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THE IMPORTANCE OF WOMEN'S PRESENCE IN SCIENCE AND EDUCATION: HISTORICAL JOURNEY AND CHALLENGES

APOSTOLOS KARAOULAS
Laboratory Teaching Staff, University of Ioannina, School of Education Sciences,
Department of Early Childhood Education

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ABSTRACT

The recognition of women in the world of science and research has been a significant issue over the past decades. Despite their substantial contributions, women are often excluded and underrepresented in high-ranking positions and honorary distinctions. This study examines the challenges faced by women in science and research, the efforts made to promote them, and the outcomes of these efforts. The literature review provides a broad basis for understanding the evolutionary path of women's recognition in science and research, as well as the obstacles and challenges faced by female scientists. Education, as a means of ensuring equal opportunities, has played a pivotal role in highlighting the contributions of women in the sciences, demonstrating that educational attainment is a decisive factor for their success in fields previously dominated by men.

Keywords: History of science, women in science and education, education and science, social equality, education and gender equality

1.0 INTRODUCTION

The participation of women in the scientific and research domain is not merely a matter of recognizing their individual achievements but a decisive factor in shaping a more equitable and inclusive scientific world. Education has served as the catalyst enabling women to enter fields previously inaccessible to them, underscoring the connection between access to knowledge and social emancipation. In a world where men traditionally dominated science, women's access to the educational system shifted the balance of power, equipping them to compete on equal terms in an once male-dominated space. Despite persistent obstacles, progress- primarily through educational and institutional interventions- demonstrates the value of education as a tool for advancing gender equality and fostering participation in knowledge.

Throughout history, men have held the exclusive privilege of accessing education, allowing them to dominate science, academia, and political office. This longstanding inequality established a system where women faced numerous barriers, not only in education but also in their professional advancement and recognition. The struggle for equal access to education became the foundation for women's entry into science, transforming this effort into a fight for social justice.

The historical trajectory of women in science is filled with examples of extraordinary individuals who, despite adversities, made significant contributions and shaped modern scientific thought. The presence of these women is directly linked to their access to education

and the opportunities they fought to secure. However, even today, women encounter challenges, including gender stereotypes, limited research funding, and underrepresentation in senior positions.

This article explores the issue from both a historical and contemporary perspective, shedding light on cases of women who overcame the barriers of their time to excel. Simultaneously, it focuses on the challenges that persist today and the dynamics developing to ensure gender equality in science and research. The aim of this study is to tunnel into the mechanisms that promote equality while contributing to the broader discourse on eliminating inequalities and building a fairer academic community.

Through this work, institutional and social interventions targeting the expansion of women's access to education and science are highlighted. Additionally, the necessity of further actions to eliminate existing barriers is emphasized, ensuring that women's contributions are adequately recognized and fully utilized, fostering both social and scientific progress.

2.0 HISTORICAL OVERVIEW

The contribution of women to science is timeless, yet often overlooked. From Marie Curie, the first woman to win a Nobel Prize, to Rosalind Franklin, whose research was fundamental to the discovery of the structure of DNA, women have made significant scientific discoveries. However, historically, women have faced numerous discriminations that limited their opportunities for education and professional advancement.

A notable example is Charles Darwin's theory, as presented in his work "The Descent of Man, and Selection in Relation to Sex" (1871), where he argued that men's intellectual abilities surpass those of women. Essentially, Darwin suggested that gender equality is an unattainable prospect. According to this theory, men are "naturally" more intelligent, a notion shaped by historical and cultural biases. Darwin posited that the process of evolution has enhanced men's intellectual capacities, which are considered superior due to the demands of their societal roles, often involving activities such as hunting and gathering (Darwin, 1871).

This notion of men's "natural" superiority is reinforced by assumptions rooted in centuries of social and cultural constructs. Consequently, the distinct differences proposed by Darwin, while framed in evolutionary arguments, are essentially products of social construction that undermine a genuine understanding of women's capabilities and roles in science and other areas of human activity. Today, science is well-equipped to refute this theory, as it establishes a divisive line between men and women, overlooking the complexity and diverse expressions of human intellect. Instead, it offers a generalized and simplistic perspective that neglects the true potential and contributions of women, particularly in the scientific field, which should be founded on critical thinking and objective analysis (Gould, 1996).

