Changes in National Media's Treatment of Math Education from 1970 to 1989

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ABSTRACT

The debate over STEM education, STEM graduates, and highly-skilled STEM immigrants captured the media's attention in 2012 because of its involvement in the United States' position in a world that is continuing to become more centered on technology. "STEM" stands for science, technology, engineering, and mathematics and represents the subjects that require technical degrees in those subject areas. As technology becomes more important to a country's position, the amount of individuals trained in technical fields becomes of greater importance ranging from concerns about commercial manufacturing and production to homeland security, but Americans are falling behind in attracting women to those fields, especially mathematics. Many authors place the blame on the lack of encouragement for young women on a study conducted by Camilla Persson Benbow and Julian C. Stanley claiming that women are genetically inferior to men in terms of inherent ability in mathematics. The publicity of this study increased the frequency of the topic of mathematics education in the news media, created the theory of the "math gene" because of the assumed validity of theory after its initial introduction and assessment period, caused concern for the implications it would create for young girls exploring interests and women in the field, and gradually transformed the reporting of test scores in mathematics to include both grade level and gender. Scientists have studied the immediate and lingering effects of the myth of the "math gene" as disseminated in this study, but the initial analysis in the news media provides the information given to a wider American public than provided in *Science* magazine. Furthermore, initial reports in national publications tended to proliferate the effects of the study despite the fact that their analysis frequently questioned its validity.

STEM Education in the Present Media

The debate over STEM education, STEM graduates, and highly-skilled STEM immigrants captured the media's attention in 2012 because of its involvement in the United States' position in a world that is continuing to become more centered on technology. "STEM" stands for science, technology, engineering, and mathematics and represents the subjects that require technical degrees in those subject areas. As technology becomes more important to a country's position, the amount of individuals trained in technical fields becomes of greater importance ranging from concerns about commercial manufacturing and production to homeland security.

This year, with or without its consent, the People's Republic of China was named as the world's largest trader, meaning the sum of its total imports and exporters are greater than any other country. China continually views itself as a poor, developing nation because as a global leader the country would be more responsible for "action to stimulate the global economy or concessions on trade and climate change," but the United States knows its potential lies in its high capacity for manufacturing, and its ability to produce and maintain a skilled workforce that can sustain a growing economy.[1] At the same time, Chinese government officials have been surreptitiously gaining access to American government organizations' and top American companies' digital platforms to locate private information.[2] In early March 2013, the Obama administration made its first public effort to hold China accountable for its cyber-espionage when it "called on China to halt its persistent theft of trade secrets from corporate computers and engage in a dialogue to establish norms of

[1] Joe McDonald. 2013. China denies it's world's biggest trader. *Associated Press*.
[2] David Sanger, David Barboza, and Nicole Perlroth. 2013. Chinese army unit is seen as tied to hacking against U.S. *New York Times*.

behavior in cyberspace." When reporting on this advancement, the Washington Post quotes President Obama's national security adviser, Thomas E. Donilon, explaining "'Increasingly, U.S. businesses are speaking out about their serious concerns.'"[3] This matter directly corresponds with the information provided by the news media on the state of United States' skilled workforce as many articles mention America's lack of skilled workers to combat the technological threat to both private companies and the United States government as well as private companies serving as the impetus for government involvement in the matters.

Remembering the historical similarities of past decades, the worrisome news that other countries are gaining a foothold in the world economy and higher education, and are directly threatening our national security is reminiscent of the impetus to focus on science educational programming with the launch of Sputnik by the Soviet Union in 1957.[4] The recent infiltration of private computer files by the Chinese government has immediately propelled United States legislators and the Obama administration into action against intellectual property theft.[5] Other organizations, and reporters, have recalled the STEM education debate citing a need for skilled professionals in cyber security when discussing this looming thereat.[6] The significance of these events on Americans' national security was clearly conveyed through headlines in the news media, both prompting action from the United States government.

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[3] Ellen Nakashima. 2013. U.S. Publicly calls on china to stop commercial cyber-espionage, theft of trade secrets. *Washington Post*, March 11.
[4] David Sanger. 2013. In cyberspace, new cold war. *New York Times*.
[5] Associated Press. 2013. New us effort launched to stem theft of trade secrets; concern about china leads to action. *Washington Post*.
[6] Booz Allen Hamilton. 2013. Shortage of skilled cyber security professionals causing economic ripple effect across the globe, (isc)≤Δ study finds. ed. Frost & Sullivan.

The information for self-evaluation and comparisons against other countries derives from information provided by the news media. The purpose of the news media is to capture stories like these and make them available to the public in an accessible format that otherwise would not be available. Although reporters aim to eliminate bias in their presentation of the facts, the news media as a whole frames the debate and discussion of topics. Max Maxwell McCombs and Donald Shaw recognize the fact that the media does not tell its readers how to think, but it tells them what to think about as it has the power to bring key issues to national attention.[7] Because the news media plays such an important role in the historical record and daily lives of Americans, it is key to gauging the information provided to citizens from where they are able to draw their own conclusions. Furthermore, not all publications have the same reach to the public. For example, newspapers and other outlets with higher circulation rates impress a larger number of people than those with a lower number of publications distributed. When determining the information available to the American public, newspapers of higher circulation rates are most important because not only does their information reach the largest audience but also their editors and reporters are more respected as a compass outlining what topics professionals from smaller publications should give their focus. Additionally, as a whole, news reporters and editors continually adjust the method in which they frame a subject based on its relevance and newsworthiness compared to other topics in the news. The attention given to a subject as well as the tone and diction used to describe the topic greatly affect how the information is conveyed as it frames

[7] Maxwell E. McCombs and Donald L. Shaw. 1972. The agenda-setting function of mass media. *The Public Opinion Quarterly* 36, no. 2: 176-87.

the issue. Although it is not always clear why reporters display information in the way they do, it's interesting to note their changes on the same subjects over time.

