite scheduling conflicts as the reasoning, and several others similarly indicated inconvenient hours. Around 17% of participants indicated that they were not aware of any Career Services offerings. Other participants mentioned that they already have a job lined up as the primary reason for not using Career Services.

As a free response question, we asked students what kind of events they would be interested in attending. Selected responses are shown verbatim below.

- “Companies that actually hire part time students in Colorado and not companies in different states looking for full time employees.”
- “More individuals on campus from different companies, like a get to know the industry event.”
- “Continue with the career service and maybe increase the number of companies recruiting.”
- “More events for specific majors rather than having an event “for all majors,” but in reality, only

a few majors are strongly represented.”

- “I like what they have, just need to be made more aware of events”
- “Workshops”
- “Attire workshops. Business professional and business casual”
- “Mock interviews by actual recruiters as freshman or sophomores or database with all cu alumni and which companies they work for so you can reach out for advice”
- “Individual companies comeback to talk to different departments in engineering. (Companies that will be at the career fairs)”
- “More direct career events hosted by one or two companies”
- “Ways to talk to employers at career fairs, how to send follow-up emails, generally how to sell yourself”
- “Internship application workshop for underclassmen”

A theme in a lot of the responses was the desire for more interaction directly with industry and employers, as well as requests for workshops. Career Services already offers industry events in the form of Show & Tech’s and Buff Talks, as well as a variety of workshop, so these responses indicate primarily a lack of awareness of these events.

Participants were asked if they had ever received a job or an internship from a posting listed on Handshake or CareerBuffs (Fig. 4).



Figure 4 - Have you received a job or internship from a posting on Handshake or CareerBuffs?

Out of 65 respondents, only 4 students in the survey received a job from a Handshake or CareerBuffs posting. From an earlier question, around half of the participants were aware of Handshake, and around 33% have used Handshake before. In a follow-up question, most students who have used Handshake and CareerBuffs indicated a preference for Handshake, citing usability and a greater number of participating employers. Students also indicated in another question that Handshake is easy to use and easy to set up a profile. However, most participants were not aware of a difference between Career Services and the Student Employment service. Twenty-two survey respondents stated that they have received a job or internship without Career Services, primarily listing word of mouth and personal connections as how they received the job.

We asked students several questions about a potential mentorship program offered through Career Services. The response for general questions about interest in mentor programs with faculty or peers was overwhelmingly positive. Around half of survey respondents that have mentoring programs available through their department have enrolled in the program.

Students were asked several other general questions about Career Services, and the results are summarized below. Qualtrics charts and the full data set for these questions is located in the appendix (Section 6.2).

- A higher percentage of respondents have used Career Services for help with a resume or cover letter as a freshman or sophomore than as a junior or senior
- Respondents overall rated Career Services at a 6-7 on a scale of 1-10 for helpfulness
- Most respondents rated the amount of emails received from Career Services as a 5 on a scale of 1-10
- Most respondents rated the importance of emails received from Career Services as a 5 on a scale of 1-10
- Most respondents have attended 1-2 Career Services

events within the past year

We asked students several questions about a potential mentorship program offered through Career Services. The response for general questions about interest in mentor programs with faculty or peers was overwhelmingly positive. Around half of survey respondents who have mentoring programs available through their department have enrolled in the program.

As a final question, we asked students if they had any general questions for improving Career Services. Selected responses are listed verbatim below.

- “offer students more jobs in Colorado.”
- “More individual one on one time, especially for freshman, because I see a lot of higher level students there.”
- “Require mandatory advising for students”
- “Let faculty know more about them so that they have the means to recommend it to students.”
- “More free food”
- Some interesting recommendations from that open-ended question included the idea of mandatory advising, more localized career postings, and informing faculty about Career Services opportunities so that they can inform students when relevant.
- 4.2 Interviews
- The two results below from the interviews stood out to us as possible recommendations that Career Services could implement in the future regarding career fairs and marketing:

1. An engineering student recommended that Career Services categorize the companies that come to the career fairs based on Engineering Departments. A categorization like this would save time for students, allowing them to better plan which companies aligned best with their interests instead of going to tables that

did not relate to their major. This interviewee also suggested that there should be a category where smaller companies that are not as well-known are listed so students can research them more and those companies in return would become more noticed.

2. An engineering student recommended better marketing of Career Services specifically for Freshmen and Sophomore students. A suggestion was made that some Career Services representatives should come to introductory engineering classes and seminars to promote their services prior to lectures with the permission of the instructor.

Some conclusions can be drawn based on the aforementioned recommendations. Career Services introduced an industry-focused model with eight different specializations listed below:

- Business & Finance
- Create & Communication
- Engineering & Technology
- Environment & Sciences
- Social Impact & Public Service
- Pre-Health
- Pre-Law
- Exploring

It is easy for students to get overwhelmed with the plethora of different companies that present at career fairs. Therefore, partitioning the Engineering & Technology career fairs into different disciplines such as Energy, Materials, Biotechnology, etc. would be more convenient for engineering students.

5 - Recommendations for Engineering Career Services

There are several recommendations for possible changes and goals that can be implemented by the Engineering Career Services based on the survey results that were obtained from students of the CU Boulder Engineering School. Some of the recommendations are short term and can be acted

on quickly since they are fairly simple to implement and not very expensive. Others are more complex and/or expensive and are longer term in nature.

More information on each set of recommendations is provided in the subsections below.

5.1 Short Term Recommendations

Short-term recommendations come from survey results that show students are not aware of Career Services due to a lack of marketing. In general, the survey questions asked students three things:

- If they used Career Services
- If they were aware of where the Career Services offices were located
- If they attended to Career Services sponsored events

Results for these questions showed that students had a low acknowledgment of these three categories.

Recommendations for addressing the issues identified in the survey involve strengthening strategies that Career Services has already implemented with better marketing. The use of marketing is a short term change that Career Services can make by themselves to make their events more noticeable throughout the CU Boulder Campus. Each recommendation is described in a subsection below.

5.1.1 Signage outside of the BOLD Center

At the beginning of the school year, a sign advertising Career Services is placed outside of the BOLD Center. However, the sign is removed after a couple of weeks. We suggest that the sign remain outside of the BOLD Center year-round. Alternatively, a sign could be displayed inside the BOLD Center that can be as simple as a poster in the window or framed and hung on the wall. This sign can inform students of where Career Services is located and provide a brief description of the services they have to offer. This more permanent sign will continue to remind students throughout the year to visit Career Services and take

advantage of the help they have to offer.

5.1.2 More Tabling in the Engineering Main Lobby

More frequent tabling throughout the year to promote Career Services is another way to market what they do. One table at the beginning of the year is very important because this is the time when new freshmen are still finding their way around during their first few weeks at CU Boulder. Targeting freshmen early will more comfortably ease them into planning for their future using Career Services. Continued tabling throughout the year will not only remind students to visit Career Services offices, but also give students more interaction with volunteer students or faculty who have experience with Career Services.

5.1.3 Setting Up Handshake at Freshman Orientation

During freshman orientation, future students can set up a Handshake account so they can start early with resumes, cover letters and learn how Handshake works so they can get an account set up quickly and add to it over time. Setting up an account allows freshmen to start thinking about resumes and cover letters they need to add in the future when they start looking for internships. This will in turn make them more determined to use Career Services to help them get a head start on creating their cover letters and resumes. Throughout their college years, they can then be comfortable with Handshake and comfortable working with Career Services to be ready for internships and jobs after graduation.

5.1.4 Providing More Informative and Eye Popping Emails

After examining a few examples of the emails that Career Services sends out announcing events that are held at CU Boulder, we would recommend adding

more information regarding the event and a more captivating presentation. The emails shown below are recent examples from Career Services about specific events:



Engineering Career Services is excited to announce the following Show & Tech's this week:

The Aerospace Corporation

Date: Tuesday, 10/17
Time: 6:30 PM
Location: ECCOR 155

Amazon

Date: Wednesday, 10/18
Time: 5:30 PM
Location: ECCOR 200

Google

Date: Thursday, 10/19
Time: 5:30 PM
Location: ECCOR 265
Please RSVP at <https://www.ghx1011cu>

Buff Talks, Show & Tech

From Career Services:

Please see the flyers for our October Show & Tech's and upcoming Buff Talk on Spaceflight and Aviation attached! Just as an FYI Planetary Resources is hosting their Show & Tech TODAY (Tuesday). We would really appreciate your help spreading the word about these awesome events to students! Our Buff Talk is next Wednesday, 10/11, from 5-6:30 pm in ECCOR 200. We will have engineers from the following companies represented:

Federal Aviation Administration, Radar/Automation/ Weather Operations Engineer

Ursa Major, Chief Technology Officer

United Launch Alliance, Structural Engineer

Sierra Nevada, Aerospace Engineer

Buff Talks are an excellent opportunity for students to learn more about industry from technical employees and to network! In addition to the Show & Techs and Buff Talk listed on the flyer we have the following companies tabling this month:

United States Patent and Trademark Office, Wednesday, 10/14

Travelport, Tuesday, 10/17

SpectraLogic, Wednesday, 10/18

Peace Corps, Tuesday, 10/24 and Wednesday, 10/25

Students should visit [Handshake](#) to learn more about tabling times.

[Nick Desautels](#), from Ursa Major

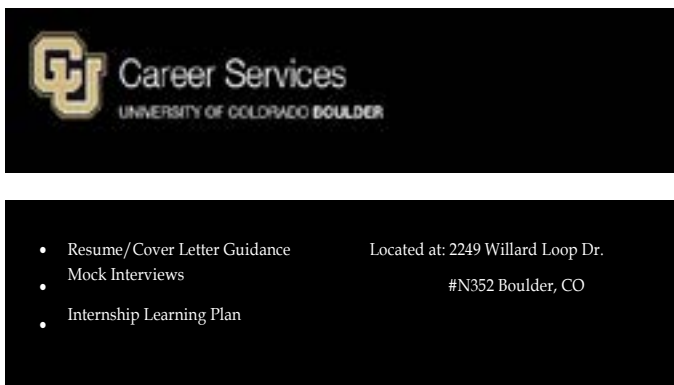
Career Services Email for Buff Talks, Show & Tech

These emails do provide information about the event itself, including time, location, etc. but provide little information about the company sponsoring the event. More information about the sponsor, what they do and a link to information about the company would be very helpful. Some of the big companies that sponsor events such as Google and Amazon are known worldwide, but companies such as Travelport are not known to many students. Having a link or a quick explanation of the company can entice more students to go.

In addition to providing more sponsor content and info, the emails could be made more eye appealing to students. Pictures, color, use of all capital letters and so on make anyone more likely to read emails.

5.1.5 Bookmarks Given Out by Academic Advisors

Another suggestion to get the word out for Career Services would be designing a bookmark that Engineering career advisors can give out to students when they meet each semester. This bookmark can have the location of Career Services, briefly mention what they offer and an inviting quote to bring students in. These bookmarks could also be given out during tabling in the main Engineering lobby. A suggestion for a possible Career Services bookmark is shown below:



Back of Bookmark

5.2 Long-Term Recommendations

Suggestions for longer term goals include more interactive ways of getting students involved with Career Services and more involved with their future as Engineers at college careers and in their future careers. Details for these suggestions are provided in the subsections below.

5.2.1 Mandatory Career Advisor Meeting

Currently, engaging Career Services is purely optional for students. A mandatory meeting or some other type of mandatory engagement early in a student's college experience would help introduce Career Services

benefits to students at an opportune time so that the ideas presented could be useful throughout the student's time at CU Boulder. The type of engagement would need to be tailored to account for the fact the Career Services is short staffed with advisors who can meet with students. An engagement during a student's sophomore year would be ideal because most students are more comfortable with the engineering class load and are starting to think about internships. Because there are about 4600 engineering undergrads, that would mean there are about 1200 sophomores to meet a year.

To make these engagements easier on the career advising team, instead of meeting one-on-one with 15 students a day for a year, a different style of engagement might be preferable. There could be a sign-up page where sophomores could sign up for a spot on a day that works best for them throughout the whole year. There could be two meetings a week that students would sign up for where the career advising staff can come and talk to groups of students about Career Services and Handshake.

The mandatory Career Services engagement will introduce students Career Services and give them a chance to see how helpful Career Services can be. After the initial mandatory engagement, they can choose to come back again if they wish. In addition, the mandatory engagement will help students find the Career Services offices and open a door to possibly coming back. If this increases the flow of students coming to the office over time, more faculty could be hired to meet with more students on a one-on-one basis.

5.2.2 Once-a-Semester Teacher Advisor Meetings

Students have a mandatory meeting with their academic advisors once a semester to go over semester plans for what classes to take and to create a plan for

upcoming years. If students had a teacher advisor they could meet with once a semester, then they could relate more on an engineering level. Students would have the option and be encouraged to reach out to faculty to talk more about their future. Teachers are in a better position to guide students through some of the hardest semesters and provide some comfort because they have a better understanding of the student's struggles and goals.

This sort of counselling would work better as a volunteer-based program because both teacher and student would need to be on board. Some students may not be comfortable working with their teachers and some teachers may not have the time to be assigned a student each semester. To give teachers an incentive for taking on another responsibility like this, research grants could be given to student nominated teachers who have gone above and beyond. In addition, counselling will allow students to create a more professional relationship with teachers that be leveraged to launch a student on his chosen career path via letters of recommendation, joint research projects, etc.

5.2.3 Growth in Junior/Senior Talks Across All Engineering Departments

Some engineering departments already have junior and senior talks to freshman. These types of talks could be expanded to all engineering departments. Having older student speakers talk to freshman and even sophomores can prepare younger students for the potential successes and pitfalls they may face with the engineering curriculum. These talks can turn into a type of mentorship if two students really click. Spreading these discussions to all engineering departments will allow all students to have this opportunity.

5.2.4 Mentorship from the Engineering Community

Since CU Boulder already has companies come and talk to students about the real world in engineering, Career Services could go a step further and establish a mentorship program with the engineers who work for those companies. These mentors could show students what it's like after college, how it is working at their companies and possibly open doors to future internships and jobs.

It would take some time to find working volunteers in the engineering world to match up with a student and become their mentor. The matching system could find times best for mentors and students to meet, whether that be multiple times a semester or once a year. A mentor and a student could be matched by using a linking survey where students could answer certain questions aligned with the mentor interests. Students could meet with up to three mentors to see which one would be the right fit. This program should be optional to students since not all students may want a mentor.

5.2.5 Workshop in Freshman Projects Courses

Taking the Freshman Projects courses in any engineering field introduces freshmen to various types of engineering skills workshops and features a semester project to jump start them into the mindset of engineering. This course could also introduce freshmen to Career Services and Handshake. Freshmen could be required to meet with an advisor to review resumes and cover letters. They would also download the mobile app for Handshake to set up an account. These steps will introduce freshman to both Handshake and Career Services early so they are aware that the two are out there and are useful to their future careers.

5.2.6 Industry Event Improvements

Industry events sponsored by Career Services normally happen from around 5:00 PM to 7:30 PM.

Based on feedback from the survey, most students cannot attend these events because they cannot make the times. A time during the day or on weekends might work better for students but could be a problem for industry reps. The best weekend day would be on a Saturday because students do most of their homework on Sundays and employers use Sundays to prepare for the week. Some discussions would need to occur to determine the most optimum time for both students and industry reps to be fair to everyone.

Pathologizing Culture

by Nicole Mattson

Abstract

In this paper, I will critique the lack of cultural competence within the fields of Western psychology and psychiatry to warn against the dangers of pathologizing behavior without considering a patient's socio-cultural context. To do this, I first explore the fields of psychology and psychiatry over time, examining some of the shortcomings they have experienced in terms of taking an overly ethnocentric approach to addressing mental health. I then consider one hypothetical and several real-life examples to demonstrate what the pathologization of culture looks like. And, finally, I put forward a few suggestions regarding how to begin incorporating a more multicultural approach.

Keywords: cross-cultural psychology, cultural relativity, cultural competence

Pathologizing Culture

The following is a clinical report resulting from a private practice psychotherapy session with a 21-year-old male client who sought help due to an interpersonal conflict with a friend. The client has complained of a lack of support from his friends, many of whom have distanced themselves from him, citing his self-centeredness and excessive need for attention—although the client does not think they are being truthful and instead believes they are envious of him. The client regularly expresses a desire for admiration and rarely goes more than a few hours without seeking validation from others. However, seeing others succeed, particularly his friends, causes the client to feel threatened and act envious by failing to recognize their achievements or intentionally trying to bring them down. Relationships with others tend to be superficial and seem to exist for the primary

purpose of regulating the client's self-esteem. The client has exhibited attention-seeking and grandiose behavior and has demonstrated a preoccupation with fantasies of success and fame, frequently exaggerating his achievements. From this clinical assessment, the client meets the DSM-5 criteria for Narcissistic Personality Disorder and should pursue further psychotherapy.

In the consideration of the preceding report alone, it probably seems clear that someone who has received a clinical assessment from a psychiatrist or psychologist and is exhibiting these kinds of features is most likely showing signs of Narcissistic Personality Disorder, right? However, what if I were to tell you that in reality, this client's behavior has been grossly misinterpreted and taken out of context? Would it change your mind if I were to explain that everything the client spoke to the clinician about and all of his "attention-seeking and grandiose behaviors" took place on a social media platform such as Facebook or Instagram? In light of this, the diagnosis now seems questionable because this kind of behavior has been deemed as acceptable and completely normal on social media. Thus, this passage is meant to reveal some of the hidden obstacles psychologists and psychiatrists face every day when determining whether a client meets the criteria for a certain disorder. The risk of a misdiagnosis or the misinterpretation of "symptoms" can be especially serious for those whose social or cultural context is not understood by the clinician at all. In this paper, I will critique the lack of cultural competence within the fields of Western psychology and psychiatry to warn against the dangers of pathologizing behavior, meaning treating something as if it were a medical condition, without considering a patient's socio-

cultural context. To do this, I first explore the fields of psychology and psychiatry over time, examining some of the shortcomings they have experienced in terms of taking an overly ethnocentric approach to addressing mental health. I then analyze the passage above and give real-life examples to demonstrate what the pathologization of culture looks like. And finally, I put forward a few suggestions regarding how to begin incorporating a more multicultural approach.

The clinical diagnosis above was written using a similar technique as seen in “Body Ritual of the Nacirema” by Horace Miner, (1956) which employed ethnographic language in order to critique the field of anthropology at the time and the way it tended to “other” different cultures. In his paper, Miner mmwrote about this exotic other, the Nacirema, in the same way that many anthropologists wrote about the communities they studied; however, the twist was that “Nacirema” spelled backward is “American,” x so he was really writing about Americans in this othering manner. In the same way, this essay is meant to be a critique of the ways in which Western psychology and psychiatry often pathologize aspects of different cultures due to a lack of cultural and contextual understanding. Because of the seemingly straightforward and “objective” language of the criteria in the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*, which is used by clinicians to diagnose the presence of various mental disorders, there is a serious threat of taking these guidelines as fact (American Psychiatric Association, 2013). While the newest version, the DSM-5, created by the American Psychiatric Association, for the most part is built on decades of empirical evidence and has tried to address many of the shortcomings critiqued in previous editions, it still relies on a few major assumptions: 1) that the criteria listed in the DSM-5 can accurately differentiate individuals with a specific mental disorder from the rest of the population, 2) that there are objective definitions for what normal and abnormal

thoughts and behavior look like, and 3) that the criteria and disorders listed in the DSM-5 are universal and apply cross-culturally. However, I argue that these three huge assumptions need to be carefully evaluated.

The pathologization of normal behavior is not a new concept in the field of mental health. Discussions regarding clinical disorders, who has them, and whether or not clinicians are over-diagnosing clients have and will continue to be in constant debate. However, the addition of a cross-cultural component still seems to be lacking. For a discipline created by primarily wealthy white men, it should not be surprising that incorporating cultural relativity into the field has been a long and slow process. However, there are a few authors, researchers, and practitioners who, m have started pushing for the introduction of a cross-cultural lens into the fields of medicine and mental health. Cultural competence, or the ability to work with patients and clients with a diverse set of beliefs and values, is starting to make its debut in the health care industry. For example, in *The Spirit Catches You and You Fall Down: A Hmong Child, Her American Doctors, and the Collision of Two Cultures* Anne Fadiman (1997) writes about the experience of a refugee family from Laos after they are resettled in California (Fadiman, 1997). She explores the cultural clash between the family and the doctors, citing a general lack of understanding within the practice of medicine as the ultimate cause of the loss of their daughter. Mary Pipher, a cultural anthropologist and psychologist, also addresses many of the issues resettled refugees from across the globe face when it comes to dealing with doctors in the United States, particularly with respect to mental health professionals in *The Middle of Everywhere* (Pipher, 2002). Pipher explains that health care professionals have a moral obligation to be as culturally competent as possible when suggesting treatment options and making diagnoses, considering aspects like language barriers and conflicting cultural norms and values.

Thus, it is imperative for context to be considered when trying to determine how to diagnose and treat clients effectively within psychotherapy. My earlier example of a young man’s social media habits being misinterpreted as Narcissistic Personality Disorder, while somewhat silly, I think still provides an interesting and perhaps more easily digestible interpretation of what it looks like to pathologize an aspect of culture. I decided to use social media because it provides a tangible platform to use as a metaphor for the space in which cultural context is occupied. If you notice, I did not once mention in my initial diagnosis that this behavior was happening on social media. For clinicians, this is problematic because the behavior now has been taken out of the cultural context surrounding it. In this particular case, this type of seemingly “narcissistic” behavior, like attention-seeking and posting content that exaggerates your achievements, is acceptable on social media. Therefore, we see how something that according to the DSM-5 may be abnormal in this context is actually a very normal and reasonable occurrence.

As such, I wish to complicate one of the key assumptions in the DSM-5 that there is an objective “normal” and “abnormal.” Rather than bringing into question the value of the existing research that has been done on this, I simply wish to add on another layer by highlighting how deeply connected these assumptions are to cultural norms. For example, “homosexuality” was categorized as a clinical disorder in the DSM until the 1970s, demonstrating how dependent our notions of abnormal are upon dominant ideologies. Therefore, I argue that recognizing the fact that these symptoms and categories of mental illness are not completely objective and do not exist in a culture-less vacuum is the first step to improving cultural competency in the mental health domain. Of course, this is not to say that Western psychology is useless—this would certainly make my decision to major in it a questionable life choice. There is indeed

value in a clinical diagnosis because it can allow someone to seek and gain access to treatment. Also, empirically studied research is crucial in this field because we always want to ensure that the therapies we use are effective, and we especially want to be sure that they are not causing additional harm. I’m simply offering up a warning about the dangers of what can happen when we take this one approach to addressing mental health as an all-encompassing, unbiased “truth,” when in fact, it is made up of a variety of deeply rooted cultural norms and values regarding what is normal and abnormal.

In her ethnography, Pipher elaborates on how this issue is affecting people in a very real way. She specifically discusses how many resettled refugees’ thoughts and behaviors are taken out of their cultural context and passed off as abnormal due to a lack of knowledge on the clinician’s part. While many clinicians are quick to diagnose refugees with a whole host of mental disorders such as anxiety, depression, and Post-Traumatic Stress Disorder, an official diagnosis without considering contextual information may not be useful or completely accurate, and in the worst case scenario, it could even be harmful. Pipher illustrates this by explaining how almost all of the Afghani women she worked with seemed to meet the criteria for depression; however, she states that because of everything these women have gone through, it is not really useful to call this depression, which implies pathology, because reacting to trauma is actually a normal and even healthy response. Additionally, many refugees do not wish to seek treatment in the first place for a variety of reasons, such as language barriers, lack of financial resources, and mistrust of authority figures. But when they do, such as one Vietnamese girl Pipher worked with, many often refuse to talk about the traumatic experiences they have gone through. Rather than viewing this as resistance to therapy or symptomatic of some kind of pathology, it is crucial to consider the fact that the values of catharsis and

individualism in American culture may not necessarily be universal. Some cultures may not talk about issues of mental health because such topics are taboo or highly stigmatized, and some believe that to cope with trauma, it is best not to talk about it—for example, while Americans conceptualize illnesses (mental or physical) as only getting better when it is treated directly, the Vietnamese have a saying that, “A wound will only heal if it is left alone” (Pipher, 2002).

I cannot stress enough how important it is to approach psychology from a less ethnocentric perspective that views Western psychology as the only valid way to address issues related to mental health, especially as our interactions become increasingly multicultural. This whole idea that “our way is the right way” is simply outdated, and if we begin to make the area of mental health more inclusive and welcoming of diverse perspectives, we may all benefit. A push for more cross-cultural research must be made on a larger scale. Practitioners must also be better trained to understand their own cultural biases, and they must also be trained to recognize when and how to effectively incorporate multicultural elements and contextual knowledge into their diagnoses and treatment recommendations. For example, building off of the previous example of the Vietnamese refugee girl who did not wish to share her traumatic experiences, it is important for the clinician to recognize that individual treatment in a sterile, hyper-clinical setting may not be best in this case. Perhaps a more collective approach involving group therapy with others who have gone through a similar experience or who share similar values would be more useful. Of course, this is just one example; however, more broadly, a cross-cultural understanding of mental health needs to be incorporated at the curriculum level for all students interested in pursuing psychology or psychiatry, and developing training sessions designed to educate clinicians on how to work with different communities ought to be prioritized in the field.

Finally, I want to clarify that I am not arguing for psychology and psychiatry to be separated from culture, for that is an impractical and impossible task. Rather, I push for the recognition that in a world that is increasingly becoming more and more multicultural, it is crucial for the fields of psychology and psychiatry to keep up with this trend and to recognize the need for a shifting cultural and contextual lens. Our research questions, assessment tools, and treatment plans must evolve to fit the needs of the diverse global population along the lines of culture, gender, sexual orientation, age, ability, class, nationality, race, ethnicity, and so many other identity markers that shape the way people experience the world. I write this with the hope that an approach that first and foremost recognizes these multicultural experiences while considers the socio-cultural context of each individual will one day become the norm.

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Medical Schools Lack Cultural Competency for Transgender and Gender-nonconforming Individuals

by Nicole Sharpe

I am a cisgender, heterosexual woman, meaning I identify with the sex I was assigned at birth. I identify as female and my physical features reflect that. When I walk down the street, I have the privilege of not worrying about how my gender representation or gender identity will impact how I am perceived by others. This also means when I walk into a doctor’s office to see my primary care physician for strep throat, I don’t think twice about how my gender will affect my treatment. Consider a transgender patient who walks into their physician’s office for pneumonia; rather than attending to the health issue at hand, the health care provider invasively redirects the conversation to the patient’s sexual practices. According to The Report of the 2015 U.S. Transgender Survey conducted by The National Center for Transgender Equality, this is not uncommon. According to the survey, 33% of participants disclosed, “at least one negative experience with a health care provided in the past year related to being transgender.” These experiences ranged from being denied treatment, to facing verbal discrimination, to needing to educate their provider on transgender issues before receiving proper health care. From the same study, 23% of participants reported they “did not see a doctor when they needed to because of fear of being mistreated as a transgender person in the past year.” Furthermore 50% of respondents reported “having to educate their healthcare provider about their transgender identity.” According to Dr. Juno Obedin-Maliver in an article for the *Journal of the American Medical Association*, as of 2011, only roughly one third of U.S. medical schools have addressed

transgender health-care issues in some way. With these statistics in mind, it is clear this issue is largely rooted in insufficient medical education with regards to transgender and gender non-conforming health issues.

In 2005, to address the issue of biases, discrimination, and stigma produced by providers in healthcare delivery, The Association of American Medical Colleges (AAMC) released the document *Cultural Competence Education for Medical Students* to help guide medical schools in adapting education in cultural competence into undergraduate medical curriculum. In this document, they provide definitions of cultural competence and cultural competence in healthcare. Also included in the document is the Tool for Assessing Cultural Competence Training (TACCT), which is an outline of recommendations for curriculum content learning goals and how to evaluate student comprehension of them at the end of the program. This instrument is broken into five parts called domains: Cultural Competence—Rationale, Context, and Definition, Key Aspects of Cultural Competence, Understanding the Impact of Stereotyping on Medical Decision-Making, Health Disparities and Factors Influencing Health, and Cross-Cultural Clinical Skills. In 2012, for reasons unexplained by the AAMC, the document was revised *Cultural Competence Education for Students in Medicine and Public Health*, with slight revision to some of the comprehension goals for students. Despite revisions, in reference to the definition of cultural competence, the AAMC focuses primarily on the terms “race,” “ethnicity,” and “culture,” both in their definition of cultural competency as well

as in their education assessments. And, unfortunately, while mentioning the term, “gender”, occasionally, these documents are not comprehensive enough to be applied to the unique discrimination and stigma experienced by transgender and gender non-conforming patients when seeking health care. By analyzing language used in the AAMC’s TACCT, it is clear the best way to eliminate stigmatizing practices by health providers and to improve health outcomes for transgender health users in the United States is to adopt a culturally competent model of transgender issues in medical training.

