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Research report

Forum: United Nations Educational, Scientific and Cultural Organization (UNESCO)

Issue: Discussing the barriers faced by minorities in STEM fields and advocating for equality in scientific research

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Introduction

Science has diverse issues. Many minorities such as but limited to; people of colour, women, those from lower socio-economic backgrounds etc, are all under-represented in the scientific workforce – and in STEM innovations. It is important that boosting diversity in all its forms allows different perspectives, backgrounds and experiences to tackle issues and help with problem-solving. Furthermore, there is a positive correlation between socioeconomic status, race and ethnicity, and academic performance has been linked to socioeconomic conditions. Students that are female and/ or people of colour, and students with disabilities, also participate at lower rates than their white male peers.

Such barriers to participation in STEM education includes socioeconomic, self-perception, physical, institutional, and societal constructs, all of which significantly impact underrepresented communities. In addition, the geographical location of schools indirectly impacts a student's access to STEM resources. Due to rural schools typically receive less funding than their urban or suburban counterparts.

Due to this issue, UNESCO has been giving special attention to this issue through research, policy and capacity-building work and as part of its efforts to promote the empowerment of girls and women, minorities and etc through education (“Girls’ and Women’s Education in Science, Technology, Engineering and Mathematics (STEM)”).



Figure 1: Three girls in Nairobi, Kenya in their Science Lab (STEM).

Thus, it is important to keep in mind that STEM fields play a crucial role in developing society as they drive innovation, technological advancement, and importantly economic growth. Moreover, STEM skills are increasingly in demand in the modern workforce, with many high-paying jobs and opportunities for career advancement available in STEM-related industries, as these jobs are not easily replaceable by AI nor bots.

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Definition of Key Terms

STEM

An abbreviation of Science, Technology, Engineering and Mathematics. UNESCO is constantly focused on this section of education as it does not only impart knowledge but also nurture critical thinking, enhance scientific literacy and cultivate the next generation of problem solvers.

Under-Represented Minorities (URM)

Minorities are an ethnic, religious or linguistic minority is any group of people which make up less than half of the population of an entire territory of a state where the population share characteristics of culture, religion and/or language. When they are underrepresented in group, in such case, STEM fields, then they are referred so. For example, African Americans and Hispanic groups within the United States.

Equality

At the state of being equal, whether in status, rights or opportunities. Equality is the means for all individuals and groups of people to have access to the same resources regardless in what circumstances they sit in.

Restitution

The restoration of something stolen or seized to its rightful owner, in this context most used to describe the stolen historical artifacts during wars and colonization.

Soft laws

Set of agreements and declarations that are not legally binding and serve more as a guideline and recommendation, which often remain vague in imposing their laws due to the sensitivity and fragility of international relations.

General overview

Scientific knowledge has rapidly grown and developed since the 19th century as there were new and radical developments in the physical, life and human sciences, etc. This led to many advancements in much of the 20th century. However, minorities and women faced significant underrepresentation in STEM fields due to systemic obstacles such as segregation, discrimination, and unequal access to resources. Especially in America, due to the Jim Crow laws that enforced or legalized racial segregation. These laws lasted for almost 100 years, from the post-Civil War era until around 1968, and their main purpose was to legalize the marginalization of African Americans. Examples like these barriers limited educational and

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professional opportunities in science and engineering for these groups. Despite the progress made through civil rights movements and gender equality initiatives, minority participation in STEM remains hindered by historical events.

The underrepresentation of minorities in STEM is propelled by several related factors (although they are not limited to).

- **Financial barriers** are arguably the biggest and most significant issue, as students from low-income families often lack access to STEM resources and high-quality education, leading to disparities in academic achievements.
- **Societal and personal identity** constructs also play a role, with stereotypes, biases and prejudice often negatively impacting minority students' self-confidence and aspirations in STEM fields and ability to perform to their best.
- **Institutional issues** further increase the problem, as educational institutions and workplaces may have policies or cultures that indirectly place disadvantages upon minority students and employees.
- **Geographical disparities** add another layer of complexity, as rural schools typically receive less funding, resulting in fewer resources for STEM education and fewer opportunities for students.

These barriers contribute to lower participation and success rates in STEM education and careers among minority groups.

Recent data illustrates the hurdles and gradual changes towards diversifying the STEM workforce. According to the National Centre for Science and Engineering Statistics (2023) study, educational attainment among minorities remains an issue. In 2021, Blacks, Hispanics, and American Indians or Alaska Natives accounted for 37% of the US population aged 18 to 34. Workforce representation also reveals inequities, with white workers still making up the bulk of the STEM workforce, followed by Asian, Hispanic, and Black workers. Minorities have little representation in studies and other higher-level occupations.

Consequently, UNESCO has been actively working to reduce disparities in STEM through various initiatives aimed at encouraging the participation of underrepresented groups. Most notable efforts being the Girls' and Women's Education in STEM initiative, which aims to open doors for minority employment opportunities in STEM fields. UNESCO's research and advocacy efforts, such as the reports "Cracking the Code: Girls' and Women's Education in STEM" and the recognition of the International Day of Women and Girls in Science, highlight factors

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influencing minority participation in STEM and provide recommendations for improving diversity and inclusion.