Although Darwin's theory has been deconstructed by modern science, his views reflect and reinforce the prevailing beliefs of his time. These beliefs recognized that "the chief distinction in the intellectual powers of the two sexes is shown by the fact that man attains a higher eminence in whatever he takes up than can woman—whether requiring deep thought, reason, or imagination, or merely the use of the senses or hands" (Wellenreuther & Otto, 2015: 5-6). These views extended to social roles, justifying the belief that women should prioritize

domestic duties and child-rearing over education or career pursuits. Furthermore, Francis Galton, Darwin's cousin, warned that if women of distinguished lineage diverted their attention from motherhood and childcare, the quality of the next generation would decline (Fara, 2015).

In this context, suffragettes advocating for women's rights argued that evolutionary principles highlighted fundamental similarities among members of a species. These countered Darwinian theories of sexual selection that bolstered cultural biases about women's intellectual inferiority (Richards, 1997). The need to reassess scientific assumptions and advocate for gender equality emerges from this contradiction, aiming to understand the true capabilities and contributions of women to scientific progress. Furthermore, it becomes evident that scientific discourse can function simultaneously as a tool for empowerment and as a mechanism of discrimination.

The analysis of women's position in science reveals the intricate interplay between scientific approaches and social and cultural values. These values shaped how scientific discourse could simultaneously serve as a tool for empowerment and a mechanism of discrimination. Until the 19th century, most women lacked access to formal scientific education, resulting in limited opportunities for education and careers, which were available only to those with independent financial resources (Orr, 2014).

This exclusion was deeply rooted in persistent biases regarding women's intellectual capabilities, often based on pseudoscientific data and evolutionary theories (Wellenreuther & Otto, 2015). Despite the challenges faced over time, women have made significant and often remarkable contributions to scientific progress. Particularly noteworthy is the increase in their participation and success in science during the 20th century. According to reliable records, women represent less than 7% of scientists who have achieved groundbreaking advances in the history of science. However, when considering scientists born after 1900, the percentage of women rises to nearly 20% (Neadle, 2016).

Throughout history, women engaged in science faced significant barriers, such as restrictions on education and limited participation in academic spaces. However, support also came from organizations founded by other women, academics, and social groups, which bolstered their efforts and provided essential assistance. By the mid-19th century, laws prohibiting women from accessing education in Europe and North America began to be overturned, leading to the establishment of the first colleges that admitted women. This development created new opportunities for women and encouraged them to actively participate in science (Etzkowitz, Kemelgor & Uzzi, 2003).

In the 1930s, many women who aspired to a scientific career encountered barriers, restrictions, and even humiliation compared to their male counterparts, a situation that sometimes persists today. In the latter half of the 20th century, many social perceptions changed, including views on women scientists. Barriers based on outdated traditions, culture, and prejudices began to be cautiously eliminated (Neadle, 2016).

Women’s contributions to science span many fields such as Mathematics, Physics, Chemistry, Biology, Biochemistry, Astrophysics, Paleontology, Embryology, Medicine, Nuclear Science, Archaeology, Anthropology, Psychology, and Environmental Science. A significant issue is that some women never received the recognition they deserved for their work. However, in our

Volume 05, Issue 06 "November – December 2024"

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times, this is no longer the case for women scientists, as science has become a field where true equality is sought and achieved.

Despite their significant contributions, the systemic lack of recognition of the value of women's participation in science remains a critical issue. However, contemporary scientific developments suggest that gender equality is achievable. The scientific community is increasingly acknowledging the importance of equal participation by women, providing the necessary support and opportunities they deserve, so that they may contribute equally to the advancement of knowledge and research.

2.1 The First Women Scientists

During the period when perceptions and prejudices about women's roles in science were at their peak, many women nonetheless managed to distinguish themselves in the scientific arena under adverse conditions. Their achievements are not simply milestones in the history of knowledge, nor are they confined solely to the significance of their outcomes. Rather, they span a wide range of scientific fields in which these women were active, while simultaneously encompassing the challenges and effort required to realize them. The determination and courage they demonstrated, often in hazardous circumstances, underscore their profound commitment to scientific discovery. Their findings were not limited to theory alone but had a direct impact on our understanding of the natural world and contributed significantly to human progress.

