



Using An Interactive Theater Intervention To Promote Gender Inclusion in Computer Science

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ABSTRACT

Increasing gender inclusion in computer science programs is an important step in addressing the systemic biases in our discipline. We present the results of using Interactive Theatre Scenarios as an intervention to help students engage in critical thinking about gender bias issues. The scenarios are run by a professional theater group who presents a scenario displaying gender bias on a first iteration, then discusses the scenario with students, and an additional iterations allows students to participate as protagonists to alter the outcome. Using surveys after the scenarios, the results suggest the use of interactive theater intervention to be successful, with most of the students believing the scenarios helped them be cognizant that they need to be aware of and address bias issues in computer science.

CCS CONCEPTS

• **Social and professional topics** → **Computer science education; Gender; Group work.**

KEYWORDS

interactive theater; gender oppression; diversity in group work; computer science education

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1 INTRODUCTION

The Partnership For Equity project is a multi-university, five-year project funded by the National Science Foundation (NSF) IUSE program with the aim of building inclusive professional mindsets in engineers and computer scientists. We conceptualize inclusive professional mindsets as attitudes and identities of students who value knowledge in both the technical and diversity, equity, and inclusion (DEI) areas in computer science and engineering. Specifically, we aim for students to understand how diverse perspectives (often originating from diverse identities) benefit the professional work of computer scientists, how to work inclusively in teams, and how the work of computer scientists impacts society and can promote or be a barrier to justice. In this paper we describe our experiences with using interactive theater to work towards building a more inclusive climate within a computer science program.

Our in-class intervention presents an interactive theater scenario of a dysfunctional team interaction where a sexist group project experience plays out using three actors: one female-identifying and two male-identifying participants. After watching the scenario a facilitator-led discussion occurs and then the scenario is re-run with the goal of directly engaging student participants. As the scenario is reenacted, the facilitators ask the students to call out “stop” to pause the dialogue of the scenario to allow a volunteer student to join the actors as the fourth participant in the team. The volunteer then is able to attempt different techniques to change the way the scene plays out with the acting troupe responding accordingly. In short, this intervention provides an interactive theater methodology to increase awareness about gender oppression within computer

science and to start building bystander skills. More details about the scenario and delivery are found in section 3.

The rest of this paper is organized as follows. In section 2 we discuss some relevant background in which our work is situated. In section 3 we describe the intervention in detail. In section 4 we describe our survey and survey results. We conclude in section 5.

2 BACKGROUND

This intervention aligns with the many efforts focused on broadening participation in computing as referenced in recent papers, panels and working groups [2, 6–9, 11, 12, 15, 18, 19, 21, 22, 24].

Over the past five years we have delivered an interactive theater scenario experience to our first year computer science students as part of our overall Partnership For Equity project. During the first three years we did not assess the theater scenario independently, instead combining assessment into an overall assessment of multiple interventions at multiple institutions in both engineering and computing [3, 17, 20]. Two of the authors have been using interactive theater to explore DEI issues in many academic and commercial settings over the past twenty plus years [1, 16]. The use of using interactive theater in engineering education was previously proposed within the context of improving students' perception regarding diversity within teams [10]. In this paper we focus solely on the interactive theater intervention within the context of computer science delivered in a first year computer science course and assessed independently to gain insight into the intervention efficacy.

A recent paper presenting study results focused on minoritized youth in AP CSP courses included a concluding recommendation that "CS classrooms should openly discuss issues of discrimination in the field of computing, and ways that youth can disrupt learning and career contexts that do not welcome their intersecting identities of race/ethnicity, gender, etc.," [23]. We argue that the same recommendation is applicable to higher education computing courses. The intervention presented here is one example of discussing issues of gender discrimination in computing.

Our research aligns with other recent works aiming to weave DEI into the undergraduate computer science education experience. Lewis created and distributed "Microaggressions: The Game!" to practice responding to microaggressions [14, 27]. Our work shares a general philosophy of using interactive learning to engage students in discussions about exclusion and toxic behavior. In "Microaggressions: The Game!", a card game is used to engage students whereas our work proposes using interactive theater. Many other excellent resources for promoting inclusion can be found at <https://csteachingtips.org> [26].

