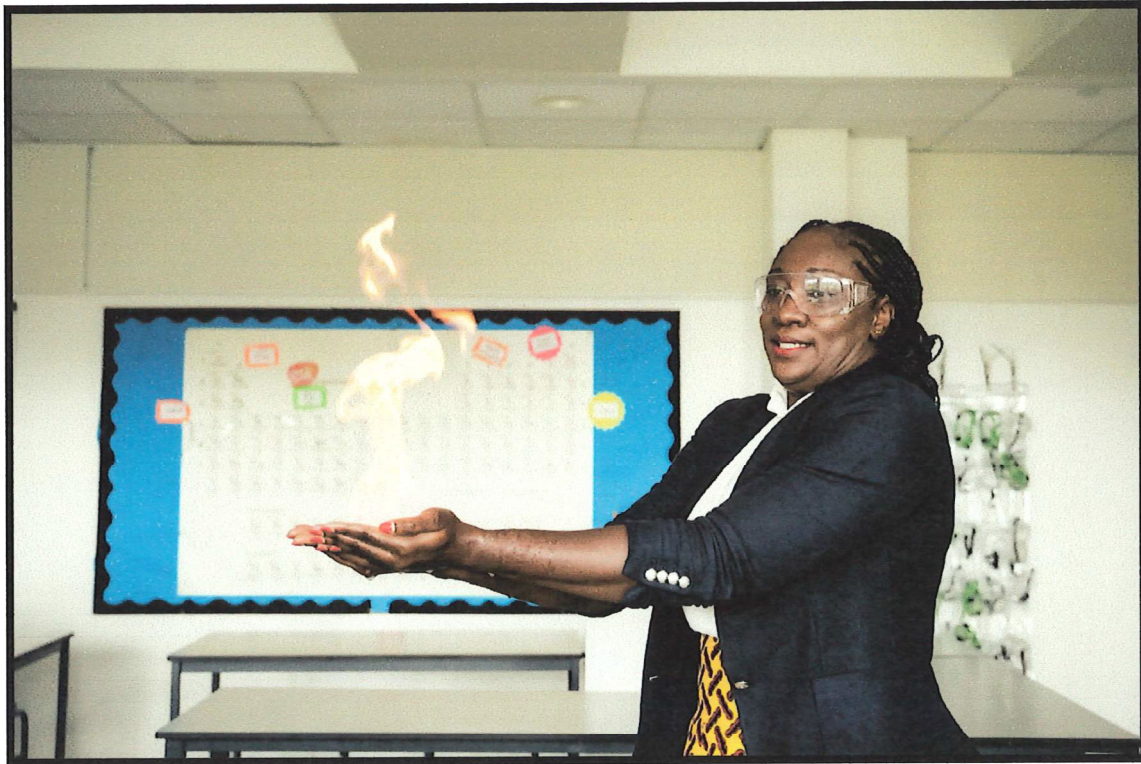


How far are black people encouraged to work in STEM,
is enough being done to encourage their participation in
this field of employment?



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Introduction

In this project I intend to outline the disparity in attainment of underrepresented racial minorities in Science, Engineering, Technology and Mathematics (STEM), and the potential causes of said disparity. I will also investigate any possible ways by which the gap can be bridged and reduced.

Lee M. J. et.al (2020) claim in their research on racial microaggressions in STEM that, although there has been a nationwide call for more diversity in the STEM fields in the United States of America (USA) for the past two decades, the results of these efforts have been slow and, in some cases, insignificant¹. They go on to say that recruitment and retention in STEM remain pervasive in education. This point is interesting, I believe there should be no difference between under-represented minorities and others. Factors that may cause this and whether the same is true in the United Kingdom (UK) will be investigated within this project.

I have chosen to write about this topic because I am a young black person with a keen interest in STEM. I want to understand any challenges I may need to overcome in the future and how to access the resources I may need. To elaborate further on my project question, my goal is to identify trends and patterns in the results of minorities at different levels of education and explain the factors that determine them. This project is very important to me personally; I have always believed that all people should have equal opportunities to progress irrespective of their background, one should always be able to prove themselves capable without bias. I am perplexed by the perceived size of the gap in attainment between the groups mentioned not only in the UK but globally too. I intend to find out if there is a correlation between these two factors, and if it is as large as perceived. In addition I will investigate the reasons why it may exist and if it is strong. In the event of a strong correlation I plan to tackle the problem of what should be done to rectify it.