Although reporters and commentators quarrel on various aspects of the origination of the issue of a lack of students interested in STEM subjects, important companies representing a large portion of our gross national product have recognized the lack of a skilled workforce and invested millions of dollars into what has been termed "STEM" education. This term has become popularized by the American media because the effects of a downturn in STEM graduation rates affects key players in the United States who have the ability to express their concerns on a national level and lobby Congress similar to their efforts in the international property theft arena. Even though the decreasing quality of the education system in the United States has gathered much attention, the STEM areas are gaining the most traction on the media's agenda because of their impact on production, invention, and development. Many large corporations have seen a decrease in skilled workers in the United States that has caused companies, among other reasons, to outsource their manufacturing and recruit talent from countries outside of the United States. To improve the economy of the United States, large corporations have realized they can play a part in the development of a skilled workforce and increase their ability to manufacture in the United States in hopes to revive the American manufacturing system and help stabilize the economy by bringing STEM education to the forefront of our national agenda through media relations efforts.[8] Their investments are not only monetary donations to programs aimed at increasing interest in STEM but also lobbying efforts to gain a greater awareness in

[8] Bo Miller. 2011. Companies must play a vital role in stem education. *U.S. News & World Report*, September 19.

the Capitol and around the country. For example, major companies such as DOW Chemical, General Electric, Exxon Mobil, Intel, Lockheed Martin, Northrop Grumman, Rockwell Automation, Autodesk and Bayer have created several coalitions to combine their efforts in the field according to the Institute of Electrical and Electronic Engineers, which claims itself as being the world's largest professional association for the advancement of technology.[9]

Over the past couple decades, reporters have frequently pointed out the discrepancy between the number of women and men with initial interest in and excelling throughout all levels of education in the subject of mathematics, one of the four components of the "STEM" term, while attempting to create a reasoning for such a large dissimilarity based on their gender through scientific studies and other evidence. Mathematics and math education are at the forefront of this debate because mathematics is needed for the basis of the other three disciplines. With this topic occurring on the national agenda, there continues to be a widespread debate about why female children aren't interested in STEM fields and why female students don't chose to study STEM subjects starting at an early age and continuing into careers. Environmental factors, race, encouragement, and opportunity are key words constantly connected with this discussion. In addition, specific genetic composition is cited as playing an most important role in creating the distinction between the sexes because numerous researchers and consequently reporters have suggested the cause for fewer female mathematics students comes from a perceived notion of higher innate intellectual ability in the mathematics field. In 2005, Lawrence H. Summers, the President of Harvard University, asserted and defended his statement that "innate differences in sex may explain why fewer women succeed in science and math careers." Following his statement, the New York Times

[9] Barton Reppert. U.S. Companies investing in stem education.

reported his defense of his consideration: "I'm sorry for any misunderstanding but believe that raising questions, discussing multiple factors that may explain a difficult problem, and seeking to understand how they interrelate is vitally important."[10] He conceded he was attempting to spark conversation with his discussion while discussing many factors. Further reactions included in the article differed from utter disgust at bias in the workplace to complete agreement. The importance of his statements can be concluded from the attention they were given following the event by both the New York Times and the Boston Globe, two newspapers with distinctly high circulation rates. Other researchers' interpretations for the discrepancy lie in encouragement and opportunities available for women at a young age, or in the time commitment required as students progress in the fields in relation to childbearing and other stereotypical gender roles for women. For example, Psychology Today published in 2011 reads, "But new research suggests that girls may prefer to study language, arts, and humanities over math and science for another reason: they believe, often on an unconscious level, that demonstrating ability in these stereotypically-male areas makes them less attractive to men."[11] Alongside the greater desire for love, because women stereotypically provide more for the household, numerous writers suggest the time commitment associated with mathematics and research-based careers deter women.[12]

Although the debate has spread far and wide, many reporters, researchers, and intellectuals refer back to women's innate intellectual ability in the field of mathematics, as did Dr. Summers at Harvard University. In March of 2012, Forbes writer David DiSalvo

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[10] Sam Dillon. 2005. Harvard chief defends his talk on women. *New York Times*, January 18.
[11] Heidi Grant Halvorson. 2011. How wanting love makes girls bad at math. *Psychology Today*, Sept 13.
[12] Sam Dillon. 2005. Harvard chief defends his talk on women. *New York Times*, January 18.

references a study[13] conducted in the same month that "suggests that the teachers of today are just as convinced that white girls can't do math as their 1950s predecessors." Furthermore, he notes, "They found that while on average teachers rate minority students lower than their white male counterparts, these differences disappear once grades are taken into account." Therefore, Catherine Riegel-Crumb, a professor at the University of Texas at Austin and co-author of the study cited, proposes, "This speaks to the presence of a subtle yet omnipresent stereotype in high school classrooms: That math, comparatively speaking is just easier for white males than it is for white females."[14] Along the same lines, in the pop culture arena, Forever 21, a popular, inexpensive clothing store with a targeted audience of young women, was criticized for a tee shirt reading "Allergic to Algebra" in their women's clothing selection in 2011.[15] The question remains why this perceived stereotype has become an accepted construct of Americans' attitudes prompting much interest in the promotion of mathematics to young girls.

Citing that the news media helps bring topics to the forefront of our national agenda, many experts in the mathematics field believe one highly publicized scientific study published in December 1980 is to blame for the myth of the "math gene," or having an innate ability to comprehend the concepts associated with mathematics. In particular, this study defines the difference as being between the male and female genders eventually demonstrating an inherent male dominance in the mathematical field. This sensationalized study graced the pages of highly circulated publications creating a great awareness for the

[13] Catherine Riegle-Crumb and Melissa Humphries. 2012. Exploring bias in math teachers' perceptions of students' ability by gender and race/ethnicity. *Gender & Society* 26, no. 2: 290.
[14] David DiSalvo. 2012. Why are high school teachers convinced that white girls can't do math? *Forbes*.
[15] Amanda Marcotte. 2011. Discouraging math smarts in girls. *Slate Magazine*, Sept 12.

message it was attempting to communicate. In doing so, the publicity of this study increased the frequency of the topic of mathematics education in the news media, created the theory of the "math gene" because of the assumed validity of theory after its initial introduction and assessment period, caused concern for the implications it would create for young girls exploring interests and women in the field, and gradually transformed the reporting of test scores in mathematics to include both grade level and gender.

The Original Study by Persson Benbow and Stanley

Camilla Persson Benbow and Julian C. Stanley conducted this highly-debated study at Johns Hopkins University. It was first publicized in Science magazine on December 12, 1980 in an article titled "Sex Differences in Mathematical Ability: Fact or Artifact?" *Science* magazine was established in 1880 using investment seed money from Thomas Edison. Currently, *Science* magazine boasts as being "the world's leading outlet for scientific news, commentary, and cutting-edge research, with the largest paid circulation of any peer-reviewed general-science journal." The magazine is published by the American Association for the Advancement of Science, whose motto is, "Advancing Science. Serving Society."[16]

Persson Benbow is a prolific author concentrating on talented and gifted children and the development of mathematical talent with an educational background in psychology, education, and gifted education. She is currently the Patricia and Rodes Hart Dean of Peabody College of Education and Human Development at Vanderbilt University. After the completion of her bachelor's, master's, and doctorate degrees at Johns Hopkins University in 1981, this sensationalized study was her first work in her abundant collection of writings

[16] About Science & AAAS.

about the assessment of gifted children. Reviewing the works she completed as an author since this original study, it seems as though the study served as a stepping-stone for future works, and for her career. She has held many positions in the academia field as a professor and held administrative positions in talented and gifted student programs such as the Iowa Talent Search Program and Study of Mathematically Precocious Youth (SMPY) while she continues her research to this day.[17]