Washington advocated for creating a course specifically on gender, race, and computing [29]. We strongly support this recommendation in addition to the approach used here: provide interventions in computer science classes requiring students to interact with DEI issues infused throughout all years of their computing education. Additional examples of infusing DEI into the curriculum can be found in [5, 13, 25].

3 THE INTERVENTION

For the results reported in this paper, the intervention was run as one class of a quarter-long first year seminar required for all computer science majors. The first year seminar serves to introduce greater context of computing; best practices for succeeding in computer science; DEI in computing; computing careers; community building and insights from an alumni panel. We have also previously run the scenario in a stand-alone evening workshop setting. One advantage of placing the intervention within a required course is that it reaches all students and conveys the level of importance we assign to this topic. For the results reported in this paper the scenario was delivered via Zoom, as described below. In earlier pre-pandemic workshop offerings, we ran the workshop in person. The in-person and virtual workshops had the same goals, but the virtual workshop had students engage slightly differently. Here we only describe the virtual workshops. The intervention is best suited for one or more hours.

3.1 Theater Scenario Description

The scenario simulates a dysfunctional group working together on a project in which three students, two male-identifying and one female-identifying, act out several well-known toxic behaviors including: a) the two men talking about sports or video games while excluding the woman; b) ignoring an idea proposed by the woman and then later when one of the two men proposes the exact same idea that the woman had, the other male responds with "good idea" to the other male; c) assigning the hard parts of the project to the males and questioning the female's ability; and d) at the conclusion of the scenario, the use of a misogynistic slur about "that time of the month". When done physically, versus on Zoom, an empty chair for a fourth participant is held vacant in the first run of the scenario.

The following is a portion of the script with female character Cilia and male characters Ben and Jason:

Cilia: We need to create a GUI (goosey) that will let the user select the product, destination and the desired arrival time.

Ben: Yeah, our GUI has to let people select the destination, arrival time... oh and product.

Cilia: Wait? Didn't I just... (say that?)

Jason: I'll take that on, I can do it tonight because I have no life.

Cilia: We're supposed to work on these together (as a group)

Ben: (Overlapping Cilia) Doing it separately is fine by me. I'll do the shipping schedule generator.

Jason: Cool, we've got this one figured out. I bet I can....

Cilia: (Jumping in) I'll take on the shipping route and distance calculator.

Ben: (Pause) Ummm... Really?

Cilia: What?

Ben: Maybe it's better if you... you know, documenting the system design.

Cilia: I did that for our last two assignments.

Ben: Yeah, but the distance calculator... is a pretty hefty bit of code...

Cilia: I can create that module. (Beat) What?

Ben: (Beat) I'm going to need that information in order to create my module and I just want to make sure it's all correct.

After watching the scenario, a facilitator-led discussion occurs to unpack what the audience just witnessed. Then the scenario is re-run with the goal of directly engaging student participants. As the scenario is reenacted the facilitators ask the students to call out "stop" to pause the scenario and allow the volunteer student participant to join into the scenario. The student volunteer is encouraged to "try out" a technique to change the way the scene plays out. After the volunteer finishes, the facilitators step in and lead a discussion with the class to ascertain what the volunteer was attempting and how well the class perceived that it worked. Subsequent volunteers take a turn as time allows. In short, this intervention provides an interactive theater methodology to increase awareness about gender oppression within computer science and to start building bystander skills.

The intervention reported here occurred via Zoom. The scenario simulated a group of students getting together in Zoom to work on the design of a typical first year programming project. When the three students enter the Zoom meeting, one of the two males uses Zoom video filters (e.g., a cat face, pirate hat, oversized mustache, antennae) and proceeds to dominate the conversation by talking about the computer game he is playing, making it difficult to begin discussion relevant to the project. Once the female character succeeds in her suggestion to move to talking about the assignment, the remaining toxic behaviors (b-d above) occur.

3.2 Learning Goals

The learning goals from this intervention are two-fold. First, the intervention aims to build awareness of gender-based (micro)aggressions and the toxic male culture often found in computer science programs. Second, the intervention serves as a mechanism for bystander training. By allowing students to practice confronting and/or deescalating the dysfunction, we seek to start embedding bystander thinking in our the audience members as well as explicitly allow practice for the volunteers. The facilitators encouragingly critique the volunteers' attempts and lead a general audience discussion about what was just tried and how well it worked. We note that these conversations do not come easily and practice is important.

