

# Statement Making: A Maker Fashion Show Foregrounding Feminism, Gender, and Transdisciplinarity

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## ABSTRACT

Maker culture has been increasingly pervasive in a variety of communities and contexts, in particular devoted spaces such as Makerspaces, Hackerspaces and Fab Labs. Several people, however, have pointed out that while one of the values of these spaces is radical inclusion, the general Maker culture can be exclusive to some based on gender, race, and socioeconomic status. With the goal of disrupting existing Maker culture by developing, diversifying, and empowering our own university Maker community, we created a semi-structured making experience that we call *Statement Making*. Statement Making is a Maker Fashion show that we invited anyone from the community to participate in by “making a statement” for them or a friend to wear in a runway show. We report outcomes and experiences of those who participated. We then discuss the key aspects of the event, especially surrounding its performative aspect, using design principles of Feminist HCI to argue that events with similar aspects might also be successful at disrupting existing culture.

## Author Keywords

Maker culture; Fabrication; Education; Feminism; Wearables; Fashion; Performance

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

## INTRODUCTION

The term “maker” has become popular recently in various spaces, establishments, and contexts to describe a re-emphasis or refocusing on humankind’s need and desire to create things. Surrounding this phenomenon is what has been described as the Maker Movement [14], educational initiatives [24], online platforms [29], communities, and an emerging Maker culture. Much of the increase in

prevalence of Making is due in part to spaces that provide access to machines for making and support communities centered around common interests. Makerspaces exist in many public spaces such as elementary schools, universities, libraries, cities, general communities etc. They provide value to their members in terms of access to equipment and the ability to innovate, but also in terms of a social community. The result is not only a stream of innovation, but also a culture. The spaces value democratization, access, low barriers, individualism, open-endedness, and creativity [45, 24, 19, 14, 25]. Makerspace expert Laura Fleming notes that “A visit to a Makerspace should leave you with the impression that the possibilities are endless” [18]. These spaces often develop bottom-up, through grassroots efforts, as opposed to through centralized forces.

Researchers have begun to study the emerging Maker culture, to understand who is part of it and why [43]. Researchers have also pointed to problems in the culture, showing how it is not as equitable as it claims in terms of gender, race, and socioeconomic status [8]. Researchers have targeted these problems and discussed activities or design principles to help mitigate or disrupt these trends [9].

There is a tension, however, between the grassroots nature of the Maker movement and the desire for equity. If the culture is all about open-endedness, grassroots efforts, and letting people generate their own experiences, then this might mean nothing deliberate is being done to ensure equity. As Britton points out, if we leave things without intervention to run their course, then we are naïve to think that this will result in a culture that is equitable rather than one that reinforces existing sources of oppression [8]. Some experiences designed around making are great at disrupting sources of oppression, such as e-textiles [9]. However, even though these experiences have a culture that surrounds the activity itself, and it remains a challenge for that sub-culture to permeate the larger Maker culture. Also, when these experiences are used prescriptively, taken as a solution to a problem, they can introduce other issues. One of the hallmarks of Makerspaces is the complete freedom to do absolutely anything and prescriptive activities take away some of that freedom. As Maker culture grows, we need to figure out ways to create events that are generative rather than prescriptive – they should allow individuals to

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generate their own experience and identity in keeping with the hallmarks of Maker culture. At the same time, it is essential to build upon affirming sub-cultures such as e-textiles, and continue to disrupt, rather than reinforce, problematic norms at the cultural level that surround the word Maker.

With these issues in mind, we created a semi-structured making event around fashion that culminated in a public performance. What we mean by semi-structured is that we gave a loose prompt for participation, but did not specify what, how, or why participants were to make. Essentially what we provided was a context and a deadline. This event was designed to develop, diversify, and empower the maker community on our campus by providing a venue that was both generative of multiple possible experiences and disrupted existing norms. The event was a making and digital fabrication fashion show called “Statement Making,” where university students and community members were invited to create a wearable piece that was then presented during a runway show. The only prompt for participation was to “Make a Statement” and anything was allowed in the show. What is most novel about the design of the fashion show as a Maker experience is the performance-based aspect. Our results show that it was successful at being an intervention to develop, diversify, and empower the campus Maker community of students, faculty, and staff in that it successfully generated a range of experiences, showcased a range of voices, and was perceived in a positive light.

In this paper, we describe the design of the event and the experiences of the people who participated. We analyze the event through a feminist HCI lens [3] and discuss considerations for the design of future making events with wearables. The contributions of this paper are: 1) A detailed description of a making and digital fabrication fashion show aimed at developing, diversifying, and empowering a campus maker community, 2) A description of the outcomes and experiences from the fashion show event, garnered from personal observations of the creators and from survey data collected from participants, and 3) A set of design considerations to aid communities planning semi-structured making events aimed at developing, empowering and diversifying the maker community, specifically with a performance as the culminating event.

## RELATED WORK

### Maker, Hacker, and Fab Lab Movement

The Maker, Hacker, and Fab Lab movements are separate but related emerging trends in recent years. The terms are sometimes used interchangeably and the movements are related and overlapping. We discuss the key differences between the trends and the values inherent to each.

