

***iDream*: Addressing the Gender Imbalance in STEM through Research-Informed Theatre for Social Change**

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Introduction

While an abundance of data clearly shows a gender imbalance in the science, technology, engineering and mathematics (STEM) fields, it is less clear how to motivate change regarding both overt and subtle barriers that hold women back.[\[1\]](#) This is particularly the case in the STEM field of information technology (IT). Since subtle gender barriers are transmitted through the cultural norms, values and gender roles of a society, creating a gender-balanced IT profession requires a way of addressing these emotional and implicit factors. The problem is that the scientific professions, on their own, are unable to do so. Information about structural barriers to social inclusion reported in scholarly publications is generally inaccessible to the lay person. Further, the scientific model of research dissemination leaves little room for the expression of subtlety, nuance, emotion, and holistic representation. Hence, artistic practice – specifically theatre for social change through relational aesthetics of transformative learning – can be employed to stimulate awareness, understanding, and activism about barriers to women in technological fields. It can also enable dissemination of research findings beyond the STEM academic community.

In response to this opportunity, an original play, *iDream*, was written to communicate, in dramatic fashion, research results from an investigation of factors contributing to the under representation of women in the IT field. It did so by tackling the issues of experiencing, internalizing, and overcoming barriers to inclusion. The characters, plot, and dialogue of the play come from prior research that both developed theory and empirically applied it in over one hundred life history interviews with women working in the IT field. The characters in the resulting play embody the struggles of those who are marginalized in the IT field by virtue of gender but who seek inclusion and equality in the information society. Following staged readings of the play, audience feedback, and audience learning assessment, the play script was revised. The final version is now available to the public on the project website. This essay considers the challenges and opportunities of using theatre to address the important societal issue of exclusion in STEM disciplines.

Backstory

In 2007 Eileen Trauth sat at her computer having just sent her final report to the National Science Foundation (NSF) about a multiyear investigation into the gender imbalance in the STEM field of IT. She had developed and empirically tested a theory in the course of conducting life history interviews with women IT workers in the USA. During interviews that sometimes went on for three hours, these women

willingly poured out their life stories – about their families, their communities, their schools, their hopes, and their dreams. They spoke about their interests and their passions, and about the people who helped or hindered their progression along a path that brought them to be participating in the interviews. She had already started publishing academic papers that added to cumulative scholarly knowledge about the problem of gender in the IT profession. But something was nagging at her. “How can I communicate what I have learned in this research in such a way that I can reach beyond my fellow academics? I want the results of my research to change the hearts and minds of parents, policy makers, educators, students and, ultimately, society,” she mused. Yet she recognized that scientific writing isn’t set up for such advocacy.

This reflection and a fortuitous conversation the following year launched her on a journey through uncharted interdisciplinary waters. The conversation was with Suzanne Trauth, a playwright, who had just finished co-creating and presenting a play about Hurricane Katrina. The play was based upon interviews with residents of New Orleans and written in the genre of theatre for social change. Being aware of the interviews Eileen had conducted, Suzanne suggested a collaborative venture.

Eileen’s research had revealed that the barriers to women entering and remaining in the IT field were not limited to those that are *explicitly imposed* on women, such as parents overtly discouraging their daughters from enrolling in computer science degree programs, or guidance counselors explicitly steering women students away from careers in computing. She had also found evidence of barriers that are *implicitly internalized* by young women themselves, when they receive messages from adults, peers, and the media about where they do and do not belong. As a result, they are sometimes *unconsciously holding themselves back*, which is being mistakenly diagnosed in the popular discourse as women “losing interest” in technology.

Eileen was searching for a way to give voice to the powerful emotions expressed by the women she interviewed. There were times when she listened helplessly to the women express their feelings about isolation, exclusion from workplace socializing, being subjected to negative gender stereotypes, self-doubt, and being passed over for promotion. She wanted to communicate not just the *facts* she learned about the gender imbalance; she also wanted to communicate what it *feels* like to be on the margins. However, nuanced writing about subtle and unconsciously internalized barriers, writing that conveys what it feels like to be excluded, is the antithesis of scientific writing. Empirical research results that are published in scientific journals are expected to be presented in a straightforward manner, emphasizing objectivity and, typically, quantitative data. The emotion, nuance and subtlety that were an integral part of Eileen’s story of barriers did not fit with mainstream scientific research reporting. Consequently, she believed that her scholarly papers were telling only part of the story.