Julian C. Stanley began his career in a much different fashion from Persson Benbow: Stanley started his career as a high school math teacher. This coupled with his experiences as a self-appointed "participant" in WWII led him to his later study of mathematically talented children. He received his doctorate from Harvard in 1950 and established his career as a researcher and supporter of gifted student programs well before his study published with Persson Benbow in 1980.[18] The Association for Psychological Science references his work *Experimental and Quasi-Experimental Designs for Research on Teaching* as "a benchmark in educational psychology since its publication in 1963." Additionally, he established SMPY in 1971.[19] Upon his death in 2005, *The New York Times* lauded him as a "champion for gifted students" because of his work to establish programs for these students to further excel through helping to "promote testing nationwide to identify promising students" and lobby "for special programs to challenge them."[20] When the article was

[17] Camilla Persson Benbow.
[18] Daniel Robinson. 2006. Profiles in research: Julian Stanley.
[19] Camilla Persson Benbow. 2013. In appreciation: Julian stanley. *The Observer*.
[20] Jeremy Pearce. 2005. Julian stanley, champion of gifted students, dies at 87.

published in *Science* magazine, Morton Hunt notes, "His post at Johns Hopkins was secure; he had been a full professor since 1957."[21]

As first written in *Science* magazine, the article explicitly states in its first sentence: "Huge sex differences have been reported in mathematical aptitude and achievement." In its short abstract consisting of only two sentences Persson Benbow and Stanley conclude:

> A substantial sex difference in mathematical reasoning ability (score on the mathematics test of the Scholastic Aptitude Test) in favor of boys was found in a study of 9927 intellectually gifted junior high school students. Our data contradict the hypothesis that differential course-taking accounts for observed sex differences in mathematical ability, but support the hypothesis that these differences are somewhat increased by environmental influences.[22]

Persson Benbow and Stanley are straightforward with their presentation of male superiority in the mathematical field throughout the article, but in these first few sentences they prepare for the presentation of their controversial topic while eliminating other factors that may have been seen culpable for their findings of the innate male superiority. In the second sentence of the article, they begin to paint the scene of the students participants in their study. When referring to them, Persson Benbow and Stanley use simply the term "boys" and "girls" while placing them in a "junior high school." The researchers wait until

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[21] Morton Hunt. 1999. *The new know-nothings: The political foes of the scientific study of human nature*: Transaction Publishers.
[22] Camilla Persson Benbow and Julian C. Stanley. 1980. Sex differences in mathematical ability: Fact or artifact? *Science* 210, no. 4475: 1262-64.

the second paragraph to divulge the student participants were associated with SMYP, the aforementioned gifted students' organization founded by Stanley.

After the authors begin with acknowledging this problem in a dramatic yet simplistic manner, their next effort is to establish their credibility through acknowledging the large amount of students surveyed and the extended duration over which the research was conducted. Although I believe recognizing SMPY increases the accreditation of their study, I believe this organization could have additional outcomes for the results of the study aside from educating the public as they are directly involved in programs such as talent searches and are focused on gifted students, which presumably means their sample population was skewed towards higher-scoring youths. To further this point, Persson Benbow and Stanley write: "A large sex difference in mathematical ability in favor of boys was observed in every talent search."[23] This involuntarily concedes these participants were found through talent searches that could have been specifically targeted at higher-scoring youths.

From the abstract and predominately throughout the article, Persson Benbow and Stanley attempt to eliminate other explanations and eschew criticism for their findings. In presenting their data, they break their sections to address each possible critical analysis of their results. For example, they focus on the disparity of girls and boys' test scores "in the upper ranges of mathematical reasoning ability" to then conclude "the sex difference in mathematical reasoning ability we found was observed before girls and boys started to differ significantly in the number and types of mathematics courses taken" and therefore

[23] Ibid, 1263.

"mathematical reasoning ability influences subsequent differential course-taking in mathematics."[24] As they assert in their conclusion:

> Our results suggest that these environmental influences are more significant for achievement in mathematics than in aptitude. We favor the hypothesis that sex differences in achievement in and aptitude toward mathematics result from superior male mathematical ability, which may in turn be related to greater male ability in spatial tasks.[25]

However, the study does not state how their results eliminate the environmental factors or distinguish between ability and achievement. Although the study gained much attention in the media and national interest, the findings were not incredibly valid, as noted in the article itself and by other subsequent researchers.

Although this article does not even fill three full pages of the magazine, it began the discussion of innate mathematical ability on a national level by thrusting this idea into the national media by the researchers themselves. This article serves as a base from which the subsequent articles agree or disagree.

Initial Reactions to Persson Benbow and Stanley's Study

After this article was published, both writers and scientists recognized the far-reaching impacts this article could have on the attitudes of Americans. At the end of December 1980, columnist Ellen Goodman for the *Boston Globe* writes:

> Designer Genes can be found at the moment on any magazine rack. In the

[24] Ibid, 1263.
[25] Ibid. 1264.

December *Science* magazine there is an article about the scientists at

Johns Hopkins who suspect that males are born better at math.[26]

Scientists have studied the immediate and lingering effects of the myth of the "math gene" as disseminated in this study, but the initial analysis in the news media provides the information given to a wider American public than provided in *Science* magazine. Furthermore, initial reports in national publications tended to proliferate the effects of the study despite the fact that their analysis frequently questioned its validity. I believe there is a break in the study of the effects of this article on American attitudes towards innate mathematical ability because the actual text of the articles immediately following the publication of the study on a national level have not been studied. Therefore, in order to research the consequences of this study conducted and publicized in 1980, I will aim to analyze the written materials published about the study in national publications, not just trade journals specializing in science and the social sciences. Additionally, I will analyze how reporters in nationally circulated publications frame the topic of math education before and after 1980. Therefore, I will gain a clearer understanding of the information available to the public on the validity of the study and intend to distinguish how it was presented to the American public in context of how math education was generally addressed. I have chosen to study the text from national publications because, as previously mentioned, Maxwell McCombs and Donald Shaw asserts news media has much influential power to set a nation's agenda and to focus public attention on a few key public issues.[27]

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[26] Ellen Goodman. 1980. By ellen goodman; ; a new design is needed . . . This one is outworn. *Boston Globe (pre-1997 Fulltext)*, Dec 23. 1-1.

[27] Maxwell E. McCombs and Donald L. Shaw. 1972. The agenda-setting function of mass media. *The Public Opinion Quarterly* 36, no. 2: 176-87.