The Maker Movement has been characterized by the emergence of community-driven spaces centered around different kinds of making. While these spaces are all different, they generally share the desire to democratize

making and build community [25]. Each Makerspace, however, can be radically different in terms of how they are run, who makes the decisions, what the focus is, and what kinds of making the space supports [43]. Some exist in university settings and are run by faculty with the help of students and strive to maximize learning experiences [37, 44]. Others have emerged in a more bottom-up fashion based on the needs or interests of members in a community [46]. A number of libraries have also joined the Maker movement because they believe it fits with their mission of providing access to tools that allow people to both read and write information and provide access to equipment like 3D printers and laser cutters [7, 19, 51, 46].

The Hacker movement, while similar to the Maker movement in its value in communities centered around certain types of making, has different central values. Hackerspaces tend to focus on repurposing, finding new uses for old things, and being clever [4, 47, 20]. They also tend to be more individualistic and anti-authoritarian [47].

The Fab Lab (short for Fabrication Lab) movement was started out of MIT by Neil Gershenfeld and now includes a network of over 1,000 Fab Labs all over the world. Fab Labs have a standardized set of equipment, focusing on digital fabrication tools such as CNC mills, laser cutters, and 3D printers. The commonality of tools allows for a global network of sharing designs, resources, solutions, and ideas [22]. Many Fab Labs serve local needs, allow communities to build the infrastructure around them, and focus on humanitarian needs. In addition to challenges faced by all machine-based spaces such as safety, management, and exclusivity, challenges for Fab Labs include access and literacy [22, 23].

While the movements themselves have different alignments and values, individual spaces are not necessarily directly aligned with any one movement and might be characterized by any or all of a Makerspace, Hackerspace, or Fab Lab. In the rest of the paper, we will primarily use the term Makerspace and making. Some work has been done to look at individual spaces to understand what has emerged from the bottom-up. Sheridan et al. did a case study of several Makerspaces and looked at how they set their goals and interact with the people who use them and conclude how different the spaces are [43]. Several others have looked at the practices to understand the ideas, goals, and perspectives of individual users in terms of their motivations, entry points, practices, challenges they face, and identities [28, 38, 42, 25, 34]. There is still much to learn as practices differ greatly between individuals, regions, contexts, and demographics and we further this research by studying students at a US university participating in a semi-structured making event centered around a fashion show.

### Critiques of Making

Even though democratization is one of the values central to Makerspaces, they tend to not be truly equitable with

respect to gender, race, or socioeconomic status [8]. Some may think that because Makerspaces and digital fabrication are so new, they are a blank slate where everyone starts off as having equal access, but Adam points out that this is naïve since this ignores systems of oppression that might be embedded in the traditions from which these new spaces emerge [2]. The United States especially suffers from gender, race, and socioeconomic status based oppression in technical and computing-related spaces stemming from socially constructed stereotypes, prior access to certain types of learning experiences, and the privilege of control over how one spends their time [11, 12, 16, 26]. Ensmenger discusses the emergence of the common computing stereotype of a male computer scientist who is antisocial, anti-authoritarian, and highly individualistic [15]. It is reasonable to expect that Makerspaces will suffer from these same stereotypes and cultural biases not only due to the strong technological component in many Makerspaces, but also due to things like the atmosphere, the vulnerability required to tinker in public, and personality traits such as a propensity to dive into things [35, 12, 33, 8].

#### **Feminism and Making**

Several researchers have investigated ways to disrupt the emerging inequitable culture surrounding making and studied alternate making identities. One strategy is to ensure that the space offers a solution to problems faced specifically by one particular group, such as daycare, since it is still expected that women in many cultures take care of the children [1]. Another approach is to expand the culture to incorporate forms of making that are not typically included, but that are familiar to certain marginalized groups. For example, Buechley focuses on e-textiles, which combine electronics with sewing and fabrics using conductive thread and sewable electronic components [9]. E-textiles offer an experience of doing technology that incorporates skills, perspectives, and interests that are traditionally part of the feminine realm. Wiebert et al. show that in groups age 8-12, e-textiles are not only successful at sparking the interest of both boys and girls, but also disrupt traditional making stereotypes and allow students to explore making identities outside of the gender binary [50].

Holbert points out that even though activities like e-textiles expand the culture to include people with wider interests, they run the risk of reinforcing stereotypes if they are articulated as a strategy to include women [27]. Similarly, a maker fashion show might be seen as feminist in that it incorporates a traditionally feminized craft into the realm of making, but it could also be seen as anti-feminist because fashion traditionally is about the subjection of women's bodies. Holbert focuses on the principles employed and associated with making. He shows that when making is framed as “a set of practices, skills, and technologies to give back to and support members of one's community” [27], young girls showed interest.

Nagbot discusses the history of feminism and making/hacking, pointing out how things like craft and care have been adopted into technological spaces as part of feminist intervention [39, 48]. Fox and Rosner investigate self-identified feminist hackers to see how they define what they do and how it is part of their identities [20]. For many, it is about hacking, or repurposing something that is oppressive. For example, since fear of failing might be a barrier to participating in making [6], a “Failure Club” changes that into a good thing [20]. Fox, however, is looking into people who identify in a certain way. The likelihood of someone to enter a space that has a certain identity is not necessarily based on that person's gender, but rather based on whether or not they have that identity, even if that identity is based on their gender. Roxane Gay points out how things she does make her feel like a “bad feminist” because they are not part of what is typically construed as a feminist identity [21]. The point is that there is not only one way to be a feminist and not only one way to adopt or not adopt a set of activities as part of a feminist identity. We thus seek to develop a culture where people can form their own identities as this is in line with the open-endedness of Maker culture, but that is not so open-ended that the culture is dominated by the rugged masculinity that seems to perpetuate in technology [15]. We seek to do this in a way such that identities similar to what Fox and Buechley discuss [20, 9] are present and prominent, but in a way that leaves room for the adoption of multiple different identities.