She was also becoming increasingly dissatisfied with limiting the dissemination of her research results to fellow academics. Over the course of the project she had developed a growing desire to communicate to the broader public what she had learned about the nature of these gender barriers. She wanted to make a difference with this research and contribute to societal transformation. In recognizing that her research had taken her down the path toward advocacy, she was confronted with the limits of her discipline to effectively advocate for change. She acknowledged that art could pick up where science left off. Thus, this collaborative, cross-disciplinary project was born.

This essay, about employing theatre to make a difference in STEM fields, recounts the process of

enacting an NSF grant to develop and produce a play as an intervention to address the gender imbalance in science and technology. It also investigates some of the challenges associated with an effort to bring three different disciplines to bear on the enactment of societal change. That is, the play needed to satisfy the demands of playwriting in the relational aesthetics of theatre for social change. Performance arts can call people into relationship with each other and to objects, ideas, and places: a *relational aesthetic*, a term coined by Nicolas Bourriaud in 1988.[2] While doing so it needed to incorporate the results of scientific research and theorizing about gender barriers in the IT field into the characters and story line of the play. Finally, the play needed to evidence audience learning in the forms of awareness, attitude change, and intended behavior.

Eileen Trauth is a professor of information science and technology, and gender studies, who conducts research on gender exclusion in the IT field.[3] She was principal investigator on this grant and co-wrote the play. She wanted to transform the findings from research interviews about gender barriers in the IT field into a medium that allowed for greater expression of emotion and subtlety than what is afforded by scientific journal articles. Karen Keifer-Boyd is a feminist arts educator and scholar of art pedagogy who served as the project evaluator; she wanted to assess the transformative learning that resulted as the playwrights, cast, and audience members experienced the performance of the play. Suzanne Trauth, a playwright, was a project consultant and co-creator of the play script. Her goal was to write a play script that would further societal transformation about barriers to achieving one's dreams.

Transformation: From Transcript to Play Script

Theatre has frequently provided a venue for reaching audiences in order to achieve social goals beyond the purely aesthetic by healing, promoting action, encouraging community, and supporting transformation.[4] One articulation is called theatre for social change, which is enacted in times and places of crisis.[5] While theatre for social change has various understandings, our use of the term to describe our project is consistent with Thornton's[6] depiction of theatre for social change as a set of five defining characteristics. The first characteristic is intentionality. Theatre is being used to alter the actual world, not just reflect it. In our project the intention is to create awareness, educate, and inspire action related to gender barriers in the IT field. The second characteristic is community, based on either geographical location or identity. The community shapes and informs the theatrical work. In our project the community consists of women IT workers whose voices are projected through the work to a potential community of IT workers in the audience. The third characteristic is hyphenation, the intersection of performing arts and sociocultural intervention. In our project the sociocultural intervention is awareness and education about gender barriers to IT careers. The fourth characteristic is conscientization: awareness leading to action. In our project awareness of gender barriers is intended to motivate behavior to resist them. The final characteristic is aesthetics. In theatre for social change multiple perspectives are often in evidence with the aim of giving voice to the voiceless. In our project two perspectives were employed (that of the playwright and that of a scientist) to give voice to an underrepresented group in the IT field: women.

There are a number of current examples of theatre for social change. *Katrina on Stage: Five Plays*, [7] is a collection of works that employ theatre to promote awareness and activism about the devastation of Hurricane Katrina. Tim Robbins' *Dead Man Walking* (2004) was written to promote activism about abolishing the death penalty. William Mastrosimone's *Bang, Bang, You're Dead* (1999) was written to increase public awareness about violence in high schools.

Insofar as the intention of our work is to create awareness and understanding, it also shares a goal of applied theatre, which is to focus on the use of theatre to educate and engage with social issues. Applied theatre is also sometimes referred to as *Applied Theatre for Social Change*.^[8] The project discussed here employs relational aesthetics in which actors, readers, and audience members experience qualitative research findings as theatre for social change, which highlights the issues associated with oppressive societal institutions.^[9]

One approach in theatre for social change is to transform research findings into an original play script. This approach has several labels, including: performed ethnography, research-informed theatre, and performed research. According to Tara Goldstein et al.,

Performed ethnography and research-informed theater are research methodologies that involve turning ethnographic data and texts into scripts and dramas that are either read aloud by a group of participants or performed before audiences.^[10]

They developed a framework of research-informed theatre to analyze the melding of research, theatre, and education to produce transformative learning. Kimmika Williams-Witherspoon employed performed research techniques in her performance piece *SHOT!* (2009) in order to reframe the discourse about an impoverished North Philadelphia community.^[11]

