Gender Equality in the Digital Age

By Divya Vatsa

Google Science Fair
May 15, 2015

Summary

Today, gender inequality remains one of the biggest barriers to global progress and development. This unsettling reality points to the urgency of developing innovative solutions that eliminate unjust gender stereotypes around the world. Within the past decade, there has been a significant migration towards social media as a novel driving factor behind social change. Thus, this study sought to identify the efficacy of social media in influencing perceptions of gender equality, specifically among young adults, and thereby mobilize the future generation to achieve a gender-equitable society. 118 students from six high schools across Arizona were surveyed anonymously. The survey aimed to capture both traditional and novel driving factors behind individuals' gender perceptions, and then correlated the effect of those findings with the results of three analytical metrics: a word association analysis, a scenario analysis, and an awareness analysis. Data from each test were weighted along an ordinal scale and then statistically analyzed for significance via the Mann-Whitney U test for two independent, non-parametric samples. In analyzing the effect of traditional driving factors such as digital media and news consumption on the experimental group, there was no statistically significant data to reveal any influence on promoting equitable gender perceptions. Rather, the data significantly pointed to the power of novel driving factors like social media in establishing a platform of empowerment for transcending unjust stereotypes. Thus, by effectively harnessing social media, society has the potential to experience an unprecedented efficacy in influencing gender-equal perceptions and thereby promote an age of widespread progress.

Question / Proposal

How does social media influence gender perceptions among young adults as compared to traditional driving factors such as gender, gender equality education, news consumption, and digital media consumption?

Gender inequality has plagued our world for years, and a rapid movement towards gender equality is imperative to our advancement as a globalized society. In my study, I focused specifically on the gender perceptions of a high school population because this demographic of people will constitute the workforce, the social structure, and the leaders of the future. In effect, this population will largely determine whether gender equality will become a reality in the future.

Primary Hypothesis:

- I hypothesized that increased consumption of and engagement on **social media** outlets would **empower citizens with a platform for gender equality**. Due to the highly interactive nature of social media, consumers of such media would be enabled to express an active voice in the quest for a gender equitable society. Unlike traditional drivers of gender perceptions, such as gender itself, education campaigns, and digital media outlets, social media grants individuals **increased efficacy** and visibility into trending issues involving gender equity and will revolutionize the context in which males and females are viewed in society.

Secondary Hypothesis:

- The **information** component of social media was hypothesized to produce more **gender equal perceptions as compared to the entertainment** component. Previous research on older populations suggests that entertainment on social media might promote gender inequality and both avoid and prevent necessary dialogue about topics of gender equality

Research

Gender Inequality in Modern Society

Gender inequality is an enduring problem females have faced for centuries. Today, gender inequality remains one of the biggest barriers to human development. Societies are plagued with discrimination in almost every facet: job security, education, political representation, and health[17].

Two misconceptions about gender equality:

- Disparity has been cured in developed countries.
    - According to the 2014 Gender Gap Index rankings **gender equity has not been achieved in any country**[17].
- Developing countries have cultural beliefs emphasizing different roles for different genders.
    - Gender roles have substantially transformed into gender hierarchies, where women are devalued because they are not given the labor-intensive jobs that contribute to developing economies[15].

Globally, gender inequality persists because of gender stereotypes. Largely based on occupational roles, these stereotypes thrive in modern societies, and **both women and men equally contribute** to these perceptions, skewing, objectifying, and degrading the female image[18].

Urgency for Gender Equality

Gender equality occurs when both women and men experience equal opportunities in all aspects of life. Previous research provides insight that gender inequality is a humanitarian issue. In developing countries especially, the family, economic, and social structure of **nations at large are at risk of further developing**[15]. Data has shown that societies that provide equal

opportunities and roles to males and females will enjoy greater benefits, achieving "excellence in science," "greater democracy," and "more economic growth"[18]. Through gender equity, the **globe** will gain a great**scope for progress**.