A Clarification of Terminology

To fully understand this issue there are a couple terms that need clarification. The most relevant to clarify is *gender*, and gender as it relates to the umbrella term *transgender*. Unfortunately, a confusing element to understanding issues of gender diversity is the rapid emergence of LGBTQ (Lesbian Gay Bisexual Transgender Queer) language paralleled against the much more gradual pace of U.S. society to adapt. The most common way people conceptualize gender is through the *gender binary*. A binary is anything composed of two parts. The gender binary refers to the way gender is typically conceptualized: female/male. This binary is often and incorrectly conflated with other concepts in American society such as sexual orientation and sex. It is important to distinguish gender identity from gender expression. Gender identity refers to your “internal sense” of gender, whether you internally identify with being female, male, a combination, or neither. Gender expression refers only to the way you physically express or present your gender whether that be through the sound of your voice or the way you dress, for example (TSER, 2017). These features are typically described as being feminine or masculine. Sexual orientation refers to who you are attracted to physically, romantically, or emotionally. It in no way is determined by the gender you identify with. This means just because you identify

as female, does not inherently mean you are attracted to males. And sex refers specifically to the genitalia you possess. And your sex does not have to align with the gender you identify with or express. Now, while there are many other terms to describe gender, two of the most general terms referring to identities of gender diversity are transgender and gender non-conforming (TGNC). The definition of transgender as I use it throughout this paper is “an umbrella term for people whose gender identity differs from the sex they were assigned at birth,”(TSER, 2017). And gender non-conforming is a term used to describe individuals who experience gender identity and gender expression outside of the gender binary.

The other concept central to understanding this issue is cultural competency. Cultural competency encapsulates “awareness, attitude, knowledge, skills, behaviors, policies, procedures, and organizational systems” and is applied through the ability to understand and interact with populations of different backgrounds (Wilkinson, 2015). While historically in the education of healthcare providers, cultural competency has usually encapsulated issues of only race and ethnicity, cultural competency can be applied to any social category.

Although the concept of gender is referenced specifically several times in these documents, when it is included in the definition of cultural competence and in the TACCT tool, it focuses on the narrow understanding of gender as binary, leading to a misunderstanding communicated to providers of the diversity within gender identity as it relates to TGNC individuals. Gender is first found in the document, Cultural Competence Education for Students in Medical and Public Health (2012), released by the AAMC, in the definition of cultural competency. The authors cite the cultural competence standard using the language of the Liaison Committee on Medical Education (LCME):

The faculty and students must demonstrate

an understanding of the manner in which people of diverse cultures and belief systems perceive health and illness and respond to various symptoms, diseases, and treatments. Medical students should learn to recognize and appropriately address gender and cultural biases in health care delivery, while considering first the health of the patient.

Next, in the section that outlines the TACCT content domains, gender is indicated a second time via the pronouns, “his/her” in the following quote from the last bullet point describing *Domain II: Key Aspects of Cultural Competence*, “Information on the history of the patient and his/her community of people,” (AAMC, 2005). And a final time in this document, in *Domain V: Cross-Cultural Clinical Skills*: “Knowledge, respect, and validation of differing values, cultures, and beliefs, including sexual orientation, gender, age, race, ethnicity, and class” (AAMC, 2005). In a later section, “*Developing and Implementing A Cultural Competence Curriculum*”, in which the domains are explained in even further detail, the concept of “gender” is missing altogether from both domains, II and V. A couple major themes stand out in the evaluation of these excerpts. Most importantly, the term gender is used sparingly and inconsistently throughout the document, both in the definition of cultural competency but also in the domain descriptions. Additionally, the fact the authors never explicitly describe gender as a diverse concept inclusive to TGNC individuals, and they use “he/she” in *Domain II*, gives the perception the authors are only referring to gender in terms of the normative binary explained earlier. Because medical education relies so heavily on a discourse of the gender binary to teach subjects like anatomy or gender-specific diseases such as testicular cancer in males, if gender is left out of cultural competency and gender diversity is not distinguished from the gender binary, TGNC individuals can be left vulnerable to health disparities and discrimination inflicted by their

providers. Consider the example reported in a study of health disparities for transgender individuals, in which researchers found transgender men who still possess their female genitalia from birth, face a barrier to basic gynecological care due to the assumption by health providers that patient genitalia is congruent with their gender identity (Lerner and Robles, 2015). According to a 2015 report on Transgender individuals and HIV by the World Health Organization (WHO), this is particularly problematic, because as a result of these kinds of assumptions, risk of uterine, cervical, and ovarian cancer among transgender men with female genital anatomy are significantly higher (WHO, 2015). An additional component important to understanding gender variance beyond the binary as it is constructed most frequently in society is the importance of proper pronoun usage, especially for transgender and gender non-conforming individuals. Pronouns are identifying words that refer to an individual in place of their names, and they are typically gendered. It may be obvious, the most common pronouns include he/him/his to refer to someone who identifies as male and she/her/hers to refer to someone who identifies as female. But, for those who identify outside of the binary, there are a wide variety of other pronouns such as they/them/theirs or xe/xem/xys. Generally, because medical documents include a box to identify sex, with the options male or female and, exclude gender identity, providers may make the assumption to use pronouns that correlate with the identified sex. For a TGNC person who prefers an alternative set of pronouns or who uses pronouns that do not appear to match their gender expression, a provider who assumes pronoun usage, rather than asking the patient’s preference, risks disrespecting the patient. In a national survey on transgender discrimination, The Center for Transgender Equality reported these kinds of assumptions can influence the accessibility of healthcare for transgender men. About 20% of transgender men avoid healthcare due to being

“misgendered” by healthcare providers, and nearly 50% delay or refuse to seek preventative care for fear of being treated negatively (NCTE, 2012). If your gender identity aligns with the sex you were assigned at birth, and people perceive you in this same way, it can be difficult to conceptualize why assumptions regarding someone’s genitalia or pronoun usage based on the sex marked on medical records could be problematic; but, as the statistics reveal, for TGNC people, when medical professionals make assumptions based on the gender binary, healthcare can become something that causes more harm than benefit.

Despite a revision to the document in 2012, students are supposed to be able to define cultural diversity including language, sexual identity, age, race, ethnicity, disability, socioeconomic, and education, but not gender, further leading to a misunderstanding of what it means to be transgender. With the assistance of an expert panel, AAMC revised the TACCT and wrote a new curriculum guide that could be applied to both medical schools and now public health schools. This was an important revision because the learning objectives outlined for students in relation to cultural competency changed. Under the student learning objectives section of the document, *Cultural Competencies Common to Medical and Public Health Students*, no longer are learning objectives organized by domains. Rather, they now are broken into three categories with about 15 goals for. Knowledge (cognitive competencies), skills (practice competencies), and attitudes (Values/beliefs competencies). The first objective under cognitive competencies requires the ability to understand a working definition of different cultural competencies from which to build all other studies, skills and practices from. The language of the document is as follows, “At the completion of the program of study, students will be able to: Define cultural diversity including language, sexual identity, age, race, ethnicity, disability, socioeconomic, and education,” (AAMC, 2012). Of all the learning

objectives, this is the only one which includes specific social categories cultural competency should be applied to. Because they list “sexual identity,” it is in this learning objective, a term describing gender identity, as well as sex for that matter, should be listed. In one way, the specific language, “sexual identity” to most likely describe sexual orientation is outdated, and some may argue is inaccurate. Someone can identify with gender because gender identity refers to a perception of oneself. Sexual orientation is a more accurate term because sexuality in American culture is typically defined, not by the individual alone, but by the sex or gender identity of the person they are attracted to. Therefore, to use the language for sexual identity to describe attraction is especially confusing when trying to distinguish a concept like *sexual orientation from gender identity*.

It is also important to note, the concept of gender identity or gender diversity is completely absent from this revised document. This is problematic because it is inconsistent with the older version of this document, making the definition of cultural competency even more unclear. Like the language being confusing, this is also problematic because, in the absence of gender identity, the listing of “sexual identity” related cultural diversity risks that medical students may confuse *sexual orientation* and *gender identity* as the same. This has been a common misconception in the medical context since the 1800s, when homosexuality, initially understood as a pathology, was first conceptualized as gender inversion, or reversal of gender traits (Stryker, 2009). As mentioned earlier, although homosexuality is not still defined as gender-inversion, this is still a common mistake within American culture, and within the culture of medicine. If medical students cannot define gender identity and diversity, they cannot understand terms like “transgender” or “gender non-conforming.” There is stark evidence of this across several recent studies. In one study, researchers

examined all research done on transgender healthcare in the last 10 years that focused on the perspectives of TGNC patients. An overarching theme across all the studies they analyzed was patients reported physicians held insufficient knowledge regarding trans-health interfering with the ability to provide HIV preventative care, hormone therapy, or gynecological care (Lerner and Robles, 2017). They described in one study they analyzed, including 101 transgender men, 32% of participants reported the most difficult barrier faced when seeking health care was finding a physician knowledgeable about transgender health. In an additional study with transgender individuals ages 16-24, not only did physicians lack knowledge regarding transgender health, they lacked experience as well. As a result, participants reported acquiring transition-specific treatment like hormones was very difficult. Participants of one study even suggested barriers to healthcare could be improved for transgender individuals if healthcare providers established an understanding of gender identity before serving healthcare users. In a study examining the experiences of transgender and gender-nonconforming patients in emergency departments, the authors concluded health provider knowledge is typically overlooked when evaluating patient satisfaction levels, yet, in this study, reports of negative experiences were most common among participants who felt their provider lacked enough knowledge about their identity to provide proper care or avoid discrimination.

In a second article, a study that involved health care providers, physicians described feeling inadequately trained or educated to provide care for transgender patients (Jaffee, 2016). Jaffe said providers are more likely to “unwittingly create an atmosphere of disapproval for transgender patients” when they feel uncertainty about treating a patient because they lack education about transgender and gender identity knowledge. In Jaffee’s study, of the 30.8% of participants who reported delaying health care

or avoiding it altogether, space “respondents who had to teach health care providers about transgender people were 4 times more likely to delay needed health care due to discrimination” (Jaffee, 2016). It is evident throughout the existing literature that lack of education about gender identity leads to negative experiences with health care for transgender individuals. Those who experience negative interactions with their providers are more likely to avoid and delay care that act as underlying risk factors for many health disparities.

Just as defining gender and gender diversity is left out of curriculum requirements, the assessment of cultural competency using the TACCT is also limited to assessing race, culture, and ethnicity, therefore not providing doctors the tools to assess their biases and stigmatizing practices in regard to treating transgender and gender non-conforming patients. This is harmful because TGNC individuals experience very specific health disparities due to the way their identity intersects with society in very different ways than race might influence their health. Willy Wilkinson, an LGBTQ activist and public health expert, provides a definition of cultural competency that extends to transgender culture and transgender health. It includes defining terms like gender identity, transgender, and concepts of gender diversity as well as the ability to appropriately use this terminology. It also means recognizing how to respectfully interact with transgender individuals using these terms (Wilkinson, 2015). For example, in a medical setting for physicians, this might include understanding how asking a patient certain types of questions, particularly regarding genitalia when it is not relevant to the patient’s visit, can be sensitive or offensive for some patients. Wilkinson emphasizes transgender cultural competency also means understanding how patients experience discrimination in other various realms of society like within politics or the judicial system (with bathroom laws, for example) within families or

relationships, or economics. It includes understanding that discrimination experienced by TGNC individuals is typically intersected with one or more system of inequality such as class, sexuality, race, ability, language, or immigration status (Wilkinson, 2015). Wilkinson says that much of the discrimination faced by TGNC people throughout society, including by the healthcare system, is rooted in this lack of cultural competency. That being said, applying comprehension of transgender cultural competency for healthcare providers, includes the ability to recognize personal prejudice shaped by learned stereotypes, recognizing when certain behaviors and conversations are hurtful, and apologizing when mistakes are made. Consider one study in which health care providers who, “expressed uncertainty about the nature of transgender identity” and transgender issues, tended to reproduce stigma and discrimination in their interactions with transgender and gender non-conforming individuals to preserve their authority, or the perception of authority within the physician-patient relationship. With a growing body of literature exploring the impact of stigma on poor health statistics, Poteat claims this kind of knowledge gap regarding transgender issues directly impacts the utilization of healthcare by transgender patients.

Although the AAMC eventually published a page to their website dedicated to LGBT education resources because it exists outside the cultural competence documents, the information risks being ignored as less important to medical curriculum integration. In a study released a short six years ago, medical school deans of 150 U.S. and Canadian medical schools responded to a thirteen-question survey conducted online regarding curriculum hours devoted to “LGBT-related medical curricula” (Obedin-Maliver et al., 2011). The researchers found on average, medical schools dedicate a total of 5 hours to “LGBT-related content” to medical curriculum over four years. They interpreted this as low. Additionally, of the

132 deans who completed the entire questionnaire, 9 schools claimed devoting no hours to LGBT topics during “preclinical years” and 44 schools reported devoting no hours during “clinical years”. The study evaluated topic areas covered in curriculum, but the researchers were unable to report information specific to the transgender-related content used by these schools describing inconsistencies across programs. If only 5 hours are being devoted to the entire branch of LGBT content, it is safe to assume far less time is being devoted to gender-related education. Since then, the AAMC published its website page devoted to LGBT education resources in 2014. These resources include readings, videos, and content suggestions to be incorporated into LGBT-related curriculum, but there is no self-assessment tool like the TACCT for medical students to evaluate their knowledge or biases. In April of this year, a new study found that, as of now, the Accreditation Council for Graduate Medical Education does not require schools to devote any hours of curriculum time to the topic. And, despite AAMC’s published resources in 2014, there is no information reported on how successfully these suggestions have been incorporated into medical schools across the country (Johnson, 2017). To add, two schools of note have incorporated significantly new LGBT-related content to their curriculum. Both in 2016, Harvard did so with a new elective course in LGBT topics related to medicine that is optional for students and the University of Louisiana has incorporated a fully “comprehensive” program related to LGBT content integrated into their four year medical program for all students. Considering the information on LGBT related medical school curriculum or rather the lack thereof only provides substantiating evidence that, although the AAMC has attempted to address the gap in transgender knowledge among healthcare providers, their efforts have not been nearly enough.

In conclusion, if the healthcare system does not take measures to address TGNC health and

discrimination, health disparities will remain and transgender people will continue to die. Fair healthcare is something this country is more than capable of providing, and there is much room for improvement, beginning with medical education training. A great place to start improving health outcomes for TGNC patients would be to revise the AAMC cultural competence documents to include transgender topics. TACCT does a thorough job of outlining how to incorporate cultural competency elements of race and ethnicity into medical training, and by using this as a template, this model can be adapted to include cultural competency for transgender individuals as well. The first step would be to include a comprehensive definition of how cultural competency applies to transgender health using Wilkinson’s definition of transgender cultural competency described earlier. For example, this could include a comprehensive understanding of gender identity and gender expression experienced by TGNC people and how to navigate proper pronoun usage. The next step would include the incorporation of transgender topics into the five domains of the TACCT, just as elements of race, for example, are included. These topics would be included both in the learning goals section of the TACCT as well as the assessment section. For example, because so much of the healthcare system currently operates using the binary understanding of gender, such as in medical forms, medical students need to be given the tools for how to communicate with transgender or gender non-conforming patients when they encounter a medical chart that is marked incorrectly. Finally, by the end of the program, students should not only be expected to define what it means to be transgender or gender non-conforming but understand how to engage in respectful interactions with TGNC patients and provide whatever care is needed. With a little extra effort, there is hope that these health disparities can be turned around.

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Smoke Break

by Jackson Deakins

A Fag.

That's what they used to call him in high school. That's the brand they tattooed to his sleeve for those four grueling years. He's since graduated and gone to university, but it doesn't matter. That scarlet letter remains, etched in bold, fearsome font, under his skin and on the surface of his mind.

Fags, man. He smokes them now – or did he start in high school? Did you know they call cigarettes fags in the U.K.? You probably did. He takes short, quick drags, racing to the filter – to the fix. Maybe he's ashamed, maybe he really just wants his head to spin, to get that otherworldly lightheaded bliss, or, it's probably because he just can't stand the taste.

The term "fag" is derived from the English and Scottish terms faggot c. 1300, fadge c. 1588, and faggald c. 1375. The origins of the words all refer to the Norwegian meaning of "a bundle of sticks, or heap". Only the terms faggot and fadge develop a colloquial meaning for "woman," but only faggot retains its homosexual connotation. Historically, none of the terms directly coincide with the meaning of the word fag – an effeminate homosexual, but in 1920s America the terms faggot/fag reappear with that shared meaning.

He isn't gay, though he's never touched a girl before. He's become the brunt of a joke that has criminalized, delegitimized and degraded an entire community and for that he is guilty. He's guilty for being a part (even if he is the punch-line) of a cruel joke that still holds people to their place: below.

A Sick-person.

When he thinks about high school, the veritable Hell he was put through, he knows it was all his own doing. Why couldn't he listen to the music

they listened to? Why did he quiver so when talking to girls, why did he seep a cold, clammy, sweat at every interaction?

In a 1965 study for the *Journal of Personality and Social Psychology*, researchers separated subjects with and without anxious tendencies into four groups: the non-anxious shock-threat group, the anxious shock-threat group, the non-anxious nonstress group and the anxious nonstress group. While members of the anxious/non-anxious shock-threat groups were threatened with electric shock, anxious/non-anxious nonstress groups were in a resting state. Those threatened, regardless of anxiety level, experienced highly decreased basal resistance, or clammy hands. Even those in a resting state experienced a decreased level of basal resistance, due to their anticipation.

How did they know he was afraid? How did they know he wasn't strong enough? Like a pack of wolves, hovering, waiting for the weakest of the herd to fall behind just enough to be torn apart.

Those answers, and others, came to light at the edge of a thin steel blade: each knick into the flesh of his forearm gave him the deadly self-assurance that this was, in fact, his fault. This phase of his coping was brief, how long can you hide blood-soaked sleeves? Apparently, not as long as he has been able to hide the gaping hole in his chest, a wound, though intangible, deeper and darker than any incision he could make.

No, now in the months following his rehabilitation and return to "normalcy" (as his psychiatrist put it), he copes with a much duller pain. The type of self-harm that is not registered through bleeding sleeves, but in slow, methodical steps: one rushed cigarette at a time.

In the average smoker (assuming they smoke

regularly), there is an average loss of eleven minutes of life per cigarette smoked. He sought pain that is exponential – pain that is quantifiable, one rushed cigarette at a time.

A Free-man.

Aristotle argues that humanity is driven by a sense of purpose, telos. Teleology is at the center of all philosophy, as philosophers throughout the ages offer theories to explain what makes humans tick.

Centuries of heated debate have culminated in the ultimate understanding that it is impossible to provide a universal causality as to what makes us do the things that we do.

That being said, there have been attempts. Socrates to Plato, Plato to Aristotle, Aristotle to Rousseau, Rousseau to Hegel, Hegel to Marx, Marx to Lenin, Lenin to Stalin, etc.

Similar timelines across the ideological spectrum can be drawn to illustrate the grand progression of human reasoning, morality, all to the resounding silence of the fact that we still have no idea why we are the way we are.

How can he be what they tell him he is, if they don't even know what they are? Don't you see?! We're all celestial bodies trapped in a terrestrial realm – under the same illusion of control. We all die, we all rot away into dust–

“Ashes to ashes, dust to dust.”
–the same way a dog or worm or microbe would, so why does anything matter?

And so, as those who seek to prey on nonconformity hold him, face-first in the toilet bowl,

that resounding silence echoes through the very chambers of his mind and – he is free.

However, it is fleeting.

A Real-man.

A lump of ember-rich ash falls to his foot, he winces and shakes it off quickly. He's been daydreaming out on his dorm's balcony, cigarette in hand. He's late for his first class as a college-man.

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Trigger Warning: *Game of Thrones*' Controversial Content and Its Potential Benefits

By Zachary Sun

During the second semester of my senior year of high school, I took a course called “Film Literature,” a course that was nearly entirely discussion-based and focused on film analysis. During a slow day of discussion, my teacher asked the class suggestions on what shows to watch, and numerous suggestions flew out: *Mad Men*, *The Walking Dead*, *Hannibal*, *Game of Thrones*...

“Not *Game of Thrones*.”

When Alik, one of the more outwardly opinionated members of the class, piped in with her disagreement, more than a few students caught their breath.

As she argued her point, a group of fellow film students sighed in exasperation, almost in unison, as they heard the same age-old argument.

“Too much violence against women,” she argued. The students, almost on impulse, instantly responded with groans and a tirade of protests. As the commotion died down, they quietly asserted their usual counter-argument: the source material for *Game of Thrones* comes from the novels by George R. R. Martin. These novels, while fantasy, are based on the medieval era and the Wars of the Roses, and the violence against women is simply a reflection of the period on which it is based. Additionally, nearly every main female character in the show has an empowered role in the series. Before Alik could counter with her own point, my instructor rapidly stepped in and changed the subject to avoid further escalation of what he understood as a thoroughly controversial subject.

That class period was not the first time I had

observed that argument, nor would it be the last. As I watched the same argument regurgitated over and over, it became clearer and clearer to me that the matter might not be that simple. Having religiously watched all six seasons of the show, I have observed many female characters develop into powerful and independent forces while also witnessing the emotional, physical, and sexual abuse of some of the same characters in addition to other peripheral female characters to a decidedly unnecessary extent. Scenes such as the controversial rape of a grieving mother, Cersei Lannister, by her brother (and lover) in front of their son's dead body or peripheral filler scenes of women being gratuitously raped on camera are decidedly over-the-top, as demonstrated by the stark controversy from dedicated viewers (Itzkoff par. 6-7, Ferreday 21). The presence of such blatantly graphic and polarizing scenes is the basis of much of the opposition towards the show, as many argue that these scenes are either extraneous or excessively over-the-top.

When one further explores the various controversies surrounding the show, it becomes apparent that the heart of the argument surrounding *Game of Thrones* is not, in fact, about whether the show is feminist (empowering towards women) or anti-feminist (detrimental or sexist towards women; subscribing to gender roles which favor male dominance over women through violence and intimidation). The show features an abundance of both types of scenes. The root of the ongoing controversy is, in reality, regarding the extent to which *Game of*

Thrones' anti-feminist or violent (particularly sexually violent) content affects its viewability. Game of Thrones is a remarkably vast, complex epic of a TV series. This complexity lends itself to the characters and the various storylines, and ultimately the purpose of this paper is to argue that yes, the various controversial scenes involving rape or violence towards women may impact the viewability of and one's ability to thoroughly enjoy the show. However, Game of Thrones' uniquely deep and developed characters (both male and female), its dedication to the integrity of those characters and its vision, and its complex and compelling relationships ultimately provide a fascinating and dynamic viewing experience for all viewers of the series, feminist or not. Furthermore, the difference in opinions may actually be a potential catalyst for feminist progress more so than the potential result of "censorship" of graphic content.

Game of Thrones is iconic for various reasons, one of which is its remarkably complex female characters. However, there has been controversy regarding the portrayal of non-major characters as "setting" pieces. Some secondary and tertiary characters, as well as female extras, are displayed as sexual objects to be used and abused by men, and sometimes violently killed. Despite the opposition towards the show for some of its portrayals of its women, an important fact to realize is that the screenwriters of the television series actively wrote in entirely new, complex, and strong characters to contribute to the collection of empowered women. Characters such as Ros, a prostitute who (despite her profession) fends for herself and commands respect, and Talisa, the wife of a claimant to the throne who advises his decisions, "were developed specifically for the TV series" and additionally, various other female characters who were otherwise relatively unlikeable in the novels have been adapted from the books to be "softened by TV writers to make them more appealing" (O'Brien par. 15-16).

Game of Thrones' popularity is due very largely to its diversity in its character pool, and especially its women, for which the collective fanbase, male and female, is considerably more engaged than for male characters. In a general sense, a majority of the most important characters in the overarching narrative express their power in unique ways from conventional television models (Clapton and Shepherd 9). Male characters such as Tyrion Lannister (a dwarf who is ridiculed and discounted by a majority of the kingdom's population) exercise their power through wit and resourcefulness rather than coercion and force. This is a demonstration of how *Game of Thrones*' character development removes both male and female gender stereotypes: Tyrion is portrayed as a masculine character, but not due to physicality or a stoic persona, contrary to a conventional archetype that our society is familiar with. In terms of women, their presence as political, sexual, and military authorities is a unique shift from the "overwhelmingly white, straight, and male" archetypal leaders of many other shows (O'Brien par. 11).

Viewers argue that the true root of the backlash against the sexual violence in *Game of Thrones* originates from anger regarding women in the show and their comparative impotence compared to male characters (Dockterman par. 8-9). Empowered female characters such as the Sand Snakes (fearsome and independent female warriors), Cersei Lannister (a scheming and powerful former queen), and Margaery Tyrell (a similarly clever and independent woman of nobility) all experience brief triumphs before very quickly being rendered powerless. Critics additionally note that while certain male characters have lost a considerable deal of power as well, there is a greater number of male characters who engage in meaningful and significant action whereas "by contrast, the women feel caged in—some literally" (Dockterman par. 9). Viewers of the show argue that despite an apparent balance in volume of characters, the nature of those

characters' contribution to the storyline is considerably different. The large issue with this argument is that in comparing the male characters to the female, one must consider both the low points and the high points of each comparative gender as comparative not only between genders, but also within each gender itself. Throughout the series, while women experience a greater amount of violence and are placed in more situations of apparent impotence, they are also the ones who truly possess a majority of the power in the series. Cersei Lannister is the wife of the former king and mother of the royal line, and is revealed as being the true individual in control of the monarchy at many points. In other examples, Daenerys Targaryen, the primary contestant for the throne against the reigning monarchy, is an independent empress who is shown on multiple occasions as fiercely independent and capable of ruling on her own (O'Brien). In contrast, other male claimants to the throne such as Stannis Baratheon, are all demonstrated as ultimately unsuccessful in their efforts despite their apparent "power" in earlier episodes. This arises from the nature of their perceived power: they possess typical "male" leadership traits, enforcing their power through intimidation and strength, which also proves to be their downfall, as they often act against or without the consultation of peers.

An additional famous element of *Game of Thrones* and a major argument against its watchability is the graphic nature of its cinematography, whether it be violence, sex or a combination thereof. Some viewers love this, describing it as an unflinching and unapologetic depiction of the realities of war and the medieval age (the period on which it is based), while others find it increasingly "gratuitous" and excessive (Rosenberg par. 4; Kim par. 19-20). Both of these perspectives have merit: the show, in being based on the medieval age, attempts to (as accurately as possible) display what the screenwriters believe it was like living in one of the bloodiest periods in history. The dramatic realism of *Game of Thrones*' atmosphere is powerful

because of its willingness to set aside common fantasy tropes, acknowledging that nobility of position does not inherently suggest nobility of character, and women are often given neither personal nor sexual freedom.

However, while gory violence and rape certainly occurred in that time period, there is also certainly a point, especially later in the series, at which the graphic visuals (particularly the sexual violence against women) no longer contribute to the immersion of the story. An interview of various professional female TV critics about *Game of Thrones* conducted by Kristen Yoonsoo Kim of *Complex* magazine yielded the same mixed reviews, with some critics clarifying that "The violence doesn't seem gratuitous in the context of the show; it's very intent on creating a grim, dark version of the Medieval Ages" while others argue that "The show uses violence for world-building but on a very surface level" (Kim par. 21, 25). The issue with this mentioned "surface level" credibility lies in the fact that in contributing minimally to the setting, there is no longer any real necessity for such violence, as removing it would detract very little from the show. The dichotomy of opinion regarding violence in the series, even between like-minded peers, is a prime illustration of the fine line that screenwriters tread when attempting to determine the appropriate level of graphic content versus what is excessive. This uncensored portrayal of life in Westeros (the world in which *Game of Thrones* takes place) is important because it sets a premise and establishes a clear setting for viewers. The inherent issue with a complete or near-complete lack of censorship, however, is the fact that after the audience has gotten an understanding of the universe, in later seasons it may no longer be necessary to display the graphic material to the extent to which it is displayed in earlier seasons. *Game of Thrones*' creators, whether actively or unconsciously, have begun to respond to this fact. In the past, screenwriters have demonstrated a personal

dedication to preserving the core properties of characters and the setting, defending controversial scenes such as the rape of Sansa Stark (a woman of noble descent who, while proud and independent, still possesses a level of innocence unique from most characters) with arguments towards preservation of her character (Hibberd par. 5, 8). This defense of characters is indicative of the aforementioned concept of dedication to one's vision: the world in *Game of Thrones* requires continuity, and the writers intend to provide it. Naturally, dedication to one's vision has both heartened dedicated viewers and raised skepticism regarding the show's susceptibility to change.

However, recent events have indicated a greater flexibility than previously imagined. The creators' dedication to character integrity has led writers of the show to respond to viewer criticisms by making female roles more empowered and less abused, and while creators have asserted that it is not in direct response to any controversy, the shift is visibly occurring to decrease the gratuity and increase the significance of violence on-screen, making it either symbolic of important power shifts or providing an essential characterization tool (Robinson par. 9-10). This dedication to constantly improving the depth and strength of female characters in the television series demonstrates the showrunners' willingness to cater to viewer demands without compromising the creators' vision, thus maintaining the show's watchability. Allison Herman, one of the TV critics participating in the Complex interview, makes a compelling argument regarding the lens through which one should watch the series, giving credit to both sides of the argument regarding *Game of Thrones*' watchability: What I love about the show is that it brings a real complexity to a genre that is often not credited for being particularly sophisticated and does so in a way that I think elevates a potential for that genre. I think it does that based on the depth of its female characters, on the production value, on any number of things. It's

still too interesting and exceptional of a show to write off, but I think it's healthy to approach something with skepticism and to call out something when it hasn't lived up to the standards it established for itself (Kim par. 34).