Intended as theatre for social change, the play script—when read, performed, or experienced as audience—brings awareness about gender barriers in the IT field and teaches how to challenge, change, and overcome inequities in IT fields. It shares with other forms of arts activism the goal of using “theatre in the service of social change.”^[12] Other forms of activist theatre are: community theatre, popular theatre, grassroots theatre, agit-prop (from agitation and propaganda) or protest political theatre, participatory theatre, Freirean “Theatre for Development,”^[13] or Boalian “Theatre of the Oppressed”—also referred to as forum or playback theatre.^[14] While the staged readings of *iDream* were performed with professional actors in professional theatre venues, we expect that it might also be performed by schools or community groups and be followed by audience talkback sessions. Our study of attitudinal change for the actors and the audience members at staged readings suggests that the pedagogy of this play project works through embodied learning when performing the play script as a staged reading, or experiencing the staged reading as an audience member. While our learning assessment occurred for staged readings of the play script we believe it is reasonable to expect that a full production would also result in embodied learning. As theatre for social change it aims to remove social and institutional barriers that women experience in the IT field.

Theatre, dance, films, and animations in STEM fields is typically used only for explanatory purposes; the arts help non-scientists visualize abstract science concepts as well as bio-physical processes invisible without specialized apparatus. For example, Vince LiCata wrote the play *DNA Story* (2009)^[15] to teach non-scientists about DNA structure and X-ray crystallography. In contrast, our goal was not to explain scientific concepts but rather to raise awareness and critique hegemonic social narratives regarding who could participate in the STEM field of IT. As theatre for social change, *iDream* performs research about women’s experiences in the IT fields in order to heighten awareness and to advocate for change.

The NSF grant scheme that funded this project to transform research findings into an original play script, and to assess it as transformative pedagogy, was directed at innovative ways to communicate research

results to a public audience.[16] The original research upon which the play project was built was a qualitative field study of women working in the IT profession.[17] Eileen Trauth interviewed 123 women working in the IT field in the USA. The themes explored in the interviews were: the extent to which the IT field is socially constructed as a man's world; pressures on women in the IT field, and how these pressures affect their professional development and working lives; the relationship between working in the IT profession and a woman's gender self-image; and, finally, how women in the IT profession cope with the challenges presented to them.

During open-ended interviews that ranged from one to three hours in duration, women discussed their life stories that led them to their current position in the IT field. They discussed their demographics, the type of work they did, personal characteristics, significant others in their lives, and influences from the larger society regarding gender roles and working in a technical field. At the outset of each interview Eileen explained her interest in understanding variation among women in the ways that they were exposed to, experienced, and responded to gender barriers throughout their careers.[18] While this research was being conducted, Eileen had not envisioned developing a play script as a way to enact societal transformation regarding gender barriers. But she *was* conscious at the time of the evocative and emotionally compelling nature of the narratives. Hence, in 2008, when Suzanne Trauth proposed writing a play based on the research findings, Eileen was quite receptive to the idea.

Two intended audiences were envisioned as the play was being developed. Teenagers constitute the primary audience for the play—those who are experiencing and internalizing barriers to participation in the IT field. While the research that informed *iDream* is primarily about factors influencing the underrepresentation of women in the IT field, it is also recognized that underrepresentation is an issue for men in certain racial, ethnic, socio-economic, and sexual groups, and that gender stereotypes are enacted by members of all genders. However, while the learning objectives of awareness and understanding, attitude change, and intended behavior about gender, race, ethnicity, and class stereotypes that are embedded in a culture could apply to men as well as women students, the focus of this particular project was on the factors affecting the underrepresentation of women in the IT field.

The secondary audience for the play consists of significant adults in teenagers' lives—parents, teachers, coaches, guidance counselors, and others who are in a position to influence them. Hence, while performances of this play are intended for younger audiences, in order to make the play appealing to adults as well some themes that were intended primarily for this secondary audience were also embedded in the play script. An example is an adult's effort to hold a young person back from pursuing a dream out of a desire to protect her or him from the same trauma s/he experienced.

A concern raised during review of the grant proposal was the need to demonstrate how the play would be compelling to the target audience. In response, at the initiation of the project Eileen Trauth conducted a focus group with undergraduate women currently enrolled in an IT degree program. As relatively recent high school students they were in a position to provide feedback on the story line and advice on techniques to engage the audience. For example, participants said that when they were in high school they lacked exposure to the range of IT educational options that were available in college; they believed that creating greater awareness and understanding about this would be valuable to high school students. As a result, the three main characters in the play and their respective stories relate to a range of IT careers. With respect to awareness and understanding about imposed and internalized barriers to women, participants recommended that the message be conveyed with subtlety. Consequently, promotional

materials about the staged readings of *iDream* emphasized its focus on current issues facing today's high school students: how to follow one's dreams while coping with real world issues such as obtaining tuition money for college, and dealing with the expectations and advice of significant people in their lives (parents, boy/girlfriends, guidance counselors, and teachers). Making a decision about careers in the IT field was positioned as the setting for the exploration of these larger themes of concern to high school students.