To discuss anew, STEM fields are crucial for addressing global issues like climate change, public health, and sustainable development. Diverse perspectives contribute to more comprehensive problem-solving. A diverse STEM workforce is essential for fostering innovation and driving economic growth. Ensuring equal access to STEM opportunities for minorities is vital for building an inclusive and sustainable economy. The modern workforce has an increasing demand for STEM skills, with numerous high-paying jobs and opportunities for career advancement in STEM-related industries.

Major Parties Involved

NASA

NASA has started numerous programs, projects, internship opportunities, activities, and products that connect students to NASA's mission, work, and people. A major example of this is their 'The Minority University Research and Education Project' also known as (MUREP) which engages URM through a range of initiatives. Grants for multiple years are awards as a part of the project to assist Minority Institution faculty and students in research (Bowman).

Girls Who Code

Founded in 2012, this organisation has built the largest community of both women and non-binary scientists in the world. As of 2022, they had contributed to the education of 580,000 students, 185,000 of which were college aged alumni. Over 50% of their students are made up of URMs of STEM fields of a low-income household (Barrett).

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Google

Google has started many internal STEM programs for the purpose of helping both students and educators develop technical skills such as but not limited to coding. They have helped through a \$100,000 grant to rural areas within the United States and further supported the schools in Los Angeles through investments that grant every student the same opportunity as the other to succeed in STEM fields such as computer science (Chaturvedi; Husain).

Organization for Economic Cooperation and Development (OECD)

The Organization for Economic Cooperation and Development (OECD) consists of 39 member states which has led to international co-operation to accelerate progress towards science, technology and innovation. This is the organisation which has provided insight and analytics for the development of STEM education for their respective member states and more (“Science, Technology and Innovation”). The organisation itself has the development of education in science and technology education for underrepresented minorities for as long as decades and played a leading and central role in global policy development (“Directorate for Science, Technology and Innovation”).

Timeline of Key Events

On 22 December 2015, the General Assembly decided to establish an annual International Day to recognize the critical role women and girls play in science and technology, through Resolution A/RES/70/212 (“International Day of Women and Girls in Science”).

In 2017, UNESCO published *Cracking the Code: girls’ and women’s education in science, technology, engineering and mathematics*. Its aim was to decipher the factors that hinder or facilitate girls’ and women’s participation, achievement and continuation in STEM education (STEM).

Year	Event
1954	Brown v. Board of Education: The U.S. Supreme Court ruled that racial segregation in public schools was unconstitutional, overturning Plessy v. Ferguson.
1964	The Civil Rights Act was enacted, outlawing discrimination based on race, color, religion, sex, or national origin, promoting equal opportunities in education and employment for minorities.

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1976	The National Action Council for Minorities in Engineering (NACME) was founded to provide scholarships and support for underrepresented minorities in engineering fields.
1980	Organizations like the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) were established to encourage minority participation in the sciences.
1996	Hopwood v. Texas prompted new strategies to support minority students in STEM without explicit racial preferences.
2000	The National Institutes of Health (NIH) boosted programs to increase diversity in biomedical and behavioral research areas.
2007	The America COMPETES Act was legislated to increase the budget for STEM education and research, with specific conditions to support underrepresented groups.
2011	The NSF ADVANCE Program focused on advancing the participation of women in academic science and engineering careers.
2013	The Obama Administration launched STEM initiatives like "Educate to Innovate" to enhance STEM education for all, including underrepresented minorities.
2020	The NSF INCLUDES National Network was developed to expand diversity in STEM by engaging more associations and institutions.
2021	An Executive Order on Advancing Racial Equity was issued by President Biden to promote racial equity and support underserved communities, including in STEM education and research.
2022	The CHIPS and Science Act incorporated investments in STEM education and workforce expansion, emphasizing support for underrepresented groups.

Previous attempts to solve the issue

YOU Belong in STEM

- An initiative taken by the Biden-Harris administration in 2022, the 'YOU belong in STEM' conference welcomes more than 200 STEM stakeholders from 30 states. This was initiated due to the low percentage of women showing an interest towards STEM fields

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due to a lack of support (“YOU Belong in STEM | Harvard Graduate School of Education”).

Helping Classes

- This is one of the major solutions in action to solve the issue of helping students in need to grasp subjects such as mathematics and physics. However, many institutions are not aware that the students may have more needs such as special support from their teacher to help them understand the difficult topics. This stops such students from pursuing STEM fields as they no longer associate themselves as a person capable of STEM (“YOU Belong in STEM | Harvard Graduate School of Education”).

Possible solutions

Improve higher education and workforce alignment

- When higher education and the workforce are aligned, the result is a beneficial for everyone involved: better-trained workers secure higher-paying jobs, employers find more qualified candidates, and the state fosters a strong, inclusive, and sustainable economy driven by a skilled, diverse workforce .

Use statewide longitudinal data to evaluate strengths and weaknesses in the STEM education-to-employment pipeline

- A comprehensive data system is essential for understanding students' experiences throughout their education journey and into their careers. Transparency in public education is critical for making informed decisions and can highlight areas where STEM education and stronger employer connections can better serve underrepresented students. This can be done by displaying graduation rates by categorizing them into student ethnicity, gender, socioeconomic status and etc (Estrada et al.).

To initiate creativity among the younger generations

- URM students often find themselves be creative when the topic at hand is close to their comfort zone. Their skills in STEM can be enhanced by linking it to their personal and cultural values. This will also be a leading figure to community-based learning and how classroom content relates to prosocial communal outcomes.

Further reading:

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