Current Research on Gender Equality

Currently, UNICEF and UNESCO are promoting education on gender equality in various countries that focuses on informing populations about the harms of gender inequality[6]. Based on the studies of economist and philosopher Amartya Sen, providing education to both males and females is directly proportional to the well-being and proper treatment of women[11].

Social Media in the Current Age

Real social change will come when a greater percentage of the population is engaged. According to the Pew Research Center, a vast majority of the population can be increasingly found on social media platforms. Since 2012, 85% of adults in the United States and **95% of teenagers are actively engaged on the Internet**[12]. With this level of interconnectivity, close to **50% of users participate in the sharing or posting of news topics and the discussing of those issues online**[1]. Previous research, however, indicates that the informal nature of social media prevents discussion of larger, more serious issues like gender equality[4].

Social Media vs. Digital Media

With digital media (i.e. television channels, cable news, radio stations, etc.), viewers have **no direct involvement**. Some studies suggest that this may be a reason behind why **digital media enhances gender stereotypes**. With social media, however, users do have **greater command and interaction**. Social media serves as a platform of discussion and for sharing of ideas.

In this study, I explored social media's role on influencing gender perceptions among a young adult population. With 95% of American teenagers on social media, I sought to understand the effect social media can have in shaping future generations.

Methods / Testing and Redesign

Survey Development

In order to develop an innovative method for assessing individuals' perceptions of gender equality, I designed an anonymous survey with Google Forms to understand the traditional and novel driving factors behind individuals' perceptions of gender equality and identify each factor's efficacy using three analytical tests I created. Data were than analyzed by grouping individuals according to the driving factors, such as high consumers of social media vs. low consumers of social media, individuals with a formal gender equality education vs. individuals with no such education, etc.

The five driving factors ultimately investigated were gender, completion of a gender equality education, news consumption, digital media consumption, and social media consumption. Of these driving factors, the first four constitute traditional influencers of gender stereotypes, which have been shown to be ineffective at sustaining widespread improvement in gender perceptions. The last factor represents the central component of this study. To characterize social media consumption more thoroughly, each individuals' media usage was tracked through questions regarding the number and types of social media accounts used, the duration of daily social media usage, the purpose and effect of using social media, etc.

Regarding the three modes of analysis, participants engaged in a word association study, a scenario study, and an awareness study.

- In the word association study, subjects were given a set of 5 terms and asked to identify whether they associated those terms with males, females, both, or neither. The purpose of this study was to discern any implicit associations affecting individuals' gender perceptions.
- In the scenario study, participants were asked to respond to a set of 5 hypothetical scenarios. For each of the scenarios, subjects were asked their opinions about the acceptability of each scenario on a 5-point scale. The purpose of this mode of analysis was to generate a nuanced metric for identifying variations in gender perceptions and also obtain a more comprehensive understanding of individuals' perspectives in a real-world context.
- Finally, in the awareness study, participants were presented with the names of the 6 highest trending gender-related subjects on social media in 2014 and asked about their familiarity with each topic along a 3-point scale. The purpose of this study was to identify the efficacy of the various driving factors outlined above in enhancing individuals' awareness of global efforts for gender equality while simultaneously increasing individuals' sense of empowerment through the potential to engage in collective endeavors to transcend gender stereotypes.

Data Collection

The target population for this study was secondary school students in Arizona. Thus, I hosted the survey online for distribution to a random sampling of students from 6 different public, private, parochial, and charter high schools across the state. Survey responses were collected in real time, and in the final analysis, the results from 118 participants, ages 13-17, were investigated.

Confirmation of Privacy

To ensure the privacy, safety, and confidentiality of the participants, the survey was securely hosted online and designed to be completely voluntary and anonymous.

Results

I clustered the data into two sample groups for each driving factor. To quantify the results from each of the three modes of analysis, I assigned ordinal weightings to each response, where gender-equal responses led to higher scores.