The case of Mary Anning (1799- 1847) stands as a characteristic example of this remarkable contribution. Mary Anning was a prominent paleontologist and fossil collector, renowned for her significant discoveries of Jurassic marine fossils. These specimens date back approximately 201 to 145 million years, an era marked by the evolution and development of a wide range of marine organisms and plants that played a decisive role in shaping prehistoric ecosystems. Working along the steep shores of Lyme Regis, at the Blue Lias cliffs, Anning devoted her life to the dangerous and often demanding pursuit of fossils- primarily during the winter months, when landslides would expose new finds. One of the most dramatic moments of her life occurred in 1831, when she nearly lost her life in a landslide that claimed the life of her beloved dog. Undeterred by such risks, Anning continued her work, providing the scientific community with invaluable specimens. Her contributions were pivotal in reshaping scientific understanding of prehistoric life and the Earth's geological history.

Anning's work was instrumental in reshaping the scientific understanding of prehistoric life and the Earth's geological history. Her discoveries, including the first ichthyosaur skeleton, the earliest plesiosaur skeletons, and the first pterosaur skeleton found outside Germany- alongside numerous fish fossils- fundamentally altered our perception of marine ecosystems and their evolutionary pathways. In 2010, the Royal Society recognized her enduring influence by ranking her among the ten most influential women in the history of science, thereby affirming the significance and lasting value of her work (Neadle, 2016).

Through her life and research, Mary Anning underscores the importance of women's contributions to science, particularly during an era in which women were marginalized. Her perseverance and dedication not only enriched the academic community but also profoundly

influenced our broader understanding of the natural world and humanity's place within it (Neadle, 2016).

Agnes Pockels (1862- 1935) is another strong example. Pockels expressed her interest in science from childhood and wanted to study physics. However, she did not have direct access to universities but could draw information from scientific literature through her younger brother, who was a student at the University of Göttingen. Pockels took care of her sick parents at their home in Germany, as she was unmarried. She constructed a device for measuring surface tension and, with the help of Lord Rayleigh (a famous English scientist), published her first research paper titled "Surface Tension" in Nature in 1891. She continued to study surface phenomena and published several more scientific papers. She received the Laura Leonard award from the Colloid Society in 1931 and was awarded an honorary doctorate by the Technical University of Braunschweig (Neadle, 2016).

Marie Curie (1867- 1934) was a physicist and chemist and one of the most famous scientists of her time. Born in Warsaw, she studied physics and mathematics at the Sorbonne, where she met her husband, Pierre. Working together, they researched radioactivity. In July 1898, they announced the discovery of the new element "polonium." By the end of the same year, they reported the discovery of "radium." Together with French physicist Henri Becquerel, they received the Nobel Prize in Physics in 1903. Her husband was killed by a carriage in 1906, and Curie took over his scientific duties, becoming the first woman to teach at the Sorbonne (Des Jardins, 2010). She dedicated her life to continuing the work she started with her husband. Curie was awarded the Nobel Prize in Chemistry in 1911. Her research was crucial for the development of X-rays in surgery. She helped equip ambulances with X-rays during World War I and improved the vehicles to make them useful. Curie died on July 4, 1934, from aplastic anemia caused by prolonged exposure to high-energy radiation during her research. At that time, scientists often suffered from the effects of hazardous substances because the dangers were not fully understood, and the adoption of safety measures and regulations was still out of reach (Winston, 2013).

Grace Hopper (1906- 1992) was an American computer scientist and Rear Admiral in the United States Navy. She was one of the first programmers of the Harvard Mark I computer in 1944 and invented the first compiler for a computer programming language. She also promoted the concept of machine-independent programming languages, which led to the development of COBOL, one of the first high-level programming languages. The respect with which the United States Navy regarded her contributions to computer science is evident from the fact that the guided-missile cruiser "Hopper" was named after her. Hopper graduated in mathematics and physics in 1928 and earned a Ph.D. in mathematics from Yale University in 1934. She was appointed associate professor of mathematics at Vassar College in 1941. With the outbreak of World War II, she joined the US Navy Reserve and, after training, was assigned to the Bureau of Ships Computation Project at Harvard University, where she remained until 1949, turning down a full professorship at Vassar to stay on as a researcher in the Navy. In 1949, Hopper joined the team developing the UNIVAC, the first commercially available computer. By 1952, she had a working compiler, and in 1954 she became the company's first director of automatic programming. In 1959, she was appointed technical advisor to the committee that defined the new COBOL language. From 1967 to 1977, Hopper served as the Navy's Programming Language Group director, holding the rank of Captain. During the 1970s, she advised the

Volume 05, Issue 06 "November – December 2024"

ISSN 2583-0333

Department of Defense to replace large, centralized computer systems with networks of small distributed computers. Hopper retired multiple times, each time being recalled to service, continuing to work until the age of 85. She received numerous awards and honors (Neadle, 2016).