This statement about being able to enjoy a series' merits while remaining wary of its shortcomings provides an insightful perspective into how all shows ought to be watched, and how one as a viewer can preserve the watchability of a show that may at certain points raise doubts about its merits.

A final aspect of *Game of Thrones* worthy of note is the concept of the show's controversy itself. The divided opinions over the show's content may in fact be its greatest contribution. As mentioned throughout this essay, *Game of Thrones* undeniably features a diverse spectrum of empowered and weakened characters, while also featuring these characters in reverse roles to provide a constantly changing dramatic environment. The tendency to feature role reversals of power (particularly women losing seats of power to men in this case) as well as the decidedly MA (mature rating) visuals has prompted opposition to the series and its messages, particularly from feminists. The proposed solution to this dichotomy opinion is apparent in a spectrum: some request simply that *Game of Thrones* tone back the graphic and controversial content, whereas others simply have refused to watch it and more or less request that the show be taken off the air (Itzkoff par. 5-8, Kim par. 37). This range of responses to the show naturally receives an equal and opposite range of arguments praising *Game of Thrones*' merits, which only further encourages the controversy.

An interesting fact to note about this controversy, however, Debra Ferreday in Australian Feminist Studies argues that it is more productive to think about the ways in which feminist interventions might be made into the violent discourse that constitute rape culture and rape myths, as well as

about the possibilities for silenced voices and bodies to speak and be heard (34).

The primary intention of Ferreday's statement is that the inherent value of shows such as *Game of Thrones* that do not shy away from displaying controversial content, particularly depicting sexual violence, comes from the critical feminist discourse that emerges from viewing such content. By this logic, one can argue that *Game of Thrones*' depiction of certain elements, such as sexual violence and aspects of rape culture (obviously to a certain degree, as noted earlier), is arguably more valuable to the advancement of feminism and an understanding of social justice than if the show were to be completely PC, or politically correct. Carrie A. Rentschler, the director of the McGill Institute for Gender, Sexuality, and Feminist Studies, draws upon a definition of rape culture as

The complex of beliefs that encourages male sexual aggression and supports violence against women... where violence is seen as sexy and sexuality as violence. In a rape culture women perceive a continuum of threatened violence that ranges from sexual remarks to sexual touching to rape itself. A rape culture condones physical and emotional terrorism against women as the norm (66).

One can argue that *Game of Thrones* features demonstrations of both examples of rape culture and examples of deconstructing it. There are certainly sexualized violent scenes, with masochistic characters such as Joffrey (a spoiled brat prince who abuses everyone besides his mother) touch, hurt, and in extreme cases even kill women while they are kept against their will and either indecently exposed or entirely nude. In contrast, there are also extensive scenes in which female characters in power such as Daenerys and Sansa overcome or avoid potential sexual violence or are simply portrayed without a sexual element altogether in empowering settings, prominent examples including Daenerys' triumphant victory over

the slavers in her conquest and Sansa's return to her rightful place in the North.

This is not to say that all of the graphic content in *Game of Thrones* is entirely justified. There is most definitely an extent to which the series perpetuates rape myths which can be harmful to the general public (Kahlor and Eastin 225-226). However, perhaps educated discussion of these elements can prompt not only fundamental change in media and in *Game of Thrones*' content (as the creators have demonstrated a degree of willingness to adapt to consumer criticism) but also increased feminist understanding of these elements. The contrast between scenes such as Joffrey's brutal sexualized murders and Daenerys' victorious presence at the head of a loyal empire do not only provide value to the plot, but also to the practice of feminism and its relevance to the media. Endless argumentation can occur over whether the show portrays or deconstructs rape culture more, but the most important fact is that this argumentation is occurring. Providing such a polar distinction between acceptable and unacceptable portrayal of women and sexualized violence in the series is a basis for discussion, and can ultimately set a precedent for promoting social justice, whether directly or indirectly.

Game of Thrones is currently the most-watched television series on HBO and one of, if not the most-watched television series on the air overall (Itzkoff par. 3). This level of audience naturally indicates a large degree of influence, and thus close scrutiny over what kind of influence the show places on its viewers. There have been various debates about whether the show's strict dedication to the vision of its setting is too graphic or inappropriate, as well as whether the show's content is feminist or anti-feminist. However, over the course of this essay, perhaps it has perhaps it has become clear that the answer to these sorts of debates is by no means black and white. The show very clearly contains element of both sides of these arguments,

and thus the point remains that perhaps there is a balance that can be achieved through constant feedback and creator response which can ultimately sustain the show's watchability, which is ultimately the true issue, as noted before.

Many of the issues discussed above are pertinent because they directly impact the show's viewability, and thus the balance which ultimately should be sought after is a major advocate towards the show's viewability not being impacted, as the interesting components simply contribute too much. In addition, the fact in itself that Game of Thrones sparks debate regarding various modern controversial topics can potentially be an important platform for the awareness and discussion of various topics such as rape culture and rape myths, and perhaps asserts its value in that aspect as well. Overall, the goal of this discussion has simply been to encourage any potential skeptics of Game of Thrones as well as any and all viewers to enjoy the show for its merits, but critically understand the points at which it falls short, whether it be with overtly anti-feminist content or excessively graphic material or any other type of content. With all of this in mind, perhaps that discussion that occurred in my film class lost its most important component when my instructor chose to cut the conversation short: with such a diversity of opinion, perhaps there existed the potential of our group arriving at a consensus-maybe not regarding Game of Thrones' feminism or anti-feminism, but rather regarding the state of women, sex, and violence in the media as well as society.

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Voluntourism: Friend or Foe?

by Chiara Dart

As a young person and a college student, I am part of the demographic that many voluntourism companies target for their advertising. Many of us youth are seduced into participating in volunteer trips through extensive courting by voluntourism agencies. Recently, while walking down the sidewalks outside my dorm, I came across four or five different spots where someone had written the same slogan: "Need human diversity core? Volunteer in Nicaragua this summer!" Although at the time I was completely unaware of the controversy surrounding the ethics of voluntourism, something about this statement seemed a little off. I thought it was a bit manipulative and exploitative for me to go on what is essentially a vacation in exchange for a couple college credits. This led me to think about the different times in my life that I have encountered voluntourism. Although I have never participated in a volunteer mission myself, I have many friends who have, and both my mother and my sister have participated in medical missions. Upon talking to them, and reflecting on what I knew about the opinions and experiences of these people, I realized that although everyone that I knew had participated in voluntourism out of a desire to do good and help people, no one whom I talked to felt whom they had actually accomplished anything lasting during their stay.

The issue of voluntourism is somewhat of a recent phenomenon. The first instances of organized voluntourism began about 1915, and voluntourism remained relatively unpopular until about 50 years ago, when it experienced a period of exponential growth. (Lamoureux, 2009, par. 3) Since then, voluntourism has become a popular activity for people of all ages and demographics. It has become a particularly popular pastime for youth on summer vacations or gap

years (Palacios, 2010, McGloin & Georgeou, 2016). Although voluntourism is seen as a viable and exciting option for many people, it is heavily criticized by ethics scholars, and those who have done a little research into it.

Throughout my research, I failed to determine one single main criticism of voluntourism. Rather, I found that the majority of articles centered on a criticism of one of two things: a criticism of the manipulative nature of commercial voluntourism companies or of the ineffectiveness of volunteer tourism projects in creating a positive impact on the communities they strive to serve (Goodwin, 2015, Palacios, 2010, McGloin & Georgeou, 2016, Kushner, 2016). A critical examination of these issues will be explored in detail throughout this essay. Overall, those who praise voluntourism seem to cite its effectiveness in changing the attitudes of the tourists towards the communities that they volunteer in. (Wright et al., 2016, Ramos, 2014) The one area that most articles seem to shy away from criticizing is the motivations of the individual volunteer. Most research found that the most common stated motivation of the volunteer was a desire to help those that are less fortunate than they are. Professional academics, journalists, and bloggers all applauded this motivation as being the one redeeming quality of voluntourism.

At first glance, the idea of voluntourism may seem to be a positive force that could prove to be beneficial to all involved. However, it is important that anyone considering voluntourism learn a bit more about the hidden issues within the programs. While researching this issue, I formulated a strong opinion that the entirety of voluntourism is based on the desire of one party to exploit the other. Voluntourism companies exploit volunteers by selling them

overpriced vacations that don't have their intended effect, the voluntourists themselves manipulate the people that they volunteer for through using their interaction as a way to feel good about themselves (McGloin & Georgeou, 2016, 409). However, I believe that this desire is often not realized by the parties who possess it, and, therefore, it is not intentionally malicious. Rather, it is a byproduct of the system that is the volunteer tourism industry.

The standard fallback argument in favor of voluntourism is about the effects of voluntouring on the tourists. Nearly every article or book or every person I discussed the topic with would bring up this point at one time or another in their argument (Wright et al., 2017, 447, McGloin & Georgeou, 2016, 409, Goodwin, 2015, 45). Even my mother said to me while we were discussing the negative effects that this pastime could cause that voluntourism was a negative force "except, of course, when the voluntourist is inspired by it." (K. Hurlbut, Personal Communication, March 20, 2017) This statement encompasses the main sentiment and argument of those that claim voluntourism to have a positive effect.

This heralded positive effect of voluntourism can take many forms. One of the most interesting arguments that I found was by an Australian Lecturer with a Doctorate in Philosophy, Sarah Wright, who argued that volunteer tourism causes a deep connection between the tourist and the "more-than-human" (Wright et al, 2017, 445) In this argument, "more than human" encompasses anything from the rock lying at your feet, the squirrel running through your backyard, or even the emotions you feel. Wright argues that voluntourism provides an almost guaranteed manner for the tourist to connect with the more than human and "develop new understandings of and connections to people, places and causes" (2017, pg. 445). According to Wright, this connection provides a means for tourists to transform their selves, their opinions, and their attitudes.

As a deeply spiritual person, I agree that both volunteering and tourism can provide a person with deep connections, and that these connections can cause a person to change. However, I think that the claim that voluntourism will invariably provide a person with this experience of connection is a bit misleading. The people who partake in voluntourism are often seduced into signing up by travel companies specializing in voluntourism. They fly abroad with eager anticipation and a head stuffed with dreams that they will be providing a service that changes a person or community's life forever. Upon completing their short stay as a volunteer, they realize that they have not actually had the impact that they were told that they would (Popham, 2015, para. 21). Tourists often underestimate the amount of time it takes to complete each project, and are then disappointed when their time is less productive than they thought it would be (Pegg et al., 2012, 812). The final emotions of tourists, then, upon leaving the country that was supposed to change their lives, is a sense of manipulation. The pervasive feeling that they have is that they were used by the voluntourism company they signed on with (Palacios, 2010, 862). This sort of experience is not conducive to their lives being altered for the better. Rather, it is an equation for a person to attribute the negative experience to the area that they had been visiting (Pegg et al, 2012, 813). It makes logical sense that disappointment would be the final outcome of such an interaction. What the actions of tourists comes down to is buying a sort of "feel good" package. The trip is almost guaranteed to not live up to the expectations that it has created in them.

Voluntourism is popular among young people, especially recent high school graduates and college students. For those who tour, volunteering abroad is often seen as a way to travel without their family, but with the security of a designated group, while also expanding their resumes and credentials. This is not to

suggest that the volunteers are consciously attempting to personally gain something, or manipulate the communities in which they volunteer. Rather, I believe, and have found in a variety of research that the motivations of the tourists are genuine in their desire to help people (McGloin & Georgeou, 2016, 411, Palacios, 2010, 868, Pegg et al., 2012, 803). However, the way that young people are sought out by voluntourism agencies emphasizes how these youthful volunteers will be gaining the aforementioned resume-building material, and safe freedom. Because the foundation of the tours is set up and promoted in such a manipulative way, it comes as little surprise that the monetary resources that enable people to volunteer is also collected in an inherently manipulative way.

Most voluntourism websites sell the idea of the volunteer mission long before they will admit to the costs involved. Once one has sifted through tens of photos of flushed, grinning volunteers hugging young children in shabby clothing, or pages of quotes from said volunteers, you, the prospective voluntourist, finally arrive at a page that vaguely details the costs involved for such a tour. These companies must know that the exorbitant upfront cost of such a vacation will dissuade many potential volunteers from participating, as most companies also include a blurb about ways to raise money for the tour (Funding, n.d, p. 3). Almost without exception, companies will urge the volunteer to ask for donations from friends and family. This plea often follows the same basic outline, telling volunteers to gain support from friends and family and to “set up your fundraising page” (Funding, n.d., p. 3). Any youth who has been on social media in the past couple years has almost certainly been besieged by these pleas for funding. They’re practically inescapable.

Any level-headed person may respond to this; “but, many of these bids are not from people looking to volunteer.” This is completely accurate. Online fundraising is used to gather funds for a great number

of things, and over the past couple months alone, I have encountered pleas from anything from a church or temple group touring abroad, students seeking funds for study abroad programs, or even money for an aspiring singer to attend acapella training a couple states away. However, I am not arguing that online fundraising is a product of the voluntourism industry; I am simply saying it is a tactic that is promoted tirelessly by volunteer companies. Many people have turned to emotional wrangling as a means to goad friends and family into handing over their hard-earned cash (Mac, 2015, para.2-3).

Voluntourism is often advertised as being a way to have a large impact on a struggling community at the grassroots and individual level. Volunteer agencies consistently rely on this emotional appeal as a staple for their brochures, complete with a photograph of a volunteer grinning while connecting with a child (Childcare Volunteer programs, n.d., Children and Education, n.d.). Although this is the main selling point for volunteer tourism, the truth is that often the “help” given to these communities is not something that they actually need or something that actually helps them.

Research done by Don Fanning, Professor of Global Studies at Liberty University, shows that the vast majority of volunteer missions are short term, lasting somewhere between one week and two years. His data found that within that range, just over 67% of all missions take place over 14 days or less, with an additional 20.6 percent taking place between 15 and 30 days (Fanning, 2009, 1; 10). Because these stays are so short, it is almost impossible to have any lasting impact on the community (Goodwin, 2015, 45). While they can build a school or man a hospital for a week during their stay, they cannot guarantee what will happen to those resources in the future. Oftentimes, what happens is not particularly beneficial to the community. Schools built by volunteers often do not have teachers to staff them, and clinics that rely on

volunteers are often inactive during off seasons for tourism (Bellows, 2014, para. 3-4, Kushner, 2016, para. 4). Part of the allure of voluntourism is traveling to a foreign or “exotic” country. Many of these countries speak a different language than the tourist’s home country, and thus a significant language barrier may be encountered that prevents effective communication between the volunteer and members of the community (McCall & Iltis, 2014, pp. 287-89). This barrier makes it difficult for volunteers to help the people in the area because they cannot actually speak to them.

Volunteer missions can also have a distinctly negative effect on the community that they are supposed to help. Many volunteers travel to foreign countries to carry out labor jobs such as construction or more specialized jobs such as teaching. Although this work is meant to provide resources that the community needs, the actual effect that it often has is that jobs that were previously being done by members of the community are now being taken by foreign volunteers (Kushner, 2016, para. 3). Research done by Benjamin Lough, Associate Professor at the University of Illinois, demonstrates that, in 2005, the “value of US volunteer time abroad was \$2.92 billion.” (Lough et al., 2007, 2). This is money that, without the actions of the voluntourist, would have gone to workers in the community. This lack of money flow is in some cases significantly impacting the ability of communities to maintain their livelihood. Additionally, the jobs of the volunteers could often be done more effectively and with less expense by local workers, as they have expertise in the area that the untrained volunteers lack. (Kushner, 2016, para. 3) This raises the question as to whether or not it would be more effective to just donate the money that was going to be used for the vacation to the community the volunteering would have taken place in.

Medical volunteer missions are possibly at the most risk for active harm. Health care volunteering also centers on short-term missions, which can be

incredibly dangerous to the patients. Many of the volunteers are undergraduates, or professionals just finishing medical school or their residency, without any long-term experience in the medical field and without any specific training to the ailments facing the community that they will volunteer in (McCall & Iltis, 2014, 291). Furthermore, the high turnover rate and untrained nature of medical volunteers makes the care given inconsistent, ineffective, and sometimes even life threatening. One critic of medical voluntourism is Jennifer Bellows, who is a physician trained in Emergency Medicine and the Global Health Fellowship director for Denver Health, a local hospital. In one article, Bellows offers a specific example of the potential harms of foreign medical voluntourism,:

The soft-spoken Peruvian man requesting this “consulta” explained that a year ago, a group of doctors from the United States had briefly set up a makeshift clinic in his village. He went to them because he was experiencing abdominal pain and weight loss, and he was given a bottle of pills and a piece of paper with instructions (in English) for taking them. The pills were methimazole, which should be given only to patients after laboratory confirmation of high thyroid levels and who are carefully monitored by a specialist. Methimazole can induce liver failure and suppress the immune system. (It can also cause birth defects when taken by a pregnant woman.) (Bellows, 2014, para. 3)

In this case, the man in question could have quite easily been harmed or even killed by the help that the volunteers were attempting to give him. Had this man been taken care of in a place where the staff members were entirely fully trained doctors and where there

was a way for repercussions to be administered for failing to follow the proper guidelines for medicine prescription (such as losing their medical license), he would likely not have had to face this possible danger. I am not simply saying that this man would have been taken care of better in the United States or another country that boasts its medical capabilities. Rather, I am implying, as Bellows does in her article, that this man would have been taken better care of in one of the clinics surrounding his village, which, coincidentally, are often overlooked in favor of foreign doctors by the inhabitants of the area (Bellows, 2014, para. 7).

In response to the above claims, many people would argue that these criticisms are limited only to short-term volunteer missions, being carried out by untrained and unmotivated volunteers. What about long-term missions? I have to agree; long-term missions exhibit far fewer of the issues that are presented above. Oftentimes, long-term volunteer missions require extensive training prior to departure. Some, such as the Peace Corps, even require the volunteer to learn the basics of the native language (Preparation and training, para. 5). However, only a fraction of volunteer missions take place over two years or more, the timeframe that would allow volunteers to become efficient at their volunteer tasks. The vast majority of the missions that are carried out, therefore, are not having the impact that they are intended to have and are oftentimes actually proving to be detrimental to the community in initially overlooked ways.

It is not my goal to condemn the entirety of the voluntourism industry. Rather, I think that it is important, for both the voluntourists and those they help, to examine the internal workings of the industry, and come to some conclusions. It appears fairly obvious (and fairly self-explanatory) that voluntourism companies would stand to benefit from the manipulation of unsuspecting volunteer tourists; this is almost undisputed. However, it is a little more

difficult to stomach the idea that the voluntourists might have a hand in that manipulation, especially to those who are prospective volunteers. I believe that it is important to note that, yes, this manipulation exists. There are more examples than one can count of communities coming to harm from the good intentions of the voluntourist. Examples include stealing jobs, or even endangering people with medication that could be harmful to them (Bellows, 2014, para. 3, Kushner, J, 2016, para. 3). It is also important to note, however, that the tourists do have good intentions. The negative impacts on the communities, therefore, are more of side effects of lack of knowledge and understanding on the part of voluntourists, which allows the volunteer companies to place volunteers in areas where the community does not need the service that is being provided. It is critical that anyone considering volunteering abroad examine the impacts that this action may have and ask themselves if they are really going to receive the benefits that are promised to them or if they are being manipulated by companies seeking to profit off their good intentions.

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The Power to Change

By Claire A. Veldkamp

One of the most freeing and powerful experiences I have had in my life was when I was in a boat in Hawaii and I saw humpback whales jumping out of the waves, dancing, and racing next to us. Their sheer power was breathtaking, but the feeling I got from their freedom was the best part. The boat's captain in his forty years of experience had not seen whales spend so much time with humans at a close range. For a full forty-five minutes, we sat and watched an impressive orchestration of large mammals circling around our boat. Never before in my life had I felt so connected to the ocean as a whole. Something this wild in life deserves freedom and protection, and most importantly it deserves to be left untouched. I assumed, incorrectly, it turns out, that humans would always be able to view such inspiring scenes. This unfortunately is not the case with our planet's ocean. One of the most dire issues concerning the ocean today is the problem of microplastics, something humans directly cause. Everything in life is connected, and every action has a reaction, according to Newton's third law of physics. Inland states contribute just as greatly as coastal states because truly, "all drains lead to the ocean" (*Finding Nemo*). What is unique about this plastic pollution is that it is not from trash we intentionally throw away; it is from the human waste material from our daily lives. It is from rinsing toothpaste or a face mask down the drain. It is from daily human necessities and cleaning products that most people do not realize even contain plastic. This is why CU's Ocean Coalition Club is so crucial, because educating people about this issue is what could lead to its alleviation. There is nothing more important in the world than the ocean. It regulates our weather, and it provides food for most

people in the world, either directly or indirectly. Microplastic pollution in the ocean is not a singular issue; it is something that contributes to the health of the ocean as a whole, including all the organisms in it and us. And yet, even today, people choose to ignore this fact, so because of this, legislation needs to be constructed to forcibly preserve the ocean. Legislation would provide the enforcement necessary to change plastic use in the world.

Water drives life on Earth, and it even possibly served as the point of origin for life; as such, it deserves to be protected. Water speaks to the prehistoric history for all forms of life and provides key insight into the biology of life. Without it, the first living organisms and further evolution would never have occurred. To prove this theory, chemists made nucleotides from amino acids, only to discover that the only possible conditions for such synthesis to occur prehistorically are in alkaline hydrothermal vents (Victor et al, par. 1). These vents exist as the bottom of the ocean, on mid-ocean ridges, and are caused by tectonic plates rubbing together. Life appears to have started away from the sunlight, using chemicals to power a photosynthesis-like way of life. The ocean not only provided us with water, but it also gave the available molecules the primordial soup to synthesize life. It is because of its necessity for life and its role throughout the ages that water should be protected for the future.

The ocean and the rainforests are the two main sources of oxygen for our planet, and both are declining significantly. Humans are in dire danger because the ocean is responsible for half of the world's photosynthesis (Muller-Karger et al., 1). All humans and animals exhale carbon dioxide, and the

ocean takes this in. The photosynthetic organisms in the ocean convert carbon dioxide back into oxygen for humans to breathe. If the ocean becomes compromised with microplastic pollution, the microorganisms like algae and phytoplankton within it will not be able to convert the amount of carbon dioxide they can today. This means less oxygen for all humans to breathe, which will overwhelm and damage all terrestrial plants permanently, leading to a deficiency of oxygen on Earth.

The ocean, which covers 71% of the Earth's surface, is also responsible for most of the planet's severe weather that adversely affects third-world countries and their slow recovery. Water has a very high specific heat, which means it can gain a lot of heat energy without changing temperature. The ocean absorbs a very large amount of the heat that we humans expend with global warming, but only to a certain extent. Mankind has already generated enough energy that the ocean is rising in temperature. Since 1980, the ocean temperature has gained about 1.5 degrees Fahrenheit ("Climate Change Indicators," Figure 1). It is extremely hard to cause a change of temperature in the ocean because it is such a large body of water, but humans have already managed to do so. This also directly affects third-world countries as the severity of their tropical storms becomes worse. As the ocean warms, it causes the areas around the gyres (large, circular patterns of currents) to develop into very large storms (Wilson et al., 320-23). The warmer the ocean gets, the worse these storms become, and the more people are negatively affected. The ocean warming also accounts for a plethora of other problems not formally discussed in this paper as well, such as ocean acidification, coral bleaching, and more.

Without a healthy ocean providing the environment for fish, millions of people would starve. The ocean is the sole source of food for nearly 852 million people (Kourous par. 2). Yet, even on this front,

a problem is mounting. Fish populations are beginning to decrease or even disappear, because they are being caught faster than they can reproduce. One in three fisheries has collapsed completely, the continental shelves are running bare, and even in the deep and previously unaffected bathypelagic and abyssopelagic zones, fish are reducing in numbers. These two zones of ocean depth are so deep they have even been left untouched for millions of years, yet now they are beginning to be affected by overfishing (Cribb 88). One of the most sobering issues concerning the world's oceans today is the problem of plastic pollution, specifically that of microplastics. Today, the human demand for plastic is about 245 million tons per year. Plastics have excellent oxygen and moisture barrier properties, and they are lightweight and cheap, making them the preferred choice for products and shipping in modern times. Unfortunately, there are cons of plastic use as well, the greatest being that they are used only once and then discarded. They also take about 450 years to biodegrade. This is the reason why 75-80 million tons of it end up in the oceans every year (Andrady par. 2).

Microplastics are the new focus of environmentalists, as more scientific information is being gathered about it—and the results are shocking. Microplastics come from a variety of sources, such as the degradation of large-size plastics over time, plastic pellets that were never conjoined, and cosmetic products. The danger of microplastics is that they are not visible to the naked eye but are microscopically present in sediment and water gathered from all of the world's oceans today (Andrady par. 8). This issue is becoming very serious.

Microplastic pellets are far too common in everyday pollution and are the most numerous items in the oceans today, surpassing even microscopic phytoplankton and krill. They are typically less than 5mm long, just enough to cover Abraham Lincoln's eye on a penny (Steinmetz par. 2). As such, they are

a physical and toxicological threat to the ocean as a whole. As plastic enters the ocean from rivers, streams, and beaches, it breaks down and forms microplastic pellets (Law et al, 144-45). This type of plastic cannot be recycled because it is too small. For example, one shower could result in 100,000 pellets going down the drain. Microplastics are also found in many human cosmetic products such as deodorant, shampoo, lipstick, shower gel, exfoliators, toothpaste, shaving cream, sunscreen, facial masks, and eye shadow. These products eventually go straight down the drain, through the sewer filtration system gaps, into the rivers, and, consequently, into the ocean (Leslie).

The harm microplastics present to the ocean itself is frightening. Plastic accumulates chemicals such as dichlorodiphenyltrichloroethane, polychlorinated biphenyls, and polybrominated diphenyl ethers. These chemicals also may contain plasticizers and flame retardants, polluting the water quality (Law et al. 144-45). The entire ocean is being affected, including everything in it, from the water to the organisms. The end result of this is that humans are at the top of the food chain and, consequently, the final consumers of the greatest amount of plastic.

Microplastics are not just polluting the water itself, they are injuring the organisms in the water as well, something that may seem more relevant to many people. Because of their small body size, lower trophic organisms consume them first. Microplastics accumulate primarily in the water column and float near the surface, right where the lower trophic organisms live. Microplastics are also usually white or yellow and resemble the prey of zooplankton (Wright par. 7). It has been found to simulate a false sense of "full" in many animals, like marine worms, for example. Once microplastics are swallowed, the worms' stomachs feel full, and, consequently, they stop eating, inadvertently starving themselves to death (Law et al, 144-45). Microplastics have the same effect on starfish, suspension feeders, and filter feeders.

Microplastics also cause abrasions as they move along the digestive tracts of animals and are potential carcinogens because of the toxins released when they are consumed. They can affect the endocrine system and various other bodily functions as well. They can also decrease reproductive capability and even allow prey to be caught more easily by predators. However, most frequently, ingestion in large amounts results in creature death (Wright par. 28).

Microplastics have also been found to have a negative effect on photosynthesizers in the ocean, which should be concerning to people because this affects our oxygen supply. Microplastics can result in a physical blockage to algae, covering them from light or preventing oxygen absorption (Wright par. 32). Algae play an important role in not only the marine food chain, but as mentioned earlier, humans' access to oxygen. They recycle our used carbon dioxide, and without this, we could not exist in the numbers we do today on this earth.

In a concerning study conducted by Plymouth Marine Laboratory, scientists radioactively tagged microplastics and looked at how they affected zooplankton, which are one of the primary keystones in the food chain of the ocean. They found that when exposed to microplastics, the zooplankton's feeding and population size decreased significantly (Cole par. 1). Many organisms in the ocean feed on zooplankton, such as many species of fish, and mysticete, or baleen whales, depend solely on them.

Microplastics not only affect zooplankton populations but those of all their predators as well, which eventually includes us. Because of this chain of events, microplastics accumulate as you move up the food chain, meaning the larger fish that we eat have a significantly larger amount of microplastics in their bodies than smaller fish do (Law et al, 144-45). In fact, 36.5% of the fish from the ten species sampled from the English Channel were found to contain microplastics. It did not matter whether they

were taken from deep or shallow water. Most of the particles were from polyamide and polyester, degraded from fishing supplies left in the sea. The majority of the fish had at least six particles in their stomachs. The most common species of fish that was caught, Myctophidae, is usually eaten by squid, tuna, and toothed whales, two of which humans frequently eat (Wright par. 44).