3.3 Facilitator Goals and Praxis

It is the facilitators' belief that people learn best when they are engaged intellectually and emotionally in a setting that allows for genuine exploration of thoughts, feelings, and experiences [16]. Each session begins with a simple warm up where participants

are asked to do a very simple physical task in unison. One warm up is to invite participants to make circles with one hand and "x"s with the other hand at the same time. The purpose of the warm up is to highlight the interactive nature of the session. It also sets the tone that the facilitators' role is one of holding space for multiple perspectives and ideas and not as experts or instructors. Furthermore, the facilitators acknowledge while participants might not have wanted to try the warm up, they did, and ultimately had fun with it. The facilitators stress that this process is about everyone staying connected to one another, trying something out, and doing the best they can.

Thus, the facilitators work to create an environment of collective learning and problem solving where there are multiple perspectives and ideas shared. A passive approach of instruction on how to create an inclusive work group environment does allow participants the opportunity to identify the issues themselves and work through skills, in a facilitated environment, on how to address them. Imagining themselves as part of the group with the presence of the empty chair technique provides an investment for participants to do something to create a shift or change in the work group dynamic. Furthermore, the characters in the scene are intentionally acting in problematic ways and also have a back story that contributes to the behavior. The more that audience members have to engage with them, the more they discover the characters' humanity which also encourages empathy.

Learning how to create an inclusive and productive working group is, perhaps, as important and necessary as the assignments themselves and prepares participants for future work environments. For some participants, this workshop becomes an opportunity for them to try an intervention for the first time. For others who feel the workshop is "preaching to the choir," facilitators underscore the importance that everything takes practice, and the more we do it, the more empowered we feel.

A two-person facilitator model is employed with intention around the gender and racial identities. The facilitators do not directly name the sexist and racist themes that are touched upon in the scenario and, instead, ask questions and provide curiosities. Furthermore, the characters in the scene are intentionally acting in problematic ways and also have a back story that contributes to the behavior. The more that audience members engage with them, the more they discover the characters' humanity encouraging empathy.

Actors in the performances rehearse the scene in a traditional theatrical approach. There are in depth discussions about the characters and their intentions. Focus is also put on identity and how a character's gender and racial identity impacts the dynamics in the scene. Actors also rehearse possible interventions and are coached on helpful responses. Attention is given to working towards participants feeling successful in their interventions, without a shift occurring too easily, so that the experience is that there are many possible ways to respond. Once the sessions moves into the interactive component, the facilitators are actively involved and are there to support the actors in the interventions by the participants.

The facilitators highlight the significance of identity within the facilitation and interactive process to highlight the impact of our identities in working groups [1]. Our gender and racial identities mean something in a field, like computer science, that has been predominantly driven by white men. When a participant enters the

scenario to practice a skill that they want to try with the actors, they do so from their own identity. Audience members can experience, for example, the power of a male identified person stepping in to address another male identified person's sexist behavior. Awareness around identity and its impact is built.

As we have previously stated, after an intervention, the debriefing process of the interventions is with an appreciation approach. Facilitators ask the participants who witness the intervention to name what they saw and appreciated. This encourages the idea that there is no right or wrong approach. The support of fellow classmates and an atmosphere oriented towards building on assets encourages further engagement and empowers participants to want to speak up within the context of the facilitated experience and beyond to real life.

4 SURVEY AND SURVEY RESULTS

After the class students were assigned to fill out a survey about the workshop. The survey was purposefully short to combat the “survey fatigue” our students are experiencing from the many “teaching during the pandemic” related surveys they are asked to complete. The survey had six questions, four were multiple choice and two were open-ended response questions. The exact questions were:

- Question 1: What is your gender identity?
- Question 2: Did this workshop/class increase your awareness of group inequity issues within Computer Science?
- Question 3: How plausible do you think this scenario is?
- Question 4: How might female-identifying or non-binary students answer the preceding question differently from male-identifying students?
- Question 5: How valuable was this workshop/class?
- Question 6: Why do you think this class/workshop helps (or does not help) to build an inclusive climate within Computer Science here at the University of Denver?

We first present the results from multiple choice questions 1, 2, 3, and 5.