Feminist HCI is an emerging set of methodologies, interaction design principles, and theories to guide HCI in practice that are grounded in feminist theory [3]. While feminism has many different connotations, academic accounts of feminist theory are largely concerned with delving into the social and cultural construction of power structures that oppress people due to gender as well as other factors such as race, socioeconomic status, and sexual orientation. Likewise, Feminist HCI is not so much about gender equality or advocating for women in particular, but rather about considering the ways in which technology reinforces or subverts socially constructed oppressive power structures. While as of yet there are no prescriptive steps to take to practice feminist HCI, guiding characteristics and principles that are present in feminist HCI have been identified. We use Bardzell's feminist interaction design principles as a lens through which to discuss the design of the fashion show [3].

#### **Fashion and HCI**

Several researchers have explored fashion as it relates to HCI and the way we design interactive systems. Fashion and clothing are part of human culture, history, identity, and daily life. Vaughan points out that there is an intimate relationship between a person and the clothes they wear, discussing what it means to “inhabit design” [49]. Various researchers have taken aspects of our relationship to fashion and clothing and apply them to HCI, for example outfit-centric design [31], asking how questions of intimacy might

help design for privacy [30], or using fashion as a lens to understand aesthetics of mobile phones [32]. Pan and Blevis explore the relationship between fashion and sustainable interaction design, deriving design principles from fashion concepts such as its relationship to communities, its adaptation to different environments and lifestyles, and its inherent personalization [40]. Pan and Stolterman discuss explicitly what it would be like if HCI became driven by fashion both in terms of how external concepts of fashion can affect what goes on in the field as well as concepts that go in and out of fashion within the field [41]. We build on this work but focus more on the culture around designing wearable technology to design an experience around making.

### STATEMENT MAKING

Statement Making was a campus-wide digital fabrication fashion show designed to develop, diversify and empower the maker community. It was run at the University of North Carolina at Charlotte, a comprehensive research university in the southeast US and was open to students and community members of all disciplines. The organizers of the event were each part of different making and fabrication facilities on the campus. We discuss specifics of the context and the design of the event.

#### Context

UNC Charlotte has approximately 29,000 undergraduate students and 6,000 graduate students. There are several Makerspaces and Fab Labs at the university in different departments: the College of Arts and Architecture, the College of Computing and Informatics, the Library, and the College of Engineering. Each is relatively new and has different policies and staffing models. For example, the Computer Science Makerspace and the Fine Arts Fab Lab are both open to students of all departments, whereas one has to be a student in a particular class to obtain access to the Engineering makerspace facilities. While all of these spaces and organizations are run by different people and have different purposes, they all share some of the same over-arching goals: to provide access to as many students as possible. Part of that goal is about becoming a cohesive network of resources and people. While the goals of university administration and the departments who fund the spaces include creating a network of spaces, they typically do not have the bandwidth or the time to create those pathways. It was thus leaders and community members of the spaces who took it upon themselves and created this event to forge new pathways.

The Statement Making event was conceived of and run by representatives of the Computer Science Makerspace and the Fine Arts Fab Lab who also help manage the spaces. One was a current PhD student in Computer Science, the other a recent graduate with a BA in Fine Arts who became employed as the lab's team manager after graduating. The event was organized with the help of representatives from the Library, the Engineering department, and several

student-run making-related organizations. While the event had the support of administrative entities, it was a grassroots effort led by dedicated community members. Several professors incorporated Statement Making into their curriculum, having their students create pieces in the classes to be worn during the show. In addition to the goal for a more connected campus Maker community, Statement Making was also born out of the informal personal observations of some of the event creators (specifically the supervisors of the Computer Science Makerspace and the Fine Arts Fab Lab, who are both authors on this paper). For example, we noticed that there were few collaborations between students in the spaces and few students had ever ventured to any of the other spaces. This resulted in each space having its own persona of student, its own use cases, and its own unique culture. We also noticed that some students who had shown interest in making had a hard time making the initial jump into a project or making the transition from downloading and printing to developing new skills. The spaces were also all set up as collections of tools. While we talked about the importance of community that precedes the tools, there was nothing we had done specifically as leaders of the spaces to implement that idea. And as Adam says, if you leave a collection of tools in a space for a culture to emerge around, it is unlikely it will be equitable [2]. From these observations, we decided there needed to be something to develop, diversify, and empower the campus-wide Maker community.

The theme for the fashion show was “Statement Making”. This means creating physical things that have a purpose, but also plays off how making a statement can mean a verbal statement or something intangible. The logo is a series of colored triangles coming together to make different shapes (Figure 1). The hard angles represent the more technological side and the bright colors are to appeal to a more artistic person. The different colors and angles all come together, similar to how the different departments come together for the event. The mixed typography also speaks to the complementary differences of different disciplines. The hard angles and bright colors were meant to appeal to a range of people.



