

Development of an Instructor Training Tool for Inclusive Teamwork

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ABSTRACT

A growing body of research has shown that women and students from other underrepresented groups often experience negative encounters and events when working on teams in engineering education. Given that teamwork is of central and increasing importance in developing future engineers, it is vital that engineering educators understand how to maximize gender inclusivity within their teamwork components. To that end, we created a training tool designed to help instructors facilitate more inclusive teamwork. This paper describes the collaborative development and content of a new, open-access, online training tool. The modules guide users through various ways in which teamwork can be problematic for women and other underrepresented groups. Users then complete activities in which they apply their newly gained knowledge to situations they might encounter in the classroom. Current efforts are now underway to disseminate the tool to engineering educators around the world.

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1 INTRODUCTION

Teamwork continues to be central and of increasing importance in developing future engineers [1-5]. At the same time, research continues to amass surrounding the difficulties that women and other underrepresented groups face when working on teams in engineering [1–3]. Difficulties range from conscious and unconscious biases to the topic of the projects chosen by instructors. Given this, it is vital that engineering educators understand how to maximize gender inclusivity within their teamwork practices.

This paper describes a training tool that grew out of an interview study with engineering professors originally from ten different countries [5]. One portion of the interviews covered teamwork issues specifically. Participants were asked about their practices, decision-making, and experiences regarding forming teams, assessing teams, and students' experiences with teamwork. From these interviews, it was found that most participants spent little time thinking about the inclusivity of their teamwork practices and were unaware of the ways in which teamwork can act as a site for gender biases [4,5]. While undertaking this research project, we also identified a gap in the tools available to instructors in regard to inclusive teamwork practices. This led us to create a training tool designed to help instructors facilitate more inclusive teamwork called TARGIT (Training and Resources for Gender Inclusive Teamwork). We took an engineering design approach to create the teamwork tool. In doing so, we focused on the *process* of design which was done by distilling the teamwork literature into an easily digest format, targeting a specific audience, and working collaboratively. To-date, the TARGIT is fully developed and awaiting testing and dissemination to interested faculty members. The tool is specifically designed to be utilized by faculty members throughout the teamwork process. For example, a faculty member interested in evaluation can skip directly to that section and by-pass other sections.

2 OTHER TEAMWORK TOOLS

Tools such as Team Developer, CATME, and BESTEAMS have been created to assist instructors and students throughout the teamwork process, including team formation and assessment [6–11]. While they may be very valuable in helping instructors facilitate some aspects of teamwork, none of these tools prioritizes gender inclusivity or addresses most of the challenges identified during our literature review and faculty interviews. BESTEAMS aims to create teams that have learning style diversity, but not gender diversity [10]. Team Developer and CATME allow instructors to select different categories or criteria that they find are important and assign teams based on student responses relative to these areas (e.g., major, gender, industrial work experience, year in school, and/or cultural representation) [8,9,12–14]. The tool then automatically assigns teams based on the instructor's ranking of importance of the different categories chosen. Though the tools do have a category for "gender," and an explanation as to why it is important to consider, instructors do not always select it as most important and have been found to select a category such as "scheduling" as most important [15].

Additionally, the way CATME handles gender and race is to not solo females or minorities. As noted, this practice is found frequently in the literature, but is not as clear-cut as it is often presented [16]. Plus/Delta is used for peer and team assessment and feedback [17]. It allows for open-ended responses but relies on students to report problems. As we will discuss, students, especially minority students, may be unlikely to report problems. Overall, these tools do not address the many ways in which gender factors into teamwork. When they do, for instance in the more recent versions of CATME, the complexities of gender in team formation are not fully accounted for.