It is worth mentioning that the first computer program was also written by a woman in 1843. Ada Lovelace (1815- 1852), daughter of Lord Byron, was a brilliant mathematician who wrote a coded algorithm designed exclusively for application and processing by Charles Babbage's Analytical Engine, which was to be a mechanical computational machine. Unfortunately, Babbage died before completing the construction of her remarkable machine.

Rachel Carson (1907- 1964) was a writer and marine biologist. In 1962, she published a book titled "Silent Spring," where she expressed concerns about the impact of human activity on the environment. For example, due to the demand for food, DDT was used as an agricultural pesticide, resulting in its accumulation in food chains and the destruction of wildlife. DDT (dichlorodiphenyltrichloroethane) is a toxic insecticide developed for use during World War II to prevent the spread of insect-borne diseases. Eventually, DDT, along with other pesticides harmful to the environment, was banned. Carson's work led to the creation of the Environmental Protection Agency (a powerful regulatory authority) in the United States. She was posthumously awarded the Presidential Medal of Freedom.

Rosalind Franklin (1920- 1958) became famous mainly for "Photograph 51", an exceptional X-ray diffraction image of DNA, crucial for unlocking the secret of life itself. However, there were many more achievements in the life of this extraordinarily talented woman, whose life ended at just 37 years of age. Born into a wealthy Jewish family, Franklin stood out for her intelligence from a young age. At the University of Cambridge, she excelled in physics and chemistry. Her first research position was at the British Coal Utilization Research Association, where she studied the porous structure of various types of coal. Her work was commercially significant due to its industrial applications, and Franklin received international recognition in this field. The next and most crucial phase of her career was using X-ray crystallography to create images that revealed the structure of complex biological molecules. Franklin worked with biophysicist Maurice Wilkins at King's College London, aiming to determine the structure of DNA. Franklin developed a technique that provided high-quality images showing a helical structure for the DNA molecule. However, Franklin was not ready to draw premature conclusions and withdrew from the now-famous "Photograph 51" to focus on other work. "Photograph 51" was given to geneticist James Watson, who was also studying DNA in collaboration with biophysicist and neuroscientist Francis Crick. For Watson, "Photograph 51" was a revelation, recognizing that the characteristic "X" pattern clearly indicated a helical structure for DNA. Franklin was unaware that the photograph, a result of her research, had been shown to Watson. Watson, in collaboration with Crick, created a model of DNA based on the helical structure and published their discovery in Nature. The immense significance of this work is that the structure of DNA holds information in a chemical code for heredity and provides a mechanism for passing this hereditary information from generation to generation. Watson, Crick, and Wilkins were awarded the Nobel Prize in 1962, leaving Franklin out (Neadle, 2016).

Volume 05, Issue 06 "November – December 2024"

ISSN 2583-0333

The third phase of her career included research into the structure of the tobacco mosaic virus. Her achievements in any of her three main research fields could be considered a very successful lifetime's work. However, her death from ovarian cancer came too early for Franklin at just 37 years old. Nonetheless, she continued her work almost to the end and did everything possible to hide her illness from her colleagues. Franklin earned the respect and immense admiration of the students who worked under her guidance. In her honor, a new world-class laboratory at the University of Wolverhampton was named after her, recognizing her immense contribution to science (Maddox, 2013).

Jocelyn Bell Burnell (1943-) is an Irish astrophysicist who, along with her supervisor Antony Hewish, named LGM-1 (Little Green Men-1) the radio signal pulses from a fixed point in the sky that she discovered while completing her Ph.D. Burnell's observations in 1967 revealed the radiative beaming of a rotating neutron star, with each pulse representing a unique rotation of the star. In 1968, these stars, which are extremely dense and believed to be primarily composed of neutrons, were called "pulsars." Hewish was awarded the Nobel Prize in 1974 for his work without sharing it with Burnell, an omission that caused reactions, even anger in some circles. However, Burnell claimed that in this case, it would not be appropriate for her, as a research student, to share the Nobel Prize because her supervisor was the driving force. Burnell received significant recognition throughout her career, becoming President of the Royal Astronomical Society (2002- 2004), President of the Institute of Physics (2008- 2010), and President of the Royal Society of Edinburgh in 2014 (Neadle, 2016).