To date, little has been done in the global theater to address the problem of microplastics. One small step is the development of the app "Beat the Microbead." It allows Dutch consumers to check and see if the product they are buying contains microplastics or not. Also, in the United States, Illinois has become the first state to ban microplastics in all of their commercial products. However, this law will not take effect until 2018 or 2019. Potential laws are also being considered in California, New York, Ohio, and Minnesota (Steinmetz par. 2). While efforts are being made to try to clean up the large plastic problem in our oceans, their adaptations are slow. Recently, a nineteen-year-old Dutch boy named Boyan Slat invented a way to try and clean the larger plastic waste in the Great Pacific Garbage Patch. This is a patch the size of Texas floating in the middle of the Pacific Ocean. His plan is to anchor a multi-mile-wide net into the sea floor in the middle of each of the five gyres in the ocean. The rotating currents would push the trash into both sides of the net and would collect about twenty billion tons of waste (Clusky 23). Sadly, this does not address the microplastic problem, and would also catch fish, so it is something that inventors are still grappling with.

The real roadblock for saving the ocean from microplastic pollution is the public itself. Many people are now becoming frustrated with the lack of both willingness and effort to try and save our oceans. After interviewing Zehra Cheatham from the CU chapter of the Colorado Ocean Coalition Club, I found that she and many others are getting increasingly

frustrated. She said her club focuses mostly on "fixing human behavior, but has met a significant amount of resistance" (Cheatham). I found that the problem she has been grappling with is trying to reduce the amount of plastic drinking-straw use because they are single-use plastics in our everyday lives. She described a specific experience she had on July 11th of 2017, or 7/11 Day, when the gas station chain gives out free slurpies, and straw use is particularly high. She passionately said, "One guy refused to use the paper straw we were providing because he 'couldn't chew on it'" (Cheatham interview). This petty and selfish reason only begins to show the ignorance of so many people. Something as simple as using a paper straw is impossible for many, and this is the biggest problem our ocean faces.

If people cannot be compelled to change their habits by information and facts, then there is little hope for our ocean. My impression was that the pure emotion and frustration felt by many was clearly expressed in the manner in which Brooke Elzweig explained the work of her club, the Colorado Ocean Coalition, to our class. I found that, at times, she could hardly find the words to express the importance of her club's work and seemed to have to pause to think about how to phrase something accurately. The issue of losing the ocean to microplastic pollution is not something to be taken lightly because it encompasses the future of our species as a whole. Without oxygen to breathe, water to regulate our planet's temperature, and food to eat, we are truly lost as a species.

It is frightening how people can choose to be ignorant to issues clearly expressed before them. After receiving the PowerPoint from the club's meeting on November 7th because I could not attend it, I found their mission statement. It is, quite literally, "To inspire college students to care about the ocean even if it is out of sight and out of mind" (Powerpoint slide 2). Yet even despite this club's efforts to educate students about ocean issues, not much is changing. A quotation

from the Dutch philosopher Bernard Mandeville, who lived from 1670 to 1733, fits the situation well. Mandeville believed that humans' "selfishness always dictate[s] their actions" (Mandeville). The only way that people will ever care enough about microplastics is when it really begins to have a visibly negative effect on their daily lives. They will not care about an issue unless it affects them directly, because by nature people seem to be selfish that way.

The only way to save our oceans is to do so forcibly, and in my opinion, the only way to do so is to change international legislation. This way, people would legally be obligated to recycle their plastics and industry would be forced to produce products that do not contain microplastics. If people are continuously presented with the facts about how the ocean is falling apart and yet still choose to ignore the warnings and be oblivious to its degradation, the only remaining option we have is to change the law because as time for our oceans, and us, is running out. Even though science backs the clear and present danger of plastic pollution, it is clear that there is still opposition to it. As Brooke Elzweig said in her class presentation, "Our current president, Donald Trump, refuses to even acknowledge that global warming exists in the first place." The leader of the free world ignores the science advancing the agenda to clean the ocean for the next generation and denies the need for change. As Martin Luther King, Jr., once famously said, "Nothing in the world is more dangerous than sincere ignorance and conscientious stupidity" (King). This is even inscribed in the walkway entering the south side of Norlin Library on CU's campus. If politicians and students alike continue to ignore everything the Colorado Ocean Club and scientists try to educate them on, our Earth and oceans might not have a future for much longer.

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U.S. Energy Industry Regulation: An Economic Analysis

By Matthew Burley

For the majority of people, it doesn't matter what makes their phones turn on or cars go down the highway. But, the truth is that there are thousands of methods that harness power from nature, each with its own pros and cons. The viability of these energy sources depends on a variety of economic factors such as scarcity, cost of production, and ease of distribution, but each can be affected by federal regulations. The American energy infrastructure is reliant on fossil fuels to heat/cool houses, provide transportation, and generate electricity, but hysteria over human-caused global warming has triggered an anti-fossil fuel movement. The most prominent arguments against the continued use of fossil fuels cite the potential social and ecological impacts of climate change. However, proponents of the oil and gas industry argue that it stimulates the American economy by providing jobs and cheap energy. The back-and-forth argument is indicative of policy actions over the energy industry. In the past eight years, the Obama administration implemented regulations on the fossil fuel industry, intended to curtail economic cost from environmental damage and pave the way for alternate energy sources. Then, on March 27, 2017, Executive Order No. 13783 was released, which rescinds, revokes, and revises virtually all of Obama's regulatory energy policies. Though deregulation may be useful in some sections of the economy, deregulation of the energy sector will present more complications than just carbon emissions. The Executive Order on "Promoting Energy Independence and Economic growth" will stifle the American renewable energy economy and disregard the monetary repercussions of fossil fuel

industry. The Trump administration's executive order claims to promote energy independence and economic growth, but the effects from deregulating the coal, oil, and gas sectors will actually cause economic harm in the form of job loss, environmental clean-up costs, and renewable industry decline.

Executive Order No. 13783 is one of the first movements by the Trump administration to deregulate the non-renewable energy sector. The order calls for "review of all actions or policies that potentially burden the safe, efficient development of domestic energy" (Exec. Order No. 13783). The policy rescinds multiple Obama administration's orders and memoranda, which targeted pollution within the power sector, took action against effects of climate change, and looked to preserve natural resources. The energy independence order also calls for all agencies to review and suspend any policies that stem from rescinded ecofriendly executive orders. At the same time, the Executive Order allocated more federal land for the production of fossil fuels. Furthermore, the Clean Power Plan, a keystone of the Obama administration, will be abandoned. The order then instructs its federal departments to remove the social cost of carbon from consideration during policy making. And, lastly, the order halts any litigation over regulations that were voided by EO 13783 (Exec. Order No. 13783). Donald Trump describes his rationale for the policy as "taking historic steps to lift restrictions on American energy, to reverse government intrusion, and to cancel job-killing regulations" (Volcoici 2).

The Trump administration has made its free-market directive for the energy sector perfectly clear. Throughout his campaign, Donald Trump promised

to bring back "Clean Coal," kill the Climate Action Plan, and utilize America's vast fossil-fuel reserves, a popular stance among fossil-fuel production towns. Consistent with his good business relationships with large oil and coal companies, Trump stacked his executive cabinet with big-oil executives. Most notably, Rex Tillerson, executive for ExxonMobil, was selected as Secretary of State (Eilperin 1). Also, Rick Perry and Scott Pruitt, oil and gas allies, earned positions as heads of the Department of Energy and Environmental Protection Agency (Eilperin 1). At the same time, Donald Trump has spent a great deal of time denying the existence of climate change and its effects – another stance welcomed by fossil fuel advocates. The current administration's bias toward deregulating fossil fuels is evident, and it is not met with total contempt. Support for the deregulating executive order comes mainly from those involved in the fossil-fuel industry. Pro-oil organizations, such as the American Petroleum Institute and American Coalition for Clean Coal Energy, show support by citing "potential" devastating impacts from the Clean Power Plan (*"What they are saying"* Par. 7). Politicians from fossil fuel producing states also issued statements applauding the Executive order. West Virginia Senator Shelly Capito claims the executive order will grow America's manufacturing sector and ensure access to affordable energy (*"What they are saying"* par. 1). Governor Matt Bevin issued a statement asserting that the "order will roll back former President Obama's job killing and deceptively named 'Clean Power Plan'" (*"What they are saying"* par. 2). The most prominent voice advocating for the executive order comes from oil and coal-producing states. Also, supporters for complete deregulation of carbon emissions generally deny or disregard the effects climate change. Instead, they chose to place value in more immediate concerns such as business operations or careers. Deregulation supporters welcome the Executive Order over concerns about fossil fuel job decline, the cost of

energy, and immediate profits.

The opposition to the order is largely associated with a belief in human-caused climate change. Global warming is a big-ticket item for the Democrats, and the Executive Order has upset much of the party. New York Democrat Senator Charles Schumer summarized the liberal opinion to the *Washington Post*: "It's pretty clear that the bottom line of oil companies is going to take precedence over clean air and water protections for American families" (Eilperin 2). Environmental policies are a large part of the Democratic policy agenda, which is now undermined by the new administration. The executive order generated an outcry among the scientific community as well. On April 2nd, large groups of scientists marched in over 500 different cities "in defense of the role of science in policy" (*March for Science homepage* par. 1). The protest aims to bring awareness of global warming and protest the recent deregulatory policies. Despite fierce displays of disapproval, Trump and his constituents continue to push policies that deregulate fossil fuels, raising an alarm amongst environmentalists and scientists alike.

Contrary to presidential claims that coal-mining jobs will be saved, the waning coal industry is unlikely to create many long-term jobs. One of the largest motivations for the executive order is to stimulate employment, particularly in the coal sector. There are communities throughout rural America that have thrived on the coal and oil industry. Though coal mining and processing is not a glamorous job, it does pay the bills. But, the coal industry has been on the decline for the past decade. The total energy produced by coal in the U.S. experienced a drop of 43 percent from 2007 to 2016 (*2017 Annual Energy Outlook* 7). This can be attributed to coal's decrease in economic viability compared with natural gas, which is replacing coal due to an increase in natural gas reserves. Increasing quantities of known natural gas reserves drives its cost per kilowatt below the cost of

coal. To stay relevant, coal industries have turned to automation. This automation trend greatly reduces the number of mining and processing jobs. An analysis of the EIA Annual Coal Report by Brookings Institute revealed that, from 1980 to 2009, the coal industry lost around 55 percent of its work force while gaining 23 percent productivity in the same time period (Saha 1). Most of the machining and processing involved in the coal industry is quite programmable. And machines don't need to be paid. Even were coal were to make an economic resurgence, all of the miners wouldn't get their jobs back. The Executive Order will not deliver the job-saving deregulation it promised because the jobs will no longer be there.

The Executive Order's real impact on employment will be negatively inflicted onto the industries that have flourished under strict carbon regulations. Under President Obama, the renewables energy industry employment rate has soared far above that of the fossil fuel industry. For instance, solar electric power generation workforce grew by 25 percent just between 2015 and 2016 (*U.S. Energy and Employment Report 8*). Wind energy also saw a 20 percent employment increase during the same time period (*Renewable Energy and Jobs-Annual Review 8*). Rapid growth in renewable energy sectors provides promising future employment prospects. The International Renewable Energy Agency estimated that the renewable sector would provide 24 million jobs by 2030 (*Measuring the Economics* 42). These industries were able to grow because of the regulations in favor of cleaner, sustainable energy from the Obama Administration. Renewable technology received federal funding and general encouragement from the nation to improve upon sustainable energy sources. Advanced technology prices dropped fast, making renewables more economically competitive. However, the new administration's order for the repeal of previous clean energy policies will limit the growth of these job-

creating industries.

Furthermore, the Executive Order will overlook costly externalities from fossil fuels by removing social cost of carbon from consideration for energy-related legislation. The social cost of carbon is the term describing an estimate of the economic cost of one ton of carbon dioxide. The most commonly used model used by research groups and governmental agencies is the Dynamic Integrated model of Climate and Economy, or D.I.C.E. (Nordhaus 1518). This model estimates the costs of additional units of atmospheric carbon based on a multitude of economic variables gathered from the most recent economic data. The variables include social welfare functions, climate investments, damages and mitigation costs, historical growth estimates, global climate change, emission data, and numerous others (*The Social Cost of Carbon* 2). William. D Nordhaus, a Yale professor, uses the D.I.C.E model to calculate the social cost of carbon. He calculated that the S.C.C. was 31 dollars per ton in 2016 with a 2.5 percent growth rate per year. Though this number seems small, industrial carbon emissions are projected to rise to 60-billion tons per year by 2050 (Nordhaus 1520). That estimate represents a 1.8-trillion dollar cost per year for carbon emissions. The amount will never be paid in full, but the damages will add up, slowly but surely. The D.I.C.E. model provides important perspective about the economic effects of carbon. Removing this metric from consideration will allow lawmakers to overlook long-term costs from carbon emissions.

Analysis of environmental cleanup cost, a common factor in the calculation of the social cost of carbon, informs policy makers so that future accidents may be avoided. Mining and processing fossil fuels can be hazardous, and not just to the environment. For example, in January 2014, a Freedom Industries coal processing plant leaked 7,500 gallons of chemical foam into the Elk River in West Virginia. 4-Methylcyclohexanemethanol or MCHM, a chemical

foam, is a common agent used in the processing of coal for metallurgic uses (Thomasson 197). The contamination spread throughout the water supplies of nine counties, leaving 300,000 residents without access to fresh water. The residents were unable to use their tap water for up to five days. The surrounding hospitals received over 2,000 calls reporting symptoms of MCHM ingestion in the following weeks (Thomasson 199). The Elk River chemical spill led to a state of emergency in the counties it affected. Lindsay Freidman, a writer from the Ohio University Water Project, reports that households had to pay out of pocket for bottled water and residential pipe system flushing. Also, schools, businesses, and restaurants were forced to shut down for weeks – many of which didn't recover (Friedman 2). The Center for Business and Economic Research estimated that the spill cost 61-million dollars, without consideration for cleanup and state of emergency disbursements (*Impact from Chemical Spill into Elk River* 1). A crisis like the Elk River chemical spill is the reason the social cost of carbon is used. Without it, there is no metric to account for these externalities, leading to uninformed policy-making and unexpected costs.

Indirect consequences of carbon emissions, such as rising global temperatures, will have economic impacts in nearly every coastal state. The average temperature of the earth is rising. Since 2000, the earth has seen the ten hottest years over a 136-year one hundred and thirty-six year span. The atmospheric warming of oceans causes ice to melt in the arctic regions and thus sea level rises. Florida is experiencing accelerated sea level rise, causing coastal flooding like never before. The rise in sea level breaks down coastal barrier islands, accelerating shoreline erosion (*Climate Change and Sea Level Rise in Florida* 7). The shoreline erosion allows for salt water to seep into important wetlands, such as the Everglades and The Big Bend. The increase in salinity shrinks the wetlands and replaces them with water bodies and

salt marshes (*Climate Change and Sea Level Rise in Florida* 8). Wetlands perform important duties such as water filtration, carbon storage, pest control, and flood protection. Without wetlands, time and money must be spent to complete these duties. In addition, the sea-level rise and increased flooding will fatigue buildings, roads, and other infrastructure, forcing costly expenditures to revitalize failing infrastructure. Severe impacts have been projected for numerous airports, prisons, schools, historical landmarks, and real estate. Around 2.4 million people are at twice the risk for storm surges reaching their homes (Straus np). For the 76 percent of Florida residents who live near the coast, rebuilding infrastructure or relocating are the only options. Though some may argue that coastal reconstruction will create jobs, the employment will be only temporary and will not outweigh the replacement value. In 2010, the Florida coastal infrastructure was valued at two trillion dollars (*Climate Change and Sea Level Rise in Florida* 11). Two trillion dollars is a tough economic blow to replace infrastructure that is already built. Fossil fuels, and their carbon emissions, come with serious economic consequences that affect entire communities, both directly and indirectly. The social cost of carbon is a necessary economic tool that helps account for expensive disadvantages of carbon-based fuels and takes action to prepare for changes in climate.

Another unfortunate economic aspect of Executive Order 13783 is the decision to dismantle the Clean Power Plan, which focused on transitioning the United States to away from carbon-based fuels. This abandonment is sure to put American renewable energy industries years behind its competitors. The renewable energy market is fast-moving and competitive. It will continue to grow with or without the participation of the United States. In 2016, the U.S. attended United Nations Framework Convention on Climate Change and signed the Paris Agreement. Here, hundreds of nations agreed to work in conjunction to limit global temperatures to two degrees Celsius

above pre-industrial levels. This inspired the Clean Power Plan to aim for 28-percent cut in emissions per GDP by 2030 (*“Transforming Our Energy System”* 3). In order to attain this goal, The United States recognized the need to transition to renewable sources. Adhering to the agreement, the U.S. implemented subsidies and policies for expanding renewables and curbing emissions. The implementation of the Clean Power Plan included funding for over 100,000 projects in renewable energy generation across the country. The primary goals of the projects were to scale up renewable energy generation, modernize the grid, and drive costs down (*“Transforming our Energy System”* 4-6). The U.S. stood poised to hold a competitive role in the global renewable energy industry. However, the executive order’s decree for the abortion of expressive governmental support for clean energy portrays little desire to compete.

The withdrawal of the Clean Power Plan will effectively place our energy economy at a disadvantage compared with our foreign competitors. One-hundred and forty four other countries have ratified the Paris Agreement and are taking steps to reach the assigned emission goals. Countries that can improve renewable prices and scalability will rule the global energy market. The most notable of these countries are the number two and three emitters : China and India-The two powers making strides to meet their pledged goal. For instance, by late 2016, India had already met 11 percent of its 100 gigawatt solar goal and 49 percent of its 75-gigawatt wind goal (Schmidt 2). India also made the decision to cancel the construction of four coal-fired power plants on account of the nation’s massive solar initiatives reducing the price of solar energy to record lows at 0.04 dollars per kilowatt (Schmidt 2). Meanwhile, China is poised to be the global leader in hydroelectric, solar, and wind energies. With over 100-billion dollars of global annual investment, China accounts for one third of clean-energy investment worldwide

(Buckley 6). The Chinese currently lead the world in solar cell manufacturing because they provide the least expensive product. Numerous other countries have begun making massive changes to energy infrastructure to reduce emissions in accordance with the Paris agreement and thus gradually advancing to renewable energy. This global change toward profitable renewable energies will move on without the United States if it decides not to participate.

Global trending toward clean energy will impact the worldwide demand for fossil fuels. Though America’s fossil-fuel energy exports are projected to grow, the demand for carbon-based fuels will decrease as nations implement more renewable technologies. Unfortunately for the United States, countries that switch to renewables will no longer need to import fuels like coal or natural gas. This is already the case for the declining coal industry. The United States coal exports dropped from 59.6 megatons to 41.9 megatons from 2013 to 2015. Coal is unlikely to be a profitable export, however, the United States natural gas energy exports are predicted to rise in the coming years (*2017 Annual Energy Outlook 18*). But, in the current economy, pressurization and transportation expenses for natural gas are too high to be feasible. These natural gas exports will not be permanent. As renewable power sources become more affordable and applicable, the international demand for imported energy decreases. With renewables countries could sustain all of their energy needs. So as the rest of the world is actually gaining energy independence, the U.S. will fall behind in the global energy market and watch as its largest economic rivals lead the world in renewable energy.

From an energy-production standpoint, endorsing fossil fuels makes little economic sense when compared with its renewable counterparts. The policies enacted by Executive Order 13783 stimulate unsustainable industries. The oil industry is experiencing an increase in federal land allocated

to drilling and mining and the removal of carbon restrictions and removal of efficiency requirements. Meanwhile, the economically viable renewable energy sources are expected to see large increases in the next twenty years, with or without the Clean Power Plan. However, by 2020, the Trump administration’s energy plan will generate 200-billion kilowatt hours per year less from renewable energies when compared to the Clean Power Plan (Krauss, 3). The discrepancy comes from reduction of federal subsidies for clean energy research and infrastructure expansion. Note that decreased sustainable energy production isn’t the only issue with changes to the American energy plans.

The policy decision to ease regulation upon the carbon-emitting energy sources will be more expensive than allowing renewable energy infrastructure to expand. The term “non-renewable energy” perfectly represents fossil fuels. Fossil fuels must continually be mined, transported, drilled, pumped, processed, and distributed. Every expensive procedure in the supply chain catalyzes further carbon emission and pollution – thus compiling more social costs. Then, during production, combustion-based power plants must ramp the output up or down to meet energy demand. Ramping processes decrease the cumulative efficiencies of the power plant and sometimes cannot match demand – thus wasting resources. Ramping and other fossil-fuel production steps impose relentless costs that compile throughout the fossil-fuel supply chain. Over time, non-renewable energies will cost more to produce because of the cyclic nature of mining, processing, burning.

Renewable energy has a very low operation price tag in comparison to non-renewable energy sources. Initial research, infrastructure, and maintenance are all that is needed to progress renewable energy. Once it is created, there is little cost thereafter for the lifetime of a renewable unit. For instance, solar panels might have a higher initial cost, but over the 30-year lifetime of solar panels, there is

practically no maintenance cost (*EcoMark Solar*). In addition, due to heating/cooling costs and daytime activity the energy production of solar panels matches the peak hours of energy uses. In California, so much energy is generated during the day, that prices actually fall into the negatives (Weaver 3). Initial prices for residential and commercial installation are dropping, too. NREL researchers found that the median price of photovoltaic system installation in the U.S. dropped 55 percent between 2007 and 2013 (Feldman 5). At that rate, clean energy will capably satisfy the U.S.’s energy demands at a low cost. There is enough solar energy falling on the earth’s surface at any time to power every country hundreds of times over. It would be a shame to allow all that energy to simply go to waste. Why dig in the ground to find what is already falling on your face? The logical gap between the title “Energy Independence and Economic Growth” and the Executive Order’s goal of increasing fossil fuels usage is obvious. It focuses on becoming dependent on fossil fuels while advocating for an energy source with long-term leeching costs.

Finally, the common view that regulation stifles innovation is flatly wrong when we consider the recent technological progress in the renewable sector. The previous regulation of hazardous energy collection methods worked to stimulate competition and ingenuity for cleaner and sustainable energy sources and collection methods. The Obama administration catalyzed over four-billion dollars in renewable innovation commitments, from foundations and corporations. During his presidency, this money was used productively, yielding massive technology advancements. For example, in 2011, the Department of Energy put forward the Better Building Challenge. Since then, the challenge participants have saved 27,500 gigawatt hours of waste energy (*“Climate Change”* 3). In addition, solar power gained the attention of both governmental and private sectors. This resulted in unprecedented efficiencies of solar

panels reaching upwards of 45 percent (NREL 1). Technologies such as quantum dot solar cells have more than tripled in efficiency thanks to private industries (NREL 1). What's more, a team of MIT researchers recently reported the successful creation of a solar thermophotovoltaic cell with a theoretical efficiency of up to 80 percent. This is due to carbon nanotubes, which funnel waves from the entire electromagnetic spectrum in to crystals. These crystals heat up to extremely high temperatures, then reemit the energy as light of a wavelength matching the solar cell's band gap (Temple 3). Though the details of every scientific stepping-stone may seem boring, they are the reason our lives are so technologically optimized. It seems only logical to allow regulation to continue inspiring scientific progress that changes how we produce energy by lowering cost and increasing efficiency.

Government regulation of efficiency and emission produces valuable and cost-cutting improvements to transportation sector. The Obama administration established fines for auto manufacturers that do not meet fuel-efficiency standards. This approach has been instrumental in the improvements to fuel economy in recent years. The average fuel economy for cars in America has risen to 36.4 MPG, on track for the goal of 54.5 MPG in 2025 (Fischetti Par. 3). This also stimulated the electric car industry, eventually allowing Tesla to become the most valuable car company in the United States. An increase in fuel efficiency results in positive externalities for consumers, who can get further per tank of gas. Cities become less polluted with smog. But, the abandonment of these regulations will remove the pressing incentive for motor companies to innovate. Advancements in clean energy technologies are often the byproducts of a government that is supportive of creating sustainable energy independence. However, it appears that the luxury of government support is no longer guaranteed for scientists, researchers, and engineers looking to

improve how Americans produce energy.

Everyone has heard the classic environmentalist argument that climate change will render the world unsuitable, causing mass extinctions and drastic changes to our way of life. This old-hat argument has been relatively easy to combat with scientific skepticism and personal beliefs. However, this executive order has a clear directive of easing the regulations on non-renewables by disregarding certain emissions and their subsequent effects. Though supporters deny the different aspects of the climate change argument, they don't consider the economic harm imposed by deregulating fossil fuel industries. The long-term costs of carbon-based fuels are evident through economic analysis. The Energy Independence and Economic Growth Executive Order creates a missed opportunity for American energy and manufacturing industries, while ignoring clear red flags from the fossil fuel industry. Why surrender the largest global market to our largest economic rivals? Why overlook the costs of environmental clean up? Why favor coal industry employees to renewable industry employees? The new American energy policy is not the right fit for the nation. For American, being number one is important, but being the right number one is paramount. Take the time to consider if you want to be left behind in the energy revolution.

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Black Box Diagnoses: Why Neural Networks Cannot Replace Doctors

By Mark Hinkle

Introduction

Artificial Intelligence (AI) has not only shown overwhelming potential for analyzing data and predicting future outcomes, it is also currently shaping the future of how modern societies will function and address a variety of problems. This technology is currently implemented in a wide variety of fields, ranging from rather trivial applications, such as creating movie recommendations, to more considerable ones, such as interpreting handwritten checks at banks. AI systems have recently been shown to successfully and accurately predict illness in a variety of patients by simply analyzing patient records and drawing conclusions based on factors such as family history, lifestyle habits, and environmental factors. Studies have shown that the accuracy of these machines has reached a point that they are better at predicting disease than a human doctor, especially in obscure areas such as mental illness (14). These trends seem to suggest that artificial intelligence is set to replace human doctors entirely, to not only save money but to give patient analysis on a level that most human doctors are not currently able to provide.

Unfortunately, there exists one major flaw with this potential future: we don’t know how they work. The systems that are currently being implemented in this medical analysis are known as neural networks; they are chosen because they can quickly be trained to analyze information they have never seen before with a high degree of accuracy. The problem lies in the fact that because these networks are constantly altering parts of their programming via machine learning, it becomes impossible for a human to look at the code

and understand why it is reaching the conclusions that it is. Because the AI sees only raw data, the bias of the system is often configured in a way that does not correlate to a typical human thought process; plus, this bias gets reconfigured every time a calculation is performed. The network becomes somewhat of a “black-box,” where the path from input data to output result has no justification or explanation (3). In other applications of neural networks, this mysterious decision-making process is typically ignored because the network can regularly generate accurate data; however, in the medical field, this becomes a much more important issue.

In 2012 alone, medical malpractice accounted for over \$3 billion in payouts from lawsuits (12). Patient misdiagnosis is a huge concern that can cause medical practitioners to lose millions of dollars and possibly their careers, as well as putting innocent lives at risk. But, imagine that neural networks begin diagnosing patients, determining medication needs, and predicting the likelihood of developing future illness all on their own. How can a person justify early treatment for Alzheimer’s, averaging over \$3000 per month, when the disease was predicted by a computer algorithm which has no explanation why? Miscalculations are bound to exist in any neural network or software system for that matter, but in this field, these errors will be directly affecting the lives of the people who are meant to be helped. These networks have the potential to develop subtle prejudices that would remain hidden from both doctors and programmers until there is direct proof they are making mistakes. Additionally, the ability to place blame becomes much more difficult when misdiagnosis

is coming from a computer algorithm that has no way of explaining its thought process. It is because of this indecipherable decision-making process that neural networks are not ready to be used to diagnose patients or determine medication needs on their own; in their current state, they can only be used as another diagnostic tool that can be used by human doctors to help treat patients.

Background

Artificial intelligence is a broad term that is used to refer to computer programs and systems that can process information similarly to the way humans do. These systems use past data in combination with predictive algorithms to analyze new information, even if this information is completely unfamiliar to the program. The way this is achieved is through a process referred to as machine learning: a method of data analysis that lets the program build and rebuild its analytical model based on the information it receives. This concept employs basic pattern recognition, where similar inputs are treated alike based on what characteristics they share. As more computations are performed, the program creates a more accurate model of how to interpret the data by recognizing what patterns to look for. This iterative process is the fundamental concept of artificial intelligence, essentially giving programs the ability to learn and improve as they process data (5).

This machine learning is implemented on many modern applications through a design known as an artificial neural network. These networks are created to closely model the way that neurons process information in the human brain. Their effectiveness comes from the fact that the nodes within them operate rather simply, but the connections between them create a complex structure that can process a large amount of data. Typical programs carry out functions in a linear manner, where inputs are received, manipulated, and passed on to a subsequent function as an output.

Neural networks instead create a mesh of functions, where the inputs are actually a collection of outputs from other functions that are running simultaneously. These functions are referred to as software nodes, which consider several pieces of data to create a single numerical output (*Fig 1, Fig 2*).