Almost a week before the controversial study was published in *Science* magazine, national newspapers had already dived on the story. Using the newswire United Press International (UPI), the *New York Times* published an article detailing the findings of Persson Benbow and Stanley's original study on December 7, 1980. Although I could not find other reprints of this exact article, the fact that it was published through a newswire means that this article could have been reprinted numerous times in both small and large publications across the United States. The article begins with the assertion that Persson Benbow and Stanley "urged educators to accept the possibility that something more than social factors may be responsible."[28] However, the *Science* magazine article did not reference specific instructions to educators but merely presented their findings with concentration on defending their results. Furthermore, the UPI article includes numerous substantial quotes from Persson Benbow directly relating to her findings, such as: "You can't brush the differences under the rug and ignore them. That's not going to help the girls. We've got to accept it and see what we can do to make the situation better." Later, Persson Benbow is quoted again defending her conclusions: "We just have to contend with the fact that there is a difference at seventh grade, before there are really any differences in attitudes and course taking."[29] Her quotations appear to be as defensive as the structure of her writing in *Science* magazine. The UPI writer allots the bulk of the conversation to Persson Benbow and Stanley's side of the argument, but concedes to include the other side in the second to last article. Included is a quote from Elizabeth Fennema of the University of Wisconsin stating, "I think they are on darned shaky ground when they draw conclusions about genetic

[28] UPI, Are Boys Better At Math?
[29] Ibid.

differences." Elizbeth Fennema, an educator, and Julia Sherman, a psychologist, released their own findings drawing conclusions much different from that of Persson Benbow and Stanley, but her earned position in the debate through her own research is not distinctly recognized.[30] Immediately following this statement, the author reverts her focus back to Persson Benbow and Stanley's results by adding the statement that another researcher's work was in agreement with their findings. The slant of this piece is clear as the author gives more credibility to the Persson Benbow findings through her greater attention to them and the positive diction in which she discusses the elimination of other variables that may have contributed to the conclusion of male superiority.

The idea of genetic male superiority in mathematics was given much importance by *TIME* magazine in the early part of the 1980s. Their first piece published on the subject was written a week after the *Science* magazine article by Persson Benbow and Stanley. The piece titled "The Gender Factor In Math: A New Study Says Males May Be Naturally Abler Than Females" was printed on December 15, 1980. The article begins with the straightforward statement:

> Until about the seventh grade, boys and girls do equally well at math. In early high school, when the emphasis shifts from simple computation to mathematical reasoning, the boys tend to pull ahead and stay there—through college.[31]

The introduction to this concept has no mention of this declaration as a theory, or upcoming assertion up for debate in the public arena. Instead, the author opens the piece with no

[30] The gender factor in math: A new study says males may be naturally abler than females. 1980. *TIME*, 57.
[31] Ibid.

conversation or discussion aside from the reference to the study in the article title. Although, the theory is then examined by citing research completed by aforementioned Fennema and Sherman in opposition to that done by Persson Benbow and Stanley, beginning with this statement as a fact means that the author consequently must support this fact instead of analyzing both sides of the discussion to arrive at a conclusion. Additionally, by stating this concept as a fact the author places this assertion in the reader's mind that cannot be undone. For example, this is a persuasion tactic used in frequently in courtrooms: a lawyer will ask a question or make a claim wildly out of their legal reach knowing it will be stricken from the record, but the jury cannot un-hear the statement and will subconsciously slant their viewpoint accordingly. The research conducted by Fennema and Sherman concludes that sexual stereotyping in mathematics occurs because of innumerable amount of influences from peers, parents, and oneself. This is recognized within the *TIME* article. The author this juxtaposes this against their summary of the findings done by Persson Benbow and Stanley recalling their exact numerical data. This article gives more importance to both sides of the conversation than the *New York Times* piece however one-sided it began while switching between arguments to analyze information. In addition to Fennema and Sherman's study, this author reaches outside the debate to a female mathematician. They incorporate Mary Gray, a mathematician from American University, and her hesitations on accepting Persson Benbow and Stanley's conclusions as both a female in that field and a researcher. On the other hand, consistent with the aforementioned article, this piece in *TIME* magazine concludes with a sharp, defensive statement from Persson Benbow similar to other articles on the subject:

> Many women 'can't bring themselves to accept sexual difference in aptitude,' says Benbow. 'But the difference in math is a fact.' The best way to help girls is to accept it and go from there.[32]

Although this article more evenly distributes the argument taking into account statements from both sides, the article does little to provoke thought in the reader about the validity of the concept. To add a visual aspect to the argument, this article "was accompanied by a cartoon in which a schoolgirl is unable to multiply two single-digit numbers while a boy completes the multiplication of a four- and a three-digit number."[33]

The same day the first *TIME* article was printed, *Newsweek* magazine published an article about Persson Benbow and Stanley's research titled, "Do Males Have a Math Gene?" This article, more than any other, establishes Persson Benbow and Stanley's place within the national conversation of math education. Jaan Valsiner recognizes the transformation of diction from the title given by Persson and Benbow to the national media's interpretation of the subject:

> This message, a rather usual nontheoretical (yet clearly positioned in favor of 'ability in' person rather than 'socialization'" text from the end of the psychological study, became turned into a deterministic statement (yet modified by the use of '?') in the *Newsweek* under the title *Do men have a math gene?*[34]

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[32] Ibid.
[33] Sheldon Krimsky and Jeremy Gruber. 2013. *Genetic explanations: Sense and nonsense*. Cambridge, MA: Harvard University Press.
[34] Jaan Valsiner. 2012. A guided science: History of psychology in the mirror of its making.65-66: Transaction Publishers.

Dennis A. Williams and Patricia King, similar to the authors of the articles previously mentioned, compare Persson Benbow and Stanley's work to that of Fennema. Williams and King introduce the subject of superior male intellectual ability in mathematics by first posing a question then introducing the topic as a conversation instead of a blanket statement:

> Can girls do math as well as boys? All sorts of recent tests have shown that they cannot. Most educators and feminists have blamed this phenomenon on socialization--arguing that because girls are told they can't do well in math, they develop "math anxiety" and don't. But last week a new study appeared that explains the difference mainly in genetic terms. The authors' conclusion: "Sex differences in achievement in and attitude toward mathematics result from superior male mathematical ability."

In this case, the author is presenting the facts instead of arguing beginning from a specific viewpoint. The authors then expand upon the study conducted by Persson Benbow and their data. To balance the argument, Williams and King draw opinions from a feminist author and a college entrance exam board's research director. To further expand upon the notion that those who oppose Persson Benbow and Stanley's conclusion prefer to believe that women are greatly discouraged in mathematics compared to their math counterparts, the authors reference a study conducted by Judy Genshaft of Ohio State University and Michael Hirt of Kent State University researching the effectiveness of encouragement and counseling to reduce anxiety in mathematics on test scores. To conclude the article, the authors address both sides of the issue to give equal weight to both sides and recognize the larger issue:

> Yet the dispute continues, because the two sides see the problem differently. Benbow and Stanley contend that scientists should first determine the source of sex differences in math ability. If the differences are environmental, they may be able to be eliminated; if they are genetic, we must learn to accept them. Their critics, on the other hand, insist that it is impossible to learn the true source of the disparity as long as males and females are not treated equally.