The focus group participants also recommended the use of humor and audience engagement to make the play appealing to high school students. To that end, the script incorporates the vernacular of 18-year-olds, their music and language, their relationships, concerns, and sense of humor. It also includes references to popular video games, and references to contemporary social media and texting. Further, some characters only appear in a technology-mediated way, such as through text messages:

MOTHER: Have you done your homework?

AMANDA: Duh. It's Friday night. I have a date with Jimmy.

(She texts and laughs. Mother grabs the cell phone.)

MOTHER *(reads, confused)*: What is this? OMG. MOS. 5. CTN. BBL8R. ILU. WYWH. It sounds like a foreign language. Like a...a code or something. Are you hiding something from me?

(Amanda takes the phone back.)

AMANDA: OMG you are so boring.

MOTHER: I want to know what you're talking about.

AMANDA: I'm making plans with Jimmy.

Though Amanda's mother reads the text messages, she doesn't understand their meaning. The scene operates on two levels: it is a humorous exchange that underscores the generational differences between mother and child while, simultaneously, emphasizing Amanda's obsession with the coded language of texts. Later, Amanda's teacher Ms. D uses her student's preoccupation with texting as a means of engaging her interest in a technology career in cryptography.

The goal of this project, as theatre for social change, was to create transformation on the part of audience members who experience the play—about intentional and unintentional barriers that can be imposed upon and internalized by young people in the pursuit of their dreams about careers in the IT field. Eileen Truth was focused on ensuring that the characters and the story arc in the play communicated research findings about gender barriers in the IT field and embodied the theoretical constructs of a gender theory that she developed and that was used in the research that inspired the play. According to this theory, *The Individual Differences Theory of Gender and IT*, the underrepresentation of women and gender minorities in the IT field can be explained by the interaction of three sets of factors (theoretical constructs). The first is individual identity: demographic characteristics (such as age, ethnicity, sexual orientation, socio-economic class) and type of IT work (such as computer hardware development, software design, or user

support). The second factor is individual influences: personal characteristics (such as personality traits and abilities) and personal influences (such as role models and mentors). The third factor is environmental influences (such as cultural norms about gender roles).[\[19\]](#)

Even though this project was undertaken to communicate the results of scientific research about gender barriers, the play had to satisfy aesthetic requirements as well. Suzanne Trauth had primary responsibility for writing the play script. She focused on ensuring that its aesthetic design created forward momentum with believable characters who live through a discernible story arc shaped by strong conflicts that force the characters to act to achieve objectives. The higher the dramatic stakes, the greater would be the audience engagement during a performance. Hence, a script was needed that would generate a high level of engagement during its performance in order to achieve the goal of societal transformation through awareness, attitude change, and intended behavior regarding gender barriers in the IT field.

In the play, three girls—Khadi, Theresa, and Amanda—are high school students confronting an uncertain future: whether or not to go to college and, if they decide to, what they would study and how to make that happen. They are encouraged by Ms. D., the dynamic teacher of their Digital Design course, to explore the male-dominated fields of information and computer technology—computer science, computer engineering, and information science. In doing so, they begin to discover their places in the world while they struggle with the obstacles—personal, family, and academic—that might prevent them from following their dreams.

The play focuses on the conflicts faced by all three protagonists: Theresa's desire to attend college versus her father's demand that she work in a hair salon with her cousin; Amanda's blossoming interest in higher education versus her mother's low expectations—and her boyfriend's priorities—for Amanda's future; and Khadi's confusion about her choice of college versus the instability of her home life and lack of appropriate mentorship. *iDream* has a single plot with three threads that are woven together as the three friends face life decisions. By graduation day, Theresa has asserted her independence, Amanda has traded an early marriage for college, and Khadi has found her mentor in an empathetic boyfriend.

