PDF - THE INFLUENCE OF GENDER STEREOTYPES ON ROLE ADOPTION IN STUDENT TEAMS - researchcub.infoEducational researchprovides ample evidence of the benefits of effective group work for engineeringstudents including improved material retention, development of higher-ordercognitive skills, and higher performance. This work also describes bestpractices in the creation of effective student teams including suggestions forteam size, the placement of students in teams, and student diversity. Whilediversity in this context includes a broad range of considerations spanningabilities and perspectives, Tonso suggests that teams should include racial andethnic diversity specifically, whenever possible. However, research has shownthat despite best practices, women or minorities on teams can experiencenegative outcomes. Their perspectives are not always considered valid bymajority teammates, and they are often assigned unimportant tasks , reflectinga societal stereotype of majority men as engineering “experts.” Moreover,under-representation of one’s social group (e.g., gender or race) in theacademic environment can lead to reduced performance as a result of stereotypethreat, i.e. the concern that poor performance may appear stereotype-confirmingto others 6, . The isolation that these students feel on their teams may leadto diminished feelings of belonging in their field and lower retention among theseindividuals. Despite the employment of best practices, our earlier analysis ofapproximately 600 undergraduates involved in group oral presentations revealsthat women on first-year engineering project teams exhibit less activeparticipation than men, and that this happens regardless of the representationof women on the team. Men are disproportionately more likely to present thetechnical content in oral presentations than women, to speak longer thanexpected and longer than women, and to field more audience questions than women. In addition, students’ selfreported learning from the project is positivelycorrelated with taking on active presentation roles, roles primarily adopted bymen. This paper provides a summary of the statistical findings of adding anadditional 500 first year student participants to the prior work, lendingfurther validity to our initial findings. To complement these quantitativeresults, we also describe the results of a focus group study, involvingstudents who were enrolled in the targeted engineering course in a prior term.Themes emerging from the focus groups highlight the presence of genderstereotypic role adoption. Although students in general felt that teams strivefor fairness in determining roles, those roles were recognizably aligned alongstereotypical lines. Despite this recognition students thought this phenomenonwas mostly self-determined, and that they were not pressured into it.Stereotyping was evidenced in reports of women most often taking onorganizational roles, taking notes, scheduling meetings, and distributingagendas. Of interest, women saw these nontechnical roles as less desirablebecause these are seen by others as insubstantial, but these were the veryroles that women were most often taking on. Thus, we were able to document thatgender stereotypes influenced the roles adopted by men and women in their groupproject presentations and that students, while recognizing the stereotypicalpatterns of behavior, do not recognize the influence that conforming to thesepatterns has on their educational outcomes. P ge 23217.2 Introduction andBackground Research from engineering education and social science provides asynergistic foundation for predictions

about the effect of gender stereotypeson the participation of male and female students in engineering project groups.Recent trends in engineering enrollment and persistence. Enrollment trends inengineering schools in the US show increased numbers of students entering theengineering field over the past decade. Enrollment of female students has beenrising, reaching 18.6 percent in 2010; however, women remain greatlyunder-represented in the field. Likewise, enrollments of some groups ofminority students remain very low. African American enrollment has declined toonly 5.9 percent of undergraduate engineering enrollment. Hispanic studentenrollments, although increasing, remain low at approximately 9.1 percent. Atthe University of Michigan College of Engineering, enrollment of femalestudents has been relatively high, reaching its peak at just over 30 percent in2002, but has recently declined despite increasing national trends, settling atabout 25 percent. Under-represented minority (URM) student enrollment inengineering at Michigan has also declined since reaching a high in 2001 ofapproximately 15 percent. While enrollment in engineering is increasing, thefield is faced with high attrition rates. Since 1975, nationwide engineeringstudent attrition has increased, doubling from about 12 percent to 24 percentin 1990, and reaching as high as 40 to 60 percent in the last decade. Thistrend exacts a significant cost on the institution and the individual. Researchacross gender and race cohorts shows that each group reports different reasonsfor leaving engineering. Students who leave often exhibit a lack of motivationand self-efficacy . Women may lack in the development of professional roleconfidence, and URM students sometimes report additional complex and uniquesituations, including financial challenges and specific experiences in theinstructional settings with other students and faculty that lead to attritionfrom the field. Overall, enrollment trends in engineering indicate that womenand minority students continue to be highly under-represented in the field,with higher attrition when they do enroll, for reasons that are associated withtheir experiences on campus. With the growing importance of group work in theengineering educational setting, and the persistent stereotyping of the fieldas a majority male domain, negative intergroup experiences in this setting maycontribute significantly to the perceptions and intentions of under-representedstudents. The group work environment in engineering education. Educationalresearch provides ample evidence of the benefits of effective group work tostudents including improved material retention, development of higher-ordercognitive skills, and higher performance. This work also describes strongframeworks and best practices in the creation of effective student teamsincluding team size, student diversity and the determination of teammembership. For example, teams consisting of three to five individualsfacilitate individual accountability, allow for less complex out-of-classmeeting time management and provide a sufficiently broad set of perspectivesand resources . Best practices also suggest not isolating under-representedstudents on teams, especially in fields such as engineering where there arefewer underrepresented students and where academic networks are notsufficiently robust to support the needs of these students. To createheterogeneous teams and control resource distribution among P ge 23217.3 teams,it is necessary for instructors to actively assign team membership, seekingbalance in terms of race, gender and ability. Although heterogeneous

teams canencounter more challenges as diverse participants learn to work together, suchteams allow students to share diverse perspectives and skills and typicallyresult in more effective performance than homogeneous teams . While diversityin this context includes a broad range of considerations spanning abilities andperspectives ,23, 24, 25, , Tonso suggests that teams should include racial andethnic diversity specifically, whenever possible. However, research has shownthat isolating women or minorities on teams can negatively impact theirparticipation in significant ways. Their perspectives are not always consideredvalid by majority teammates, and they are often assigned unimportant tasks .Also, under-representation of one's social group (e.g., gender or race) in theacademic environment can raise concerns among women and minorities that poorperformance may appear stereotypeconfirming to others 6, . The isolation thatthese students feel on their teams may lead to a lower feeling of belonging intheir field and lower retention among these individuals. These processes havebeen examined in social science research in the areas of stereotype threat,gender differences in small group dynamics, and active learning. StereotypeThreat. A large body of social science research has demonstrated that genderstereotypes exist purporting than men have more ability than women in math andscience fields, including engineering. Laboratory studies on the topic ofstereotype threat have demonstrated the significant detrimental effect of thesestereotypes on women's performance in math and science fields, and on theirintention and motivation to pursue math and science-related education andcareers. For example, in lab studies women score lower than men on a math testwhen cues in the setting raise awareness of the gender stereotype . Thisphenomenon was also observed for performance on an engineering exam. This lowperformance of women is said to occur because awareness of the stereotype leadswomen to worry that a poor performance would appear stereotype-confirming toothers, and the threat of appearing stereotypic raises stress and distractsthem from concentrating fully on the test. Of importance, such studies alsoshow that women's math and engineering performance outcomes can match that ofmen's when instructions are given that minimize the relevance of genderstereotypes in the testing situation, e.g., by describing the test items asnon-diagnostic of inherent ability. This indicates that women have aptitudesimilar to men, but that expression of this aptitude is impeded by thestereotype.

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