This particular section is not only equal to both sides of the argument but also indicative of the large role Persson Benbow must have played in the distribution of information about the study to the news media because the word choice of the authors is reminiscent of quotes given by Persson Benbow to other news publications released on the same day.

In reaction to this research, both trade and national publications ran opinion pieces on the validity of the study and implications for its dispersal. As more opinion pieces are submitted to newspapers in the form of op-eds and letters to the editor than there is the capacity to print, the decision to include these pieces demonstrates the importance of the topic of greater male intellectual ability in the field of mathematics on the national agenda. The April 1981 issue of *Science* magazine ran seven letters to the editor arguing against the initial claims brought forth by Persson Benbow and Stanley in article.[35] Johnathan Beckwith and Michael Woodruff wrote a reach in the same publication ridiculing the researchers for not properly eliminating other variables in their research even though the original article by Persson Benbow and Stanley was structured around such anticipated criticism. They

[35] Jonathan Beckwith, Michael Woodruff, Joseph D. Novak, Dennis R. Ridley, and Camilla Persson Benbow. 1984. Achievement in mathematics. *Science* 223, no. 4642: 1247-48.

recognize the skewed population of the participants in their description of the study by recalling, "The results presented by Camilla P. Benbow and Julian C. Stanley on the difference in performance of mathematically precocious boys and girls on the mathematical part of the Scholastic Aptitude Test." Their commentary directly attacks their research methods from a scientific perspective. After detailing the variables that were not considered by Persson Benbow and Stanley, Beckwith and Woodruff recognize the harmful affects of the promotion of a study with serious scientific failings: "Finally, the interpretation which Benbow and Stanley have attached to their studies and the publicity they have received are not harmless." In particular, they refer to the myth of the "math gene" that has been created by this study and "have already had their influence on students in math classes" and the possibility of less female graduates in mathematics.[36] The following letter to the editor written by Joseph D. Novak and Dennis R. Ridley is increasingly less concerned and lengthy. Novak and Ridley simply present their conclusion as congruent with Persson Benbow and Stanley's despite using a different hypothesis and means to which they reached their findings. This piece is important because it demonstrates a need for scientists to react to the controversial study with their own interpretation of the validity of the results. In this instance, the authors are not as adamantly against the findings although they have convergent perspectives. As previously mentioned, Ellen Goodman refutes the research in the *Boston Globe*, but more importantly specifically references an article about this study that appeared in a publication with an even larger circulation rate, *Newsweek*. Goodman believes this article, along with the original article in *Science* magazine, exponentially increased the popularity, and therefore the consequences, of the original study. In this

[36] Ibid.

piece, as well as Beckwith and Woodruff, Goodman acknowledges the myth the "math gene" as a term being popularized by the news media.[37] Edith H. Luchins was another woman who was given a voice on the national level in response to this study. As a scientist, she contested the study and admonished Americans to believe the results because of their ability to discourage future women mathematicians when their number of graduates was recently rising in a piece published in another national publication, *The Christian Science Monitor*.[38] The subsequent reactions to this study were poignant because their writers truly feared for the repercussions in the amount of female mathematical students in the future.

Reporters recounted the findings of Persson Benbow and Stanley in many national publications giving attention to the arguments and providing support for the shortcomings of the study. The defensive nature of the original content by Persson Benbow and Stanley gives insight as to why the reporters framed the topic in such a peculiar fashion and demonstrates why this topic garnered much media attention. Throughout the articles, the reporters undoubtedly were receiving the same information and stock quotes from Persson Benbow as well as taking clues from their first text. Because Persson Benbow and Stanley's article was arranged in a defensive manner highlighting the possible limitations of their work, reporters were given these points to communicate through their own work. They did not have to work greatly to consider the limitations of Persson Benbow and Stanley's work. Because these were given for them and they presumably had limited background knowledge of the subject, there is a possibility that there was limited consideration for any

[37] Ellen Goodman. 1980. By ellen goodman; ; a new design is needed . . . This one is outworn. *Boston Globe (pre-1997 Fulltext)*, Dec 23. 1-1.
[38] Edith H. Luchins and Richard Levine. 1981. Women and the pursuit of a career in mathematics. *Christian Science Monitor*.

other possible faults. Consequently, this defensive tactic gave reporters more information for their writing that may have garnered more weight in the argument when presented in succinct articles. If the reporters were attempting to completely convey the information provided by Persson Benbow and Stanley, there would be little room for the opposing argument, but much room to contest possible objections. Additionally, the heightened tension addressed by Persson Benbow and Stanley makes this article sexier to the American public. Americans who are not well versed in this type of scientific study can easily understand the bottom line: Males have more innate ability than females in the field of mathematics. However, an article explaining the complicated data associated with this claim is less appealing to readers than reading how the scientists combat any possible backlash, especially because the backlash includes simpler areas such as encouragement of women. Persson Benbow and Stanley's framing gives reporters more than just an interesting, informational sentence of a controversial claim. Shelia Tobias notes, in reference to the article in *TIME* magazine, the readership "would not have the patience to wade through Benbow and Stanley's tables of data or to read the criticism that the editors of *Science*, in an effort to counter the effect of the article, summarized in an editorial in the same issue."[39] Accordingly, this method also furthers Persson Benbow and Stanley's argument because not only is their claim there but also they did not have to support their faults for it was already given in the original report.

Secondary Authors Remembering the Sensationalized Study

Americans gain an understanding of science and math concentrated professions through general mass media communications. Scientists and inventors have continually been

[39] Sheila Tobias. 1994. *Overcoming math anxiety*: W. W. Norton & Company.

portrayed as aloof, isolated, intelligent, but also dangerous. LaFollette ascertains these differences in representations between fact and fiction have arisen because although the intellectual prominence and importance of scientists was achieved through the mass communications in the twentieth century: "The competitive world of commercials broadcasting" relies on dramatization and marginalization of science.[40] The communications industry has created dramatic perceptions of scientists and the technological professions that have shaped Americans attitudes of their intellectual ability to mirror those of the entertainment industry. Therefore, careers such as those in mathematics are widely understood to require more intellectual ability than those in other areas.