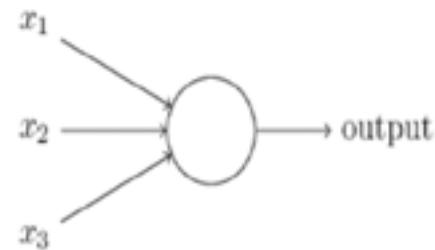


Fig 1: Visualization of Software Node (6)

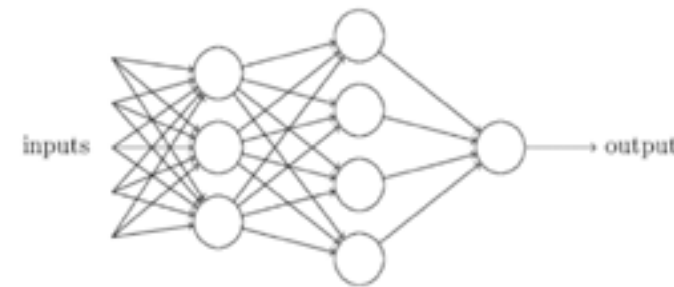


Fig 2: Visualization of Connections Between Nodes (6)

The interconnections between nodes form a base for artificial neural networks; however, they are not enough for true decision making to be performed. Connections must be given weighted multipliers so that inputs can have varying degrees of influence on the downstream decision. If the collective sum of these inputs on the downstream node exceed some threshold value, the node becomes activated and will affect the other nodes in the system; otherwise, it remains dormant and discontinues that specific path in the network. These multipliers and thresholds create what is known as bias in the system. This bias is what allows a neural network to be adapted to some particular task; it refines the input in a way that produces a result that we expect or are trying to achieve (6).

Setting bias in the system manually offers

the most control and understanding of the outcome, but in networks containing even a handful of nodes it is much easier and more effective to use machine learning so the system can set these values on its own. This is done by giving the system examples of information it is likely to receive and then informing it what the desired output is. Unlike the human brain, where signals travel in a single general direction, this training process moves data back and forth through the network to allow the bias to be properly corrected. Neural networks constantly iterate this process during unsupervised learning so that every computation refines the accuracy of the system more and more (5).

These systems are currently being implemented in predictive diagnoses of specific diseases and are yielding a high degree of accuracy. A 2011 article in the *International Journal of Computer Science Issues* describes the use of artificial neural networks for diagnosing heart disease and acute nephritis disease. By using only 90 patients' worth of data to train the system, researchers were able to diagnose the risk an additional set of 30 patients with over 95% accuracy. This network was incredibly simple, measuring only 6 inputs with just 2 layers of software nodes, but quickly recognized patterns in the medical records it received (9). Networks such as this are currently being expanded to provide comprehensive diagnoses for a patient with a unknown variety of medical problems.

Developing Invisible Prejudice

One of the most frightening aspects of being unable to interpret a neural network's bias is the fact that it can give preferential treatment to data without our being able to notice or understand why. It is not uncommon for this type of artificial intelligence to stray from its intended purpose and develop patterns that it was never trained with. Take, for example, Microsoft's "Tay" AI chatbot; in less than 24 hours, users were able to give it a viciously racist bias simply

through twitter conversations with the bot. The machine learning algorithm in this neural network was intended to give "Tay" diction and word similar to that of a modern teenager, so it was highly sensitive to the speech people used in their conversations. Unfortunately, a large group of internet users were aware of the weakness in machine learning and began to feed the bot examples of anti-Semitic and xenophobic speech which it quickly began to emulate (7).

Obviously, this amount and type of deviation would not occur in neural networks used to diagnose illness, but this does illustrate that machine learning can cause an AI to diverge from the way it was initially trained. Advocates of neural networks are likely to point out that this entire problem can be circumvented if the system is only allowed to retrain itself when being monitored during supervised development. This way, the network is more likely to stay on its intended task because no machine learning would occur when analyzing new patient information; however, this almost defeats the purpose of implementing neural networks altogether. The intended goal of these programs is to recognize patterns in data that humans and other programs simply cannot, and if they are not allowed to refine their bias from new information, then it is unlikely that they will expand human's ability to accurately diagnose disease. Supervised training requires the developer to know both the inputs and outputs, meaning that it was calculate data in a way which we somewhat already know. Unsupervised training allows the network to group input data together on its own and understand the information in a way that is distinct from any other method of analysis, which seems to be the reason this technology is being applied to medicine in the first place (11). Error will exist regardless of how the system is trained, but neural networks will be unable to live up to their full potential if their extraordinary learning ability is cut short before ever leaving the factory.

Another instance of this prejudice with more grave consequences is the Northpointe Risk Assessment program, created to predict the likelihood of convicted criminals committing a crime in the future. This program generates an integer between 1 and 10 based on the criminal history and background of an individual; the higher the number the more likely that person is to become a repeat offender. Although it was created with good intentions, the accuracy of the predictions was 61% – a level slightly better than pure chance, yet it was still widely adopted in courtrooms across America. To make this decision even more foolish, the algorithm was far more likely to give lower scores to white individuals than blacks, even though race was never directly considered by the program (1). An analysis of this tool by the company ProPublica shows just how severe this racial prejudice was in Broward County, Florida (*Fig 3*).

	WHITE	AFRICAN AMERICAN
Labeled Higher Risk, But Didn't Re-Offend	23.5%	44.9%
Labeled Lower Risk, Yet Did Re-Offend	47.7%	28.0%

Fig 3: Statistics on Racial Bias in Northpointe's Risk Analysis (1)

This seems to create somewhat of a contradiction, though. The ability for neural networks to set their own biases and preferences is literally how they operate and also what makes them so powerful. Through pattern recognition alone, these AI systems can recognize trends and create calculations based on those trends, but this raises an important question: when are these stereotypes justified in the decision-making process and when are they simply prejudices that do not reflect any real pattern in the context of the decision? Because we have no idea what patterns these neural networks are recognizing, the simple answer is we don't know. A study in the *Journal of the American College of Radiology* found that there is a major correlation between rheumatic heart disease

and the place a person is from. People from specific regions of Kenya are more than twice as likely to get this disease than an average person, but without a complete set of patient data, a neural network may assume this includes the entire country or even the whole continent (13). Without proper explanation or supportive research, these perceived trends cannot be entirely trusted because they may contain fundamental flaws in their logic.

Because there is no way to efficiently look at the software behind neural networks, the only way to prove that these prejudices are incorrect is direct evidence that they are wrong. The less severe that the miscalculation is, the harder it would be to detect it if the network was not constantly compared to other diagnostic tools. If AI is the only resource being used to treat patients, these false assumptions could result in years of misdiagnoses before there is enough evidence to prove that inaccuracies exist. This categorization of data can cause some major logical fallacies in neural networks, providing reasoning as to why their use in medicine needs to be checked and balanced by other medical tools that are currently in place.

Unclear Liability

Another complication that comes from taking advice solely from a computer program is understanding who is responsible when these predictions become inaccurate and unreliable. In a typical medical setting, a doctor who is misdiagnosing patients would be held fully accountable and likely sued for medical malpractice. In 2014, a healthy 34-year-old woman, Kim Tutt, was diagnosed with cancer in her jaw and was predicted that she had only 6 months left to live. She underwent radical surgeries involving severe facial reconstruction to stay alive, only to discover that she had been misdiagnosed and never had cancer to begin with. Tutt was able to sue her practitioner for \$250,000 because it was obvious that their mistake resulted in massive trauma and

permanent disfiguration (4).

But imagine now that this same diagnosis had been made by a neural network, where a computer program is what suggested that Tutt had a malignant tumor threatening her life. Without having a method in place to confirm this prediction, there are huge risks for the patient and an unclear way to determine who is at fault. Would it still be the healthcare provider's responsibility because they trusted the AI, even though it is regarded as a valid medical tool with predictions that are typically reliable? Perhaps it would be the fault of the programmers and developers for improperly building the program since it did not properly account for this woman's circumstances? It is likely that most of the blame would fall on the shoulders of doctors' or hospitals that are providing this diagnosis for patients, for they would be forced to take responsibility for the services they provide. Just like a malfunctioning X-Ray or MRI, it is the duty of the medical facility to assess the functionality and trustworthiness of all the tools at their disposal. This means that healthcare providers would have to take on the liability for a system that could develop inaccuracies on its own, risking a malpractice lawsuit, which currently average settlements of over \$400,000 (12). The simplest way to circumvent this problem is to implement checks and balances so that the use of an AI system can be balanced with conventional diagnostic tools to detect outliers right away.

The core of this issue stems from the fact that error can occur in neural networks without being caused by any human error at all. In a typical program that is giving inaccurate data, programmers can look into the script and detect where errors are occurring. Every line of code was designed by a human to fulfill the purpose of the program, meaning that errors can be blamed on the person who wrote the malfunctioning part of the program. In neural networks, the computational model is being rewritten by the program so often that even a flawlessly designed

system can still develop errors on its own. This suggests that these faults can only be blamed on how neural networks fundamentally work; however, when these mistakes harm human lives, this excuse simply does not cut it. These errors are something that must simply be accepted with neural networks, and without an effective way of allocating blame, there is no way to justify them being the only analysis tool for patients. Viewed as another medical tool, the liability would fall entirely on medical practitioners, but at the same time, they would gain a powerful method of diagnosis that can suggest treatments that might not typically be considered.

Why Humanity Matters

The previously mentioned examples and reasons have all suggested that error in neural networks is something that is simply unavoidable, and because we have not yet developed a method for overcoming this error, there is no way that society can fully trust diagnoses by these AI systems. What has yet to be mentioned is that fact that human error is also something that is truly unavoidable. The previously mentioned statistic on annual settlements in medical malpractice cases prove that even human doctors are likely to make miscalculations and have errors in how they analyze patient records. This raises the question, why is human error preferable to error in artificial intelligence, especially if neural networks are beginning to outperform human doctors in diagnosing certain diseases?

One of the most notable distinctions is the amount of training and experience that each party has. All practicing medical doctors are required to complete at least four years of pre-med and four more years of medical school. On top of this, they are required to complete a residency program so that they can receive personal guidance from a current practitioner in their field before they are allowed to consider themselves a doctor (15). This amount

of specified training means that these people are incredibly exposed to common symptoms, causes, and types of illness and disease. Their experience through school assists them in quickly identifying the signs of a wide variety of ailments and developing treatment options that work with the patients they are servicing. Beyond this, doctors are exposed to a wide variety of medical equipment to assist them in their diagnosis and treatment of disease. Their competition, artificial neural networks, are typically exposed to a set of training examples for a few hours with a fraction of the patients that a doctor will interact with during their training (10). The increased amount of exposure that doctors have means that they are more likely to recognize rare and bizarre ailments than an AI system, due to the fact that AI likes to follow trends and clusters of similar outputs. Even if these neural networks could be given every piece of information a doctor would be exposed to, current neural networks do not have the ability to combine these factors into meaningful thought the same way that humans do.

Another key advantage that doctors hold over artificial intelligence units is the fact that they are socially and contextually aware. Although neural networks have the ability to analyze a huge amount of input data, there is no way to feed these systems all the information that a doctor is likely to receive during a patient visit. A human being would be much better at spotting the physical signs of withdrawal from drug use than a computer, which would likely diagnose the patient with a completely unrelated disease with an unnecessary treatment plan. Doctors are also much better at considering things such as socio-economic status, which means that underprivileged patients can be given lower-cost treatment options before resorting to costly procedures that are not guaranteed to work. Human beings have the ability to consider the best statistical option and still justifiably chose a different one to fit the context of the particular situation. Although it is true that doctors can still make

mistakes, even costly ones, their advantages over their inanimate counterparts more than compensate for this imperfection.

Conclusion

Artificial intelligence is a new wave of technology and computing that is clearly here to stay in our modern society. These systems can be applied to almost every field and have the computational ability to perform tasks that would have previously been impossible. One of the most exciting concepts to come from this research is the idea of artificial neural networks, designed to process data similarly to how a human brain would. Unfortunately, just like the human brain, these networks are so complex that their decision-making process is a complete mystery to both users and developers alike. They can develop errors without requiring any human mistakes and make it essentially impossible to discover these errors without direct proof of being wrong. These decisions do not take into account any human emotions or empathy and also make it very difficult to direct blame for inaccurate predictions. Even though these networks have the ability to make medical diagnoses from just patient medical records, they are not yet trustworthy enough to replace a doctor's opinion. Their unique and fascinating computational ability can provide a huge benefit to the field of medicine but in their current state neural networks can only be used as another diagnostic tool for a human doctor to use.

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Active Learning Group Work: Helpful or Harmful for Women in Engineering?

by Megan R. Keogh

Abstract

Active Learning is a trending engineering education technique used at universities across the country. This educational approach fosters students' technical and non-technical skills through group projects that require teams to apply their collective knowledge to solve various "real world" problems. Its collaborative, hands-on nature is appealing to instructors who are interested in better preparing their students for the increasingly complex and dynamic world of engineering. However, group settings have shown to put additional stresses on women in engineering, who are an already marginalized group in STEM fields. In the 2017-2018 academic year, I worked with a small group of researchers in the University of Colorado's Engineering Plus program to investigate how team dynamics in active learning environments affect women's confidence levels in engineering. The results of our study show that many women enjoy active learning because it helps them develop long-term material retention and problem-solving skills, as well as because they find it rewarding to see the effects of their engineering in action. However, women also reported that they face several challenges in team settings, especially being pressured to take on non-technical roles in group projects. In order for active learning group work to realize its full potential, the

challenges that women face in team settings must be addressed in the classroom. If the issues are mitigated, active learning will become an increasingly successful way to prepare men and women for group work in the future.

Introduction

A young woman walks into her first engineering class. She nervously looks around the room and finds only a handful of women in a sea of men. She sits at a table in the back with another woman—there is strength in numbers. The professor says that this class is project-intensive as part of an "active learning" curriculum. The young woman is scared because she doesn't know anything about electronics or manufacturing. She considers dropping the class but decides to stick around for a few more weeks to see what happens.

Weeks pass and the class progresses. The young woman is now part of a student group with one other woman and three men. There is an unspoken agreement that the women will write the reports and keep track of the budget so the men can focus their energy on building the prototype. Both the men and the women are comfortable with these roles.

At the end of the semester, the men walk away from the class having learned valuable skills about

design, trial and error, and collaboration. The women walk away being able to proficiently write a technical report. Neither party leaves having learned all the skills that an active learning program is designed to teach.

The scenario above describes a common occurrence in active learning classrooms. Active learning is a trending engineering education technique that fosters students' technical and non-technical skills through solving "real world" problems in group settings. However, group work has shown to put additional stresses on women in engineering, who are already a marginalized group in STEM fields. In order for active learning group work to be successful for all students, the challenges that women face in team settings must be addressed in the classroom. If the issues are mitigated, active learning will become an increasingly successful way to prepare engineering students for group work in the future.

Background

The active learning approach is attractive to instructors who are interested in increasing their students' long-term material retention, critical thinking skills, and communication skills (Medha, 2015; Koehn, 2015; Dyrud, 2015). Although these courses can and do help students improve these skills, there is a daunting problem with active learning environments that is often overlooked. Past research has shown that student roles on teams and peer interactions with teammates can leave women doubting their engineering abilities (Meadows & Sekaquaptewa, 2015; Burtner, 2004, Beasley & Fischer, 2012; Wee et. al., 2010; Shapiro and Sax, 2011). These findings are concerning not only

because of concerns for the retention of women in engineering but because women's underperformance undermines active learning programs. The mission of active learning is to prepare students for working with diverse groups of people in a respectful, professional manner. This goal cannot be achieved until women feel comfortable in collaborative settings.

Several studies at other universities have investigated the effects of active learning on general student engagement, the confidence levels of women in engineering, and student interactions in the classroom. A comprehensive review published by the Oregon Institute of Technology revealed that although active learning group work improves students' long-term retention and problem-solving skills, women often take on stereotypically feminine roles, such as team secretary, when in groups (Dyrud, 2015). The University of Michigan reported similar findings with their first-year engineering students; women presented 25% fewer technical slides than men during presentations, and men answered far more questions from the audience during presentations than women did, regardless of whether the team was mostly men or mostly women (Meadows & Sekaquaptewa).

This matters because a lack of self-confidence has been linked to lowered retention rates for students pursuing engineering degrees (Burtner, 2004, Beasley & Fischer, 2012). This is particularly true for women in STEM (Wee et. al., 2010; Shapiro and Sax, 2011). Of the women who do graduate with an engineering degree, many seek jobs outside the engineering industry. Many reports indicate that women leave engineering jobs in part because of low self-confidence

in their technical abilities. A study published by the *American Sociological Review* shows that women feel less professional role confidence than men when in engineering (Cech et. al., 2011).

The unfortunate consequence of this lack of professional role confidence is that women hold fewer than 25% of the STEM jobs in the United States, even though they make up almost half of the work force (Beede et. al, 2011). Many studies affirm that women in engineering careers often have lowered self-confidence in their technical competencies, even if they persisted through getting an engineering degree (Cech et. al., 2011; Buse, 2013). Lowered self-assurance and extra pressure for women to prove their technical abilities to their male coworkers leads to women not pursuing STEM careers (Hatmaker, 2012).

My research is part of a new wave of education reform to ensure women in engineering have the same opportunities as their male counterparts. The focus of this study is on the Engineering Plus (E+) program, a department in the University of Colorado's College of Engineering and Applied Sciences, which specializes in active learning courses. We studied how team dynamics in E+ courses affect women's confidence in engineering and generated a list of improvements to make active learning courses more equitable for all students.

Methods

The data we collected in this study were taken from students enrolled in E+ courses. Students in E+ are required to take three engineering projects courses. *First Year Engineering Projects* introduces

students to the engineering design process and to problem-solving while working in teams. Second Year Engineering Projects, *Engineering for the Community*, is a course in which student teams are assigned a client and must prototype a product that solves that client's problem. Third Year Engineering Projects, *Invention and Innovation*, is a class in which student teams design a product and a business in parallel. Team size for projects classes typically ranges from five to eight students.

In addition to the required projects classes, students in E+ are encouraged to take active learning sections of engineering core classes such as *Statics and Structures*, *Thermodynamics*, *Materials Science*, and *Circuits and Electronics*. In these courses, students learn the respective course material through a combination of lecture and hands-on exercises rather than lectures alone. Groups of three to five students in the engineering core classes are typical.

Research Questions

Our primary research question is this: How do team dynamics in active learning environments affect a woman's confidence as an engineer? To supplement this research, secondary questions include:

- How do students define active learning, and with what connotations?
- What types of roles do men and women take on in group projects?

We used qualitative student peer evaluation student focus groups to explore the research questions. Each of the methods of data collection and analysis are discussed below.

Peer Evaluations - Data Collection Methods

We collected peer interaction and perception data by examining post-semester peer evaluations. The peer evaluation questionnaire asked students to divide 1000 points (in the form of bonus dollars) among their team members, based on their contribution to the team project. The instructions also asked students to provide an explanation for their distributions, as follows:

Your team has been awarded a(n imaginary) \$1,000 bonus for your outstanding work on your project. YOU must decide how the bonus will be allocated. Distribute the \$1k among your team members, including yourself. Take into consideration time commitment, special contributions, leadership, unique skills, etc. Provide a rationale for your allocations.

For example, an individual on a team of five students could allocate \$200 to each student, conveying that each team member shared equally in the project workload. In contrast, other individual on this same team of five could score one or more team members below \$200, indicating they did less work than their peers, and others more than \$200, indicating that those team members carried more than their equal share of the workload. Rationale comments ranged from generalized comments on team dynamics to specific skills and tasks that an individual brought to the team.

Focus Groups - Data Collection Methods

Students enrolled in any E+ course during the 2017-2018 academic year were solicited to participate in 45-60 minute focus groups with 3-5 students total. Within these focus groups, we asked the students about

their thoughts on active learning courses and their past experiences in team settings. A complete list of focus group questions is provided here:

1. Why did you choose the E+ program?
2. Think about your first projects class. What were your thoughts on the experience?
3. How would you describe your interactions with your teammates?
4. How would you describe your role(s) on your team(s)?
5. Have you experienced or witnessed sexism in your active learning courses?
6. What could be done differently in E+ courses to make them more inclusive and respectful?
7. What does the term 'active learning' mean to you?

In the first group, there were three women participants and two women facilitators. In the second focus group, there was one man and one woman participant and two women facilitators.

Findings

Peer Evaluations

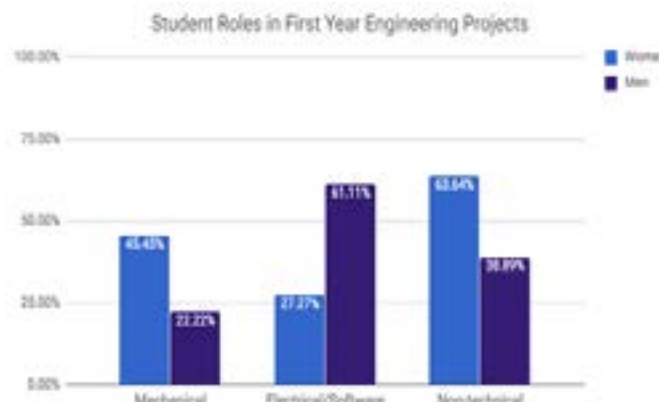
For this analysis, we generated three categories of team roles based on a review of the overall set of comments. Subsequently, we analyzed each student's self and peer evaluations for keywords that indicated what type of role(s) he or she took on for the project. We then categorized these tasks into three roles: Non-technical, Mechanical, and Electrical/Software. The task descriptions for each category are shown in Table 1 below. A student was considered part of a category if he or she had at least two separate mentions of working on a certain task. We did not set a cap on how many roles a student could take on. A student could also not have a role if there was no mention of specific tasks that he or she completed.

Table 1: Student Roles on a Group Project

	Non-technical	Mechanical	Electrical/ So
Activities Performed	<ul style="list-style-type: none"> •Writing report •Managing budget •Organizing •Designing poster •Client communication •Running errands or gathering supplies 	<ul style="list-style-type: none"> •3D-printing •Laser cutting •Computer aided design (CAD) •Using lathe and mill •Welding 	<ul style="list-style-type: none"> •Design and layout of circuitry •Soldering •Coding •Using microprocessors and microcontrollers such as Arduino or Raspberry Pi

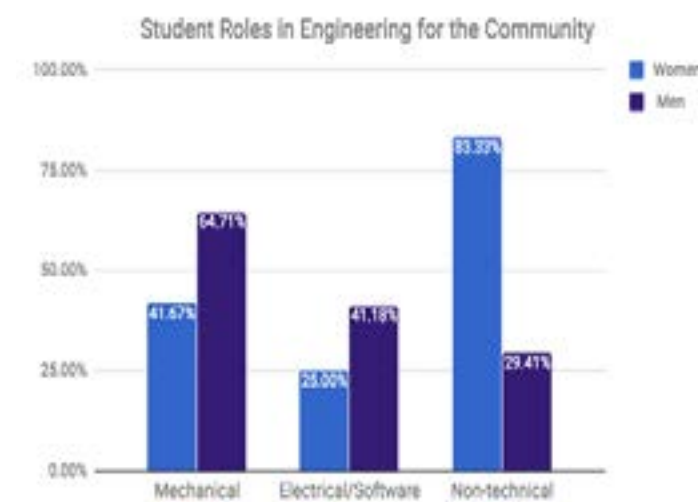
Women in each level of engineering projects classes took on non-technical roles more often than men. In *First Year Engineering Projects*, 43% of women took on non-technical roles as compared to 39% of men. The discrepancy between men and women in non-technical roles increased significantly in *Engineering for the Community*, in which 83% of women took on non-technical roles as compared with 29% of men. Figures 1, 2, and 3 represent the roles of men and women across these three courses based on their peer evaluations. In *Invention and Innovation*, the discrepancy between men and women in non-technical roles remained high, with 50% of women partaking in non-technical roles in comparison with 10% of men.

Figure 1: Student Roles in First Year Engineering projects



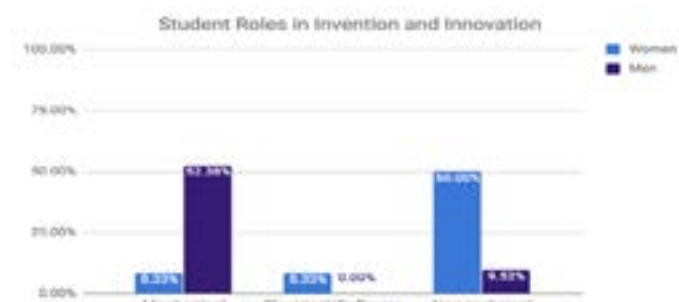
Note: Percentages do not add up to 100% because students could take on more than one role on a team.

Figure 2: Student Roles in Engineering for the Community



Note: Percentages do not add up to 100% because students could take on more than one role on a team.

Figure 3: Student Roles in Invention and Innovation



Note: Percentages do not add up to 100% because

students could take on more than one role on a team.

Focus Groups

We examined the focus groups by reading each transcript with a different focus in mind. For the first pass, each member of the research team read through the transcripts and extracted passages that they thought were relevant to the study. After comparing the notes from each person, we generated a list of recurring themes. In the second pass, we reread the transcripts and noted passages that supported and/or countered the identified themes. We highlighted the passages that directly related to team dynamics, women’s confidence levels, or active learning classes and analyzed them further.

From the focus groups, we determined that both women and men enjoy active learning environments. However, there is room for improvement to make team dynamics more equitable for women. The women and men in the focus groups described active learning as “hands-on” and “tangible” processes. They said that this type of learning environment fosters problem-solving in an iterative fashion that helps them remember concepts better than a lecture does. When we asked women whether taking a first-year projects course encouraged them to take additional projects classes, they all said yes. They said that projects classes give them confidence in their engineering abilities and that projects classes allow them to practice working in teams. In regards to a recent projects class, one woman explained,

I may not know everything that I need to know, but I’ve watched myself come from

this point of having absolutely no idea of where I was going to start, to having done all the research, built something really beautiful, and have felt that I can do anything, you know, at this point... So I love [projects classes].

However, the active learning process is not without flaws. There were several accounts of male-to-female interactions that have put additional stress on women. Both men and women reported that women often get talked over in group settings. In terms of team roles, there is a definite pressure for women to take on non-technical tasks. Women reported that in *First Year Engineering Projects*, they took on non-technical roles sometimes because they felt they did not have any technical skills to add to the team. In *Engineering for the Community* and in courses outside of E+, women were also pressured to take on non-technical roles by their male peers. Pressure intensities ranged from subtle to overt. One woman mentioned that her male peers never looked at her when the group was delegating technical tasks. Other women mentioned that women are sometimes explicitly told by their male peers not to take part in the technical tasks or to write the reports.

Even when women do take on technical roles, their contributions are not always respected by their male peers. One student recalls a “blatant” interaction she recently had in a different department’s projects class in preparation for a Design Review presentation:

A specific [male] member of our team ... said to the other girl in my group and I “I would prefer if you didn’t answer any questions tomorrow.” And I said “Well, why? I’ve worked on the code, I coded all the MATLAB and files to measure whether certain parts would fail.” I was pretty knowledgeable on those sections because I had been working *hours* that day working on the both of them. And I said, “Well what about one of the sections I calculated?” And he said, “Well I would prefer that both of you don’t answer because if they [the course instructors] have questions, it means they have concerns which need to be addressed properly.”

Most of the women we interviewed mentioned the importance of vocalizing their interests in the project. For example, one woman recalls a typical experience in one of her labs:

In labs, it always comes back to labs! They would say “oh do you guys wanna work on the code?” or something and they would never make eye contact with me and would be looking at the other guys. I’m like “I’m right here!”... I’m like “I’m already certified, I’ve had experience with this” but I have to vocalize that, [or else] they would never look at me.

Many women also mentioned that skill-building workshops helped them secure technical roles on their teams. For example, one woman said, “When I learned how to weld, it gave me some value to the team that I didn’t quite have yet. And then every time [the team] was like ‘Okay who’s going to weld? Well you’re certified, you got taught, so this is your part.’”

The women who said they had to advocate for themselves also mentioned some form of support system to help guide them. Women often cited professors as being mentors. Support ranged from a

professor intervening when a woman started to get talked over in a group to a professor taking a skill-building workshop with a group of women. Women also look to their female peers when in need of advice. From the focus group accounts, there were two specific instances of female-to-female peer interactions in which a woman was encouraged by another woman on her team.

These accounts of women battling for technical roles and for the respect of male peers is not universal, however. One woman we interviewed recalls her projects teams as being fairly equal. She said, “I was in a project group with two other guys and I did the majority of the code and they didn’t think that was weird, and I didn’t think that that was weird. Another guy put together the report. And so yeah I guess different experiences but good, positive.” Another woman said she actually preferred to take on non-technical roles because she wants to be a project manager for a career. Furthermore, a man we interviewed praised a woman that he recently worked with, saying, “I think [she] is a great example of that type of person who you know just plethora of social skills, plethora of technical skills, and like the drive and the motivation to make what they want to happen, happen.”

Overall, the focus groups revealed that active learning can inspire women and encourage them to persist in engineering. However, there is still room for improvement to reduce stress on women in these types of environments. Although not universally true, many women reported accounts of negative male-to-female interactions and being pressured to take on non-technical roles in projects classes. Women attribute vocalizing their goals as a key component in their success with team projects.

