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Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Full length article

Examining potential mechanisms underlying the Wikipedia gender gap through a collaborative editing task

Christina Shane-Simpson ^{a, b, *}, Kristen Gillespie-Lynch ^{a, b}^a The Graduate Center, CUNY, 365 Fifth Avenue, New York, NY, 10016, United States^b The College of Staten Island, 2800 Victory Blvd, Staten Island, NY, 10314, United States

ARTICLE INFO

Article history:

Received 28 June 2016

Received in revised form

18 September 2016

Accepted 22 September 2016

Keywords:

Online

Gender

Editing

Communication

Wikipedia

ABSTRACT

Research has identified a significant gender gap on the online encyclopedia, Wikipedia. The current research used a mixed experimental (type of feedback) and quasi-experimental (gender) design to examine the editing behaviors of college students during a public, collaborative editing task to identify potential factors underlying the Wikipedia gender gap. Overall, women edited more than men. However, in the editing condition most akin to Wikipedia, wherein female peer editors were underrepresented in the essay edits and feedback from peers was neutral, men trended towards adding more content than woman. Women added more content than men in this male-dominated essay condition when peer editors modeled constructive feedback. Although the type of edits from peer editors was counter-balanced, participants typically viewed an anonymous peer editor as male. Women viewed the anonymous editor as more critical of the participant's own work when compared with a gender-neutral peer editor. These results suggest that visible female editors on Wikipedia and broader encouragement of the use of constructive feedback may begin to alleviate the Wikipedia gender gap. Furthermore, the relatively high proportion of anonymous editors may exacerbate the Wikipedia gender gap, as anonymity may often be perceived as male and more critical.

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1. Introduction

Recent research has revealed a Wikipedia gender gap; women edit Wikipedia at significantly lower volumes than men (Collier & Bear, 2012; Eckert & Steiner, 2013; Glott, Schmidt, & Ghosh, 2010; Hill & Shaw, 2013; Lam et al., 2011; Pande, 2011). Explanations for this gender gap often highlight the contentious nature of Wikipedia as favoring traditionally male communicative styles (Collier & Bear, 2012; Lam et al., 2011; Laniado, Kaltenbrunner, Castillo, & Morell, 2012), as women may be less sure of their expertise, more often targeted for harassment, and more negatively affected by critical feedback than men (Bear & Collier, 2016). Consequently, women may contribute more during online discussions rather than through visible, article-based Wikipedia editing (Lam et al., 2011). Gender differences in Internet familiarity (Hargittai & Shaw, 2015), the desire to contribute to the common

good, and differences in leisure time may also contribute to the gender gap.

The Wikipedia mission statement centers on the *empowerment and engagement of people around the world* to collect and disseminate knowledge (see [Wikimedia Foundation Mission Statement, 2015; Wales, 2016](#)). Despite Wikipedia's commitment to involving diverse people in the dissemination of shared knowledge, gender inequality in Wikipedia editing has been well documented through survey research (e.g., Collier & Bear, 2012). Consequently, the barriers that women encounter obtaining equality in other environments (e.g., Fenstermaker & West, 2002) also persist on Wikipedia.

Injustice towards women online has also been documented on other sites. For example, in a review of the comments left on the Guardian website, researchers found that their female opinion writers (compared with those that were male) experienced the greatest levels of harassment through comments left on article posts (Gardiner et al., 2016). These trolling behaviors may represent a unique form of discrimination found online; due to the nature of many online environments, harassing behaviors can be hidden under a veil of anonymity for the antagonist. Trolling may be particularly salient on sites like Wikipedia that do not require users

* Corresponding author. Psychology Department, The Graduate Center, CUNY, 365 Fifth Avenue, New York, NY, 10016, United States.

E-mail addresses: Christinam.shane@gmail.com (C. Shane-Simpson), Kgillyn@gmail.com (K. Gillespie-Lynch).

to identify personal information in a profile. In fact, gender inequality appears to be particularly apparent on anonymous sites such as gaming sites (see Thacker & Griffiths, 2012) and discussion forums (Herring, Job-Sluder, Scheckler, & Barab, 2002). Consequently, these widespread online inequalities may impact how women participate in certain collaborative environments and may underlie the current Wikipedia gender gap.

While a wealth of interventions have been proposed to address the Wikipedia gender gap (see <https://meta.wikimedia.org/wiki/Grants:IdeaLab/Inspire>), the majority of the prior research focuses on self-reported survey data or content analyses of Wikipedia editing and thus lacks a systematic examination of how gender disparities in collaborative editing arise. This lack of research examining potential mechanisms underlying gender inequality on Wikipedia may prevent the gap from closing, as interventions designed to address the gap may miss these underlying mechanisms. These issues have led to surface-level interventions that only target specified groups of women and neglect to include the majority of potential female editors of varying ages, ethnicities, and professional affiliations. For example, Wikipedia edit-a-thons, which target women or Wikipedia articles on women, have been implemented in major cities. While beneficial in improving the content of Wikipedia articles, these edit-a-thons are often dominated by current female Wikipedians. Systematic analyses of the mechanisms underlying the Wikipedia gender gap could be used to broaden the focus of interventions to include a wider range of female Wikipedians. Such research has the potential to remove barriers that women encounter when attempting to edit, bringing Wikipedia closer to its goal of empowering diverse people to share in the work of collecting, refining, and disseminating knowledge.