3 DESCRIPTION AND EVIDENCE OF WORK UNDERTAKEN

This paper describes the collaborative development and content of a new, open-access, online training tool. TARGIT was created by a team of two engineering education researchers and two faculty development specialists, who also have backgrounds in engineering education research. The work began with an extensive literature search about teamwork and gender. From there, the body of literature was distilled into four areas: team formation, team roles, team facilitation, and team evaluation. These four areas were decided upon through a combination of what was most prevalent in the literature and the findings from the interviews [4,5].

TARGIT begins with a welcome screen to introduce the training, including an explanation of the goals and objectives. Audio in the form of a speaker is used throughout the tool to guide users and present the material contained within each module. The modules contain interactive activities before users are given the opportunity to put their new knowledge to use in the Experience sections. The teamwork tool concludes with a list of best practices for instructors before wrapping up the training and providing a list of references and resources. TARGIT allows users to sequentially follow through the training or skip around to sections that would be most useful to them at any given time. The modules and interactive experiences are explained in greater depth in the sections to follow.

3.1 Team Formation

Team formation is often an aspect of teamwork that instructors do not devote much time to but can have a significant impact on the project outcome, team dynamics, and student experiences. As noted, while tools exist to help instructors assign teams, they do not fully account for the complexities of gender in team formation. Our tool therefore focused on providing users with a range of formation options, including the benefits and drawbacks associated with each one, such as the benefits of creating homogeneous teams [1,18–21] versus heterogeneous teams [22–30].

Users are given the choice to learn about instructor assigned teams or self-selection (figure 2). Within each selection method, users are exposed to a range of options within team formation and how these options can impact gender inclusive team formation. For example, TARGIT elaborates on the practice of “soloing” women and how it is generally a practice that should be avoided but not always so [1,16,31]. Overall, the module recommends instructor-assigned teams as they allow the instructor to take into account the unique attributes of each individual and to create teams accordingly.

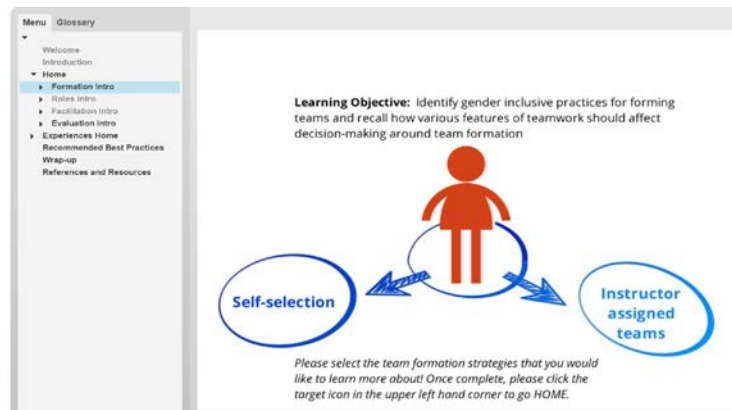


Figure 2. Team Formation home screen

3.2 Team Roles

Assigning team roles can mitigate one source of gender bias within teamwork [1,32]. When students self-select their team roles, there is a documented tendency for women to end up in the role of organizer, note taker, or secretary. While the “soft” or “professional” skills learned during these roles are important, they also tend to be less highly valued in comparison to “technical” skills [33–38]. Therefore, it is not only important for instructors to assign roles but also to rotate roles throughout the teamwork activity so everyone has experience practicing technical and professional skills [1,32].

Users are walked through the importance of assigning team roles and rotating roles by explaining the value placed on professional and technical skills. The module goes into depth explaining this and provides easy to implement strategies to utilize in teamwork activities.