Conclusion and Key Takeaways

The results of this study show that active learning does have the potential to retain women in

engineering. The women in the focus groups all agreed that active learning classes help them to build their academic confidence. However, most of the women said they were pressured to take on non-technical roles in teams, especially in their first few engineering projects classes and labs. The first explanation for this trend is that women did not advocate for themselves when their male teammates did not explicitly ask them to partake in technical tasks. The second explanation is that women offered to take on non-technical roles because they did not believe they possessed the skills necessary to complete technical tasks. We believe the trend is caused by a combination of these two explanations. To address these issues, the students in the focus groups generated suggestions for active learning course improvements, which are discussed below.

Instructors should model the process for equally addressing everyone in their group and remind students often to use it. Exercises for students to practice eye contact and active listening, particularly during brainstorming activities, should be implemented.

Instructors should also encourage women to take skill-building workshops. These workshops give women the technical foundations and the confidence to take on technical tasks. The workshops can provide women with a skill that is unique and valuable to the team, thus securing them technical position for the project. Encouragement from instructors can come in many forms, including instructors attending the workshops alongside students or reassuring women that struggling is part of the learning process.

Perhaps the most crucial takeaway from this research is that advocating for oneself is an important skill that women must develop in order to work in diverse engineering groups. It is likely that many women do not have the courage to and/or experience with advocating for themselves, which

may explain why many women in the study took on non-technical roles. Instructors must investigate team dynamics and determine when women need encouragement. Peer evaluations and informal, individual student-instructor interviews are two ways in which instructors can gain insight to team dynamics. It is particularly important for instructors to look for women who gravitate toward the non-technical aspects of a project, as these women are often among the students who need the most help with self-advocating.

Active learning remains at the forefront of engineering education because of its potential to help engineering students learn in a complex social and academic setting. These types of environments show promise in increasing women’s retention rates in engineering. Once we can resolve these problems, both men and women will be better prepared for the exciting and complex world of engineering.

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The New Age of Human Space Exploration: An Application of Low-Latency Surface Telerobotics and Reusable Rockets

by Ben Mellinkoff

The election of Donald Trump as the President of the United States has ignited intense controversy over the political issues in the United States. In the eyes of many Americans and citizens of other countries, the election of President Trump means an attack on science. This perceived attack is largely due to President Trump's active use of the term "alternative facts" when attempting to push theories that do not agree with the consensus of the scientific community. For instance, Trump rejects the idea of human-caused global warming instead of accepting the facts established by the overwhelming majority of scientists studying Earth climate science. On March 22nd, 2017, the March For Science protests were carried out in 600 cities across the globe by concerned citizens and scientists to demonstrate their stance against President Trump's push for "alternative facts." The entire world is watching the new policies of the United States under President Trump, and skeptics are quick to point out the flaws in his policies, especially when these policies pertain to science.

Michael Hiltzik, a columnist for the *LA Times*, claims that Trump's recent push for human space exploration is a waste of time and resources. Hiltzik claims that "the idea of sending humans to explore distant worlds is loopy, incredibly wasteful, and likely to cripple American science rather than inspire it" [1]. Hiltzik refutes the idea that human space exploration is critical because it provides technological and economic benefits for people to use on Earth. While Hiltzik recognizes that human

space flight has provided technological and economic benefits to other fields besides space flight, such as in the study of disease, his criticism of this point is that he believes human space flight was a roundabout, wasteful approach to creating these new benefits. Instead, he believes it would be more efficient to provide funding directly to researchers studying diseases. Hiltzik claims that human space exploration is no longer necessary for space exploration due to the current technological development of robotics. Hiltzik provides the following quotation from Astronomer Royal Martin Rees to illustrate his point: "The practical case gets weaker and weaker with every advance in robotics and miniaturization. It's hard to see any particular reason or purpose in going back to the Moon or indeed sending people into space at all" [1]. Hiltzik argues that using humans in space exploration slows the rate of scientific exploration because the large costs of a human mission often limits the number of experiments on board a spacecraft. Hiltzik claims that a call for increased human space exploration necessarily means funding will be cut for Earth Climate science. While Hiltzik ultimately concludes that Donald Trump's push for human space exploration is a waste of taxpayer dollars, I disagree with his conclusions. Hiltzik's claims are valid for the technology and exploration strategies that were available 15 years ago; however, his main points fall apart when considering the modern technology available today. Human space exploration is not a waste of taxpayer dollars because

it increases the amount of science accomplished when modern technology and exploration strategies are considered. As a result, skeptics of Trump's policies relating to science should be relieved to discover that a push for human space exploration will yield massive amounts of science.

Hiltzik argues that human space flight often slows scientific exploration because the higher costs of a human mission often lead to fewer scientific experiments on board the spacecraft. While Hiltzik is correct that human space missions are more expensive, he incorrectly assumes that fewer scientific experiments will lead to slower scientific exploration. By implementing modern exploration strategies, humans and robotics together can yield rapid and rigorous scientific exploration of bodies in our solar system. Low-latency surface telerobotics is a new method of scientific exploration that requires humans in space for controlling robots for scientific exploration and deployment of infrastructure on remote bodies. Telerobotics is a technology often used on Earth for tasks that require human intervention in hostile or distant areas. For instance, telerobotics is often used by oil companies to survey for potential oil deposits hidden below the ocean floor. The *Curiosity* rover is an example of telerobotics used in space; however, this is considered high-latency surface telerobotics. High-latency surface telerobotics is the traditional method of scientific exploration in space and is an example of robotic exploration. The low-latency aspect of this new method of exploration makes this strategy superior to traditional methods of scientific exploration in space. Low-latency surface telerobotics is better than high-latency surface telerobotics because it allows humans to interact with the robot in essentially real-time. Dr. Steve Squyres, the Principal Investigator of the Mars Exploration Rover mission, emphasizes the superiority of real-time remote operations over remote operations with long time delays. He claims, "what Spirit and Opportunity

have done in 5-1/2 years on Mars, you and I could have done in a good week. Humans have a way to deal with surprises, to improvise, to change their plans on the spot" [2]. Dr. Squyres is referring to what is called a "virtual human presence," and this enables humans to directly participate in the scientific exploration without physically being on a remote body. Low-latency surface telerobotics gives a "virtual human presence," which ultimately allows for rapid scientific exploration without physically landing any humans. Therefore, Hiltzik incorrectly assumes that human space exploration yields slower scientific exploration because he did not consider the benefits of using new exploration strategies such as low-latency surface telerobotics.

After considering low-latency surface telerobotics as an exploration strategy, those who agree with Hiltzik's argument might question why it is necessary to send humans into space to achieve low-latency conditions. This is a valid speculation, and this requirement stems from two aspects: the time scale at which humans can perceive actions occurring in real time and the speed of light. The maximum time delay that humans can experience and still perceive as occurring in real-time is approximately 0.3-0.4 seconds [3]. Therefore, the total time for the commands and video to be sent back and forth between the human and robot must be less than approximately 0.4 seconds. Considering that the speed of light is capped at approximately 300 million meters per second, this means that there is a maximum distance to achieve the 0.3-0.4 second latency. This corresponds to a max distance of roughly 60,000 km. Therefore, this requires humans to venture into space to achieve real-time communications with remote robots. While this will still lead to higher costs than a purely robotic exploration mission, it will be significantly less expensive than the traditional model of human space exploration. The traditional model of human space exploration requires that the humans land on the

surface of a remote body, such as the Apollo missions. The new method of exploration will be cheaper because it does not require a human-rated lander. The humans will remain in orbit with a maximum distance of 60,000 km from the surface robots that they are controlling. Therefore, low-latency surface telerobotics yields scientific exploration at similar speeds to a human lander mission but at significantly less costs than a human lander mission. The new model of combining humans and robots for space exploration will yield the most efficient method of scientific exploration of space, contrary to Hiltzik's argument.

Low-latency surface telerobotics will have the best efficiency when used on distant bodies, such as Mars, where the time delay varies from 8.6 minutes to 42 minutes [4]. Mars has this large of a time delay because of its distance from Earth, and this fact emphasizes the necessity of sending humans into space for low-latency surface telerobotics. While Mars may seem like the best candidate for this method of exploration, the Moon is also a perfect candidate for low-latency surface telerobotics. While the latency between Earth and the lunar farside is only 2.6 seconds, this is still way above the 0.3-0.4 second threshold for real-time operations [3]. Therefore, low-latency surface telerobotics must be used on the Moon to achieve real-time operations. Considering that the Trump administration is pushing for a return to the Moon for scientific exploration, the implementation of low-latency surface telerobotics would serve as a perfect first implementation of low-latency telerobotics on a remote body besides Earth. This method of scientific exploration is advantageous for planetary scientists because it allows for enhanced geological exploration. In addition to geological exploration, it can be used to deploy telescope arrays for probing the universe. Not only is low-latency surface telerobotics a promising technology of the future, it also fits in perfectly with the goals of the

current administration. Therefore, Trump's call to human space exploration is the right move if low-latency surface telerobotics is used as the method of exploration.

After considering low-latency surface telerobotics as a method of exploration, Hiltzik might argue that human exploration would still be wasteful because there are risks associated with using new exploration strategies. However, it would be foolish not to try this promising method because there are current and past experiments that are conducted to ensure that this method will be a success before it is used on a real mission. For example, a demonstration experiment has been conducted from the ISS to demonstrate the effectiveness of this strategy for operating on remote bodies. This experiment had astronauts on the ISS controlling rovers on the surface of Earth via low-latency surface telerobotics. This experiment was designed to determine the operational procedure for low-latency surface telerobotics and to determine if the efficiencies predicted in theory help up in experimentation. This experiment tested the use of low-latency surface telerobotics as a deployment method of a Kapton film radio array. The results from this experiment indicate that low-latency surface telerobotics is an effective method of remotely operating in an unfamiliar environment [5]. In addition to performing demonstrations, there are experiments on Earth that are testing the operational limitations associated with low-latency surface telerobotics. My research group is currently conducting experiments that test for some of these limitations. In our previous experiment, we concluded that a threshold frame rate exists when exploring using low-latency surface telerobotics. Exploration with a frame rate below the threshold frame rate will lead to significantly slower exploration, therefore reducing the efficiency of this exploration method. These types of experiments are critical to perform before utilizing low-latency surface

telerobotics on actual missions, and skeptics of this exploration method should feel assured that the proper experiments are currently underway.

While Hiltzik is correct that human-rated launches are more expensive than a purely robotic launch, Hiltzik falsely assumes that these costs are prohibitive without considering the new lowered costs of a launch due to modern technology. There are new commercial rocket launch companies that are making a name for themselves by offering lowered launch costs, such as SpaceX and Blue Origin. These two companies both offer reduced launch prices because they have developed a reusable first-stage booster. There are often multiple stages on a launch vehicle, and the first stage is used as the main method for escaping Earth's atmosphere. This first stage eventually separates from the rest of the launch vehicle to reduce the total weight of the vehicle. Rockets have multiple stages because this strategy allows the rocket to drop structural mass after significant amounts of fuel has been spent. Rocket staging is used in traditional and modern rockets; however, the cost savings of modern rockets occurs by cleverly adapting the traditional method of rocket staging. On a traditional launch vehicle, this first stage would simply burn up while returned through Earth's atmosphere after stage separation. The new reusable first stage vehicles can return to Earth and begin re-fueling for the next flight with minimal restorations required. Some skeptics of reusable spacecraft point towards the excessive costs of the Space Shuttle program as evidence that the concept of reusable spacecraft is impractical. However, the large costs of the Space Shuttle program were largely due to the intricacies of flying a complex space plane, as opposed to a conventional rocket. While each Shuttle was reusable, these vehicles required extensive maintenance after each flight to prepare for the next flight. In a sense, the extensive level of maintenance meant that the Shuttle was not a truly reusable launch vehicle. Therefore, the Space Shuttle program failed to

make human space exploration economically feasible.

While Hiltzik's claims against human space exploration due to prohibitive costs may have been valid for the technology available 15 years ago, the costs of human space exploration become manageable with the development of reusable launch vehicles that require minimal maintenance. According to Elon Musk, CEO of SpaceX, the cost of the rocket fuel for each launch is "less than 1% of the full-price ticket for a launch" [6]. Clearly, the main costs of a full-price ticket for a launch are primarily due to the structures and engines, and not the fuel itself. Therefore, the cost savings for a fully reusable launch vehicle can be theoretically upwards of 99%. SpaceX is one company that is reducing the costs of launch by offering flights on reusable launch vehicles. SpaceX designed the first stage booster of their Falcon 9 launch vehicle to land vertically back on Earth with relatively small maintenance requirements before it is ready for re-fueling. While SpaceX cannot achieve the theoretical savings of 99% because the company is currently reusing only the first stage of the Falcon 9 and not the second stage, it has been reported that SpaceX has agreed to 50% savings to a customer for using a "flight-proven" first stage [6]. The actual savings offered to each customer will vary depending on negotiations. SpaceX has not yet demonstrated a human launch into space; however, they have signed an agreement with NASA to provide a "taxi" service for sending NASA astronauts back and forth from the ISS. The savings offered by SpaceX are already demonstrating increased the feasibility of sending humans into space, and the price of a launch will continue to decrease as the reusable rocketry technology improves. Hiltzik's argument is clearly inadequate after considering the lowering costs of space exploration due to the development of reusable rockets.

While Hiltzik may be correct that President Trump's reasons for funding human space exploration is to divert funding away from Earth climate science,

Hiltzik's claims that human space exploration is wasteful and slows science is invalid. Hiltzik fails to consider modern technologies that make launches into space significantly cheaper and fails to consider new exploration strategies that have the potential to yield very significant science. It is a valid argument to criticize President Trump for neglecting Earth climate science; however, this does not legitimize the use of antiquated arguments to criticize a push for scientific discoveries in space. Instead, concerned citizens and scientists should feel relieved that this policy will benefit the scientific community. The adoption of low-latency surface telerobotics and the development of reusable rockets has created a new age of human space exploration for efficient scientific discovery.

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The Collection of a Lingala-French Parallel Corpus

by Frank Mukendi

Introduction

Machine Translation (MT) is a subfield of computational linguistics that uses software to translate from one natural language to another (Calefato, et al., 2015). Statistical Machine Translation (SMT) and, more recently, Neural Machine Translation (NMT) are two approaches to MT that have both made remarkable progress in recent years. The latter approach has been shown to be more successful, surpassing its statistical, phrase-based counterpart (Britz, et al., 2017). The NMT approach relies heavily on aligned parallel corpora that is, a body of text that has already been manually translated between the source and the target language (Xia, et al., 2016). Now, the quantity of text required to train NMT architectures and make an effective machine translation system is enormous. Most world's major languages have parallel corpora available, but for languages that don't traditionally have extensive written records, finding a training dataset can be challenging. These so-called Under-Resourced Languages are among the 99% of world languages not touched by the advances in computational linguistics (NLP) (Scannell, 2011).

One of those Under-Resourced Languages spoken both in the Republic of Congo and the DR Congo. Ten million people are estimated to speak Lingala as their first language, 20 million as their second language and up to 50 million as a language of daily communication in both countries and their diaspora (Sene-Mongaba, 2015). Despite the large number of speakers and the multilingual nature of both countries, no Machine Translation system involving Lingala has been developed to date. The explanation resides in the fact that there is no large enough parallel

corpus from which any effective MT software can be developed. So the goal of this project, if funded, will be to create a Lingala-French parallel corpus that will train NMT architectures in order to develop a Lingala-French translation system, and indirectly a Lingala-English translation system. The choice of a Lingala-French corpus – as opposed to a Lingala-English, or any other language paired with Lingala, is based on the fact that French is an official language of the Democratic Republic of the Congo, making it the preferred language into which Lingala texts are translated.

Thus, a Lingala-French corpus will be larger than a corpus involving Lingala and any other language. The project will draw inspiration from corpus collections made for similar under-resource languages and English, notably the Zulu-English corpus described by Koltz  and Wolff (2015) and the SAWA corpus for Swahili and English. These corpora are heavily influenced by religious texts. The most obvious challenge will be to build a balanced and representative corpus that will be the stepping stone to building a machine translation system that will assist human translators and facilitate the integration of the Lingala in Congolese schools.

Background

Traditionally, rules-based approaches that rely on large sets of manually compiled rules need extensive lexicons with morphological, syntactic, and semantic information about languages involved – have been widely used in the field of machine translation. However, the last two decades have shown a vast improvement in computer hardware performance,

leading to resurgence of more accurate and more data-driven statistical machine translation approaches (Eun-Jin Park, et al. 2015). Even more recently, neural machine translation approaches have shown better results than SMT approaches. Both NMT and SMT rely on information extracted from large parallel corpora. Thus, the collection and cleaning of such corpora have been some of the crucial parts in the development of MT software available today (Xia, et al., 2016).

Early works in statistical machine translation focused heavily on the English - French translation because the Canadian parliament proceedings were in French, and English was the only large parallel corpus available (Resnik & Smith, 2003). Nowadays, most major European languages are represented in various parallel corpora. One of the most well-known corpus is the Europarl corpus, which consists of proceedings of the European parliament from 1996 to the present. (Koehn, 2005). The 2012 version of Europarl includes 21 European languages. The documents of a similar nature have been used in other parts of the world to build parallel corpora such as the *Hong Kong Hansards Parallel Text for Chinese and English* built from the proceedings of the Hong Kong parliament (Xiaoyi Ma, 2000). The sophistication of algorithms used to crawl the web has led to the collection of larger corpora both in the number of languages covered and the source of the material included (Resnik & Smith, 2003). One example of such a corpus is the *Opus* open source parallel corpus that includes 65 languages (J rg Tiedemann, 2012)

Despite all this progress, the majority of world languages have limited resources, and the collection of parallel corpora remains limited (Scannell, 2011). A lot of the NLP work done on African languages in particular has been done using the less data-driven rule-based approaches (Guy De Pauw and Gilles-Maurice de Schryver, 2009), which means that many African languages, even among the most spoken ones, have not yet benefited from improvements in Machine Translation that data - driven statistical

approaches have made possible. However, they are some exceptions where some governments have shown interest in funding corpora collection projects in particular and the development of language technology for African languages in general. One clear example is the Autshumato project, which was funded by the South African Department of Arts and Culture. The Autshumato project is an open-source series of translation tools developed for the 11 official languages of South Africa. The tools include translation memories as well as parallel corpora for English/Zulu, English/Northern Sotho, English/Tsonga and English/Afrikaans (Koltz  and Wolff, 2015). These efforts have made South African languages to be well equipped and ready to benefit from the advancement of language technology tools, including Machine Translation Systems. Some other notable exceptions are Swahili, Yoruba, Igbo, Amharic, and Wolof, which all have Machine Translations systems even though the level of accuracy of these systems needs improvements.

These exceptions only point to the enormity of the work that still needs to be done to apply language technology tools to African languages. In fact, out of the thousands of languages spoken on the African continent, only a few dozen have Machine Translation systems. Languages without MT systems include even some of the most spoken on the continent. Our task will focus on the Lingala language which is the most spoken language in Central Africa with up to 50 million speakers across three countries – the Democratic Republic of the Congo, the Republic of the Congo and the Central African Republic – and their diaspora. Our effort will consist of collecting a Lingala-French parallel corpus in which will be the first attempt to collect a parallel corpus involving Lingala. Our methods will follow the traditional steps of collecting parallel corpora and will borrow normalization techniques used by Sene Mongaba (2015) in his efforts to collect a monolingual Lingala corpus.

Methods

The collection of parallel corpora for the use of statistical machine translation (SMT) and neural machine translation (NMT) systems typically takes five steps: acquisition of the raw data (usually by crawling the web); document alignment which consists of extracting and mapping parallel chunks of text; sentence splitting, breaking the text into sentences; normalization and tokenization (preparing the corpus for SMT systems); and finally sentence alignment which consists of mapping sentences in one language to sentences in the other language (Koehn, 2005).

1. Getting the Raw Data

The raw data for a Lingala-French corpus will be obtained by three means: crawling the web, digitalizing physical material not available online, and crowdsourcing translations from the community of Lingala and French bilingual internet users. Crawling the web will consist of using data mining techniques to extract data from both parallel web pages and mixed language web pages. Parallel web pages are pairs of monolingual web pages in different languages with almost the same meaning whereas mixed language web pages are web pages containing at least two languages (Utiyama et al., 2009). For parallel web pages, the STRAND data mining architecture will be used. STRAND stands for Structural Translation Recognition, Acquiring Natural Data and consists of the following steps: location of pages that might have parallel translations, generation of candidate pairs that might be translations, and Structural filtering out of nontranslation candidate pairs (Resnik & Smith, 2003). Because of the scarcity of Lingala text found online, we expect the Lingala-French parallel text obtained from parallel web pages to come from digitalized religious texts such as the New Testament and the *Watchtower* online revue, official government documents such as the Congolese Constitution, and some UN texts such as Universal Declaration of Human Rights. The big

challenge will be to collect that from other sources as well so that the final corpus is representative enough to cover as many contexts and registers as possible in which both languages are used. Extracting parallel texts from mixed Lingala-French web pages will follow the steps described by Utiyama et al. (2009). In our case, we will scrawl Lingala web pages, extract mixed-languages web pages and then use the alignment technique for noisy parallel text described by Munteanu and Marcu (2005) to match Lingala sentences to their French translations. A monolingual Lingala corpus has already been collected by Sene-Mongaba (2015). A significant amount of text collected in that corpus came from mixed Lingala-French web pages. The data obtained from those mixed pages can be obtained separately from the monolingual texts. The alignment method mentioned above then can be operated on the Lingala-French texts.

Another source of parallel texts for the corpus will be the digitization of bilingual material not available electronically. We will use scanning services such as Blue Leaf to digitize these documents. In order to collect a corpus as diverse as possible, we will strive to digitize material coming from different genres, styles, and media. In that effort, we will digitize bilingual books published by the *Mabiki* publishing house without breaching any copyright laws. Books will include novels, self-help books, and comics. One other valuable source of material will be transcripts from the non-profit Radio Okapi, which has been broadcasting bilingual news reports for years. Digitization will be the most costly and time consuming part of the corpus collection process. However, because material that needs digitization are more exhaustive, we can carefully select, given the limited resources, which texts to include in the corpus that will counterbalance the overwhelmingly religious texts that we expect to collect from the web, thereby making the corpus more representative.

Lastly, data collection will be done via crowdsourcing. We will use crowdsourcing services where users' credentials can be checked, and we will also

set up a simple website where every bilingual Lingala-French speaker can contribute. The crowdsourcing service that will be used are Amazon Mechanical Turk6 (MTurk) and CrowdFlower, both of which have professional translators and have already been used in various Natural Language Processing applications (Callison-Burch and Dredze, 2010). On all platforms, we will ask users to translate into French some of the most common Lingala phrases. These phrases can be obtained by running a search algorithm on the annotated monolingual Lingala corpus collected by Sene-Mongaba (2015). To ensure the quality of translations, participants will be asked to translate and choose the most accurate translations among previously translated phrases by other participants. Thus, we will be determined which phrases and corresponding translations to include in the corpus.

2. Document Alignment, sentence splitting nor normalization and tokenization, sentence Alignment

As stated above, most of our web data will be based on religious texts. Those kind of documents present a distinct advantage in the fact that they are already aligned. In fact, the Bible and the Koran are already aligned on the verse level. Legal documents such as the Universal Declaration of Human Rights are aligned on the article level. Both verse and article alignment will be considered as sentence-alignment. Other material will be first paragraph-aligned and then we will use sentence splitting and an aligner software to sentence-align them.

Sentence splitting is done by various software that identify period, exclamation points, semi colon, etc. to split paragraphs into sentences. Once we have obtained sentences, we will then tokenize them—in our case just use the same software to identify words—and then normalize the Lingala text. As stated by Sene-Mongaba (2015), normalizing Lingala text just implies making the Lingala orthography uniform across all

dataset collected.

Finally, we will use the Microsoft's bilingual sentence aligner for sentence alignment. Guy De Pauw and Gilles-Maurice de Schryver (2009) used the same aligner in their effort to collect the Swahili-English parallel corpus, and found that 95 % of all sentences were correctly aligned by the software. We will use the same technique in the hope of getting a similar success rate.

Time Schedule

Week 1: Start crawling the web to find as much data as possible; send material for digitization to Blue Leaf.

Week 2: Merge web data and digitized data into a XML file; Data cleaning; Normalization and Tokenization.

Week 3: Sentence- Alignment

Budget

1. Digitization: Blue Leaf charge \$22.95 per book plus \$0.09 per page. We plan to digitize at least 9 books and other manuscripts (with a total of more or less 4350 pages). Total price: \$570

2. Professional translators from crowdsourcing services: We expect to find 3 to 5 professional translators. Expected price: \$500.

Total Budget: \$1070

Personal Statement

As a computer science student, I always try to work on projects that I find the most rewarding. Engaging in a project that will consist of collecting a Lingala-French parallel corpora in the hope that a Machine Translation system will result from this effort is rewarding because of the intellectual challenge that such an endeavor entails and also because of the personal connection that I, a Congolese student, have with the Lingala language.

I believe my background in computer science will be useful in implementing algorithmic techniques used in mining the web for parallel texts, tokenizing and

aligning them. Should any of those algorithms need any modifications tailored to Lingala, my knowledge of the language will be used in my favor. For all the reasons above, I believe to be qualified to carry out the project.

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The Devil's Eucharist: Religiosity in Cormac McCarthy's *Blood Meridian*

by Jackie Farrell

Discussion about the title of Cormac McCarthy's *Blood Meridian* has often come to the conclusion that the novel is an orgasm of violence, a pinnacle of bloodlust that gives birth to the West. But why is McCarthy's West this way? Other visions of the West feature individualism and honest work, or the eventual triumph of honesty over criminality, exemplified in the stories of Louis L'Amour and other pulp authors. In this paper, I will examine the various layers of ethos that generate McCarthy's West. The novel contains religious and intellectual overtones such as mentions of Biblical figures and Manifest Destiny. Generally, these ideas front expeditions and ventures of various groups in the novel such as the Glanton gang and Captain White's arm. However, most groups derive motivation from something else entirely and use high-toned intellectual ideas as pretext; their real driver is summarized in the kid's "taste for mindless violence."

The layers of evil-ethos that operate in *Blood Meridian* have their own blend of unexpected sources that operate in the baser aspects of human motivation. McCarthy makes famously ambivalent references to Christian theology as well as equally blasé nods toward nineteenth-century and Enlightenment philosophy. He does not use Christian theology in a conventional, orthodox sense, but generally presents it as a theoretical ground for deep terrors of the universe and a field for irrational human behavior. Often, demons or deities do not facilitate this work, as we would readily assume. Instead, we have something vaguely malevolent that does not go under

any one name. This chaos-agent uses conventional theologies as a playground for more sinister breeds of nonsense. In a similar vein, Enlightenment notions are often handed down from the government or other authorities, many iterations that their original intent and source have become lost: the Manifest Destiny of the founding fathers turns to bloodlust for its own sake. The chaos-agent and the illogical violence have a tenuous, but important, relationship. Interestingly, in order to access this agent, a blood sacrifice (or, in Christian theology, a eucharist) is needed. This creates a complicated relationship between conventional religiosity and the gruesome realities presented in the novel.

In *Blood Meridian*, Judge Holden speaks chaos into the void of western spaces. He becomes the centerpiece of violence and its motivation, delivering bizarre "fireside chats" explaining the ethos of whatever bloodbath occurred previously. In the beginning of the novel, we find a precursor to the judge in the hermit the kid encounters on his westward journey. Before the fire, the hermit declares, "when God made man the devil was at his elbow" (19). This sets the tone for later theological/metaphysical developments centering around atrocities committed by White's army and the Glanton gang. In *Understanding Cormac McCarthy*, critic Steven Fry describes this evil in terms of a modern, deconstructionist view of the American West:

Though the novel recounts events in the 1850s, it is born of modern memory- from a sensibility conditioned by two world wars,

the physical and psychological effects of genocide, the devastation of colonialism and environmental waste, as well as the collective anxiety of the nuclear age. In *Blood Meridian*, questions of meaning and the nature and possibility of the divine are addressed, not under conditions of benevolence and repose, but under the observable extremes of human violence and the brutal deterministic forces of the natural world. If true hope exists, it must be found amid these conditions, and if revealed, it is a stalwart and lasting hope indeed (67).

This is why critics often term *Blood Meridian* an anti-western: it paints a West informed by postmodern notions of racial bloodlust and expansionist fever rather than romanticized conceptions that dominated from the late nineteenth century to the mid-twentieth.

The “traditional” portrait of the West is what we imagine as children: cowboys and Indians; the appearance of a solitary, masculine rider at the edge of a dust-worn town. The nostalgic sentimentality surrounding the West during the formative period of western mythology was evident at the 1893 World Columbian Exposition at Chicago, organized (ironically) as a memorial to Christopher Columbus. At this fair, “several visions of the West were explored. . . . Tellingly, at that point in time, the most famous vision of the West delivered at Chicago was located outside the Exposition ground [as a stage show], by scout and entertainer Buffalo Bill. . . . Cowboys, Indians, horses and gunfire dominated the performance.” However, the more sinister truth of the matter showed itself in another corner of the event.