It was assumed that the population behavior did not exhibit a Gaussian distribution. Because the observations within each pair of sample groups were independent of each other and the responses for each test were ordinal, I used the nonparametric Mann-Whitney *U* test to determine the significance of the variation between the sample groups for each driving factor. To conduct the analysis, the data in each study were ranked using the ranking package in Excel. The rank sum was calculated for each sample group (V1, V2) by summing the ranks within each sample. The *U* and z statistics were then defined as follows:

n1 = sample 1 size $\quad U1 = (n1)(n2) + [(n1)(n1) + (n1)]/2 - V1$

n2 = sample 2 size $\quad U2 = (n1)(n2) + [(n2)(n2) + (n2)]/2 - V2$

$U = \min(U1,U2) \qquad m_U = (n1)(n2)/2 \qquad \sigma_U = [(n1)(n2)(n1 + n2 + 1)/12]^{0.5}$

z-critical $= (U - m_U)/\sigma_U$ $\quad P$-value calculated accordingly for $\alpha = 0.05$

Figure of results (significant p-values highlighted blue)

1

Association Analysis		Scenario Analysis		Awareness Analysis	
Sample Size (Male)	47	Sample Size (Male)	47	Sample Size (Male)	47
Sample Size (Female)	68	Sample Size (Female)	68	Sample Size (Female)	71
Mean (Male)	8.277	Mean (Male)	16.936	Mean (Male)	7.255
Mean (Female)	7.794	Mean (Female)	21.647	Mean (Female)	9.423
Rank-Sum (Male)	2993	Rank-Sum (Male)	1808	Rank-Sum (Male)	1966
Rank-Sum (Female)	3678	Rank-Sum (Female)	4862	Rank-Sum (Female)	5056
U Statistic (Male)	1332	U Statistic (Male)	2516	U Statistic (Male)	2500
U Statistic (Female)	1865	U Statistic (Female)	680	U Statistic (Female)	838
Mann-Whitney Test Statistic	1332	Mann-Whitney Test Statistic	680	Mann-Whitney Test Statistic	838
z Critical Value	-1.516	z Critical Value	-5.223	z Critical Value	-4.568
Significance Level	0.05	Significance Level	0.05	Significance Level	0.05
P Value	0.065	P Value	0.000	P Value	0.000

Effect of **Gender** on Personal Gender Perceptions

2

Association Analysis		Scenario Analysis		Awareness Analysis	
Sample Size (Education)	32	Sample Size (Education)	32	Sample Size (Education)	34
Sample Size (No Education)	83	Sample Size (No Education)	83	Sample Size (No Education)	84
Mean (Education)	7.594	Mean (Education)	21.750	Mean (Education)	9.676
Mean (No Education)	8.145	Mean (No Education)	18.940	Mean (No Education)	8.107
Rank-Sum (Education)	1610	Rank-Sum (Education)	2378	Rank-Sum (Education)	2456
Rank-Sum (No Education)	5061	Rank-Sum (No Education)	4292	Rank-Sum (No Education)	4566
U Statistic (Education)	1575	U Statistic (Education)	806	U Statistic (Education)	996
U Statistic (No Education)	1082	U Statistic (No Education)	1850	U Statistic (No Education)	1861
Mann-Whitney Test Statistic	1082	Mann-Whitney Test Statistic	806	Mann-Whitney Test Statistic	996
z Critical Value	-1.538	z Critical Value	-3.258	z Critical Value	-2.570
Significance Level	0.05	Significance Level	0.05	Significance Level	0.05
P Value	0.062	P Value	0.001	P Value	0.005