Barnett and Rivers believe the Persson Benbow and Stanley's study publicized in 1980 was the starting point for this conversation about the differences in ability between sexes as "the mainstream media picked up the cry."[41] Morton Hunt refers to the result of the publicity following their report as "a lighted match tossed into dry underbrush during a windstorm; it touched off a fast-spreading conflagration of articles and letters in the media throughout the country and in scientific journals."[42] According to their research, the implications of these materials have led to "male superiority in math-related subjects is often taken as fact in conversations between parents, teachers, counselors, and others."[43] The authors further argue that because of this attitude females have been less likely to be

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[40] Marcel C. LaFollette. 2008. *Science on the air : Popularizers and personalities on radio and early television*. Chicago: University of Chicago Press 1.
[41] Barnett, Rosalind C. and Caryl Rivers. *Same Difference : How Gender Myths Are Hurting Our Relationships, Our Children, and Our Jobs*. New York: Basic Books, 2004, 150.
[42] Morton Hunt. 1999. *The new know-nothings: The political foes of the scientific study of human nature*: Transaction Publishers.
[43] Barnett, Rosalind C. and Caryl Rivers. *Same Difference : How Gender Myths Are Hurting Our Relationships, Our Children, and Our Jobs*. New York: Basic Books, 2004, 150.

encouraged or supports in aspirations related to mathematical fields although the study itself has many limitations that were not properly addressed.

Recalling the media attention, so prevalent and disconcerting it has been described as "hoopla," received by Persson Benbow and Stanley's "wild speculation,"[44] authors and researchers acknowledge the span of the effect on young girls even though Julian C. Stanley himself said, "that it's hard to know how much damage it did."[45] Sheila Tobias asserts,

> Because of that paper, our campaign to persuade women (and men) that, if properly encouraged, girls could do just as well in mathematics as boys was set back perhaps a dozen years . . . But the damage was done. Another generation of girls and their parents would accept lower performances in math than in other subjects.[46]

Sue Vilhauer Rosser concedes, "Although discussion and criticisms of Benbow and Stanley's data and interpretations were published in *Science,* these received little, if any, notice in the mainstream media." This statement has truth because many articles were not focused on discussing Persson Benbow and Stanley's work aside from their self-appointed faults, but news articles and opinion pieces were published in the national media discussing their shortcomings past that of their own confessions. Furthermore, "without discussion of their limitations or later talent search statistics, are still mentioned in the mainstream press (e.g., "Academy of P.C. Sciences," *New York Times* 2006), and cited in popular works (e.g.,

[44] Sheila Tobias. 1994. *Overcoming math anxiety*: W. W. Norton & Company.
[45] Morton Hunt. 1999. *The new know-nothings: The political foes of the scientific study of human nature*: Transaction Publishers.
[46] Ibid.

Boys and Girls Learn Differently! 2001).[47] Persson Benbow and Stanley's work is still harmful today not only because of its enduring argument despite the continuation of their work providing otherwise:

> But what is surprising about this scientific myth's lasting power is that continuation of the Johns Hopkins University study of mathematically precocious youth in the years since 1980 has shown a progressive reduction in the difference between boys' and girls' performance on the math tests.[48]

However, there has been an absence of media coverage surrounding more recent data.[49]

Their publicity surrounding their work greatly affected their career, whether or not making them a more prominent name in the scientific field was a positive or negative attribute. Julian C. Stanley recalls he was resistant to a direct attack, but he found it harder to win grant awards from foundations he had previously had a relationship with. Camilla Persson Benbow was shocked by the response to the article admitting, "'I guess I was naïve."[50] Although the study was discussed heavily both in the national media and in the scientific community, the legitimacy of Persson Benbow and Stanley's argument was not widely accepted as demonstrated by the different treatment they received.

How Reports By the National Media on the Topic of Math Education Changed

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[47] Sue Vilhauer Rosser. 2008. *Women, science, and myth: gender beliefs from antiquity to the present*: ABC-CLIO.
[48] Sheldon Krimsky and Jeremy Gruber. 2013. *Genetic explanations: Sense and nonsense*. Cambridge, MA: Harvard University Press.
[49] Ibid.
[50] Morton Hunt. 1999. *The new know-nothings: The political foes of the scientific study of human nature*: Transaction Publishers.

After the publicity surrounding Persson Benbow and Stanley's findings concluding that genetically males have more math ability, the subject of innate intellectual intelligence was placed on the United State's national agenda. Alongside the exponential increase of the topic in academic and trade journals, national newspapers more frequently wrote about the concept. Before 1980, national publications created awareness of the disparity between males and females in mathematics, but reporters focused on social factors, which Persson Benbow and Stanley had specifically found as irrelevant in the conversation, and the comparison of American students' scores on mathematics exams to students' scores from other countries. Additionally, academics and researchers had created much literature on the topic, but it did not gain the national fame of Persson Benbow and Stanley's assertion. An example of a common article found within the pages of the *New York Times* is "Tests Show Drop In Math Ability Of U.S. Students."[51] This article appeared on the front page on September 14, 1979. The author Gene Maeroff details a federally financed study demonstrating "the mathematics achievement of students in nation's elementary and secondary schools, particularly the ability to apply knowledge to problem-solving, has declined in the 1970's."[52] The article gives no mention to innate intellectual ability of either gender while using only grade level and ages to distinguish between groups tested. Instead, the article provides the straightforward facts of the report. The text of this article is in stark contrast to the provocative nature of the articles written about Persson Benbow and Stanley. Similarly, an article appearing in *TIME* magazine on March 14, 1977 titled "Math Mystique: Fear of Figuring" paid no attention to innate intellectual ability. As the article explores why

[51] Gene Maeroff. 1979. Tests show drop in math ability of u.S. Students. *New York Times*. A1, D14.
[52] Ibid.

women fail to hold an equivalent number of jobs pertaining to mathematics through the quoted term: "math anxiety."[53] The article goes on to consider why, according to Lynn Fox, "an educator who studied precocious math students for her doctoral thesis at Johns Hopkins University:"[54]

> 'There are more negative stereotypes for math-gifted girls than boys,' and that mathematically apt girls 'seem more willing to sacrifice intellectual stimulation to social stimulation.' Other studies have confirmed that girls' interest in math plummets at around age twelve, when adolescence makes them more aware of social roles.[55]

The author of this article takes into account many social factors, but does not consider genetic male superiority in mathematics. The frequency of these articles was lower because the topic did not have a foothold on the national agenda.

After 1980, reporters focus on innate intellectual capability in terms of not only gender but also on other genetic factors while they wrote more frequently about innate intelligence. For example, in 1988, UPI released an article called "Gender Doesn't Affect Math Ability,"[56] and the Associated Press released an article with the title "Math Is Doing A Number On Many Fearful Pupils."[57] Because of the broad reach of newswires expanding across the United States needing to provide information relevant to the nation while touching on subjects of national importance, the attention they paid to the topic of innate intellectual ability in mathematics demonstrates the concept's increased importance.

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[53] Ibid.
[54] Ibid.
[55] Ibid.
[56] Gender doesn't affect math ability. 1988.A13: United Press International.
[57] Math is doing a number on many fearful pupils. 1988.D3: Associated Press.