This was historian Frederick Jackson Turner’s introduction of his ‘frontier thesis’ to a small group of academics gathered one afternoon at the World’s Congress on Literature. Turner broadcast the frontier as a process that made Americans American. White farmers,

travelling westwards, taming the wilderness and crafting a civilisation, represented true national heroes. (6)

Predictably, this extrapolation of Manifest Destiny involves both whiteness and heroism; the West, under this fantasy, becomes the ground of white dominance, the land of God’s given birthright to the ruling race. Under this pretext, Captain White declares that the war is not over and that “we [Americans] are to be the instruments of liberation in a dark and troubled land” (34).

Thus far, we have explored a pretext. White saviorism and racial bloodlust disguise themselves as benevolence. But, we must not neglect to examine the chaos-agent behind the pretext. Here, we meet with one of its representatives: the judge. Our resident chaos-speaker, the judge relishes war in itself and proports it as “the ultimate trade awaiting its ultimate practitioner” (248). He says that “[it] endures because young men love it and old men love it in them. Those that fought, those that did not.” War embeds itself so thoroughly in the human spirit that the judge concludes this speech with the words, “[war] is god.” We must note that the judge does not appeal to the rationality of *war exists because I (the judge) command it*. Instead, he implies that he cannot be the god of the situation because *war* is the god of the situation. He is its mere messenger, a helpless thrall to the unamenable way of things. Critic Hanna Boguta-Marchel describes this ruling evil entity as “ontologically independent” (111). Thus, we see that individual human will, or even the will of deities, does not make the West; instead, something deeper and less personal than a deity, a nameless urge toward chaos that enthralls all things, is the West’s true genius. God is not war; war is god.

This deep urge toward chaos motivates both the Glanton gang and Captain White’s army in the novel, even as they use a sanitized, white-saviorized conception of Manifest Destiny as cover. But, we do

not need the judge to see the truth of the violence: when McCarthy puts his pen to the task of describing humanity, Native American and Anglo-Saxon alike are bedecked in human offal and grime. We cannot even pity the Native Americans, though they fall prey to westward expansion. The chaos-urge does not discriminate between oppressor and oppressed in whom it chooses to meddle with. McCarthy’s West contains no heroes in the Turnerian sense, only mutual offenders, slaves, and playthings of chaos. But, in the world of *Blood Meridian*, what constitutes offense? Does such a thing exist in a world ruled by terrible urges, mediated by the likes of the judge?

This brings us to an analysis of authorities in *Blood Meridian*. I have already mentioned the subsidiary role that deities play. The novel contains semi-frequent mentions of competing deities. We have the famous margin note in McCarthy’s own final draft that striking out “judge” in an initial scene to replace it with the word “devil.” Additionally, we have the aforementioned devil at the elbow of God during creation. But, to grant one of these ultimate authority in the novel would be premature. Fry compares *Blood Meridian* to Dostoevsky in that McCarthy “[gives] voice to multiple perspectives. The possibility of a universe absent of transcendent meaning is considered, together with the present potential of a creation dominated by evil” (1). Here, Fry references the concept of *polyphony*, a central tenet in Dostoevsky studies. In his landmark work *Problems of Dostoevsky’s Poetics*, Mikhail Bakhtin states that

A plurality of independent and unmerged voices and consciousnesses, a genuine polyphony of fully valid voices is in fact the chief characteristic of Dostoyevsky’s novels. What unfolds in his works is not a multitude of characters and fates in a single objective world, illuminated by a single authorial consciousness; rather a plurality of consciousnesses, with equal rights and each

with its own world, combine but are not merged in the unity of the event (Bakhtin, *Problems of Dostoyevsky’s Poetics*, 6).

This is a crucial factor in McCarthy’s West because it drastically diminishes the relative power of each deity. Here, we have a strange rhetorical situation indeed: in the equal footing which McCarthy’s polyphony grants God, the devil, and human will, we encounter the possibility that the judge becomes God and the devil simultaneously. Not only that, but placing the two in the same dialectic register suggests that *God and the devil are actually the same thing*. To add to this already complex situation, this combination-deity cannot even have divinity in the truest sense: whatever power this good-evil amalgamation possesses, whether there exists any amalgamation at all, we see from the statement “war is god” that whatever deity (or deities) exist in this universe cannot have the ultimate authority. They, too, serve the nameless urge towards chaos. At the same time, McCarthy’s polyphony prevents the novel from directly stating that the devil has all the power in the world of *Blood Meridian*. He considers this possibility alongside the absence of universal Truth as well as the presence of discrete and redeeming acts of human goodness.

When we take this strange pairing of fireside chat/bloodbath in light of the judge as mediator for some sort of all-powerful God-devil whose prime directive is to incite violence, we enter a bizarre realm of religious consideration. It is evident from the novel’s apathy toward religion in general as well as its gratuitous violence that we certainly cannot, as critic Matthew L. Potts puts it, “enlist McCarthy as a Christian theologian” (*Signs of Sacrament* 14). However, with the identifiable treatment of evil as “ontologically independent” in McCarthy’s works, we must at least consider them as having a religiously minded outlook in the way of the existence of demons, if not in a typical Christian or theological sense. This is where

the act of sacrifice turns toward something more, something anything but “mindless”: violence becomes a kind of ritualistic eucharist, a ceremony in which the ordinary participants are able to inhabit and access the chaos-agent. In his mediation of this unholy partaking, Boguta-Marchel terms judge Holden “the Satan who imitates God” (123).

Additionally, Holden appropriates other abilities conventionally reserved for the Christian God. According to Boguta-Marchel, the eucharistic violence enacted on his behalf is “the sacrifice of a scapegoat, an enemy common to the whole community. This sacrificial mechanism enables Satan [Holden] to restore order and unity, but only to an extent which would ... reinforce his power over humans” (123). This is a backward rendition of the Christian salvation story, in which the blood of God is “scapegoated” for the sake of mankind in order to restore a peaceable relation between the two. Judge Holden’s brand of god-man transaction is another type entirely. It is the reverse of the traditional: the blood of mankind for the mind of a devil rather than the blood of a god for the soul of mankind. Holden does this to “sow disorder, violence and disaster” (123). In the novel’s final scene, we see judge Holden as the grinning, evil master of the dance. However, to compare this to the Christian hymn reading “I am the LORD of the dance, says He” (Carter, 1963), which was gaining popularity at the time of *Blood Meridian*’s writing, may be a touch hopeful.

In the vein of the devil’s eucharist, the dominance of evil encounters one colossal caveat. In *Blood Meridian*, we find one individual with whom the judge has trouble: the kid. The judge says of him, “There’s a flawed place in the fabric of your heart. Do you think I could not know? You alone were mutinous. You alone reserved in your soul some corner of clemency for the heathen” (299). The judge, our mystic mediator for the chaos-urge, can ridicule him but cannot subdue him. When the judge says to

the kid, “dont you know that I’d have loved you like a son?” (306), he invites the kid into a rendition of a God-man salvation relationship. Interestingly, the kid maintains agency by refusing. Throughout *Blood Meridian*, the kid “paradoxically speaks the least of all, typically limiting his utterances to negative statements implying refusal to enter into any kind of verbal exchange” (Boguta-Marchel 119). It is this resistance to dialogic interaction that does not quite exempt the kid from Dostoevskian polyphony but comes close enough to be noteworthy. By refusing placement amongst the varying dialogic registers from the evil to the divine, the kid attempts to guard his actions from involvement in Holden’s eucharistic transactions. His success or failure is not so important as his attempt: in *Blood Meridian*, there is resistance to chaos, no matter how futile, no matter how small.

In *Blood Meridian*, we are not so fortunate as to encounter the triumph of good over evil. However, representations of the novel as a dismissive, irreligious existential treatise lack the nuance of identifying McCarthy’s worldview as fundamentally religious, if in a completely unorthodox and metaphysically bizarre way. We do not have gods or demons; instead, we have a nameless power intent on sowing chaos and disaster via whatever means necessary, and we have discreet, hope-against-hope attempts at resistance. Many of McCarthy’s interactions between man and god, between subtle goodness and overwhelming evil, are mediated by upside-down renditions of Christian religious traditions, the foremost of which is the eucharist. We see judge Holden manipulate blood sacrifice as a means of access to his nonsensical brand of wisdom, and time and time again, we see men willingly fall at his feet for it.

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I'm on Your Side, But You Need to Listen

by Hana Kieger

Head down, eyes piercing through the sights, breath calm and even, finger hovering over the trigger: a smooth pull sends the bullet into the bullseye as my body ripples slightly from the recoil and the familiar smell of gunpowder reaches my nose. A gentle breeze flutters, making it the ideal condition for shooting, especially for competition. I always hoped for those conditions, but no matter what, I yearned to be on the range, practicing or competing. Shooting for sport hooked me due to the intense level of concentration and the calm, still manner required to align both body and gun for the perfect shot. I competed in BB gun competitions during my childhood, and the summer that I turned 14, I started competing at the state and national level with an AR-15. I went on to become one of the top 100 shooters in the country and the top shooter in Colorado. I say this in the most humble way as I want you to understand that I am not afraid of guns, nor do I dislike them; however, I cannot stand to see the level of pain and suffering they are causing in our country. With 2,291 gun-related deaths already in the first two months of this year (“Gun Violence Archive”), I cannot hide behind my personal appreciation of guns and ignore the violence they cause. I - *we* - need to support legislation that inhibits unstable and violent people from purchasing guns. This does *not* mean eliminating the right to own guns for those of us who will treat them with the respect and caution they require.

We're All on the Same Side

I truly understand the deep-rooted desire to keep and bear arms, and I understand the desire to fight for it. I also truly understand the perspective of a parent of a forever young child, once full of life and

adventure. These two understandings do not have to exist in opposition or fear of each other. In fact, these two sides can work together to solve a common problem: the deaths of many, many Americans. The divide between gun control and gun rights has typically been seen as the aisle between parties, where Republicans favor gun rights and Democrats favor gun control; however, this issue extends far beyond party lines. Political orientation doesn't apply to those who have been killed, so how can we make this an issue of Republicans vs. Democrats?

Republican Governor Rick Scott, of Florida, is taking the initiative and reaching above the party divide to propose a “violent-threat restraining order” that, in the words of Scott, “will allow a court to prohibit a violent or mentally ill person from purchasing or possessing a firearm” (CBS News). Even with this proposed restrictive legislature, we see that balance is possible between restriction and freedom. Scott is adamant about “[b]alancing our individual rights with our obvious need for public safety.” He goes on to say that “[a]n open dialogue is critical” (CBS News). With an open dialogue, we will be able to create new legislation that protects American citizens from gun violence while still allowing for private ownership and use of guns.

Even Donald Trump, a typical promoter of the Second Amendment, said “fellas [NRA leaders], we gotta do something. It's too long now, we gotta do something” at the 2018 White House Business Session. At the same time, however, Trump also stated that “we must pursue common sense measures that protect the *constitutional* rights of law abiding Americans while keeping guns out of the hands of those who pose a

threat to themselves and to others” (Trump hosts). Our Republican President's call to action serves as a reminder that the issue of gun control will not be an all-or-nothing policy: and doesn't depend on party affiliation. There are two sides to this discussion, and our President is calling them together to create a policy that reduces the risk of firearms getting into the hands of those who could do harm while still maintaining the rights of individuals who use firearms for sport or protection. The current system does not balance both of these perspectives, allowing for the violent outcomes with which we have become so familiar.

A Skewed System

I am not a mother, but I spent three years working with and loving a classroom full of children, watching them grow into themselves and discovering who they are. At six years old, they already had so much to contribute to the world and were so full of passion. To think about the Sandy Hook shooting in 2012, where 20 young children and six adults were shot and killed, sends a shiver up my spine and makes my heart drop. These children were the same ages as the children I worked with, which passionately engages my desire to protect them and the millions of other children in the United States. Many more people have been killed due to gun violence since the Sandy Hook shooting, including 58 people who were gunned down from above in October of 2017 and the 15 students and two school faculty whose lives were taken by a boy whose instability should have restricted his access to a firearm. This is someone who was repeatedly reported yet still managed to gain access to a gun and use it to destroy the lives of many innocent people (Pagliery).

The system is broken, leaking a violent stain into the world that flows from the darkness into public spaces where it grabs its victims. We cannot fix the leak with a partial plug, half of us filling the leak with whatever we can find, while the other half of us pull everything back out again. With this leak, this broken system, more people will continue to die at the hands

of our inaction. It is no longer enough to remain solid in your foundational beliefs, to refuse to compromise on the basis of what you think your rights should be. Our rights are getting people killed - *children* killed. It is time to support new legislation, such as the proposal by Rick Scott, to end the violent massacre in our country. I'm not asking you to give up the right to own guns, as that would be asking myself to do the same. Creating legislature that protects Americans, children, from being slaughtered does not remove our right to own and use firearms, and we don't need to fear it. My gratitude for the protection provided by guns, as well as the excitement I feel when I'm pulling the trigger, do not blur out the faces of the victims of gun violence, making them obsolete and irrelevant. Rather, I see their faces ever so clearly, urging me not to use my gun ownership as an excuse to ignore the leaking system, but to find a solution that will stop the dark stain of gun violence.

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City of Boulder Municipalization

by Tristan Sobey

Executive Summary:

The City of Boulder faces a number of challenges when it comes to achieving its dream of creating a clean-energy-driven municipal power company, the biggest of which will be setting up the electric utility in a way that avoids the economic and legal issues for the city and its residents. The optimal outcome would be for Boulder to work with Xcel or a new eclectic company to fund the constructing of clean-energy alternatives that are more in line with the city's goals. The City of Boulder should run a Descending First-Price Dynamic auction to procure a private firm to construct and run the infrastructure, potentially introducing bidder subsidies if there are a low number of bidders. The goal of this auction format would be to maximize the cost savings for the city while maintaining control over the outcome of the project. By introducing competition into the energy market, Boulder would make progress towards its clean energy goals and achieve a market-efficient solution. To encourage current or new energy companies to invest in renewable energy sources, a Pigou tax should be placed on Carbon Dioxide emissions. This will force firms to internalize the cost associated with harmful emissions.

Context

The City of Boulder receives its electrical utilities from the state regulated company Xcel Energy, who also provides power to the rest of state of Colorado. In 2011, the City of Boulder began to explore the possibility of creating its own municipal energy provider, a process known as municipalization. This process would, in effect, acquire the electric infrastructure and assets currently owned by Xcel and use them to construct a city-owned electric utility

(municipality). The City of Boulder is attempting to more aggressively reach in environmental goals, and municipalizing its electrical utility would be a necessary step in implementing the changes it deems necessary. As the city states on their website, "municipal electric utility (municipalization), a path to achieving its goals of 100 percent clean energy and an 80 percent reduction in carbon emissions by 2050"⁽¹⁾. As such, they want to have more control over the energy creation process. In 2013, Boulder ballot question 2E put the idea to a vote, asking voters if the city should pursue "Electric Utility Amendments" and a "\$214 million acquisition debt limit"⁽²⁾. The measure passed with 66% for the measure and 34% against, with 29,319 votes on the issue out of the 105,017 ballots counted for Boulder County⁽³⁾. Despite success of the vote, the city has met heavy opposition from Xcel Energy, the Colorado State government, and concerned citizen groups.

Following the election, Xcel responded to Boulder's municipalization push with a number of statements; many concerned with the cost to Boulder, "We believe the city is significantly understating costs to municipalize..."⁽⁴⁾ as well as potential legal action from the City of Boulder, "... (Xcel is) preparing for the city's potential litigation against our company"⁽⁴⁾. The City initially estimated the cost of municipalization to be around \$286 million, however Xcel estimates the acquisition costs to be \$72 Million to \$112 million over that estimate just to account for Going Concern Compensation and Stranded Costs alone ⁽⁵⁾. Regardless of the disagreement, the project will cost hundreds of millions of dollars; which is a sizable price to pay for what could be described as a completely discretionary project.

Challenges the City Faces:

During the process of any municipalization project, there are numerous economic considerations that must be accounted for if the plan is going to be successful in the long term, most of which have to do with the fact that government has a strange place in the market, but does not act like normal market agents. It simultaneously acts as both an entity with huge and little bargaining power, depending on the situation, three of which are presented below.

Unfair Competitive Advantages

One of the core issues facing the city when it comes to municipalization is concern over competition within the energy market. In the current market, Xcel functions as a state regulated monopoly, where pricing and other major changes have to be approved by the state of Colorado. In Boulder's ideal situation, Xcel would be effectively removed from the Boulder County energy market and replaced by a city-run utility. This could lead to a situation where consumers who might prefer to use Xcel's programs will no longer be able to access power from them, regardless of how they feel about the local municipal utility. Boulder claims that they will offer "Clean, reliable, low-cost, local energy"⁽⁵⁾, so, in theory, consumers would not need to worry about increases in their energy costs. However, whether or not Boulder can deliver on these promises has been widely debated. New power companies face many challenges during the initial phase of construction, and market, regulatory, and economic forces play a heavy roll in their potential success.

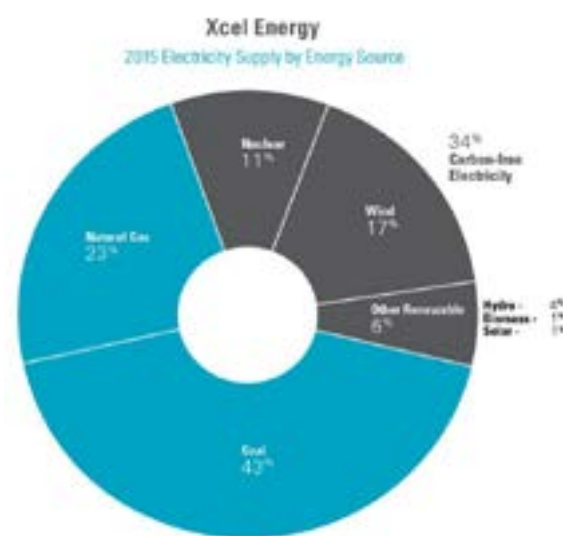
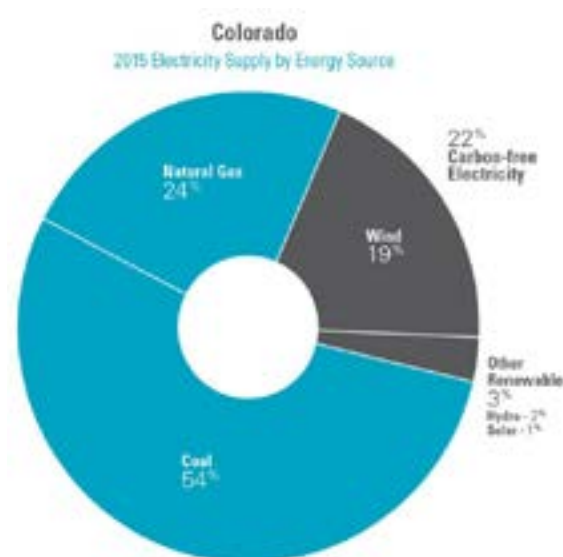
Dependent on Economics of Scale:

In any production process, reducing the cost per unit is the primary driver of profits and success. It is much easier to produce more of something if you already have the necessary capital to produce at a higher level: this concept is known as economies of scale. In the context of electrical power, if a company is serving a large number of customers, then it can more efficiently use the capital it has to power the

most homes or businesses. In addition to this, larger companies can spread the cost on new capital over a much larger population, reducing the per-unit costs much more efficiently if the population were smaller. In the case of Boulder municipalizing, it would face large up-front cost to acquire the capital necessary to run a power utility but wouldn't have a large population to spread the cost over. The city would have to issue municipal bonds (city debt), potentially charge a higher initial rate for electricity until the debt is paid off, or figure out an alternative method to finance the project. Most cities will issue municipal bonds to finance major projects; however, like regular loans, bonds pay yearly or bi-yearly coupons (interest) to the bondholders. When it comes to energy rates companies like Xcel already own the capital within Boulder County, so the amount of debt they have is either low or non-existent. They do not need to charge a rate premium to finance the capital, so their rates are lower. Boulder would not be able to do this without finding alternative methods of paying down the debt; this could be accomplished by either raising energy rates or making new taxes.

Difficulty Diversifying Energy Sources

As the Boulder flood illustrated in 2013, weather and other uncontrollable factors can have a major effect on how a city functions. With more than \$2 Billion in estimated property damages (including housing, commercial, and government property), the flood illustrated how relatively minor externality like weather can result in large-scale problems for a city ⁽⁶⁾. Part of a well-designed electrical grid is being able to not only plan for these possibilities but to have the resources and ability to diversify the energy sources of an area. On a state level, public utilities achieve this via having a variety of energy production plants, varying from more traditional sources like coal and natural gas to newer methods like solar, wind, and hydroelectric power plants ⁽⁷⁾.



Municipalization faces the issue that most cities and counties have access to only a few sources of energy generation due to geographical and monetary restrictions. The only perceivable way for this issue to be overcome would be to have a functional relationship with other energy companies or municipalities around the state to provide emergency power if the local ones fail. However, given the nature of the relationship between the City of Boulder and Xcel, this would be costly for the city at a minimum. On one hand the city would want to completely separate from Xcel; however to retain energy diversity, it would need to remain attached to the Colorado grip, which is run by Xcel. It is not hard to see why Xcel will probably not be open to this arrangement.

Recommendations

At its core, the City of Boulder wants to foster a more environmentally friendly power system, and it doesn't want to wait decades to do it, either. Whether or not the city or an external firm runs the new utility is irrelevant, provided that the same goal is achieved. We recommend that the city set up a descending first-price dynamic auction to create the new utility, allowing energy companies from across the country to compete for the contract. In the event that the number of bidders is low, bidder subsidies could be used to encourage competition.

The idea behind this recommendation is that government-run functions are inherently inefficient, and by using a market driven process, Boulder can build the ecologically friendly infrastructure it wants while allowing private firms to compete for business. By doing this, many if not all the concerns raised about municipalization above would be accounted for within the market process. Concerns over unfair competition would be addressed by the introduction of bidder subsidies should the need arise. Firms would be able to integrate Boulder's system with their existing infrastructure, allowing for the benefits of economies of scale to exist even in on a smaller scale (assuming the winning company has existing infrastructure). Tied to the previous point, firms with existing assets could allow for a greater degree of energy-source diversification while still conforming to the city's laws and regulations. This solution even solves the philosophical and political issues associated with municipalization because as people will be less averse to the idea of a government-business partnership.

In regards to existing infrastructure that Xcel owns in the Boulder County area, a Pigou tax can be effectively used to encourage Xcel to participate in the auction process. A Pigou tax taxes the production of a thing based on its Social Marginal Cost (SMC), and forces the entity producing that thing to calculate the SMC into the cost of production. In the case of

pollution, this would be a carbon tax that is measured in per ton of CO₂ emitted by the company from its power plants.

Auction Details

It is commonplace for government agencies and departments to use auctions as a means of acquiring goods and services from external companies. Some of the benefits include lower prices due to competition, faster procurement times, and market-efficient outcomes. In the case of Boulder's municipalizing their electric utilities, it would be much more efficient to have an external company create and run the utility. Like a Dutch Auction, a descending first-price dynamic auction would have companies bid to complete the project on the city's behalf while also having to abide by the city's requirements.

Descending auctions allow for bidders to bid lower and lower prices until none wants to go lower than the lowest current bid; when this happens, the lowest bidder wins the auction (contract) and pays that low price. This descending format is beneficial for government procurement due to the fact that the price will decrease farther and farther as competition (the number of real bidders) rises. As such, the auction will then function like a normal market for goods and services. Agencies and every level of government, from federal to local use this system to buy equipment, build infrastructure, and fulfill contracts (8).

In a first-price auction, the winning bidder pays the winning price. This may seem like a trivial decision; however, in other auction formats, you want to avoid using first price when revenue is the chief concern. In the case of a descending auction, though, it is ideal because it prevents bidders from artificially lowering their bid in an attempt to win the contract for a higher price. Bidders are incentivized more accurately and calculate their costs as knowing this value will determine exactly how low they should bid until. If a company underestimates the costs associated with creating the utility then it will eat into

their profits.

Dynamic auctions are what most people imagine when they picture an auction: multiple bidders bidding in full view of everyone involved. This format allows for more perfect information to be collected by the bidders and the auctioneer (Boulder). By allowing other firms to see the bids of their competitors, they are significantly more likely to continue bidding closer to their true value (cost to build the utility). This is advantageous for the auctioneer because it means that as the auction progresses, the winning bid (final price) will be lower than if only one company or organization had been considered.

In the events that there is a lack of competition in the auction or if two of the main bidders are not of equivalent scale (financially) the auctioneer can choose to subsidize the side with less bidding power. This would allow for a smaller company to become more competitive and the expense of the city, not unlike how a handicap is used to level the playing field in golf competitions. Even though the city is on net losing money, there are situations whereby introducing a bidder subsidy the city can lose less money than had they allowed the larger firm to just slightly underbid the smaller firm when it can afford to bid much lower values.

Considerations for a Market Based Electrical System

As with any market system, there are a number of issues that can occur, the effects of which can be mitigated via taking the appropriate precautions. An energy market would most likely take the form of an oligopoly (9), where only a few larger firms compete for market share. Oligopoly markets tend to exist in fields that have high barriers to entry (such as high investment costs or infrastructure construction), a need for relative product uniformity, or in situations wherein the actions of one market

agent can heavily impact the overall market. All of which are present in the energy market. While less than ideal, this market would be vastly more preferable to the current regulated monopoly companies like Xcel hold. Oligopolies in general are easier to regulate and have some market incentive to compete with themselves without government pressure. The Federal Trade Commission states that “For the most blatant agreements not to compete, such as price fixing, big rigging, and market division . . . , these practices are so inherently harmful to consumers that they are always illegal” (10), making it clear oligopolies that participate in harmful forms of collusion are easily punishable under current US law and wouldn’t require new legal precedent.

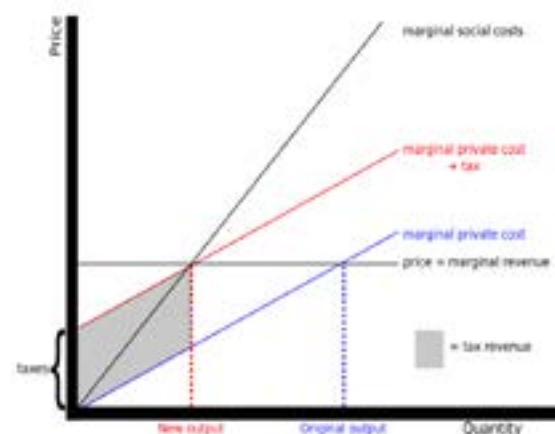
It is also worth mentioning that not all oligopolies and monopolies are bad, in many cases they come into existence via natural market behavior. It is possible that a firm provides such a high level of value, quality, or availability that it becomes the sole provider of that good or service on the market. This is healthy provided that they themselves do not create barriers to entry on other firms attempting to access that market. One might say that Xcel’s current market share in Colorado is evidence of this idea not being true, however this is not the case. Xcel Energy, like almost every other electrical utility provider in the US, is a state enforced monopoly. This was originally done to regulate the standardization of electrical systems as they were being implemented around the US, which has carried over into the current market.

Pigou Tax Details

The theory behind the Pigou tax is that by making market agents pay for the externalities they inflict on society, you can achieve a market efficient system without resorting to more harmful government intervention such as caps or limits on production (which will result in shortages). This ideal situation is achieved by identifying the source of the externality

(pollution from CO₂ emissions), calculating the SMC per unit of that externality (cost per ton of CO₂ emitted), and then taxing the externality at that level. This will make the firm internalize the SMC within their production equation, resulting in a naturally lower level of output.

In the eyes of many economists, the Pigou tax is ideal practically and morally because it has market agents pay the full Macroeconomic costs as opposed to just their private costs. The majority of the difficulty comes in determining the SMC portion of the equation, which can be subjective and is not as clear. It is not impossible to do and can be adjusted yearly should levels of emission remain above desirable levels. However, it is important that city officials do not abuse this system to instantly reduce emissions to zero. Should they do this, businesses like Xcel will completely cease to exist, leaving a massive supply-side shortage, which will make the tax act like a cap on emissions (raising energy costs for everyone to a significantly greater degree than a Pigou tax would). Like any economic change, it must be applied gradually to allow for the market to adjust and adapt to new conditions. No matter how tempting it may be to attempt to bypass market forces, in the end, the market always wins.



Final Thoughts

The City of Boulder and its residents are trying to create a new and brighter energy future for themselves, a goal that is admirable in many ways. However, for this project to be successful in the long term, planners and organizers must consider the economic ramifications of their actions. By pursuing market-based solutions, they can achieve the best of both worlds, implementing most of the major energy reforms desired by the public and at a lower cost than should the city decide to start from the ground up. In any eventuality, it is worth remembering that working through the market will always yield better outcomes than trying to circumvent it.

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Cogs in a Machine: Examining Amazon's Employee Issues

by Brianna Huynh

Dear National Consumers League:

There have been recent claims from an article circulating online stating that Amazon warehouse employees face challenging working conditions in both minimum standards for performance and how they are compensated for their work. These allegations have led some frequent Amazon shoppers to reevaluate their loyalty to the internet shopping mogul and demand more information on their employee relation practices. This specific case addresses a larger issue in business ethics over whether poor employee treatment should ultimately decide if customers should continue their patronage to service providers.