Effect of **Gender Equality Education** on Personal Gender Perceptions

3

Association Analysis		Scenario Analysis		Awareness Analysis	
Sample Size (High News Intake)	29	Sample Size (High News Intake)	29	Sample Size (High News Intake)	31
Sample Size (Low News Intake)	76	Sample Size (Low News Intake)	76	Sample Size (Low News Intake)	77
Mean (High News Intake)	8.138	Mean (High News Intake)	19.103	Mean (High News Intake)	8.000
Mean (Low News Intake)	8.000	Mean (Low News Intake)	19.711	Mean (Low News Intake)	8.597
Rank-Sum (High News Intake)	1603	Rank-Sum (High News Intake)	1428	Rank-Sum (High News Intake)	1651
Rank-Sum (Low News Intake)	3962	Rank-Sum (Low News Intake)	4138	Rank-Sum (Low News Intake)	4235
U Statistic (High News Intake)	1036	U Statistic (High News Intake)	1212	U Statistic (High News Intake)	1232
U Statistic (Low News Intake)	1168	U Statistic (Low News Intake)	993	U Statistic (Low News Intake)	1155
Mann-Whitney Test Statistic	1036	Mann-Whitney Test Statistic	993	Mann-Whitney Test Statistic	1155
z Critical Value	-0.473	z Critical Value	-0.785	z Critical Value	-0.261
Significance Level	0.05	Significance Level	0.05	Significance Level	0.05
P Value	0.318	P Value	0.216	P Value	0.397

Effect of **News Consumption** on Personal Gender Perceptions

4

Association Analysis		Scenario Analysis		Awareness Analysis	
Sample Size (High Digital Media)	26	Sample Size (High Digital Media)	26	Sample Size (High Digital Media)	27
Sample Size (Low Digital Media)	89	Sample Size (Low Digital Media)	89	Sample Size (Low Digital Media)	91
Mean (High Digital Media)	7.500	Mean (High Digital Media)	20.692	Mean (High Digital Media)	8.111
Mean (Low Digital Media)	8.135	Mean (Low Digital Media)	19.438	Mean (Low Digital Media)	8.692
Rank-Sum (High Digital Media)	1295	Rank-Sum (High Digital Media)	1613	Rank-Sum (High Digital Media)	1509
Rank-Sum (Low Digital Media)	5376	Rank-Sum (Low Digital Media)	5057	Rank-Sum (Low Digital Media)	5512
U Statistic (High Digital Media)	1371	U Statistic (High Digital Media)	1052	U Statistic (High Digital Media)	1326
U Statistic (Low Digital Media)	944	U Statistic (Low Digital Media)	1262	U Statistic (Low Digital Media)	1131
Mann-Whitney Test Statistic	944	Mann-Whitney Test Statistic	1052	Mann-Whitney Test Statistic	1131
z Critical Value	-1.428	z Critical Value	-0.702	z Critical Value	-0.625
Significance Level	0.05	Significance Level	0.05	Significance Level	0.05
P Value	0.077	P Value	0.241	P Value	0.266

Effect of **Digital Media Consumption** on Personal Gender Perceptions

5

Association Analysis		Scenario Analysis		Awareness Analysis	
Sample Size (High Social Media)	46	Sample Size (High Social Media)	46	Sample Size (High Social Media)	48
Sample Size (Low Social Media)	60	Sample Size (Low Social Media)	69	Sample Size (Low Social Media)	70
Mean (High Social Media)	7.913	Mean (High Social Media)	21.152	Mean (High Social Media)	8.604
Mean (Low Social Media)	8.043	Mean (Low Social Media)	18.768	Mean (Low Social Media)	8.529
Rank-Sum (High Social Media)	2619	Rank-Sum (High Social Media)	3123	Rank-Sum (High Social Media)	2988
Rank-Sum (Low Social Media)	4051	Rank-Sum (Low Social Media)	3548	Rank-Sum (Low Social Media)	4034
U Statistic (High Social Media)	1636	U Statistic (High Social Media)	1133	U Statistic (High Social Media)	1549
U Statistic (Low Social Media)	1538	U Statistic (Low Social Media)	2042	U Statistic (Low Social Media)	1812
Mann-Whitney Test Statistic	1538	Mann-Whitney Test Statistic	1133	Mann-Whitney Test Statistic	1549
z Critical Value	-0.280	z Critical Value	-2.595	z Critical Value	-0.720
Significance Level	0.05	Significance Level	0.05	Significance Level	0.05
P Value	0.390	P Value	0.005	P Value	0.236

Effect of **Social Media Consumption** on Personal Gender Perceptions

For all the tests, the word association results were insignificant. In retrospect, five words were not sufficient to gain insight of implicit associations.