3.0 CHALLENGES AND OBSTACLES- UNDERREPRESENTATION AND DISCRIMINATION

Women in science often face barriers such as lack of access to resources, discrimination in hiring and promotion, and workplace biases. Studies have shown that women researchers receive less funding for their research and have fewer opportunities for publications and collaborations. Although the face of science is changing, barriers still exist that discourage women from pursuing careers in science. There is not only a lack of women in leadership positions, but many successful women in science are not equally recognized for their contributions. Research by Latu, Mast, Lammers, & Bombar (2013) showed that the underrepresentation of women in science creates a lack of role models to attract new women to scientific careers. Women contribute significantly to pioneering many scientific advances; however, their role in advancing science is not equally represented in courses and corresponding textbooks.

The progress of women's education in Europe and North America represents a significant chapter in the history of gender equality. By the mid-19th century, the barriers preventing women from pursuing higher education began to weaken. This shift was marked by the establishment of the first women's colleges, which offered women not only access to education but also employment opportunities. However, these opportunities came with significant compromises. For example, academic positions often required women to remain unmarried, thus depriving them of the right to start a family, a condition that persisted in some areas until the 20th century, during both World Wars (Barnett & Sabattini, 2009).

Employment opportunities for women in academia were further restricted by the requirement of many colleges for staff to hold a doctoral degree, a difficult prerequisite given that most

universities in Europe and North America initially prohibited the admission of women to graduate programs. In the 1890s, only a small number of institutions allowed women to enroll in advanced study programs, and broader acceptance developed slowly.

It was not until the second half of the 20th century that substantial changes occurred. Women began to gain numerically greater access to postgraduate education, thus possessing the necessary qualifications to equally claim a position and join the faculty. Notably, some traditionally all-male colleges responded to the growing demand from women for higher education by creating all-female institutions that coexisted with the "main" departments in the colleges.

For example, Harvard, although initially an all-male institution, saw an explosion in the number of female students attending public lectures in 1870. The new conditions created resistance from the traditional cores of the institution to the inclusion of women in the newly established Graduate Department in 1872, a problem Harvard solved by simply opening a sister institution called "The Society for the Collegiate Instruction of Women" in 1879, which later became Radcliffe College. This separation allowed female students to be taught by Harvard professors willing to earn extra income by teaching their courses twice, once for men and once for women. It was only in 1963 that Radcliffe Graduate School merged with Harvard Graduate School (Horowitz, 1986).

Additionally, Princeton became coeducational in 1969. An early attempt to establish a parallel institution for women, Evelyn College for Women, closed in 1897, ten years after its founding, due to financial problems and lack of support from Princeton (Selden, 2000).

Apart from the lack of access to higher education, women's scientific achievements have traditionally been undervalued. Historically, women were forced to settle for secondary roles in the production and authorship of scientific articles. They often took on roles as translators, illustrators, and transmitters of science, connected to distinguished male scientists through family or kinship relations (Orr, 2014). As a result, women were often presented as "volunteer" faculty members, with their significant discoveries frequently attributed to male colleagues. Esther Lederberg (1922- 2006), a microbiologist, conducted pioneering research in genetics, mainly on bacteriophages. She discovered the lambda phage, a virus that infects E. coli bacteria, and published the first report on it in the Microbial Genetics Bulletin (Lederberg, 1950). Her work helped her husband, Joshua Lederberg, win the Nobel Prize in 1958, which he shared with Edward Tatum and George Beadle (Harvey, 2012). Similarly, Rosalind Franklin (1920- 1958), a pioneering X-ray crystallographer, developed images of DNA molecules that were crucial for deciphering its structure, one of the greatest and most significant scientific leaps of the 20th century. The recognition of her contribution to the discovery of the DNA structure remained limited during her lifetime (Jones & Hawkins, 2014; Orr, 2014).