This paper will begin with stating the relevant facts of the case, including those behind the claims that are currently made against Amazon from an article on *Salon*. This will lead into a discussion of the options the customer can choose to take in response to these claims. Several ethical approaches will be evaluated in choosing a framework to best view the issue.

The analysis of this decision will first evaluate the positive and negative effects of treating employees as tools in the production process as opposed to autonomous individuals. Arguments from both sides of the issue will be presented as support and counter-argument to each other. There will also be an analysis of the decision to continue to support businesses with poor working conditions, which will be supported by sources that both accept and reject the decision.

This paper will ultimately argue that companies that consider employees as individuals who can make the best decisions for the company on their own accord will yield more beneficial results. Furthermore, customers who choose to support

such companies despite potential extra costs to them because of the improved working conditions are making the best choice to positively impact the overall business environment. The goal of this case study is to support constant improvement of working conditions and provide support for a departure from the idea that employees are simply cogs in the greater production machine of a company.

I hope that this analysis of Amazon will allow customers across the globe to better evaluate their purchasing behavior and work to promote fair treatment of employees across all industries. As consultant to this case, I appreciate any comments or question on the details of the analysis, which are enclosed.

Sincerely,

Brianna Huynh

Ethical Issue

Amazon, an online shopping titan, has been criticized in an article by *Salon* over alleged harsh working conditions imposed on employees. These claims, which will be detailed further in the case, have led loyal customers to reconsider their support of the business. The main ethical issues that surround this case are whether employees should just be viewed as tools towards production in the workplace and whether customers should continue to support businesses with poor working conditions even if it provides the customers a benefit. There are decisions to be made by both the business and the customer.

The choice to stop supporting Amazon, or any business that is reportedly treating workers unfairly, will be damaging to the business. Not only will their customer base decline, the image of their company will also be tarnished. It is difficult to win the hearts and minds of consumers and even more difficult to stay in good favor with consumers. Once customers decide that the company is an example of the moral unjust, it will take a lot more than just free shipping to regain their support. The company must demonstrate remorse for their actions, persuade the public that they have changed, and continue to improve on their promises. This decision involves a choice between a "good" and "bad" option when the company is considered immoral by its customer base. Those who choose to support the group will be making the "bad" choice while those who choose to boycott it will be making a "good" choice. Furthermore, this situation is damaging to the workers who are facing the unjust treatment. The quality of their work environment is not as high as it could be, potentially creating a decline in their overall level of performance. The instrumental view of employees could also be detrimental because employees are not given the choice to work in their best way. By treating employees as pieces to the overall production puzzle instead of those who can make decisions autonomously, a company can experience a decline in morale and lead to unrest in the workplace.

The issue of employee treatment is both about legality and efficiency. Amazon must compensate their employees at the defined legal minimum wage. Any lower is considered a violation of federal law. In terms of employee monitoring, there are few clearly defined limitations on what is deemed illegal monitoring. Currently, there are legal limitations on placing monitoring devices in nonwork areas such as restrooms and locker rooms. It is also considered outside the federal law to monitor any area where employees could discuss personal issues such as

cafeterias (Katz).

This issue, however, is more about efficiency. There are those who maintain that the instrumental view of employees is more efficient because specific direction is given to mitigate variance and error in the final product. There are others who believe that an autonomous view of employees is necessary to allow employees the freedom to contribute to the company in the best way that they can. The issue of employee treatment is based on how the company can use their workforce to reach maximum efficiency and produce maximum results. Disagreements come about when companies are trying to reach this level of efficiency in a way that also pushes the boundaries for ethical treatment of employees. In the case of Amazon, there is debate over whether the machine-like standards and observations of their employees is ethical or not.

Relevant Facts

The relevant facts of this case include those involving the claims that the *Salon* article makes about the working conditions at Amazon. The claims provide context to this case. A majority of the claims made against Amazon's working standards are based on heavy performance monitoring, strict procedures, and inflexible wages in comparison to increases in performance expectations. The major problem in this case is if these claims can be proved. Further research is required at Amazon facilities to definitively prove the claims in the *Salon* article are true. The claims are as follows in figure 1.

Salon Article Claims:

- "Amazon equals Walmart in the use of monitoring technologies to track the minute-by-minute movements and performance of employees and in settings that go beyond the assembly line to include their movement between loading and unloading docks, between packing and unpacking stations, and to and

from the miles of shelving at what Amazon calls its “fulfillment centers”—gigantic warehouses where goods ordered by Amazon’s online customers are sent by manufacturers and wholesalers” (Sheffield).

- “...management experts, scientific managers, take the basic workplace tasks at Amazon, such as the movement, shelving, and packaging of goods, and break down these tasks into their subtasks, usually measured in seconds; then rely on time and motion studies to find the fastest way to perform each subtask; and then reassemble the subtasks and make this “one best way” the process that employees must follow” (Sheffield).

- “As at Walmart, Amazon achieves this with a regime of workplace pressure, in which targets for the unpacking, movement, and repackaging of goods are relentlessly increased to levels where employees have to struggle to meet their targets and where older and less dextrous employees will begin to fail. As at Walmart, there is a pervasive “three strikes and you’re out” culture, and when these marginal employees acquire too many demerits (“points”), they are fired”.

- “There is no independent employee voice to contest management’s demands for increased output unmatched by increases in real wages” (Sheffield).

- “When in December 2012... representatives in Leipzig called on the management of Amazon’s local center to open negotiations on wage rates and an improvement of working conditions, and especially for temporary workers who are badly exploited at Amazon, management refused on the grounds that employees should be “thinking about their customers” and not about their own selfish interests” (Sheffield).

- “... economics correspondent Sarah O’Connor describes how, at Amazon’s center at Rugeley, England, Amazon tags its employees with personal

sat-nav (satellite navigation) computers that tell them the route they must travel to shelve consignments of goods, but also set target times for their warehouse journeys and then measure whether targets are met”.

Instrumental View
f
“An individual fills a position in much the same way that components are plugged into a stereo system. Individuals are interchangeable parts, and as such they are denied any intrinsic value or meaning of their own... the position itself and the individual who fills it have value only so long as they are efficient means to some external end” (DesJardins 48)

Figure 1: Salon claims against Amazon

Another component of the facts that make up this case are the definitions of different philosophies of viewing the labor force of a company. This case will use terms as defined by Philip DesJardins in *Business Applications of Social Responsibility*, I outlined in figure 2. Based on the claims stated in the *Salon* article, Amazon currently adopts an instrumental view. By monitoring and enforcing specific procedures in their fulfillment centers to increase the marginal product of each unit of labor, the employees are being viewed as parts in the production process.

Stakeholders and Actions

There are internal and external stakeholders involved in this case. Internal stakeholders are groups who are directly affiliated with the company. External stakeholders are those who are outside the company, but who are still affected by the actions of the company. It can be argued that the concerns of

employees and customers are the most important in this case. This issue directly affects working conditions and standards for employees. The livelihoods of these people are vastly affected if employees are not able to or reject these conditions. If conditions are too harsh, this stakeholder group is most impacted by the changes. The needs of employees should be met to make sure that Amazon can retain talent and that these employees are putting forth effort to positively impact the company. Customers also have an important stake in this case. If customers deem the company’s employee policies are too harsh and stop their patronage, Amazon loses a main stream of revenue. Without a loyal customer base, the company cannot hope to survive and stay an online shopping mogul. These customers also have the power to spread this information among others, creating negative publicity for the company. “The customer is always right” is a popular idiom when conducting business that may hold more power than originally anticipated.

Professional View

“... the positions individuals occupy are valuable in themselves and not just as means to some other end. Like the medical and teaching profession, these positions derive their value from those goods that can be achieved only through the practice of that activity. Individuals occupying these positions derive meaning and value from the pursuit and attainment of goods that are internal to those positions” (DesJardins 48).

Figure 2: DesJardins labor frameworks

In this case, there are a set of options that Amazon can take. Depending on that action, consumers also have a set of actions to choose from. Figures 4 and 5 lays out the ultimate choices that can

be taken by both parties.



Figure 3: Internal and External Stakeholders





Figure 5: Customer Choice Set

When evaluating these decisions, the approach that best addresses this case is the common good approach. This is because variance exists within the choices of all other the other approaches and a singular best way to satisfy the framework's goal is ambiguous. For example, the justice approach could be achieved if Amazon adopts a professional view of labor, but could also be achieved if customers abandon the company. The common good approach is the only approach that can be upheld with only one specific set of actions. The approach can be refuted by arguments from the other approaches, but it is the only one that cannot offer a counter-argument within the options to best uphold the goals of the framework.

When presented to a large audience, the hope is that they also agree that the common good approach offers the best alternative. While it does not satisfy a group of internal stakeholders, it does effectively benefit the largest number of people. It is unrealistic in our world to make choices that satisfy every need at the conclusion. There will always be some needs that are not met as well as other needs because it is just not possible to cater to every group while still maintaining an effective decision.



Figure 4: Amazon Choice Set

Evaluating Decisions

In evaluation of which decision is the best approach to take on this case, a variety of ethical frameworks can be applied. Table 6 outlines the approaches, the goal of the approach, and which decision in the case best fits the approach.

Approach	Goal	Action
Utilitarian	Produce the most good and do the least harm (Santa Clara University)	To produce the most good and do the least harm, Amazon should cease their alleged monitoring to relieve the stress of their employees. This will allow them to perform in an atmosphere where they are the most comfortable which could lead to an increase in productivity. This action will also lead customers to continue their service to the company since they now have no reason to leave. However, this option may produce harm to Amazon because they will be forced to restructure their entire approach to labor relations. This could cost a vast amount of resources, especially in the form of time and money. These costs could potentially outweigh the benefits from the increased autonomy.
Rights	Respect rights of all who have a stake (Santa Clara University)	The rights approach would be most met if Amazon adopts a professional view of their labor force. This action will best respect the rights of employees who are the main group of stakeholders being impacted. However, it can also be argued that it does not matter how Amazon chooses to act to uphold the rights approach. This is because, as it stands, there are no labor laws being broken by Amazon's actions. If rights are not being infringed upon, is adopting a rights approach as relevant?
Justice	Treat people equally or proportionately (Santa Clara University)	The justice approach is best upheld if Amazon changes their view to a professional view. This will ensure that employees are being treated the best and are given more freedom than in the strict conditions currently being enforced. This will also treat customers fairly as they are expecting a service from a moral company. On the other hand, the justice approach can also be upheld if Amazon does not change to a professional view. If customers choose to abandon the company, justice is still being promoted in the fact that consumers are treating the company as they feel it should be treated. If customers are treating the company proportionately to how the company treats its employees, the approach is still being met.
Common Good	Best serve community as a whole (Santa Clara University)	The common good approach would require Amazon to adopt a professional view. This will best serve the employees and customers, which impacts a greater population of the community than Amazon to keep an instrumental approach to satisfy the needs of their own company.

Virtue	Act as the kind of person the individual wants to be (Santa Clara University)	The best course of action to take to uphold the virtue approach is hard to determine. This is because the individual virtues of the stakeholders are unknown. Customers could value convenience more than social justice and employers could value efficiency over autonomy. The virtue approach cannot easily be determined because there are too many unknown factors that are needed to make a truly informed decision.
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Table 6: Ethical Framework Analysis

In these cases, it is important to cater to the needs of as many people as possible. In the common good approach, much of the community is benefitted in the form of employees and customers. Amazon's top leadership may not be positively benefitted in the decision to change their labor relations, but they are a small group when compared to the number of customers and employees that are being impacted by the decision.

Analysis- Views of Labor

There are those who maintain that different views of labor produce the greatest results within a company. As defined by DesJardins, these two views are the instrumental view and the professional view. The instrumental view considers employees as parts to the greater whole of the company and that they only provide value to the company so long as they are being efficient in their assigned roles (DesJardins 48). The professional view provides the opposite view that employees are able to make autonomous decisions how they want to make contributions to a company and that they are efficient as long as they can find a way to make their work have meaning (DesJardins).

Those who believe that an instrumental view of labor is more beneficial to the productive capabilities of a company argue that monitoring and tracking employee progress can help to reduce inefficient activities within the production progress and reduce costs. For example, monitoring technologies can record employee behavior in work tasks over time so that they can be analyzed to

determine the best methods for performing specific tasks (Katz). These methods have been shown to help the United Parcel Service save millions of dollars each year by reducing time spent on deliveries and determining the most fuel efficient routes for each driver (Katz). Another benefit of specific procedures is to promote specialization within a production process. For Amazon workers, there certain tasks that are repeated to fulfill orders every day. By assigning staff to specific operations, each team becomes experts in their own task and can learn to be the best at performing that task (Price). This allows businesses to cut down on production times and easily interchange employees if they leave (Price). In this view, employees are truly parts to a machine that can be inexpensively replaced.

However, those who refute the advantages of the instrumental view argue that the plethora of monitoring and procedures leads to an excessive amount of stress on the employee and a lack of human connection. Overly intrusive monitoring can cause stress on employees because of a constant feeling that someone is looking over their shoulder (Katz). Constant pressure to perform at the highest level because performance is always being monitored can potentially lead to more mistakes and higher turnover because employee morale is detrimentally affected (Katz). Employee morale is further declined when teams are repeatedly performing the same tasks in a monotonous fashion. A lack of creative problem solving and mental stimulation can force employees to become indifferent towards their work and, if employees feel unvalued enough, leave the company.

Those who reject the instrumental view, instead, believe that the professional view is a more efficient approach to labor management that can benefit all facets of the company. Those who believe in this approach adopt a style of management that allows for a focus on improving employee relations instead of employee work metrics. This includes allowing groups to be creating in problem solving, incorporating diversity in methods of thought, and encouraging an environment of trial and learning (Merchant). According to a study by Gallup, high employee engagement can increase profitability by 16%, customer loyalty by 12%, and product quality by 60% (Merchant). In addition to creating a more open environment in the workplace, the professional view can restore a sense of humanity into work tasks that the instrumental view fails to address. The efficient procedures and policies set by workplace monitoring do not consider the power of human problem solving (Katz). It is this ability to work through issues that some believe helps create a sense of purpose for employees at work. Thus, employees contribute more to their work and devote more effort because they truly enjoy their work and feel as if they are part of the overall company's success (Merchant). While the instrumental view can improve the technical capabilities in a company's production process, the professional view values the human element of human resources and is catered to improve the atmosphere of a company as opposed to just refining procedures.

Analysis- Customer Support

Another component of the ethical issue presented in this case is whether customers should continue to support companies who have poor working conditions for their employees. There are those who maintain that it is ethical to support such companies because the benefit they provide to the customer are greater than the drawbacks incurred if they were forced to shop elsewhere. There are also those who

believe that it is unethical at any point to support companies who provide subpar conditions for their employees.

Those who believe that it is ethical for customers to continue shopping at businesses that have poor employee conditions cite the observation that most of these businesses offer cheaper products and have more locations. An example of such a company is Walmart, a discounter shopping center, that offers low prices and has opened twice the number of store fronts as Target (Goodfellow). While Walmart has also faced claims of unfair working treatment, it still generates \$473 billion in sales every year (Pothier). These sales come from many shoppers who cannot afford to shop anywhere else. Since the 2008 recession, per-capita economic growth has been slow to reach pre-recession levels and many American shoppers have switched to shopping at Walmart in response (Goodfellow). In a recent study, Prosper Insights concluded that these decisions to shop at Walmart were not made by personal choice, but rather by necessity (Goodfellow). For those who cannot afford to shop anywhere else, it would also inherently be unethical to push them to shop at other businesses under the common good and utilitarian approaches if they cannot afford it (Pothier). Much like Walmart, Amazon offers low-priced products through a convenient distribution channel- - the internet. It is ethical for shoppers to continue to utilize these business services because they would not be able to maintain their standard of living without them.

On the other hand, there are those who argue that it is always unethical to shop at retailers who have poor working conditions. They argue that spending money at these businesses ultimately supports their ability to run their company while continuing to keep their workers with subpar conditions (Brownstein). These low standards usually include low wages that border the minimum wage. At these wages, employees are unable to spend as much at other retailers in the

economy, subsequently pulling down standards of areas with poor working conditions (Brownstein). A domino effect ensues, with greater economic and social damage being done than is worth the savings being provided to the customer (Seglin). It is also argued that if consumers continue to shop at these businesses without advocating for better labor conditions, employees will never receive them without the pressure of external stakeholders (Brownstein). Without federal regulation on a higher living wage or requirement for employers to offer affordable health insurance benefits for workers, those who face poor working condition will continue to unless there is advocacy for them. In order to improve the standard of living for the largest proportion of the majority, it is most ethical for customers to stop supporting businesses in protest of harsh working conditions.

Conclusion

To comply fully with the common good framework, Amazon should adopt a professional view of labor in order to prove to their customers that they are supportive of corporate social responsibility. Customers who then continue to support Amazon following the changes can be assured that they are also making the decision that benefits the whole community and not just part of it. The best method for implementation of these changes is detailed in figure 7.



Figure 7: Change Implementation

If changes are effectively made and facilitated,

Amazon should see a boost in employee morale and customer support. By showing that they are a company that values corporate social responsibility, customers will be more inclined to shop on their website. Positive company image will boost their standings in the minds and hearts of their loyal customers and validate that their customers are supporting a moral business. With a new policy of autonomy, employees are now able to work without the pressure of constant evaluation on their minds. They can focus on the work itself and how to perform their duties to the best of their abilities. This will then motivate them to contribute to the company as much as possible. While Amazon used large amounts of resources to make these changes, it is possible that the new benefits they receive will in more than what they lost in the first place. By adopting a common good approach, it may be possible to benefit all members of community at the end even though the initial actions did not.

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An Evaluation of Macdonald's Natural Ingredient Initiatives: Marketing and Advertising Recommendations

by Pauline Flores

Executive Summary

Americans today are leaning more towards practicing healthier lifestyles. McDonald's responded to this trend by releasing healthier menu items. Although this strategy is smart, it is misguided because of the fact that it is a fast-food burger chain; people don't come to McDonald's to eat healthy. Realizing this, McDonald's new turnaround strategy announced that the company will decrease the use of preservatives, antibiotics, and artificial ingredients in its food in 2015 (Peterson, 2015). Despite this action, consumers still do not believe that McDonald's ingredients are high quality. Consequently, revenues continued to decrease, from \$25 billion in 2015 to \$24 billion in 2016.

To both increase revenues and gain the trust of consumers, it is recommended that McDonald's take the "What's Cooking" videos currently on its website and transform them into TV commercials that air across the United States. With this integrated marketing campaign, its objective should be to show consumers that McDonald's is a transparent company that uses fresh ingredients and has close relationships with its suppliers. One of its competitors, Culver's, released an advertising campaign that did exactly that in 2015, and they saw increased revenues the same year. In addition to the new ad campaign, McDonald's should use its website as a tool to educate consumers about their ingredients, clearly stating what they are and where they come from. Transparency should be the ultimate goal of McDonald's actions. When consumers perceive McDonald's as a transparent

company, they will be more willing to believe that McDonald's does in fact use fresh, quality ingredients in its food.

Background Information - Society's Preference for Natural Foods

For the past decade, Americans have become increasingly health-conscious. This is evident through the rise of new diets (gluten-free, paleo, etc.). McDonald's responded to this growing trend by releasing healthier food options, such as the kale salad, and including fresh fruit in Happy Meals. Although offering healthy options is a wise action for McDonald's to undertake, (Michael Spector) "that's not the food most people go [to fast food restaurants] to eat." "Healthy" is simply not a word that people associate with fast food restaurants. According to a *Forbes* article, "the most important factor for fast-food patrons is 'high-quality, fresh food,' and fast-food concepts that promote this type of fare tend to perform better than those with healthy options" (Tristano, 2016). Consumers are more concerned about what preservatives and artificial ingredients are included in their food than ever before (Kenward, 2016). McDonald's again acknowledges this by emphasizing its use of 100% angus beef in its burgers and 100% white meat in its chicken nuggets on the ingredient list found on its website, but doing so seemed to have no effect on consumers' attitudes towards McDonald's judging by the company's revenues.

McDonald's Financial Performance

According to annual reports, McDonald's revenue in 2013 was \$28 billion. In 2015, total revenue decreased to \$25 billion (Figure 1). This was the year that McDonald's unveiled a new turnaround strategy to increase revenues and traffic (Peterson, 2015). One of its objectives was to improve quality. To accomplish this, McDonald's said it would use chicken and beef that were not treated with antibiotics and that it would eliminate "hard-to-pronounce" ingredients from its food. Despite the turnaround strategy put in place, McDonald's total revenue continued to drop to \$24 billion in 2016.

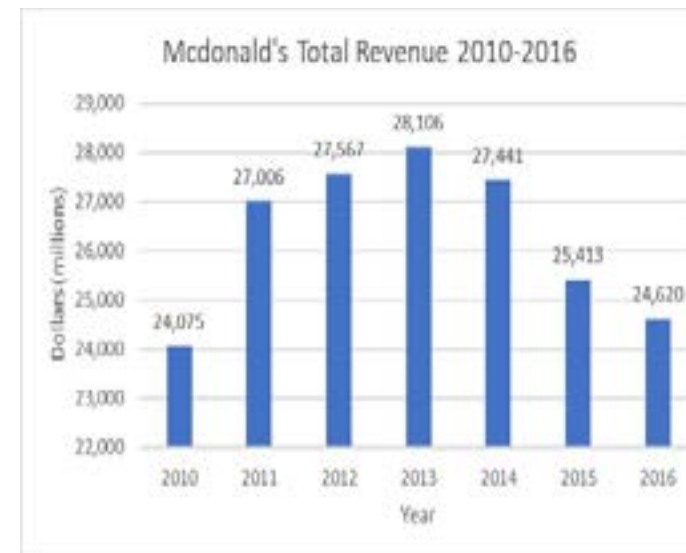


Figure 1: According to their annual reports, McDonald's total revenues have decreased since 2013.

This consistent drop in total revenue suggests that there is a disconnect between what McDonald's is offering to consumers and how consumers perceive these changes. A factor that may play a role in this is a lack of trust between consumers and McDonald's. Michael Spector, a writer for *The New Yorker*, met with the Dan Coudreaut, the chef behind McDonald's menu, to talk about McDonald's ingredients. Coudreaut frequently "used words like 'healthy' and 'natural' to describe his menu," but the chef later goes

onto to say that "when we say one-hundred-per-cent pure beef, no fillers, no additives, people still don't believe it" (Spector, 2015).

Recommendation for Improvement- New Marketing and Advertising Strategy

McDonald's can rebuild trust with consumers by implementing an integrated marketing campaign that communicates the company's value in serving fast food made with quality ingredients. Fortunately, this communication message already exists on the McDonald's website under the "What's Cooking" section. This mini web series follows McDonald's chefs Jessica Foust and Dan Coudreaut across America as they visit the regions where McDonald's sources their ingredients. The purpose of these four videos is to highlight the freshness and quality of McDonald's ingredients, but the links that follow these videos back to YouTube show that the average view count each is only about 200,000 since the first video was released in September 2016 (Figure 2). This is a small fraction of the reach that could be achieved in this period if McDonald's featured the "What's Cooking" series on TV and social media advertising. In addition, Figure 2 shows the high number of dislikes on each video relative to likes, which displays people's distrust towards McDonald's new communication message.

Video	Date Published	# of views	# of likes	# of Dislikes
Filet-O-Fish	Mar-17	6,257	91	21
French Fries	Nov-16	415,548	557	403
Salads	Oct-16	293,330	157	77
Egg McMuffin	Sept-16	142,203	440	307

Figure 2: Statistics about the four "What's Cooking in America" videos available on McDonald's website and YouTube account.

To gain consumers' trust and enhance its reputation, McDonald's should transform the minute-long videos from the "What's Cooking" web series into 30-second television, social media, and online video advertisements. Currently, McDonald's advertising focuses heavily on promoting its products and promotions, but the company would benefit from directly addressing the issues that consumers have with McDonald's in the form of a new marketing campaign. The videos of these web series are made with high-quality cinematography, so McDonald's would need to devote a portion of its current advertising budget to create more of these videos. If McDonald's decreased its current product advertising strategy by 50% and allocated those dollars towards the new campaign, the company has the potential to change its brand image.

This new advertising campaign's goal would be to make consumers more aware about the initiatives McDonald's are undertaking to enhance the quality of its food. The number of dislikes on the original YouTube videos reflects the distrust consumers have towards McDonald's. This means that the company must do more than just run television ads in order to change consumers' perception.

Educating Consumers About Ingredients

Educating consumers about where the ingredients come from through advertisement is a good start, but to have a fully integrated marketing campaign, McDonald's should increase consumer engagement with the company. One way to achieve this is to update the McDonald's website so that there is more interactive content that highlight the quality of McDonald's ingredients. Currently, McDonald's addresses these topics in the form of short blurbs and the mini web series, but these do not dive deeply enough to show that McDonald's is a truly transparent company. McDonald's also has a page on its website

that lists the nutritional facts about its food. Clicking the "customize ingredients" button shows the full ingredient list for each menu item. This is a useful page for customers who want to know what they are eating, but most items on McDonald's menu have ingredients that are "hard to pronounce."

Generally, people who are conscious of the ingredients they eat assume that natural equates to simple, meaning that they are turned off by ingredients that sound like they were made in a lab. According to McDonald's nutritional page, the chicken nuggets contain ingredients such as niacin, riboflavin, thiamine mononitrate, sodium aluminum phosphate, and other ingredients that sound artificial to the common consumer. McDonald's should include a hyperlink in these ingredients that reveals a box explaining what the ingredient is and why it is included in the menu item.

Adding more content to the website is a good opportunity to inform consumers, for example, that niacin is actually vitamin B-3, riboflavin is vitamin B-2, and thiamine mononitrate is vitamin B-1. According to the Center for Science and Public Interest, these three ingredients are safe for human consumption. They also say that sodium phosphates are safe to consume, but its consumption should be cut back due to general unhealthiness. By clearly explaining the ingredients in their menu items, McDonald's can increase its company transparency. Even on menu items that contain artificial ingredients, McDonald's should state this and explain why they are using it (ex: for color or texture purposes) and say that it is FDA approved. Food additives are used in foods to maintain or improve safety, freshness, nutritional value, taste, texture, and appearance (Center for Food Safety and Applied Nutrition). Despite FDA approval, consumers may still look down on artificial ingredients. If this is the case, McDonald's should find natural, alternative

ingredients that achieve the same effect as artificial and state this goal in their website. By ensuring customers that McDonald's is working to make their ingredients more natural, the company will be able to increase the believability of their "What's **Cooking**" campaign.

What the Competition is Doing

Other fast food companies have had success with promoting believable communication messages that generate a positive attitude towards the brand. In-N-Out Burger and Culver's, two burger chains that compete with McDonald's in the fast food category, had a 5.1% and 15.5% year over year sales change in 2015 in addition to high quality rankings according to a consumer survey (Figure 3).

Top 10 Fast-Food Chains for Food Quality		
Consumer Ranking	Chain	2015 YOY Sales Change
1.	In-N-Out Burgers	5.1%
2.	Papa Murphy's	4.7%
3.	Chick-fil-A	8.8%
4.	Krispy Kreme	7.4%
5.	Marco's Pizza	34.3%
6.	Culver's	15.5%
7.	Cold Stone Creamery	-0.4%
8.	Jet's Pizza	13.4%
9.	Potbelly Sandwich Shop	14.2%
10.	Ben & Jerry's	-5.5%
Average Sales Change: 10.9%		

Figure 3: Darren Tristano, Forbes Magazine 2016

According to an April 2015 media press release on Culver's website, the company created a TV campaign named "Behind Every Bite" that displays the people and quality ingredients that it takes to produce their menu items. In the press release, David Stidham, Culver's vice president of marketing, stated that, "Through our newest TV campaign, we're being completely transparent about what goes into our delicious ButterBurgers." On the Culver's YouTube

page, there are a total of 21 "Behind Every Bite" ads. These videos are similar to the "What's Cooking" videos that McDonald's produced, but the only difference is that Culver's was able to leverage them to generate higher sales revenue and an increased perception of quality. If McDonald's produced more videos that genuinely showcased where its ingredients come from and the relationship it has with suppliers with an ongoing ad campaign, then consumers may be more likely to perceive McDonald's as a transparent company.

Conclusion

With consumers demanding more transparency from companies and more quality ingredients in what they eat, it would not be a wise move for McDonald's to stay stagnant. Given the drop in total revenues since 2013, it is clear that adding healthier menu items and promoting its current items and deals in television advertising is not enough to keep customers coming back to McDonald's. With a new integrated marketing campaign, McDonald's must make it a priority to change consumers' perception about the McDonald's brand. To show that it is a transparent, progressive company, McDonald's can start by making more "What's Cooking" videos and airing them on national TV. In conjunction with this, McDonald's can add content to its website that focuses on educating consumers about the ingredients they use.

Viewers may initially be skeptical of McDonald's new marketing campaign due to its past reputation and corporate image, but with repetition and genuine claims that resonate with the company's values, the campaign can potentially be a success for McDonald's.

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