Study 1: For the scenario (**$p<0.05$**) and awareness (**$p<0.05$**) analyses, the data were highly significant, showing that, on average, females display more gender equal perceptions than males. This is consistent with previous research that one's gender induces one to advocate for a platform of equality for their gender.

Study 2: For the scenario (**$p=0.001$**) and awareness (**$p=0.005$**) analyses, the data were highly significant, showing that, on average, individuals who have received a formal gender equality education display more gender equal perceptions than individuals who have not. This is consistent with previous research that educational awareness campaigns stimulate attitudes of equity and empowerment. However, this approach is an impractical, costly, and unscalabe solution.

Study 3: There is no statistically significant data associated with news consumption for any of the three analyses. This points to a deficiency in traditional sources of information, such as news outlets, in inducing advancement in societal perceptions of gender equality.

Study 4: There is no statistically significant data associated with digital media consumption for any of the three analyses. This points to a deficiency in traditional sources of media, such as digital media, in inducing advancement in societal perceptions of gender equality.

Study 5: For the scenario analysis (**$p=0.005$**), the data were highly significant, showing that, on average, high consumers of social media display more gender equal perceptions than low consumers of social media. Although the data for the awareness analysis was not significant, a similar trend was suggested by the U statistic.

6

Association Analysis		Scenario Analysis		Awareness Analysis	
Sample Size (Entertainment)	86	Sample Size (Entertainment)	86	Sample Size (Entertainment)	87
Sample Size (Information)	29	Sample Size (Information)	29	Sample Size (Information)	31
Mean (Entertainment)	7.953	Mean (Entertainment)	20.279	Mean (Entertainment)	8.851
Mean (Information)	8.103	Mean (Information)	18.069	Mean (Information)	7.742
Rank-Sum (Entertainment)	4894	Rank-Sum (Entertainment)	5361	Rank-Sum (Entertainment)	5435
Rank-Sum (Information)	1777	Rank-Sum (Information)	1309	Rank-Sum (Information)	1586
U Statistic (Entertainment)	1342	U Statistic (Entertainment)	874	U Statistic (Entertainment)	1090
U Statistic (Information)	1153	U Statistic (Information)	1620	U Statistic (Information)	1607
Mann-Whitney Test Statistic	1153	Mann-Whitney Test Statistic	874	Mann-Whitney Test Statistic	1090
z Critical Value	-0.609	z Critical Value	-2.4023	z Critical Value	-1.581
Significance Level	0.05	Significance Level	0.05	Significance Level	0.05
P Value	0.271	P Value	0.008	P Value	0.057

Effect of **Information vs. Entertainment Perspective** on Personal Gender Perceptions

Study 6: For the scenario (**p=0.008**) analysis, the data were again highly significant, indicating that **those who view social media as a source entertainment exhibit more gender equal perceptions**. This contradicts previous research on adult populations.

Conclusion / Report

Experimental Conclusions

In this study, the goal was to identify the role of social media, arguably one of the largest driving forces in the digital age, in influencing societal perspectives on gender equality. This project started by analyzing the effect of traditional driving factors behind gender perceptions, including an individual's gender, the completion of a gender equality education, and most notably digital media consumption. The primary hypothesis that social media is effective at inducing sustainable progress in the realm of gender equality was confirmed. The data significantly pointed to the power of social media in establishing a platform of empowerment to transcend gender stereotypes. However, the secondary hypothesis that the information aspect of social media promoted gender equal perceptions was negated. Rather, the data indicated that individuals who viewed social media as a source of entertainment were more gender equal in their perceptions. Through the power of social media, and by especially influencing the entertainment industry to get on board and distribute more gender-empowering content via social

media outlets, society has the potential to experience a significant advancement in influencing gender equal perceptions and usher in an age of widespread social progress.

Future Directions

In the future, I plan to expand the scope of this research from Arizona high school students to teenagers worldwide. This would include both educated and undereducated youth. The impact of social media on the perceptions of individuals with varying levels of education would provide a more comprehensive understanding of this global injustice. Additionally, elucidating regional influences of social media on gender perceptions would be beneficial in better identifying the specific impacts of social media.