1.1. Inequalities on Wikipedia

Research has found inequalities in the overall volume of editing, revealing that less than 10% of Wikipedians contribute over 90% of the total number of contributions on the English Wikipedia (Ortega, Gonzalez-Barahona, & Robles, 2008). In addition to this more general inequality, the identification of a gender disparity, in which men edit at greater volumes on the English Wikipedia, was revealed in recent Wikipedia surveys (Glott et al., 2010; Hill & Shaw, 2013; Pande, 2011), analyses of Wikipedia itself (Lam et al., 2011), and subsequent research about the media's often belittling responses to reports about the Wikipedia gender gap (Eckert & Steiner, 2013). Only 22.7% of U.S. Wikipedians on the English Wikipedia self-identify as female relative to those who identify as male (Hill & Shaw, 2013), a number that increased only slightly (after more precise data analysis) from the original estimate of 17.8% female Wikipedians in the Wikimedia Foundation Survey (see Glott et al., 2010).

Recent research also highlights the persistence and prevalence of the Wikipedia gender gap beyond the English Wikipedia. A 2014 study conducted by Mass and Zelenkauskaite (2014) found that in comparison with self-identified male users, women represented a smaller percentage of Wikipedians in almost all of the current Wikipedia online encyclopedias (across cultures). Some of the Wikipedia environments with the smallest proportion of female users were Hindi, Bengali, Persian, and Chinese. Even in consideration of these findings, it remains unknown how gender is communicated in this public, collaborative space, which might influence how men and women actively engage on Wikipedia.

1.2. Underlying motivations for Wikipedia editing

Researchers also attribute online participation in the Wikipedia community to personal motivation, cultural and linguistic factors,

and antecedents of participation (Okoli, Mehdi, Mesgari, Nielsen, & Lanamaki, 2012). In regards to personal motivation, research has revealed that Wikipedians express a strong desire to *give back* in an effort to enhance public knowledge of complex phenomenon, heightened intrinsic motivation, and heightened altruistic behaviors and motivations (Baytiyeh & Pfaffman, 2010; Cho, Chen, & Chung, 2010; for a review see Jullien, 2012; Kuznetsov, 2006; Nov, 2007; Okoli et al., 2012; Shroer & Hertel, 2009).

Potential gender differences in many of these characteristics have not yet been identified on Wikipedia, which is likely due to the use of unstandardized measures or lack of exploration and/or reporting of gender in data analyses (see Okoli et al., 2012). Prior studies indicate that women are more altruistic than men, specifically when the cost of the behavior is *expensive* (Andreoni & Vesterlund, 2001). This finding implies that women would be more active on Wikipedia. However, the current gender gap contrasts with this finding, suggesting that even if women have a strong desire to contribute on Wikipedia, they may experience significant barriers when attempting to do so.

Studies also suggest that the gender gap may be fueled by gender differences in Internet familiarity and Internet use, specifically for highly skilled editors, who are more likely to be male (Hargittai & Shaw, 2015). In younger age groups, studies find that boys report (via surveys) more confidence in their computer-based skills when compared with girls, are more attracted to computer-based environments, and express more dominance in these spaces (Comber, Colley, Hargreaves, & Dorn, 1997; Underwood, Underwood, & Wood, 2000). Survey research conducted by Bear and Collier (2016) ($N = 1,598$) on Wikipedia found that women also reported less confidence in their editing expertise and greater discomfort with editing when compared with men. In addition, women reported a greater internal, negative response to critical feedback from other Wikipedians than men. Both lack of confidence in expertise and discomfort with editing were significant predictors of the number of articles edited by participants.

As novice editors begin editing on Wikipedia, they may receive positive or negative feedback from other, unknown editors. The nature and reception of this feedback might guide whether/how these novice editors make future edits on the site. Research has used edit revert-detection methods on Wikipedia data from the Main Namespace area, an area that includes a set of Wikipedia pages whose names begin with a specific word. For example, this might include all article pages on Wikipedia that begin with *Main/Article*. Lam and colleagues (2011) explored whether an editor's contributions on Wikipedia were their first edits or if they had edited more than once to identify whether female or male editors were more likely to have early edits reverted. Results revealed that women were more likely to have their edits reverted on Wikipedia. Given that novice women were just as likely as novice men to leave Wikipedia after an edit reversion, their greater number of reverted edits might also result in fewer women continuing their editing on Wikipedia articles.

1.2.1. Explaining the gap: contentious nature of Wikipedia

Social dynamics, such as forced interactions with those who use dissimilar communicative patterns may also prevent certain groups of individuals from Wikipedia editing. When women begin editing on public sites, such as Wikipedia, they encounter a largely male-biased editing community. In examining Wikipedia discussions, researchers found evidence of emotional homophily, where Wikipedians with specific communicative styles tend to engage with similar (versus dissimilar) others (Laniado et al., 2012). Laniado and colleagues (2012) found that Wikipedians sent and received more messages from users who communicated in a similar style, such as matching the valence of the communication (e.g., happiness,

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