Table 1: Question 1 - What is your gender identity?

male	female	non-binary/third-gender	prefer not to say
38	10	1	1

Table 2: Question 2 - Did this workshop/class increase your awareness of group inequity issues within Computer Science?

yes	maybe	no
39	8	3

We note that the majority of participants/respondents identified as male, as shown in Table 1. The results from questions 2, 3, and 5 (found in Tables 2, 3, 5), indicate that students: a) felt the intervention increased their awareness of inequity within computer science; b) generally found the scenario believable; and c) found the

Table 3: Question 3 - How plausible do you think this scenario is?

not believable <i>exaggerated</i>	somewhat believable	believable	very believable
4	16	20	10

Table 4: Question 3 Aggregated By Gender

gender	not believable <i>exaggerated</i>	somewhat believable	believable	very believable
male	4 (10.5%)	13 (34.2%)	14 (36.8%)	7 (18.4%)
female	0	2 (20%)	6 (60%)	2 (20%)

Table 5: Question 5 - How valuable was this workshop/class?

not valuable	somewhat valuable	valuable	very valuable
1	17	24	8

workshop to be valuable. Also, as shown in Table 4, a significantly higher percentage of the 10 female identifying students found the scenario more believable than the 38 male identifying students. We note there were two additional student respondents who specified genders of “non binary” and “prefer not to say.” We omitted these two responses and acknowledge we need to find ways to meaningfully include the input from non-binary/gender-neutral individuals without violating anonymity concerns.

The open-ended questions provide an opportunity for more nuance and to gain more insight into student’s thoughts about this intervention. We used qualitative research coding theory to code responses enabling discovery of common themes among answers [4, 28]. Codes were iteratively refined by two team members and then used by one of the two. The codes we used were:

- “B” for “more likely to find the scenario believable,”
- “S” for “more likely to have experienced similar situations first hand,”
- “N” for “one’s gender has no influence on believability of the scenario”

Reviewing answers to the questions, each answer was coded with one or more codes to indicate which categories the answers fell into.

For question 4, “How might female-identifying or non-binary students answer the preceding question differently from male-identifying students?”, we found three major groupings of responses. Of the 46 responses, 25 responses indicated that the respondent felt female identifying students would be more likely to find the scenario believable, 23 responses indicated respondents thought women were more likely to have experienced similar situations first hand, and 5 responses indicated they thought one’s gender identity would not influence how believable they found the scenario. There was overlap of the first two categories. Sixteen of the responses indicated female identifying students were more likely to have

experienced this behavior and hence were more likely to find the scenario more believable.

For context, “Celia”, “Ben”, and “Jason” mentioned in the example quotes below are the names of the three characters in the interactive theater scenario. Celia is the female-identified student in the scene. Ben is a male-identified student who exhibits aggressive and misogynistic behaviors toward Celia. Jason is also a male-identified student who plays the role of the bystander in the scene. Some particularly illustrative responses include:

- “Because female identifying or non binary students may have experienced this, they would say that this scenario is likely. However for a male or white male, they might have never experienced this and say that this is an unlikely scenario.”
- “Female identifying students have probably been on the receiving end of this kind of treatment before, which makes it easier for them to believe. Even if a male has seen this happen they might easily forget it or dumb it down in their heads, and see this example as overly exaggerated and not plausible.”
- “Male-identifying students would be less likely to say the scenario was believable since it’s not targeted toward them very often. They don’t experience that treatment unfairly because they have privilege in that scenario.”
- “Differences in positions and stances in the performance. Celia was specifically being picked on the entirety of the show with no male support. For a guy looking for a relatable [sic] position as a character, I’m sure we’d mostly pick Jason since Ben is the obvious antagonist and no one wants to admit to being a CENSORED. However, as a female or non-binary student, these positions may hit closer to home as they’re more likely to relate to Celia in this scenario. In the end, besides relations, I think gender identity doesn’t have as much weight as experience would persay [sic].”

In our opinion, this last response above speaks to the power of interactive theater. The student specifically tries to see themselves as one of the scenario characters and how they would not want to think of themselves as the “toxic male” character.

Further, some responses were indicative of students making connections with broader gender inequity issues:

- “I personally answered the last two questions with “no” and then “Very believable” because I have experienced and witnessed this kind of situation on any occasions. It reminds me of how men don’t realize that women and non-binary people often times can’t walk alone at night because they have to live in this constant fear of being attacked and it is a very real fear. It plays into this idea that sexism in STEM careers and classes doesn’t go unnoticed by those that it effects verses those that it doesn’t effect.”
- “I think there is a lot more misogyny and other things that would make being a person of those groups have much more difficult time than males. Just overall stereotypes that are in our society that would demean and devalue people of those groups, that some people would throw around more and buy into.”