In view of our goal, the interacting arcs of the three primary characters drove the narrative and textual foundations that held the production together. The integration of their three stories and the personal, academic, and familial barriers they confront as they face the challenges of planning for life after high school become the scaffolding upon which the moment-to-moment actions of the play unfold. Their objectives drive the narrative. The conflicts raised in the play reflect the range of obstacles discovered as a result of the research on barriers to careers in STEM for women and underrepresented groups. Theresa struggles with cultural and parental expectations. Her father is focused on the short term economic benefits of Theresa's employment immediately after graduating high school. He does not see the long term economic benefits from Theresa remaining out of the labor force for four years while in college. Khadi confronts a lack of consistent mentoring about her future. And Amanda must tackle low parental expectations that affect her self-esteem.

THERESA: Papi tells me to get my nose out of the books and learn to do something practical so I can earn money for the family.

KHADI: Dad would say “yeah” but Mom is worried about money. I would need a scholarship or something.

AMANDA (*mimics her mother*): Mom says, “I’m not wasting good money on college when I’m not sure you’ll even graduate high school.”

All performance elements play a crucial role in the dissemination of the research findings. The story arcs of the characters express the results of the research: as the three girls confront personal and social barriers to achieving their goals, they embody the questions and concerns raised in the course of the interviews undertaken by Eileen Trauth. This storytelling, in turn, triggers audience engagement, via personal empathy during the performance and the public discussion afterward. Art and science converge in an exploration of career opportunities in the twenty-first century, and barriers that might hold people back. The focus is not so much on overt barriers that are imposed on individuals; rather the play dramatizes the process by which a young woman might unconsciously internalize limits on her dreams.

Research-Informed Theatre

Two forms of research were involved in this project. One form of research was the field study of women working with IT that produced the theoretical constructs and findings about the gender imbalance. These findings were, in turn, embodied in the characters and story line of *iDream*. The characters are a composite of the stories told by the adults about barriers they experienced and observed over the course of their lives, and the constructs of the theory used in the research. The other form of research was the process of obtaining and incorporating feedback into the writing and revising of the play script. Hence, the relationship of the audience to the performance was an integral part of this project. It was through audience engagement that this second kind of research was accomplished.

The transformation of a scientific product into a theatrical process was intended to enact transformative learning through relational aesthetics in the experience of reading, performing, or viewing the play: to build awareness, change attitudes, and motivate behaviors and actions. The goal was to shift perspectives about individual, environmental, and social forces at work in creating barriers for women in technology fields. According to Juanita Johnson-Bailey, Josiah Meigs Distinguished Teaching Professor, Director of the Institute for Women’s Studies, and a professor in the Department of Lifelong Education, Administration and Policy at The University of Georgia, societal transformation is a movement to change oppressive forces and begins with investigating the ways the forces form and operate.[\[20\]](#) Jack Mezirow notes:

Transformative learning refers to the process by which we transform our taken-for-granted frames of reference . . . to make them more inclusive, discriminating, open, emotionally capable of change, and reflective so that they may generate beliefs and opinions that will prove more true or justified to guide action.[\[21\]](#)

The need for societal transformation is evident in the data about both the significant underrepresentation of women and gender minorities (e.g., black men and LGBTQ individuals) in STEM fields such as IT and in the hegemonic masculine culture that pervades the high tech world.[\[22\]](#) Two groups of individuals are the focus of the societal transformation: those who are experiencing and internalizing the barriers and those who are in a position to tear them down.

The development of the play script involved the creation of an initial draft based on the results of Eileen Trauth’s fieldwork and her interactions Suzanne Trauth. This was followed by two workshops

sessions and a series of public staged readings of *iDream*. Following each of these, the play script was subsequently revised. The script was first workshopped with actors at a table reading with Suzanne Trauth, Eileen Trauth, the director, and the dramaturg in attendance. The goal of this session was for Suzanne, the director, and Eileen to hear the play being read for the first time. The second script workshop occurred a month later on a stage in front of a small audience comprised of teachers, college students, and high school students. The project team observed the script being presented in a staged reading format and gained initial audience feedback on the script.

Six staged readings of the play with professional (i.e., Equity) actors in front of public audiences were then held in 2012. The first staged reading was in June 2012 for an audience of several hundred NSF-funded STEM researchers. In October 2012 the remaining five staged readings in front of public audiences were held, three in New Jersey and two in Pennsylvania. Each performance was followed by audience talkback sessions held immediately afterward. Following each event, the script was revised. The final version of the play was completed in 2013.