Figure 1. The Statement Making logo.

The prompt for participation was “make a statement”. A statement piece could be anything that is worn — a whole

outfit, a hat, an accessory, etc. We encouraged the use of digital fabrication, but also allowed pieces that had been made with traditional sewing machines or needle and thread. The reason for this was so that the overall show would combine traditional craft with new technology.

We also made sure to communicate that while pieces with a strong message were welcomed and encouraged, this was not meant to exclude those who did not know what they wanted their piece to say. We drew attention to the fact that all actions and artifacts in the world make some sort of statement and represent a point of view, even if that was not the explicit intention of their creator. The act of choosing to participate is a statement in itself, as is choosing not to participate. The framing as Statement Making was not a requirement for participation, but rather a prompt to encourage people to reflect on why they make and how the artifacts they make might be perceived by others.

#### Before the Show

Statement Making was advertised starting about two months before the show would take place. At this time, both the call for participation and the date of the show were announced. We sent out emails to active students, faculty, and staff who participate in the various spaces on campus, emails to the entire school of Arts and Architecture and Computing and Informatics, and posters on the walls of all academic and recreational buildings. Leading up to the show, we held a series of events to provide social, technical, and creative support.

Speed dating – Our first event was an information session with speed dating. After a session on the philosophy of Statement Making and an overview of the available resources on campus, we had students shuffle around and meet each other. We considered helping people match up for collaborations using a spreadsheet based on interest, but speed dating was a more human-focused approach that was not only open for more spontaneous collaborations but also communicated that this was not a traditional academic event. We also liked how the initial stages of a collaboration might make one feel a vulnerability that is similar to what one experiences on a date.

Workshops – Each space held a series of workshops centered around relevant techniques and tools with the hopes of adding to students' toolkit of skills, encouraging exploration, and sparking inspiration.

Model Training – We held a specific workshop for all the models who would be walking on the runway on how to walk with confidence and how to move in a way that draws the most attention to the garment they are wearing.

#### During the Show

The main part of the show was the runway where the designers or other community members walked down the stage wearing the fabricated pieces. Participants had to register for the event with a short description about what they made and why. Music played as the participants

walked and two emcees narrated each piece, using information provided by the creators. There were also tables set up for other maker community members to show things they had been working on and tables for all the maker-related spaces and clubs on campus.

#### OUTCOMES

We describe the event itself and the pieces featured in it as well as the results of a post-event survey. Data about the event was collected in the form of video and photographs by the event organizers and community members. The survey was administered online via Google forms.

#### The Event

A total of 50 garments were part of the show. These were created by 29 individuals and 9 collaborative groups. Three individuals and one group made multiple pieces. 43 of the participants were students, 3 were faculty or staff, and 1 was from the outside community. We did not collect data on demographics of all participants in the show.

The show was divided into 5 sections: Intro, Costume, Statement, Collaborative, and LEDs. These sections were decided the day before the event based on descriptions provided in the registration cards associated with each piece. The organizers aimed to make the groups of equal size and to keep the audience engaged. The Intro section had pieces representing a wide range of work, to communicate the scope of the show. The first piece in the show was created and worn by the Dean of the College of Arts and Architecture, who was very excited by the collaboration and made a piece to represent this (Figure 2a). He also wore a bowtie and pocket square that had been 3D modeled and printed by some students.