The recognition of women's achievements through their participation in Academies of Sciences was also limited. Indeed, three of the main scientific societies, the Royal Society of London (founded in 1660), the Parisian Académie royale des Sciences (founded in 1666), and the Berlin Academy of Sciences (founded in 1700), did not allow women to become members for nearly 300 years from their establishment (Schiebinger, 1993). Marie Curie, perhaps the most well-known woman scientist in modern human history, who won two Nobel Prizes, was rejected for entry into the prestigious Académie royale des Sciences in 1911, the year she won her second

Volume 05, Issue 06 "November – December 2024"

ISSN 2583-0333

Nobel! Indeed, Yvonne Choquet-Bruhat was the first woman elected as a member of the Paris Institute for Theoretical Physics (Institut des Hautes Études Scientifiques) in 1979 (Schiebinger, 1993). Mathematician Hertha Ayrton (1854- 1923) became the first woman nominated as a member of the Royal Society of London in 1902 but was denied this honor on the grounds that she was married (Fara, 2015). It took nearly four decades for the next women to be nominated. Finally, in 1945, Kathleen Lonsdale (1903- 1971), a pioneer in X-ray crystallography, along with microbiologist Marjory Stephenson (1885- 1948), became the first women elected as members of the Royal Society in London, holding the status of fellows (Glazer, 2015). The German Academy of Sciences in Berlin took even longer to open its doors to women. Elisabeth Welskopf-Henrich was the first woman elected as a regular member of the Academy of Sciences in Germany in 1964. She was a professor of history and had participated in the resistance against Nazism during World War II (Wobbe, 2002).

Striking examples of these discriminations are all the aforementioned women scientists. Mary Anning, one of the first and most important paleontologists in history, faced discrimination due to her gender. She was not allowed to become a member of the Geological Society of London because she was a woman and often did not receive the recognition she deserved for her discoveries and contributions to paleontology. Despite this, Mary Anning is now recognized as one of the most important figures in paleontology, contributing to our understanding of prehistoric life on Earth.

Marie Curie, despite being head of the Radiological Service for the International Red Cross, faced constant opposition from male scientists in France and received few financial benefits from her work (Des Jardins, 2010). Although Rosalind Franklin discovered "Photograph 51", which was given to Watson, he and his collaborators were awarded the Nobel Prize, while Franklin was not included in the honor (Maddox, 2013). The same happened to Jocelyn Bell Burnell, where for her discovery of LGM-1 (Little Green Men-1) radio pulses from a fixed point in the sky, her supervisor Hewish was awarded the Nobel Prize in 1974 for his work without sharing it with Burnell, an omission that caused reactions, even anger in some circles (Neadle, 2016).

Despite the progress made towards gender equality in academia and science today, inequalities still exist, as shown by statistics on membership in top institutions and the distribution of awards, such as the Nobel Prize. For example, the National Academy of Sciences (NAS) of the United States, founded in 1863, still exhibits a significant gender numerical imbalance. Of the 2,113 active and emeritus members, only 219 are women. This ratio remains unchanged even when considering foreign associates, where out of 2,508 total members, only 251 are women. These figures indicate a significant lack of representation of women, which does not reflect the full potential of distinguished women who have earned a doctoral degree (Wellenreuther & Otto, 2015).

Furthermore, this gender inequality is even more evident when examining the distribution of Nobel Prizes across various scientific categories. From 1901 to 2014, only 3% of Nobel laureates in Medicine, Physics, or Chemistry were women. The inadequate representation in one of the world's top honors in intellectual achievement highlights the ongoing challenges women face to be recognized and achieve equality in the field of science (Wellenreuther & Otto, 2015).

Even today, in most scientific fields, such as medical and technological research, men make up more than half of the workforce, especially at higher levels. The gender gap is smaller today than in the past, and there is a sense that balance between male and female researchers will soon be achieved. Current initiatives to promote women's participation in scientific research seem to be working adequately, although not sufficiently. In the study by Holman, Stuart-Fox, & Hauser (2018), which examined the number of male and female authors referenced in over 10 million academic articles published since 2002 to evaluate the gender gap among researchers and its rate of change for various fields of science and medicine, the following conclusions were reached: (a) many research specialties (e.g., surgery, computer science, physics, and mathematics) will not reach gender parity this century, given current rates of increase in the number of female authors; (b) the gender gap varies significantly by country, with Japan, Germany, and Switzerland having remarkably few female authors; (c) the assignment of authorship to women is reduced, consistent with gender bias by journal editors (Wellenreuther & Otto, 2015).