The New Jersey performances were held at Premiere Stages in Union, New Jersey. The audiences for the two daytime performances were recruited from high schools in Jersey City, Elizabeth, and in and near Union. The students came from urban schools that have significant ethnic and socio-economic diversity in the student bodies. Suzanne Trauth and John Wooten, Producing Artistic Director of Premiere Stages (who was also a consultant on this project) invited theatre teachers in these high schools to bring their students. The third performance took place on a Saturday evening as part of a new playwrights series with an audience consisting of adults who came to see the staged reading of a new play; the subject matter of *iDream* was not the main motivator for attendance. The two Pennsylvania performances were held on a Saturday night and a Sunday afternoon at the State Theatre in State College, Pennsylvania. The audiences for these performances were recruited from newspaper announcements, posts to email listservs, and an interview by a local television station with Eileen Trauth, Suzanne Trauth, and the director. The performances were also listed among the upcoming events on the theatre's website. Audience members at all five performances were presented with a pretest and an informed consent form to sign, both of which provided background information about the project. In addition, immediately preceding each performance, the director came onto the stage and gave a brief introduction to the project and the play.

We achieved engagement with the target audience by writing the script in such a way as to build empathy with the characters, by relating the storyline to the audience members' own experiences, and enabling them to "see themselves" in the unfolding drama. In this way, audience members were drawn into the circumstances in *iDream*. Audience members' connection, in a visceral way, to the play provided the emotional energy moving the story along to the climactic moment.

THERESA (*proudly*): My trigonometry exam. I got 99 out of 100.

(*Father reluctantly takes the paper and studies it.*)

FERNANDO: 99 out of 100. (*teases*) Why not 100 out of 100? But what will you do with 99 out of 100 in your cousin Maria's beauty shop? This trigonometry will help you cut hair?

(*He hands the paper back to Theresa.*)

THERESA: I was thinking about college—

FERNANDO: No, Theresita. You will go to beauty school. You will have a trade that you can be proud of. You will be able to help your family. In America we have a better life. It has been hard and I work many long hours. But I do it for you and Mami and Imelda and Juan. Theresita, I know you are smart. But you must do this for the family.

THERESA: But things change and it is different here now.

FERNANDO: Your family never changes.

THERESA: I could get a scholarship.

FERNANDO: No Theresa! You cannot give any information to the school about our family. You must NEVER talk about us to [outsiders.] Do not betray your family.

THERESA: But Papi, this is our country now. They are not outsiders—

FERNANDO: No. Come and set the table. No more talk of [outsiders]. And no more talk of numbers.

(He leaves. Theresa presses the exam to her heart.)

During the talkback sessions, audience members, who had experienced being devalued as a woman or person of color, were emotional in their responses; they related the characters to their own lives.

Two sub goals were embedded in the overall goal of stimulating awareness, understanding, attitude change, and activism. One sub goal was to generate awareness about types of careers in a field that has been stereotyped as being the exclusive domain of men. The second sub goal was to create awareness about both overt and subtle barriers to participation in the IT field, which are experienced by members of underrepresented gender groups.

Karen Keifer-Boyd was responsible for designing and implementing the learning assessment. Research-informed theater can be transformative learning if the relational aesthetic experience of a performance “exposes a discrepancy between what a person has always assumed to be true and what has just been experienced, heard, or read.”^[23] Consequently, Karen designed an assessment to gauge changed assumptions and attitudes about women in the IT field by audience members who attended the staged readings of *iDream*. Three forms of data constituted the audience learning gains assessment. First, audience members were asked to complete a pre-survey form consisting of open-ended questions. Second, at the end of each staged reading, Eileen Trauth, Suzanne Trauth, the director, and actors responded to questions and comments from the audience members during a talkback session. Karen Keifer-Boyd and a graduate student attended the staged readings and took handwritten notes regarding audience responses during these sessions. A third form of data came from a follow-up online survey that was sent to audience members who had completed the pre-survey.

Responses during the talkback sessions and follow-up survey consistently showed that *iDream* “speaks” to the audience. One mother revealed, “I didn’t know the computer field was so broad.” A Latino actor

commented that one of the characters “behaved just as my mother did.” An adult Latina audience member said: “The play was telling my life.” Some women audience members related the play to their own experiences of gender stereotyping and being dissuaded from IT careers, or not being given the same opportunities as their male counterparts. One woman audience member “strongly identified with Theresa because it brought back memories of being the oldest in an Italian family and being expected to help the family [rather than undertake a career].”

Audience members revealed that after experiencing the staged reading *iDream* they were now aware that the IT field is available to women and underrepresented minorities and showed some evidence of change in their perceptions of who can pursue IT careers. For example, an audience member stated, “The careers were presented as *really accessible* in the play.” One student stated, “Students play games but they don’t think about how they’re made. The play did a good job of presenting careers.” A 41 year-old woman responded on the post-survey, “After the play I know they [IT professionals] do more than just ‘develop software,’ which was my original answer.”