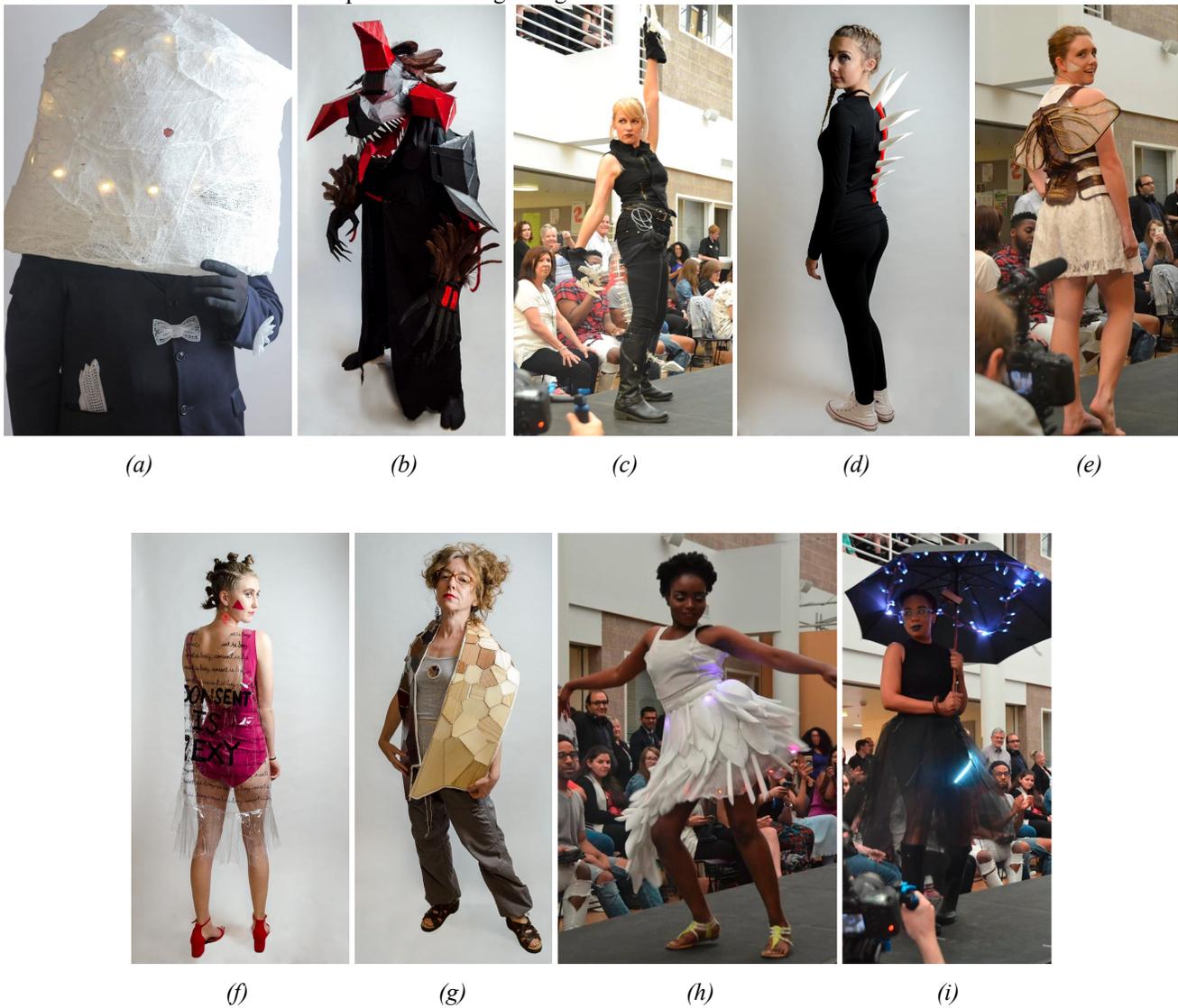
Some of the pieces from the Costume section were cultural. One piece was a Puerto Rican Vejigante festival mask (Figure 2b). It was made collaboratively using 3D modeling and laser cutting. It also had human-actuated moving parts—the mouth and tongue could move. Other pieces from the cultural section represented or celebrated different cultures such as a Hmong headdress, a paper-cut Aztec design, a laser-cut acrylic ancient Egyptian collar. Other pieces from the costume section featured accessories such as a tail and claws (Figure 2c), a 3D printed spine (Figure 2d), and wings (Figure 2e).

Pieces in the Statement section ranged in focus. Pieces that spoke to oppression surrounding women and women's bodies were popular (Figure 2f). Other issues featured included gendered bathroom laws, Islamophobia, Black Lives Matter, pollution, and the declining bee population.

The collaborative section had pieces that were the result of collaborations between students of the same and different departments. One piece was a collaboration between an electrical engineering student, an art student, and a dancer. Their idea was to make the piece light up based on the dancer's movements. They had to consider the dance, aesthetics, technology, and the overall effect (Figure 2h).

The last section, LEDs, had all of the pieces that lit up and had the most technology directly incorporated into the garments. This was also the section where most of the computer science students' work was featured. Notable pieces included a dress that lit up whenever lightning

strikes in the state (Figure 2i), a chameleon dress that uses a color sensor to change to the color of the surroundings, and an LED-lit hijab.



**Figure 2.** (a) The Dean of the College of Arts and Architecture wears a piece he made and 3D printed accessories made by a student; (b) Puerto Rican Vejigante festival mask; (c) Laser cut light up tail and claws modeled by an Arts professor; (d) 3D printed spine; (e) Laser cut wings; (f) Consent Statement; (g) A student explores the materials themselves in the creation of a new textile; (h) The result of a collaboration between an Electrical Engineering student, a dance student, and an art student. The dress lights up based on dance movements; (i) Dress and umbrella light up whenever lightning strikes in the state.

**Post-event survey**

We administered a survey to all participants 8 months after the event to hear their reflections and gauge the lasting effect of their participation in the show. As the goals of the show were to develop, diversify, and empower the campus Maker community, we designed the survey questions to capture insights around these themes. Since many of the pieces had a political alignment, it seemed that the event was empowering for participants, so we asked questions about the perceived purpose of the show overall. As far as

diversifying and developing the community, we wanted to see the extent to which the event was successful at generating a multitude of experiences rather than one singular experience. We also wanted to know to what extent participating pushed people out of their comfort zone, prompted them to grow, and provided them with opportunities to meet new and different people.

Specific survey questions include:

1. Why did you participate in last year's show?

2. What did you make and why?
3. How did your participation in the show push you out of your comfort zone (if at all)?
4. Did you attend the event and watch (at least the majority of) the runway show? If so, how would you describe the event to someone who didn't go?
5. Did you make any connections as a result of your participation? Please describe.
6. Where is your garment now and why?
7. Are you going to participate again this year? Why?

Results were aggregated and coded within each of the questions asked based on emergent themes, which were determined by the authors following a thematic analysis approach [13]. We later discuss the results in terms of Feminist HCI interaction design principles.