Researchers, including Persson Benbow and Stanley, began to research other genetic traits that may have a factor in math ability such as nearsightedness and lefthandedness, which gained attention in the national media as well.[58] Persson Benbow's research released in 1986 caught a foothold in the news media that it would not garnered without the introduction of the topic in such articles as "Male Hormones Linked To Math Ability In Junior High School Boys" circulated by the Associated Press,[59] "Developments in Brief Biological Factors May Tell the Boys From the Girls in Mathematics Tests" as reported in the *Los Angles Times,*[60] and "Math Aces? It May Be Hormones" as featured in USA Today.[61] These major publications across the country found importance in furthering the research of genetic superiority in mathematics.

An extreme cause for concern after the publicity garnered by Persson Benbow's article was centered on the assumed validity of the theory of the "math gene." In the years after the initial article introducing the subject of innate male intellectual superiority in mathematics with Persson Benbow and Stanley's report, reporters began to presume readers knew of this theory and proceeded mentioning it without referencing Persson Benbow, Stanley, their report, or its faults. An article titled "Curing Math Anxiety" published by *Newsweek* on August 23, 1982 is an example of this assumed knowledge. The article reads,

> The symptoms are familiar to millions of girls and women: the ciphers on the blackboard blur, a defensive somnolence sets in, the mind goes

58 Near-sighted lefties have inside track on genius. 1985. United Press International.
59 Male hormones linked to math ability in junior high school boys. 1986. Associated Press.
60 Developments in brief biological factors may tell the boys from the girls in mathematics tests. 1986. *Los Angeles Times*.
61 Marilyn Elias. 1988. Math aces? It may be hormones. USA Today.

> blank -- until the only computation that makes any sense is the number of minutes till the end of the class. This fear of figures is known as math anxiety, and it causes many high-school girls to abandon math and science after completing the bare minimum of courses required for graduation.[62]

In this case, the reporter's emphasis on this universal feeling creates the idea that the lack of female math ability is normal. An article circulated on newswire from Philadelphia, PA by the Associated Press begins by recognizing the fact that "junior high school boys are better than girls at math" before reporting on further research by Persson Benbow.[63] The acceptance, as Persson Benbow originally suggested, became pervasive as the news media disseminated the idea that female genetic inferiority was expected.

The concerns for the impacts on amount of graduates in the mathematics field did not end in the years directly following the publication of the results in national newspapers at the end of 1980 into 1981. In 1986, researchers Jacquelynne S. Eccles and Janis E. Jacobs were already researching the impacts of media reports on parents. They found that only five years after the original study, parents were already changing their attitudes towards encouraging and believing their children's capabilities. They detail the parents attitudes toward their children's ability would impact how they would treat their children based on preconceived notions of their ability and how they would pass on the attitude.[64] These researchers did not end their association with the original study and published another study

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62 Eloise Salholz and Rosa Jones. 1982. Curing math anxiety. *Newsweek*, 71.
63 Male hormones linked to math ability in junior high school boys. 1986. Associated Press.
64 Janis E. Jacobs and Jacquelynne S. Eccles. 1985. Gender differences in math ability: The impact of media reports on parents. *Educational Researcher* 14, no. 3: 20-25.

hoping to invalidate the Johns Hopkins' results. Not only does this work provide a valid counterargument, but also it demonstrates that the initial study prompted both more scientific studies as well as sociological studies because of the controversial nature of the original findings.[65] After Eccles and Jacobs study, an innumerable amount of social science researchers have looked into the long ranging effects of encouragement on young women in the field of mathematics.

The method in which test scores were reported after 1980 when Persson Benbow and Stanley's findings were released gradually changed. In 1977, the *New York Times* reported test scores in Florida by grade level: "Forty-two percent of the 19,000 juniors in Dade County (Miami) who took the standardized test in October failed the math portion . . . that one-fourth to one-third of the stat's 100,000 high school juniors might fail."[66] An article two years later in 1979 divides test scores by age when discussing national assessment: "Last year, the National Assessment tested the mathematics ability of 71,000 students 9, 13 and 17 years old. . ."[67] However, in 1984, an article reporting a national evaluation of students concluded, "The data revealed no significant differences in the scores of the male and female students in the 8th grade, something that Mr. Travers described as 'a welcome finding.'"[68] Although this article does not present any differences between male and female test scores, the acknowledgement of this possibility of a difference demonstrated the heightened importance of testing between males and females on the national level. As the

[65] Janis E. Jacobs. 2005. Twenty-five years of research on gender and ethnic differences in math and science career choices: What have we learned?
[66] Math a big problem for florida schools. 1977. *New York Times*. 23.
[67] Gene Maeroff. 1979. Tests show drop in math ability of u.S. Students. *New York Times*. A1, D14.
[68] Edward Fiske. 1984. American students score average or below in international math exams. *New York Times*. 30.

decade continued, more newspapers noted the difference between male and female scores in the same grade level. Presently, most mathematics exam scores are reported with male and female distinctions.

Conclusion

Scientists have studied the immediate and lingering effects of the myth of the "math gene" as disseminated in the news media in articles about a study conducted at Johns Hopkins University by Camilla Persson Benbow and Julian C. Stanley concluding that men have a greater innate intellectual ability in the field of mathematics. The initial analysis of the text distributed by the news media provides insight into the information given to a wider American public than provided in *Science* magazine, where the findings were originally published. The study of this text in conjunction with news articles written later in the decade and in the previous decade demonstrate the publicity of this study increased the frequency of the topic of mathematics education in the news media, created the theory of the "math gene" because of the assumed validity of theory after its initial introduction and assessment period, caused concern for the implications it would create for young girls exploring interests and women in the field, and gradually transformed the reporting of test scores in mathematics to include both grade level and gender.

BIBLIOGRAPHY

"About Science & Aaas", Science.

Associated, Press. "Math Is Doing a Number on Many Fearful Pupils." *Orlando Sentinel*, Aug 03 1988, 0-D3.

Associated, Press. "New Us Effort Launched to Stem Theft of Trade Secrets; Concern About China Leads to Action." *Washington Post* 2013.

Barnett, Rosalind C. and Caryl Rivers. *Same Difference : How Gender Myths Are Hurting Our Relationships, Our Children, and Our Jobs*. New York: Basic Books, 2004.

Barnett, Rosalind and Caryl Rivers. "Gender Equity: Doing the Math." *Los Angeles Times*2012.

Booz Allen Hamilton. "Shortage of Skilled Cyber Security Professionals Causing Economic Ripple Effect across the Globe, Study Finds." edited by Frost & Sullivan, 2013.

Beckwith, Jonathan, Michael Woodruff, Joseph D. Novak, Dennis R. Ridley and Camilla Persson Benbow. "Achievement in Mathematics." *Science* 223, no. 4642 (1984): 1247-1248.