For reasons

Research

To facilitate the completion of this project I have found various sources through various means. Overall I have found that most of my sources to be reliable and in this section I will describe why I think this as well as describing why I have chosen to use these sources. The first source to be mentioned in this section is a research briefing by Hubble S. (Susan Hubble) Bolton P. (Paul Bolton) and Lewis J. (Joe Lewis) (2021)² who have all written works pertaining to government policy, work and incomes in addition to education. During the introduction to the report it is stated that the following questions will be answered: How likely are different groups of young people to go to higher education? When they get there how likely are they to continue to the end of their course and get 'top' grades? How do earnings and employment vary between these groups? All of these questions aid in the answering in of my project questions they directly provide me with relevant data pertinent to black

¹ Lee, M.J., Collins, J.D., Harwood, S.A. et al. "If you aren't White, Asian or Indian, you aren't an engineer": racial microaggressions in STEM education. *IJ STEM Ed* 7, 48 (2020).

² Hubbard S. et al Equality of access and outcomes in higher education in England UK parliament house of commons library (2021)

people's relative performance within STEM this source also later mentions potential government policies to address any disparity in results between black people (as well as other underrepresented minorities) and others which is also very helpful for my project. Some of the reasons I find this source to be reliable are: It was written recently (2021) meaning that its data is up to date, It has multiple authors that have written reports previously meaning that they are likely to be credible and finally this source was published on the UK parliament's house of commons library meaning that the data is corroborated by the government.

A02
relevance
credibility

Another source that I have found to be useful is an article on the website lifescied.org Improving Underrepresented Minority Student Persistence in STEM³. While this source primarily pertains to the U.S.A I believe this to still be useful to answering my project question as potential underrepresentation of minorities is a global issue and the U.S.A and U.K have many similarities in society structure and governmental systems. This source is highly detailed as it not only describes patterns and trends within the data they collected but also suggests potential remedies for said patterns. Within this sources black people are collected within group they call underrepresented minorities (URMs) which includes: African American, Hispanic or Latino/Latina, American Indian, and Alaska Natives. The source then goes on to purport how a three-step model can be applied to diversifying STEM (Lewin, 1946, 1947) in the quote "To be stable ... change must, in short, be a change in the 'cultural atmosphere,' not merely a change of a single item" and I interpret this to mean that to insight change society must adapt as well as the system; I have found both this statement and the concept it outlines to be particularly useful to answering my project question. Overall I find this source to be reliable as: It contains several references to other articles stretching back to the 1940's and as recent as the 2010's, the sources was written by a multitude of authors (16 are named in the article) and the original form of this article was published in a quarterly publication with numerous volumes which contains a multitude of other articles covering a variety of topics such as: broadening participation in life sciences, increasing the diversity of the biomedical research workforce and funding opportunities in food, agricultural, natural resources and social sciences education . I find the combination of these factors to sufficiently prove the publication and further the source within it to be credible.

A02
relevance

A02
credibility

The final source I will be covering in this section is an article from the website PNAS (the proceedings of the national academy of sciences)⁴. This source first outlines the experience of a black student attempting to pursue STEM and the struggles they faced as well the reasons they ultimately left the STEM field. I find this approach to compiling data to be extremely effective as it makes it very clear as to what caused this student to leave the STEM field, how they felt about the services they were provided and what they feel can be done differently. I think this is important because in my experience those most knowledgeable about what needs to be changed are those that would have benefited therefore making the experiences of black pupils known is an excellent method of inspiring change. The source then proceeds to elaborate on some of the causes of a potential attainment gap through the quote from Shirley Malcom, director of STEM Equity Achievement Change "These

A02
relevance

³ Estrada M. *et al* Improving Underrepresented Minority Student Persistence in STEM CBE-Life Sciences Education, vol. 15, No. 3 (2016)

⁴ Suran M. Keeping Black students in STEM PNAS Vol. 118 | No. 23 (2021)

differential opportunities limit students from honing their skills and demonstrating their strengths" adds Malcom. Too often, she says, "the focus is on fixing the student rather than fixing the system." In this quote Malcom proposes that the reason black students tend to have lower attainment in comparison to their white peers is that opportunities to hone one's skills are not equal for all ethnicities. Overall I find this source to be reliable as: The journal it is published in has a very exclusive acceptance rate for articles (19%), the source is detailed and contains many quotes from those in relevant positions and lastly the source is very modern being published in 2021 ensuring the relevance of information.

AO2
credibility

Discussion

In this section of my project I will be discussing some of the answers I have found for my project question in the research literature. Some ideas support my viewpoint and highlight the issue I am investigating as a problem, whereas others focus on the actions taken to mitigate it.

The opposing argument

I start with the opposing argument which supports the idea that existing policies have made access to STEM accessible to all groups of people.