4.0 CRITICAL VIEW -CONCLUSIONS

Highlighting the contributions of women in the realm of science and research is of pivotal importance, as it is inextricably linked to establishing an equitable society and fostering scientific creativity. Women's perspectives and experiences not only enrich the diversity of scientific methodologies, but also open new horizons that enhance innovation, leading to solutions that reflect a more comprehensive and multidimensional understanding of the world. Their participation broadens the scope of inquiry, prompting consideration of issues previously overlooked, and helps reshape the scientific community by promoting values of justice and equal opportunity. The active presence of women in research and academic settings is not limited to generating new knowledge; it also brings about broader social change by challenging the existing structures that perpetuate discrimination.

Michel Foucault's (1980) sociological perspective on the relationship between power and knowledge provides valuable tools for understanding the invisible yet potent social structures that shape women's access to science. Women often find themselves confined by gendered norms and roles that are imposed upon them, limiting their opportunities and reflecting deeper systemic inequalities. Recognizing this reality urges us to dismantle traditional gendered frameworks, as suggested by Jacques Derrida (2020), thereby paving the way for a more profound reevaluation of women's identities and experiences within the scientific domain.

Pierre Bourdieu (2021) highlights the importance of social relations and "capital" in shaping scientific careers. More specifically, "capital" refers to various types of resources- such as social, cultural, and economic capital- that influence individuals' opportunities and access to critical resources within the scientific community. Women often lack access to the same networks and opportunities as their male colleagues, posing barriers to their professional advancement and limiting their prospects for promotion. These inequalities do not pertain solely to isolated instances, but rather shape the overall structure of the scientific community, perpetuating systemic disparities that call for a coordinated and systematic approach to intervention.

Establishing support networks, such as mentoring programs and scholarships, represents an important step toward improving women's participation in science. Promoting women to

Volume 05, Issue 06 "November – December 2024"

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leadership roles provides positive role models and enhances their involvement in decisions shaping the future of science. However, the path toward full equality remains slow and challenging. The difficulties of achieving work-life balance and the persistence of stereotypes in professional communities continue to pose obstacles to a more equitable distribution of opportunities.

In this context, the institutionalization of policies that promote equality is essential. Implementing quotas, ensuring equal pay for equal work, and providing parental leave are fundamental measures that can facilitate the advancement of women in scientific and research fields. These initiatives promote not only social justice but also scientific excellence, as diversity in perspectives and approaches fosters innovation.

The ultimate challenge lies in the ongoing dismantling of stereotypes and structures that hinder the equal participation of women in the scientific field. As Foucault (1980) argues, the educational community can play a pivotal role in driving this change. By fostering the teaching of values such as equality and justice, education can serve as a catalyst for cultivating a fairer and more inclusive world.

The future of science depends not only on technological advancements but also on the integration of values such as justice and equality, with the active participation of all members of society. Women are not merely "participants" but agents of change, bringing new perspectives and shaping a scientific landscape that reflects the multidimensional nature of our societies. The journey toward equality may be long, but the steps taken today lay the foundation for a fairer and more innovative scientific world.

The increased participation of women in the scientific field is a multidimensional issue that impacts scientific progress, social values, and the very concept of justice. Moving away from prejudices and social constraints that reinforce gender discrimination is not only a moral obligation but also a prerequisite for fostering a more dynamic and inclusive science. As Foucault (1980) emphasizes, education and the production of knowledge are intrinsically linked to power, making it imperative to overturn traditional gendered relations at every level of the scientific process.

The vision for the future of science necessitates the integration of technological advancements with values such as justice and equality, highlighting the importance of active participation from all members of society. Women are not merely participants but transformative forces, bringing fresh perspectives and contributing to the creation of a scientific field that reflects the complexity of our societies. Despite challenges, today's initiatives are laying the groundwork for a fairer and more innovative scientific world. The shift toward a more inclusive approach requires a critical reevaluation of established values and systems of knowledge classification, enabling a holistic understanding of the human experience. Within this framework, the equal participation of women is not only a matter of justice but also a necessary condition for shaping a creative, innovative, and equitable scientific future.

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