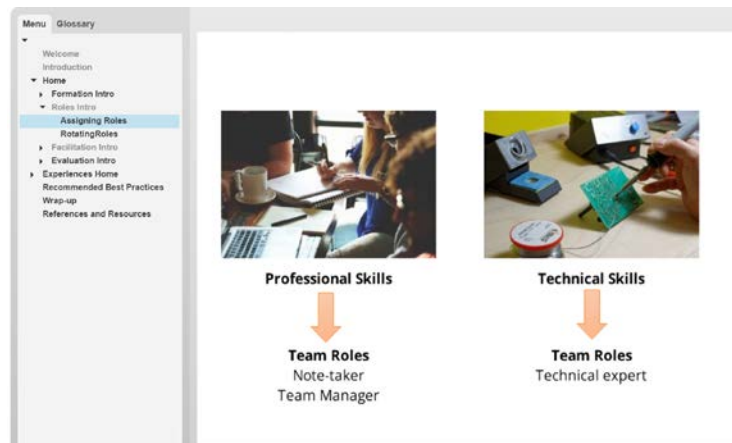


Figure 3. Assigning Team Roles

3.3 Team Facilitation

Women often have negative experiences and less positive views of teamwork than men [39–44]. Instructors can minimize negative experiences by actively facilitating teamwork, and TARGIT provides strategies for doing so. It covers four elements of teamwork facilitation: (1) Gender bias challenges, (2) Pre-teamwork, (3) Topic, and (4) Check-ins throughout the project (figure 4). For example, within the *topic* element, the tool explains how certain project topics can be seen as masculine (e.g. racecar engineering) and that other topics may be more gender inclusive (e.g. biomedical devices).

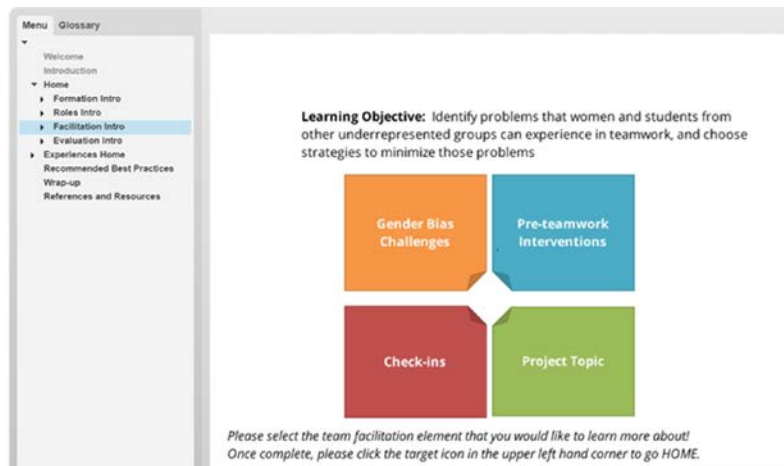


Figure 4. Team Facilitation Module home screen

3.4 Team Evaluation

Even though not intentional, gender biases can affect the way in which faculty evaluate teams and students evaluate each other. For example, men have been found to more harshly judge feminine speech characteristics which are often quieter, self-deprecating and less assertive [44]. These communication differences can have an impact not only during team discussions but also during group presentations. Furthermore, men often present more of the technical slides and are rated as more knowledgeable compared to women because of this [1]. Ensuring that women’s contributions are explicitly shown or documented can assist in eliminating gender bias during team evaluations [45]. To raise awareness of these issues, users are exposed to the different ways in which gender may play a role in team presentations and peer evaluations. Users are given the opportunity to interact with the module by sorting statements that are either characteristically feminine or characteristically masculine (figure 5).