Furthermore, in regards to individual empowerment, studies can be conducted to determine not only whether social media influences perceptions but also if it invokes action from within people to bring about social change. The objective of this study would thus be to understand the ability of social media to promote social activism. Such a study would be useful in determining how social media can be most effectively harnessed to stimulate the global community to progress in a gender-equitable direction.

Finally, an important consideration of any future research is that social media obscures gender identifications. Online, users do not associate with male or female. Rather, they are simply individuals. Future studies could thus include studying the effects of this element of gender anonymity on promoting gender equality.

Bibliography, References and Acknowledgments

References

1. Anderson M, Caumont A. "How Social Media is Reshaping News." *Pew Research Center* 2014, 1-4.
2. Duflo, Esther. "Gender Equality and Development." *Munich Lectures* 2012, 1-19.
3. Duggan M, Ellison NB, Lampe C, Lenhart A, Madden M. "Social Media Update 2014: While Facebook remains the most popular site, other platforms see higher rates of growth." *Pew Research Center* 2014, 1-18.
4. Gill, Rosalind. "Cool, Creative, and Egalitarian? Exploring Gender in Project-Based New Media in Euro." *Taylor and Francis Online* 2011, 70-89.
5. Jayachandran, Seema. "The Roots of Gender Inequality in Developing Countries." *Annual Review of Economics Northwestern University* 2014, 1-16.
6. Madden M, Lenhart A, Cortesi S, Gasser U, Duggan M, Smith A, Beaton M. "Teens, Social Media, and Privacy." *Pew Research Center* 2013, 1-8, 11-12.
7. Matsa KE, Mitchell A. "8 Key Takeaways About Social Media and News." *Pew Research Center* 2014, 1-4.
8. Palmer, Jimmy. "The Role of Gender on Social Network Sites." *Mary Tripp's Fall 2012 ENC 1102* 2012, 1-8.
9. Pew Research Center. "Social Networking Fact Sheet." *Pew Research Centers Internet American Life Project RSS*2013,1-5.
10. Salzburg Academy on Media and Social Change. "Empowerment Through Internet Access: Promoting Women's Rights with Social Media." 2013,1-2.

11. Sen A, Dreze J. “Basic Education as a Political Issue.” *Journal of Educational Planning and Administration* 1995.
12. Smith, Aaron. “Reaching Your Audience in the Digital Age: Key Research Trends to Watch.” *Pew Internet Project*2012, 27-42.
13. Smith MA, Rainie L, Himelboim I, Shneiderman B. “Mapping Twitter Topic Networks: From Polarized Crowds to Community Clusters.” *Pew Research Center* 2014, 1-6, 37-42, 54-57.
14. Statista. “Facts on Social Networks.” *Statistics and Facts about Social Networks* 2014.
15. Tanzin, Juhayer A. “An Assignment on Dimensions of Gender Inequality and Its Impact on Society.” *Department of Women and Gender Studies, University of Dhaka* 2011, 4-11.
16. United Nations. “United Nations Millennium Development Goals.” *UN News Center* 2014.
17. United Nations Development Programme. “Human Development Reports.” *Gender Inequality Index (GII)* 2014.
18. Verloo, Mieke. “Mainstreaming gender equality in Europe. A critical frame analysis approach.” *The Greek Review of Social Research* 2005, 117.11-34.
19. Wolska, Malgorzata. “Gender Stereotypes in Mass Media. Case Study: Analysis of Gender Stereotyping Phenomenon in TV Commercials.” *Krytyka* 2011, 1-5.
20. World Economic Forum. “Global Gender Gap Index 2014.” *Global Gender Gap Report* 2014.

Acknowledgments

I would like to acknowledge and sincerely thank all of the students from the various high schools in Arizona for taking the time to respond to my survey and contribute to this important study. To my physics teacher, Mr. Paul McClernon, I would like to offer my sincere gratitude for

providing advice on conducting the statistical analysis of this investigation. Lastly I would like to thank my family, friends, and everyone at She's the First for constantly supporting me and motivating me to pursue this study on gender equality in the digital age.