### Participants

A total of 8 fashion show participants responded to the survey (8/29). All respondents were either current students or recently graduated at the time of participation in the event. Three reported their field of study as Art (P3, P4, P6), two were Graphic Design (P1, P7), one of whom also studies Digital Media (P7). One student was from Architecture (P5), one was a Computer Science student (P2), and one reported their field of study as Electrical Engineering, Business, and Software (P8).

Two of the respondents were in the same collaborative team (P6 and P8). Three of the other respondents were also part of collaborative teams.

Five respondents were men (P1, P2, P4, P7, P8), three were women (P3, P5, P6), and none were non-binary.

### Purpose of Participating

We asked participants why they participated in the fashion show. Three reported that they participated in the event due to an existing connection either to one of the maker labs or to the university community (P1, P2, P4). P1 said that he wanted “to support the digital fabrication community on campus”. P2 said “It was a great opportunity for [sic] take part in a makerspace event”.

Two people participated because of an existing interest in fashion (P3, P6). Two people were drawn to the event simply as something new, exciting, or different (P4, P7). One participant noted his desire “To collaborate with students from different departments” (P8). One participant did not respond to this question (P5).

### Purpose of Artifact

In addition to the reasons for participation, we also asked participants why they made what they made. Responses fell into 5 categories, described in more detail below:

- To experiment with a technique or process or do something in a new way (P2, P7)
- To make a statement (P3)
- To bridge fashion and technology (P6, P8)
- To have some sort of functionality (P2, P5)

- To achieve a certain aesthetic (P1, P4)

All participants responded with different reasons for their garments than the reasons they provided for their participation in the show, except for P8. P8, the Electrical Engineer/Business/Software student, was part of a collaborative team with an Art student who reported that his reason for participation was collaboration, also reported that the purpose of the piece his team created was “to show a beautiful amalgamation of fashion and tech community” (P8). P6, who worked with P8, used similar language to describe their piece, saying “The garment was made to bridge the gap between fashion and technology to function as a wearable”, though her initial reason for participating in the fashion show was not the collaboration itself, but rather because of her existing experience with fashion.

P2 (Computer Science) and P7 (Graphic Design and Digital Media), both reported the purpose of their pieces as exploratory. P2 was exploring how to take weather data from the web and “display them creatively” using lights. P7 made a laser cut wooden textile because he “wanted to experiment with combining digital and analog processes”.

P3 (Art) says she “made three garments that made a statement regarding three different feminist topics. I made these because the show was called “Statement Making” and these were topics I feel very strongly about.” P3 was the only one of our survey respondents who made a piece with a political message and was the only who commented on the theme of “Statement Making” as being an integral part of her inspiration.

P2 (Computer Science) and P5 (Architecture) aimed for functionality. P2, in addition to exploring creative ways of visualizing weather data, aimed to make a functional piece that was successful in getting the data and translating it into light. P5 made a transformational dress that “solves the problem of not knowing what to wear”.

P1 (Art) and P4 (Art) both discussed the purpose of their piece as being to achieve a certain aesthetic that was of personal interest to them. P1, who made a 3D printed gauntlet “wanted to make something fantasy oriented” and said that the “piece is literally a product of my imagination from when I was a little kid”. P4 says that he “love[s] concept art and film design and I wanted to make something of that ilk” and thus made “a sci-fi-esque costume/couture”.

### Descriptions of Event

When asked how participants would describe the event to someone who had not been there, most mentioned the aesthetic, artistic or fashion-related nature of the pieces and overall feel (P1, P2, P4, P5, P6, P7), saying things like “fun casual fashion show” (P6), and “you could clearly see the passion for fashion” (P4). P2, a computer science student, said it was “an art show where the art is stuck on people”.

Two participants described the show as a collaborative or interdisciplinary event (P3, P6). P3 (Art) was the only one who mentioned technology in their description, saying it involved students from different disciplines who “incorporated making statements and different technological aspects”.

Two participants commented on the political aspect of the show (P3, P5). And four participants commented in just a general positive way (P4, P6, P7, P8), saying things like “energetic and fun” (P4) and “bold and wonderful” (P8).

### Connections and Bridges

When asked if they made any connections, almost all respondents reported some sort of social aspect to their participation (P1 made no connections and P5 did not answer). Four respondents explicitly said they met someone from a different discipline or from the other side of campus (P2, P3, P6, P8). Two respondents mentioned that they met or reconnected with people, but did not say whether they were from the same or a different discipline (P4, P7).

We also asked participants where their garment currently was to see if it had a life beyond the show. One respondent said their garment no longer existed because they had disassembled the garment so others could use the electronic components (P8). For one participant, the piece he made for the show went on to be displayed in another art show (P7). No other participants discussed a definitive way in which their work for the fashion show was a bridge to something else. However, two participants said they were keeping their pieces with some sort of future in mind (P4, P6).

Others stored their garments not for a purpose, but just because they did not know what else to do with it (P1, P2, P3, P5). P1 noted that he is storing the piece he made, but sees no future use for it because it was “for a specific, one-time event”. Some participants discussed the impracticality of what they had made for actual wearing (P2, P3, P5).

### Learning and Growth

When asked if and how participating in the show pushed respondents out of their comfort zone, only P1 said it did not push him at all. Other respondents said it pushed them to learn a new skill related to sewing (P2, P5, P8), two had never done fashion before (P2, P7), and one mentioned it pushed them to collaborate with someone new (P6).