The audience members also revealed awareness of implicit and explicit barriers that can be both imposed and internalized. They identified with the characters, or knew people and experiences reflected in the play. A mother in the audience stated, “My daughter is nine and when she was five she told me that other kids told her math is not for girls. This play showed the options in the computer field.” Another area of awareness was about resources, particularly the role of teachers in helping underrepresented groups overcome restrictive stereotypes. Nearly all of the respondents in the post-survey mentioned the significance of the teacher in the play as encouraging the three female characters to pursue college and careers in IT. A male audience member stated, “I am *pleasantly amazed* with the presentation of representing a message in art. ... This play spoke to ... *a dream deferred* because the barriers are there, but the story also presented opportunities.”

We are aware that identifying the arts as a venue to articulate women’s experience of barriers in STEM might perpetuate a stereotype of the arts as a feminized discipline in contrast to the masculine STEM fields. Throughout the life of this project, which included talkback sessions following the six staged readings and seven presentations at a diverse set of conference venues, there were numerous opportunities for this issue to be raised. Yet it never was. But this doesn’t invalidate the concern. Indeed, Eileen Trauth, in her capacity as a scholarly journal reviewer, has encountered this arts-feminine/science-masculine stereotyping in manuscripts she reviews. For this reason, we believe that it is best to anticipate the potential for this issue being raised and to be prepared to address it in discussions and workshops that accompany future performances of the play.

Enacting transformative learning through relational aesthetics in theatre for social change is not to prescribe or expect specific behavior changes. Rather, it is a pedagogical design of this play project that awareness and attitude change set in motion behavior changes specific to each individual’s life and circumstances. For example, one female high school student related the character of Theresa in the play to her brother, who has an interest in gaming and graphic design. She intends to tell her brother he could make a career out of developing video games. A high school teacher “appreciated seeing the struggles of students at home and the different cultures represented, so I can understand and help get students through graduation.” Several audience members recommended that all high school students should see the play. For example, a college professor recommended to all in attendance at one of the staged readings that all first-year college students should see the play because “there’s confusion about STEM—everyone thinks

it's too hard." A student asked that the script be made available to schools "so *they* could perform it. Another asked about courses for her daughter to take that would help her "attack gender bias in the IT community."

Transformative learning, a goal of this project as theatre for social change, is "behaving, talking, and thinking in a way that is congruent with transformed assumptions or perspectives."^[24] Assessment of the impact of experiencing staged readings of *iDream* indicates pedagogical potential for transformative learning. The accessibility of the play script, not only literally by downloading from the play website, but also in the familiar dramatic aesthetics of its construction, lends it the potential for societal transformation through widespread education of high school students, parents, teachers, and counselors about the overt as well as the subtle barriers to participation in the IT field that confront women and other underrepresented groups.

Postscript

At the conclusion of the project a website was created to make the *iDream* play script available to those interested in reading and/or performing the play (www.iDreamThePlay.com). The final version of the play script became available to the public in 2014. The website also provides resource materials related to overcoming gender barriers in the IT field, such as a short video about the project and interviews with cast and production personnel. These materials offer an opportunity for both documenting and disseminating the performance, and for analyzing the performance process.

Three questions accompanying the video convey the learning objectives of the play.

1. How do we help people become aware of the subtle barriers that exist in our society, ones that are often unconsciously internalized, that hold young people back?
2. How do we engage students in thinking about college and careers in science and technology?
3. How do we awaken them to the possibility of creating their own individual dreams—and acting on them?

As high schools, community groups, and universities perform the play or do in-class readings, these three questions can guide group discussion, providing a pedagogical design to be adapted to particular groups and places. The goal for the artist working toward relational aesthetics is to create an event or set in motion a social experience, which is the actors' and audience's experience of the art. In this project, the play script is the vehicle for creating art as experience. Groups can read and perform the script together and then work with the prompts and resources on the play's website to reflect on their attitudes, perceptions, and positionality in relation to the IT field. The "Resources" section on the play website was created in response to audience members' requests for a place to learn more about IT careers. Resources include information about information technology careers, organizations of underrepresented groups in information technology, and articles about theatre and STEM. The website is an important way for high school teachers to learn about the play and to produce a staged reading or full production in their schools. It provides a way to advance knowledge and practice, and enable others to build upon the results of the project. Through dialogue and research motivated by the play, further awareness, attitude change, and transformative learning with intended and actualized behaviors toward addressing gender barriers in STEM fields are the ultimate goals of the generative pedagogical design.