Camilla Persson Benbow and Julian C. Stanley. "Sex Differences in Mathematical Ability: Fact or Artifact?" *Science* 210, no. 4475 (1980): 1262-1264.

"Camilla Persson Benbow", Vanderbilt University.

Campbell, Patricia B. and Jennifer N. Storo. "Girls Are... Boys Are...: Myths. Stereotypes & Gender Differences." (1994). http://research.yaaams.org/images/stereotypegender.pdf.

"Developments in Brief Biological Factors May Tell the Boys from the Girls in Mathematics Tests." *Los Angeles Times*1986.

Dillon, Sam. "Harvard Chief Defends His Talk on Women." *New York Times*, January 18 2005.

DiSalvo, David. "Why Are High School Teachers Convinced That White Girls Can't Do Math?" *Forbes* 2012.

Eccles, Jacquelynne S. and Janis E. Jacobs. "Social Forces Shape Math Attitudes and Performance." *Signs* 11, no. 2 (1986): 367-380.

Elias, Marilyn. "Math Aces? It May Be Hormones." USA Today, 1988.

Evans, Stacy. "Ambivalent Modernity: Scientists in Film and the Public Eye." University of Massachusetts, Amherst, 2010.

Fiske, Edward. "American Students Score Average or Below in International Math Exams." *New York Times*1984, 30.

Frayling, Christopher. *Mad, Bad and Dangerous? : The Scientist and the Cinema*. London: Reaktion, 2005.

"The Gender Factor in Math: A New Study Says Males May Be Naturally Abler Than Females." *TIME* 1980, 57.

Grant Halvorson, Heidi. "How Wanting Love Makes Girls Bad at Math." *Psychology Today*, Sept 13 2011.

"Gender Doesn't Affect Math Ability." A13: United Press International, 1988.

Goodman, Ellen. "By Ellen Goodman; ; a New Design Is Needed . . . This One Is Outworn." *Boston Globe (pre-1997 Fulltext)*, Dec 23 1980, 1-1.

Hall, Cathy W. and Cynthia Hoff. "Gender Differences in Mathematical Performance." *Educational Studies in Mathematics* 19, no. 3 (1988): 395-401.

Holderman, Lisa. *Common Sense : Intelligence as Presented on Popular Television*. Lanham: Lexington Books, 2008.

Hunt, Morton. *The New Know-Nothings: The Political Foes of the Scientific Study of Human Nature*: Transaction Publishers, 1999.

Jacobs, Jacquelynne S. Eccles and Janis E. "Social Forces Shape Math Attitudes and Performance." 11, pp. 367-380: The University of Chicago Press, 1986.

Krimsky, Sheldon and Jeremy Gruber. *Genetic Explanations: Sense and Nonsense*. Cambridge, MA: Harvard University Press, 2013.

Jacobs, Janis E. and Jacquelynne S. Eccles. "Gender Differences in Math Ability: The Impact of Media Reports on Parents." *Educational Researcher* 14, no. 3 (1985): 20-25.

Janet Shibley Hyde*, Elizabeth Fennema, Marilyn Ryan, Laurie A. Frost, Carolyn Hopp. "Gender Comparisons of Mathematics Attitudes and Affect." *Psychology of Women Quarterly* 14, no. 3 (1990): pp. 299-324.

Kirby, David A. *Lab Coats in Hollywood : Science, Scientists, and Cinema*. Cambridge, Mass.: MIT Press, 2011.

Koebler, Jason. "Major Corporations Promote Stem Education." *U.S. News & World Report*2011.

LaFollette, Marcel C. *Science on the Air : Popularizers and Personalities on Radio and Early Television*. Chicago: University of Chicago Press, 2008.

Long, Marilee and Jocelyn Steinke. "The Thrill of Everyday Science: Images of Science and Scientists on Children's Educational Science Programmes in the United States." *Public Understanding of Science* 5, no. 2 (1996): 101-119.

Luchins, Edith H. and Richard Levine. "Women and the Pursuit of a Career in Mathematics." *Christian Science Monitor* 1981.

Maeroff, Gene. "Tests Show Drop in Math Ability of U.S. Students." *New York Times*1979, A1, D14.

"Male Hormones Linked to Math Ability in Junior High School Boys." Associated Press, 1986.

Marcotte, Amanda. "Discouraging Math Smarts in Girls." *Slate Magazine*, Sept 12 2011.

"Math a Big Problem for Florida Schools." *New York Times* 1977, 23.

"Math Is Doing a Number on Many Fearful Pupils." D3: Associated Press, 1988.

McCombs, Maxwell E. and Donald L. Shaw. "The Agenda-Setting Function of Mass Media." *The Public Opinion Quarterly* 36, no. 2 (1972): 176-187.

McDonald, Joe. "China Denies It's World's Biggest Trader." *Associated Press*2013.

Miller, Bo. "Companies Must Play a Vital Role in Stem Education." *U.S. News & World Report*, September 19 2011.

Nakashima, Ellen. "U.S. Publicly Calls on China to Stop Commercial Cyber-Espionage, Theft of Trade Secrets." *Washington Post*, March 11 2013.

"Near-Sighted Lefties Have inside Track on Genius." United Press International, 1985.

Pearce, Jeremy. "Julian Stanley, Champion of Gifted Students, Dies at 87." (2005).

Perkowitz, S. *Hollywood Science : Movies, Science, and the End of the World*. New York: Columbia University Press, 2007.

Persson Benbow, Camilla. "In Appreciation: Julian Stanley." *The Observer* (2013).

Reppert, Barton, "U.S. Companies Investing in Stem Education", Institute of Electrical and Electronic Engineers

Riegle-Crumb, Catherine and Melissa Humphries. "Exploring Bias in Math Teachers' Perceptions of Students' Ability by Gender and Race/Ethnicity." *Gender & Society* 26, no. 2 (2012): 290.

Robinson, Daniel. "Profiles in Research: Julian Stanley." (2006).

Salholz, Eloise and Rosa Jones. "Curing Math Anxiety." *Newsweek*1982, 71.

Sanger, David. "In Cyberspace, New Cold War." *New York Times* 2013.

Sanger, David, David Barboza and Nicole Perlroth. "Chinese Army Unit Is Seen as Tied to Hacking against U.S." *New York Times* 2013.

Smith, Jessi. "The Interplay among Stereotypes, Performance-Avoidance Goals, and Women's Math Performance Expectations." *Sex Roles* 54, no. 3 (2006): 287-296.

Tobias, Sheila. *Overcoming Math Anxiety*: W. W. Norton & Company, 1994.

Valsiner, Jaaan. "A Guided Science: History of Psychology in the Mirror of Its Making." 65-66: Transaction Publishers, 2012.

Vilhauer Rosser, Sue. *Women, Science, and Myth: gender Beliefs from Antiquity to the Present*: ABC-CLIO, 2008.