Two mentioned that having an audience was new for them (P3, P4). For P4, this pushed him in terms of scope to take on something larger than usual. P3 said her “participation as a designer helped to push my creativity of what statement I wanted to make and how. And my participation as a model walking in the show pushed me out of comfort zone [sic] by being on stage and performing in front of a large group of people”. P3’s work also spoke most directly to the theme of the show, taking the notion of “statement making” to heart. She discussed stepping out of her comfort zone in terms of being in front of people and in terms of considering a new creative medium and plans to push herself further next year.

As an art student, the event is likely a valuable experience for her and others to develop their voices through fabrication and fashion.

For some, the benefit was to take an existing skill of theirs and use it either in collaboration with others (P8) or for their own idea (P2). This provided them the opportunity to deepen their learning of the skill and work through any complications of working in a different context. P5, an architecture student, took a very architectural and pragmatic approach to her design, which was a garment that could change shape and “solves the problem of not knowing what to wear”. As in architecture, she worked to combine both form and function, thinking not only of the aesthetics, but also of the human interfaces with clothing and how that relationship could be improved.

All participants said they were interested in participating again in next year’s show except for P1 who thought since he graduated he would not be able to. P3 was the only participant who expressed the way she would continue to push herself next year, wanting to “collaborate more with other students and incorporate more technology”.

### DISCUSSION

We discuss takeaways at the level of the individual and at the level of how the individuals relate to the event as an interdisciplinary collaboration. We then discuss the key aspects of our event for consideration during the future design of a performance-centered wearable-based making event. Throughout our discussion, we refer to Bardzell’s Feminist HCI interaction design principles (plurality, participation, self-disclosure, advocacy, and ecology) [3].

### Development, Diversification, and Empowerment

As the goals of our event were to develop, diversify, and empower the campus community, we discuss our results in terms of these themes. We saw clear evidence of development at both an individual level and at a community level. Examples of the types of individual growth included the opportunity to develop voice (P3), appropriate a skill to a new domain (P2, P5, P8), acting as a catalyst to collaborate (P6, P8), and experimentation (P2, P7). An increase in collaborations and people meeting new people means that the community is developing to be more connected across campus as well as more diverse and less siloed based on lab. The number of political statements shows that the event was an empowering platform for some to voice their opinions. The fact that participants tried new skills shows also that they were empowered to explore in the realm of digital fabrication. Our data also shows evidence of diversification in the form of multiple experiences. There was not just one way or reason for participating or view of the event as a whole. This means that this was successful at generating multiple experiences as opposed to prescribing what the experience should be. Overall, this event builds on the sub-culture of the e-textiles movement in disrupting norms surrounding Maker culture

in a way that is in the spirit of the open-endedness of the Maker community.

### Key Aspects

Our analysis provides insight and considerations for the design of future semi-structured making events centered around a fashion show or other wearable-based performance. Based on the outcomes of the event we ran, we identified these aspects of our event as key to the experiences and outcomes. We also discuss how these aspects and our results speak to Bardzell’s feminist HCI interaction design principles (plurality, participation, self-disclosure, advocacy, and ecology) [3]. Ultimately, by using these principles as a lens through which to look at these generalized aspects of the event we ran, we argue that there is something about these aspects that is Feminist.

### *The performance*

Working towards being in front of people is inherently different than doing or making just for oneself or working alone. Several of our participants pointed out how the performative aspect pushed them to do more or to be bold.

Performance is also inherently different from giving a demonstration, even though both are done in front of people. A demo implies showing and demonstrating an external artifact, whereas performance implies acting and becoming. The performance thus inherently invites consideration of the self, identity, and expression as the artifact is inseparable from the human who is wearing it. Judith Butler talks about gender as a performance, not in the sense that it is like a costume we can choose to put on or take off, but rather in the sense that it is something that is learned, practiced repetitively, and displayed publicly [10]. Thus, the way we perform and our identity are inextricably tied. Creating an event that involved performance provided an opportunity for participants to reflect on identity.

### *The stage*

A performance takes place on a stage, but we define and build the stage well before the performance. It exists in peoples’ minds before they even start considering what to make. Some stages are to make people laugh, some are to tell a story. Our stage is a runway, which exists as a place for people to show their fashion designs being worn by models who walk and pose. It is also a place where traditionally women’s bodies are put on display and can have connotations of being anti-feminist and oppressive, but we used the “Statement Making” prompt to subvert the historically constructed view of fashion by making the focus on voices, rather than on bodies.

Although a runaway can be gender oppressive, it is at least a place where gender is not invisible. Because fashion is largely gendered (men wear different clothing than women), a piece that is worn by a man will be perceived differently than when that same piece is worn by a woman. Bardzell talks about the feminist design principle of embodiment and calls upon designers to consider

differences in socially constructed gendered bodies. Using a runway as a stage provides room for this because the pieces were not shown in isolation, but through an embodied performance. The designers had to consider the body of the human who would be wearing the piece for the show.