From Karen Keifer-Boyd's perspective as an arts educator who teaches students how to teach new media art, the benefit of working cross disciplinarily lies in the potential of the play script as education and art, to be used to challenge gender inequities in the IT field. Within her discipline she sees the potential for girls to be motivated to creatively play with technology as a mechanism for opening their minds to possible careers with technology. She believes society and institutions need to encourage such play. For Suzanne Trauth, a playwright, framing the issues of gender equality in the context of theatre reminds all involved in the process that these issues are not unique to the STEM fields. The American theatre has long struggled to establish gender parity with regard to the production of plays by female playwrights. That struggle is in the process of being addressed in recent years with the Dramatists Guild's initiation of *The Count*, an ongoing study that explores the question of who is being produced in American theatres. In the November/December 2015 issue of *The Dramatist*, the organization presented for the first time three years of data from regional theatres across the country: only 22% of the plays produced from the regional sample were written by women. Meaningfully, playwright Marsha Norman, the author of the article, suggested that "if life worked like the theatre, four out of five things you had ever heard would have been said by men." [25] Clearly, the American theatre has a distance to travel in achieving gender equality on its stages. In confronting the STEM issues, the artistic side of the collaboration is reminded that the goal of gender parity crosses disciplines.

By the end of the project we came to see that it was really just the beginning. We had embarked upon this project with the goal of producing a play script as a way to disseminate Eileen Trauth's research findings. The National Science Foundation funding supported development of a play script, and the production of a series of staged readings in order to obtain developmental audience feedback that would inform a subsequent revision of the script. That project is completed and the play script is currently available at the *iDream* website for those interested in reading or presenting a full production of the play. But we now view our original project as the inaugural steps of a longer-term mission. Eileen Trauth and Suzanne Trauth are currently exploring an expansion of this venture to broaden access to the story begun in *iDream* by using video story-telling and interactivity as options for greater engagement with the subject matter for a wider variety of audiences.

Eileen Trauth is professor of information sciences & technology, and women's gender & sexuality studies at Pennsylvania State University. She conducts research on societal, cultural and organizational influences on the information technology profession with a special focus on gender and social inclusion. She held the 2008 Fulbright Distinguished Chair in Gender Studies at Alpen-Adria-Universität Klagenfurt, Austria, and served on the scientific advisory board for *Female Empowerment in Science & Technology Academia (FESTA)*, a European Union project to increase female academic participation in science and technology. Her research has been supported by grants from the National Science Foundation, the Fulbright Foundation, the Australian Research Council and Science Foundation Ireland. She is editor of the *Encyclopedia of Gender and Information Technology* and editor-in-chief of *Information Systems Journal*. (www.eileentrauth.com)

Karen Keifer-Boyd is professor of art education and women's, gender, and sexuality studies at Pennsylvania State University. She was the 2012 Fulbright Distinguished Chair in Gender Studies at Alpen-Adria-Universität Klagenfurt, Austria, and received a Fulbright in 2006 for research in Finland on intersections of art and technology. Her writings on feminist pedagogy, visual culture, inclusion, cyberart

activism, transcultural dialogues, action research, social justice arts-based research, and identity are in more than 50 peer-reviewed research publications, and translated into several languages. She co-authored *Including Difference: A Communitarian Approach to Art Education in the Least Restrictive Environment* (NAEA, 2013); *InCITE, InSIGHT, InSITE*[\[amazon.com\]](#) (NAEA, 2008); *Engaging Visual Culture* [\[davisart.com\]](#) (Davis, 2007); and co-edited *Real-World Readings in Art Education: Things Your Professors Never Told You*[\[amazon.com\]](#) (Falmer, 2000). (www.personal.psu.edu/ktk2/)

Suzanne Trauth is a playwright, novelist and screenwriter. Her plays include *Françoise*, which received staged readings at Luna Stage and Nora's Playhouse and was nominated for the Kilroy List; *Midwives* developed at Playwrights Theatre of New Jersey; *Rehearsing Desire*; *iDream*, supported by the National Science Foundation's STEM initiative; and *Katrina: the K Word*. She is a member of Playwrights Theatre of New Jersey Emerging Women Playwrights program and the Dramatists Guild. She wrote and directed the short film *Jigsaw*, nominated for best film in the shorts category at the PF3 Film Festival and screened at New Filmmakers, NY. Ms. Trauth has co-authored *Sonia Moore and American Acting Training* and co-edited *Katrina on Stage: Five Plays*. Her novels include *Show Time* and *Time Out*. (www.suzannetrauth.com.)

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