Gendered Engagement with Posts Authored by Female Scientists on Facebook (Short Paper)

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Abstract

Popular media representations of female scientists tend to emphasize "feminine' qualities rather than professional achievements. These representations can be explained by society's different gendered expectations as well as gendered stereotypes. A recent study analyzing comments to science YouTube videos featuring scientists found that science videos with a female presence received a higher percentage of comments about appearance, or comments characterized as hostile, sexual, and negative or critical. In our study we ask whether there is a difference between comments submitted to female vs. male scientists on a popular science Facebook page where the participants engage with popular science texts rather than video. We collected 166 posts and their 10,166 respective comments, published on a popular science Facebook page and written by either a female (n=6) or a male scientist (n=10) between 2016 and 2018. Analysis demonstrated significant differences in three categories: (1) More comments to female scientists were not relevant to the topic of the post; (2) Female scientists receive more advices on how to write better, and (3) Overall, females received more positive comments than male

writers. These findings are consistent with a trend in which sentiments toward women are more covert and not overtly negative.

Keywords: Facebook, gender gap, women in science, Science communication.

Introduction

In recent years, there has been a dramatic increase in the number of women who study and work in STEM fields (Science, Technology, Engineering and Mathematics), but the progress is still insufficient (Blackburn, 2017). In the U.S women occupy almost 50% of all jobs, but only 25% of STEM jobs (Beede et al., 2011). Recent data on tertiary education in STEM fields shows that in Finland, Norway and Sweden – all countries where gender equality is considered to be very high, fewer than 25% of STEM graduates are women (Stoet & Geary, 2018).

The under- representation of female scientists is also noticeable in popular culture such as in mass media representations. In most television programs, newspapers, films and commercials there are more representations of male scientists compared with female scientists (Carli et al., 2016). This phenomenon also exists in social media. For example, in Instagram female scientists have fewer followers than male scientists (Jarreau et al., 2019), and of the 50 most followed scientists on Twitter only four are women (You, 2014). This low representation is one reason that the public tends to associate science with men much more than with women (Amarasekara & Grant, 2018).

These differences can be explained by society's expectations of men and women and gender stereotypes (Van et al., 2016). Gender stereotypes about women's role and traits orient girls to be supportive, loving and sensitive. These stereotypes also lead women to focus on children and family and to choose a profession that is people-oriented (Konrad et al., 2000). On the other hand, gender stereotypes about male qualities include assertiveness, independence and competitiveness (Carli et al., 2016). These stereotypes orient boys to explore the physical world and to figure out how things work (Buck, Leslie-Pelecky & Kirby, 2002) actions that are compatible with the work of a scientist (Tonso, 2006).

These stereotypes contribute to the gender disparities in the choice of study subjects (Van et al., 2016). Indeed, PISA tests (Program for International Student Assessment) predict that one of three girls should successfully complete a STEM degree. In reality, the percentage of women graduating in a STEM field is much lower in most countries (Mostafa, 2019).

This study was inspired by Amarasekara and Grant (2018) who examined the correlation of gender with the popularity of YouTube science videos and viewers' comments to these videos. They found that science videos with a female presence received a higher percentage of these different types of comments: remarks about appearance, hostility and sexuality, as well as negative or critical comments, compared to videos with a male presence. In addition, the study found that in female's videos the percentage of positive reactions from all responses was higher compared to male's videos (Amarasekara & Grant, 2018).

Given these findings on the differences in viewer's comments, we were interested to examine this in a different public platform where scientists engage with the public. Our research asks whether there is a different between comments submitted to textual posts authored by female vs. male scientists on a popular science Facebook page.

Methodology and Analysis

Facebook is the largest social media platform in Israel and Little, Big Science (LBS) is the largest independent Facebook page for popular science in Hebrew, with more than 130,000 followers. We collected all 166 posts published between 2016-2018 that included a gendered author name (a name recognized with only one gender): these were written by six female and ten male scientist). All relevant 10,166 comments to these posts were extracted for analysis. Codebook was based on Amarasekara and Grant's (2018) study but further developed to address unique characteristics of Facebook. Analysis followed 2-steps: first coding the posts (detailed code book in Table 1) and then the comments (Table 2). Coding was done by two research assistants with satisfactory inter-coder reliability measures (Cohen's Kappa between 0.92 and 0.99. Chi-square and Pearson correlation (r) tests were used. Pearson correlation (r) was transformed to explained variance (r^2).

Table 1. Analytical scheme of Facebook posts written by female and male authors on the Facebook page "Little, Big Science".