### *The invitation*

People were invited to participate in the event. The nature of the invitation was key. Our only prompt for participation was to “Make a Statement”. We consider this a generative invitation rather than a prescriptive invitation, in that it allows individuals to generate their own experience rather than us prescribing exactly what their experience will be. This resonates with Feminist HCI design principles of plurality and participation [3]. These two principles are in opposition to the general HCI concept of universal usability. They instead advocate for designs that are sensitive to the complexity and diversity of what constitutes the human experience and the experiences of the marginalized [3]. Digital fabrication is an area of computing that is open to an almost limitless potential of applications, purposes, and perspectives. However, it is often the case that experiences designed around digital fabrication are designed around one particular application, or identity, as Holbert points out with the e-textiles [27] and as Roxane Gay notes in her self-labeling as a “bad feminist” [21]. A particular activity or action might be part of one’s identity as a person or as a maker, but there is more than one way for it to be part of them. The fashion show, while culminating in one common event, allowed for a plurality of experiences and pathways to participation that covered a range of what digital fabrication has to offer. The non-competitive nature of the invitation was also key as it encouraged internal and intrinsic reflection rather than external comparison.

The invitation is also where the Feminist HCI design principle of self-disclosure has the most potential to be incorporated [3]. When we invited people to participate, we included who we were and that our goal was to make a fun collaborative event. We did not, however, discuss the event in terms of the Feminist HCI principles such as advocacy or pluralism or the event as a whole as feminist.

### *The frame and the voice*

With any event, there is a purpose that lies within a particular discipline or multiple disciplines. For example, it might be an artistic goal, an educational goal, a creative goal, etc., or the combination of several. Statement Making was in every way interdisciplinary: the coordinators of the event were representatives from Fine Arts and Computer Science, we encouraged collaborations between departments, and the stage brought together fashion and technology. We invited people to participate as individuals or collaborate with someone from a different department, being careful to maintain that while there were different ways of participating, no one discipline was more important than another. However, our results show that the fashion

show did not have equal representation or experiences from students of different disciplines. We introduce the notion of the *frame* of the event and the *voice* of an individual to discuss these different experiences.

Lying at the intersection between fashion and technology, Statement Making might be described as doing something creative in fashion through technology (we call this Art-frame) or doing something creative with technology through fashion (we call this Technologist-frame). Given these two framings, we can consider what the voice of either an artist or technologist might say given their perspective as such:

*Technologist-voice, Technologist-frame:* The future of computing is not screen-based. It is physical, gestural, embedded in the world around us, and ultimately worn on our bodies. For the Statement Making fashion show, let's push the bounds of technology's relationship to the body.

*Art-voice, Technologist-frame:* The computer scientists are working to push technology to be more wearable. Let's share our skills with them to ensure the aesthetics are intentional and speak to our humanity.

*Art-voice, Art-frame:* Fashion is about pushing the bounds, being creative, making a statement, doing new things. We use technology to push the field of fashion forward.

*Technologist-voice, Art-frame:* Artists are always working to push the bounds of creativity. Let's share our skills with them towards that vision.

Interestingly, both students from the art/design side as well as students from the CS/technology side described the event with the Art-frame, articulating the overall purpose as being fashion-related. Even the all-CS team described not only an Art-frame, but also an Art-voice (P2) by viewing the event as "an art show where the art is stuck on people" and seeing their own contribution as a creative exploration rather than a technological innovation.

We discuss the frame and voice here in terms of Bardzell's principle of advocacy. While having a bias towards a certain frame and a certain voice might limit who opts in to participate, it might also engage new participants who would not otherwise be part of the community. It is also likely beneficial for students in one discipline to practice adopting the voice of another discipline. This allows them to deepen their understanding and develop a voice they might not have known that they have.

#### *The community*

As with any stage-based event, an entire community gets involved with everything from costumes to scenery to programs. The Fashion Show was the same way, with projects like designing fabricated giveaways and creating foldable popcorn holders. The fact that there were multiple points of entry gave opportunities for more community members to be involved and excited. Also, the spaces of the individuals who hosted the events, the departments

involved, and the professors who participated showed that there were existing community infrastructures that contributed to the social dynamics of the event and everything surrounding it. This again resonates with Bardzell's principles of pluralism and participation.

#### *The After-party*

Bardzell calls upon designers to consider the ecology of a system in interaction design in terms of how the design fits into a larger system of designs and to consider the way demographics factor into that ecosystem [3]. The fashion show we ran is part of a complex ecology including the spaces involved, the academic departments, the university, the broader maker community, and the broader fashion design community. To consider the ecology, we must consider the most broad and far-reaching impact. Because the fashion show was a one-time event, there is the opportunity and the need to allow the artifacts from the event to permeate other spaces and have a life beyond the event. Responses from our participants support this as they said that they have energy and interest for some sort of continued engagement with what they made and with the community involved in the event.

#### **CONCLUSION**

We presented the design and outcomes from running an interdisciplinary maker fashion show at a university campus that had the goal of developing, diversifying, and empowering the campus Maker community. We extracted key aspects from the event and discussed these in terms of Feminist HCI design principles to inform the design of future semi-structured making events culminating in a performance. By using these principles as a lens through which to look at these generalized aspects of the event we ran, we argue that there is something about these aspects that is feminist. Applying these aspects in the design of future making events will help to develop an array of experiences that disrupt the norms of Maker culture and continue to develop, diversify, and empower the Maker community.

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