For question 6, “Why do you think this class/workshop helps (or does not help) to build an inclusive climate within Computer

Science here at the University of Denver?”, student responses can be categorized into three significant themes - awareness building, group work improvement, and disagreement. Of the 47 responses, 21 responses indicated the workshop builds an inclusive climate by raising awareness of the issues, 13 of the 47 responses indicated the workshop builds an inclusive climate by improving group-work skills, and 5 of the 47 responded that they did not feel it builds inclusive climate. Of these last five, two stated the workshop did not build an inclusive climate because they personally already knew these concepts hence it was not useful.

Some illustrative/interesting responses relevant to group work include:

- “It increases self-awareness when within a group project. This helps to establish a connected and enjoyable environment where everybody can collaborate and get a good grade.”
- “This workshop helped to build an inclusive climate by taking the time to discuss common difficulties faced in group and workplace environments. Computer science majors are often placed in situations where cooperation is crucial so it is beneficial to have time separated to this subject.”
- “I think that this workshop brings to light issues that happen within groups working on specific projects. By displaying what could go wrong, viewers (us as students) can reflect on why certain behaviors do not work in small groups. I think that just by witnessing and reflecting, we are building a more inclusive atmosphere within Computer Science at DU.”

Some responses affirming that the intervention builds an inclusive climate in this department as well as touching on CS more broadly include:

- “I think it does help build an inclusive climate within Computer Science at DU since it raises awareness about situations that may arise and shows possible solutions for dealing with said situations.”
- “It shows the reality that some people have to live in. It’s bringing awareness to the issue.”
- “It makes us aware of the social aspects and misconceptions surrounding CS.”
- “I think this does build an inclusive climate because it is making sure that we are aware of issues such as those conveyed in class.”
- “It talked about the inequities present in the society and made us more aware about them leading us to be more inclusive”
- “We should be aware of the biases that run rampant in the CS industry if we are going to be programmers. I’d like to help fix it.”

Responses arguing that the workshop is not needed (note, this was a minority opinion based on our analysis of the survey results) included:

- “I do not feel like the workshop was very helpful. I already agree with all of the values and ideas presented so the workshop felt redundant.”
- “I thought that the motive behind and goal of the exercise was well-intended and very on-point, but I thought that the execution was a bit lacking. Granted, I’m a white dude so take what I say with a grain of salt, but I think that the overall

vibe of the exercise was a bit immature with respect to the environments people our age will be engaged with. I think that real-world gender discrimination in a workplace is often less obvious than what was demonstrated, which would be useful to point out as a very dumbed-down presentation does not help identify that”

- “I think it is very important for women and non-binary students to have their voices heard, but I do not think this workshop does a good job in doing that or teaching that lesson. Most students here are mature enough to already know the value in women’s and non-binary students’ voices. I think a far more valuable lesson would have been for a notable female or non-binary computer scientist to come in and discuss their achievements and struggles in the industry. That is just my opinion though and if others did find a lot of value out of this lesson then I think it was a very successful workshop.”

We note that as educators we are pleased that some of our students already have this awareness and hope the percentage continues to increase. For now, such perspectives appear to be the minority. Further, the above response are focused more on an individual’s own personal perspective versus the communal good and inclusive climate building that may be resulting from this intervention.

5 CONCLUSION

This study illustrates the novel use of theater as a vehicle to address gender biases in computer science environments. Students participated in an in-class interactive theater scenario based workshop and then were surveyed about the experience.

Some responses indicate that a small number of students did not find the scenarios believable. As part of our future work, we plan to refine and expand the interactive scenarios with the hope of reaching students such as these without affecting the impact of the sketches as a whole. The majority of student responses indicated the experience increased awareness of and provided some tools for addressing gender biases as they arose in scenarios. Additionally, many of the students attempted to put themselves in the proverbial shoes of the actors, which is further illustrative of the potential power of this medium for raising awareness and providing opportunities to practice addressing misogynistic behaviors within computer science group work. While interactive theatre alone is not sufficient to build inclusive identities in computer science students, our results show that it effective in helping students be cognizant that they should be aware of bias and try to address it in their group interactions.

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