Code	Explanation	Categories
Author	16 authors – each author is identified by a different number.	
Subject and Sub- subject	Life science: biochemistry, genetics, ecology, zoology, evolution Exact Sciences: physics, chemistry, aeronautics, astronomy, mathematics	
Gender	Of the post author	1 – Female 2 – Male
#All comments	Number of all comments recorded at the beginning of the study, including name tags and references added by the post author	
#Relevant comments	Number of comments analyzed in the study, excluding name tags and refs	
Follow up	Posts written in response to an item published in the popular media	0 – No 1 – Yes
Language use	A score between 1 and 5 based on simplicity of explanations, use of scientific concepts and jargon	1 Daily language 5 Science Language (e.g. effective negative mass, Gene SLC16A11)
Integrated popularity index	An index from 1 to 5 that characterizes the extent to which the post headline, theme and visual is inviting and relevant for general audience	1 Not attractive 5 very accessible and relevant
Criticism	Is the post written in response to a recent popular science event? (for example, in response to a news article)	0-No 1 – Yes
Facebook generated data	REACH - Number of people who had the post in their feed	#

Code	Explanation	Categories
	ENGAGE - The number of actions taken concerning the post (like, comment, share, etc.).	#

Table 2. Analytical scheme and frequencies of 10,166 Facebook comments submitted to popular science posts.

Code name	Explanation	Categories	Frequency	%
Relevancy of feedback	How is the comment related to the post	Comment unrelated to the post (including reactions to other comments - even if relevant to the text)	6340	62.9
		Comment directly related to the post	2177	21.6
		Comment related very marginally to the post & Comment on the author of the post	1551	15.4
Positive	Positive can refer to a post (then feedback 1), a mockup page, or a writer (feedback 2)	No	9302	93
		Yes	704	7
Hostile	Hostile reaction can refer to a post, a mockup page, or a writer based on (Amarasekara & Grant, 2018).	No	9179	91.8
		Yes	827	8.2
Neutral	Questions about the post / part of the post (questions of knowledge) or comments that cannot be associated with any other category. Based on (Amarasekara & Grant, 2018).	No	7193	72.1
		Yes	2813	27.9
Hitchhiking	Comments that their relationship to the post is unclear (including advice for something marginal)	No	4666	52.2
		Yes	4816	47.8
Advice	Giving tips to the post writer What he/she needs to do differently.	No	9837	98.3
		Yes	169	1.67

Results

Only three of the categories examined, differences between comments to female vs. male scientists were both significant ($p<0.05$) and had a reasonable explained variance ($r2 >0.1$). These are discussed below and summarized on Table 3.

1. Positive comments: Among posts written by females, 11.5% of the comments had a positive element compared to 4.6% among males.
2. Advice comments: Among posts written by females, 2.3% of comments had an element of advice; compared to only 1.4% of posts written by males.
3. Irrelevant feedback comments: Female scientists received a higher percentage of comments that were irrelevant to the posts compared to male scientist.

Table 3. Analysis of differences in 10,166 comments submitted to 166 Facebook posts written by 6 female and 10 male scientists

Code name		**Percentage of comments for female**	**Percentage of comments for male**	**Chi-Square Tests**	**explained variance (r2)**
Feedback*	Not related to post, including reactions to other comments (even if relevant to the text)	69.3	59.6	93.56	$r^2 > 0.1$
	Related directly to the post	17.6	23.9		
	Related very marginally to the post Comment on the author of this post	13.2	16.5		
Positive *		11.5	4.6	170.7	$r^2 > 0.1$
Hostile*		9.0	7.8	4.28	Negligible
Neutral*		24.3	30.2	40.61	Negligible
Hitchhiking		51.0	50.7	0.09	NA
Advice *		2.3*	1.4	11.56	$r^2 > 0.1$

Note to Table.

1. * Marks significant at the $p<0.05$ level; When r^2 is lower than 0.1, explained variance is negligible.
2. Total percent is lower than 100%, because comments containing only Emoji are not reported here.

Conclusions

An analysis of comments to female and male scientists Facebook posts demonstrates subtle, implied differences, which are not openly manifested. The study found no difference in hostile comments written to females and males, but females receive more irrelevant comments to the posts and comments offering advice (Table 3.). These findings are consistent with a trend in which sentiments toward women are more covert, disguised as compliments and not directly hostile. For example, Maria Mayer, winner of the Nobel Prize in Physics in 1963, was described in the press as a shy and devoted woman whose children are important to her and Barbara McClintock, the 1983 Nobel Prize winner in Medicine, was said to be a good baker (Chimba & Kitzinger, 2009). In addition, our findings about ‘advice' echo the literature on "Mansplaining", in which males

explain to females on the assumption that they are more proficient than females on the subject (Koc-Michalska et al., 2019).

Student's self-confidence in their ability to succeed in STEM fields is one of the major factors influencing his/her choice to study STEM subjects (Van et al., 2016). Exposure of girls to different comments to female scientists compared to male scientists on Facebook may affect their sense of self-confidence and ability to succeed in STEM and thus may hold them back from studying these subjects (Buck, Leslie-Pelecky & Kirby, 2002; Tonso, 2006).

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