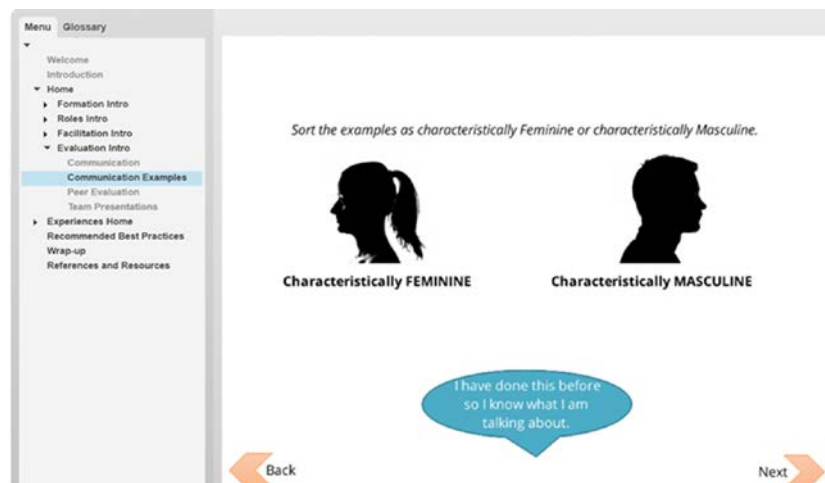


Figure 5. Gendered communication activity

3.5 Experiences

Interactive “experiences” were created as a way for users to test and apply the knowledge they gained throughout the training. Experiences synthesize the modules into activities that ask users to apply their knowledge. For example, experience 1 presents users with a scenario in which the instructor plans on utilizing teamwork in their classroom. Users are then taken to a second screen (figure 6) to identify and sort the practices within the scenario that are either gender inclusive or gender biased.

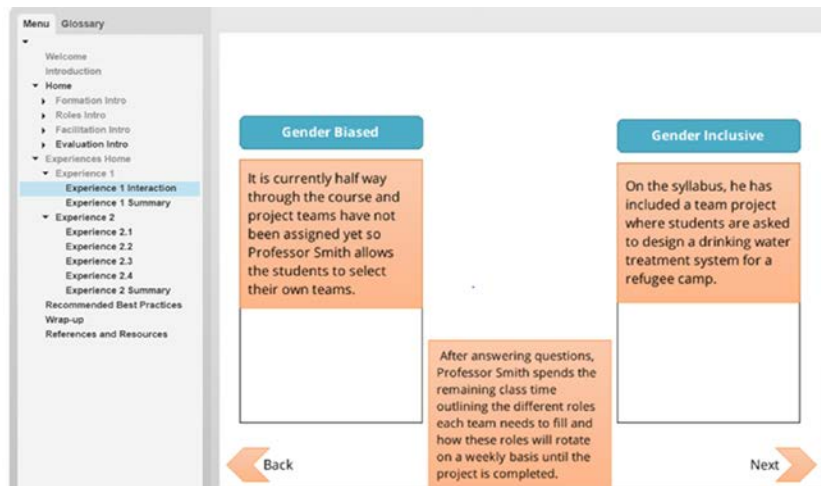


Figure 6. Sorting exercise associated with Experience 1 in the training tool

4 CONCLUSION

The strength of the teamwork training tool lies in the collaborative process that brought together engineering education researchers and faculty development specialists. While the researchers often had no trouble identifying and citing teamwork research, the faculty development specialists were able to assist in converting the research into an easy-to-digest platform that has the potential to reach users around the world. The collaborative process drew upon the strengths of the individuals to collectively produce a research-based training tool that can assist users in learning and implementing inclusive teamwork practices in their classrooms. Teamwork was essential in the success of this project and is of critical importance within engineering education. The tool created here can assist in educating instructors about how to incorporate inclusive teamwork practices into their classrooms and is one step to creating an inclusive environment and increasing diversity within the engineering workforce.

5 FUTURE WORK

Future work will focus on piloting and disseminating the training tool to engineering educators around the world. Efforts currently underway include conducting workshops, presenting posters, and conducting presentations at national and international engineering education and higher education conferences. TARGIT can also be updated as new research is published and as best practices change over time. The tool currently appeals to users who have not spent much time thinking about inclusive learning practices and is an entry point into the conversation about inclusive teamwork practices. Future work may expand TARGIT to audiences who are further along in their engagement with inclusive classroom practices. As of this writing the tool's URL is not yet available; it will be posted on <http://www.sociologyofengineering.org/> when it is available.

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