AO3 L2
evaluation
consider
opposing view

The equality Act 2010

It can be argued that due to extensive government investment into providing a so called level playing field within education and policy changes within schools themselves, it appears as if the education system is sufficiently reformed and black people are sufficiently encouraged to pursue STEM. While I disagree with this point it is still useful to weigh my argument against an opposing one. This viewpoint is supported by the existence of The Equality Act 2010 and schools - a policy detailing ways in which schools are not allowed to discriminate against groups of pupils. The equality act 2010 is a combination of 9 previous government policies, this was done to make the rules that schools have to follow with regards to equality as clear as possible. The existence of this document suggests that schools already adhere to rules on promoting equality. This document supports the argument mentioned previously because it makes it far easier to present an argument pertaining to discrimination within schools as it makes the relevant laws far clearer and therefore making a court case against a school based on discrimination becomes more of a realistic pathway to oppose said discrimination; it also makes it harder for a school to defend any unlawful discrimination they may commit as the law is very clear and accessible. The threat of legal action and/or public action theoretically makes discrimination within schools far less of an issue and therefore makes the suggestion of allocating more resources and money to reforming education potentially redundant.

AO3 clear
organisation
logical
order

Action within schools

It is also apparent that schools in themselves do a lot to help reduce discrimination. For example the school that I attend (Samuel Whitbread Academy) has several provisions for students that feel that they may be being discriminated against. This is done through a

number of channels lead by both staff and students. I myself am a member of a student lead diversity team and I find the work we do to be gratifying, important and effective. In my current school, the ones I have attended previously and schools I have visited, a common theme is noticeable; creating a unified identity and a level-playing field. Additionally, OFSTED requires schools to provide opportunities equally for all pupils with protected characteristics before they credit the school with their coveted higher ratings of outstanding and good. This is another measure to encourage schools to be as equal as possible. The prevalence of this theme is evidence that schools in general do aim to promote equality without interference. This can be interpreted to mean that schools are sufficient when it comes to providing equal opportunities to all students and therefore black students are encouraged enough to pursue all subjects including STEM.

Meyerhoff Scholars program

From my research I have also learned about a potential method of education that could aid black students who would like to pursue STEM. The origin of this method is UMBC's (University of Maryland, Baltimore County) Meyerhoff scholars program. The Meyerhoff scholars program aims to recruit and support promising black students both educationally and financially through scholarships and recruitment programs in addition to providing a more personalised experience for its students. This method has proven to be more effective than others at improving diversity within STEM. This may be because Meyerhoff scholars respond better to the educators that share their ethnicity or because they feel that they are being supported better by the personal experience the program provides. In any case, the Meyerhoff scholars program has created amazing results as its scholars are 4.8 times more likely to complete a STEM PhD than comparable sample students⁵. These results are extremely promising and reassures me that the STEM field can diversify. In addition to this the success of the Meyerhoff scholars program has caused other universities to consider adopting a similar model. In 2014 the Meyerhoff Adaptation Project began which worked to learn about how the Meyerhoff model could be applied at the Pennsylvania State University and the University of North Carolina (UNC) the results from this study proved conclusively that the Meyerhoff model can be applied effectively elsewhere and while there may be challenges, I believe that this model can help to diversify STEM.

My argument

From my research I have found that black people are not sufficiently encouraged to pursue STEM due to many, many reasons, the sheer multitude of which I find shocking.

House of Commons library data

A source that supports my findings is the previously mentioned article from the House of Commons library within this source is data that provides insight into the patterns in

⁵ Maton I. K. et. al. Outcomes and Processes in the Meyerhoff Scholars Program: STEM PhD Completion, Sense of Community, Perceived Program Benefit, Science Identity, and Research Self-Efficacy CBE—Life Sciences Education Vol. 15, No. 3 (2016)

attainment between groups with protected characteristics. From this source I have learned that black students have the poorest retention rates among ethnic groups in higher education despite boasting the highest entry rates. This means that even though black students are among the most eager to enter higher education they are most likely to leave without a degree; this discrepancy is unlikely to be anomalous as it is corroborated by several other sources. In addition to this, the source also details some reasons why equality in higher education has not been achieved namely: financial concerns, insufficient advice and the prevalence of harassment; these reasons are correlated with others in other sources which gives them greater significance.

Data on STEM degree distribution

To further support my point I have found an article from Life Sciences Education journal that contains data relating the distribution of STEM degrees amongst ethnic groups. From this source I found that under-represented minorities attain significantly less STEM degrees (an approximate average of 11.9%) than they should proportionally, compared to their percentage of the population in the U.S during 2010 (29.3%). As well as this, the source also includes a list of recommendations for improving diversity within STEM these being: increase institutional accountability, create strategic partnerships with programs that create lift, unleash the power of the curriculum, address student resource disparities and fire the creative juices. I believe that without accomplishing these goals the STEM field will sadly remain as it stands.

Personal experience of a black student

Another source that supports my argument is an article from PNAS which includes the personal experience of an eager black student that STEM failed to retain, and information on a model of education that could help to rectify the issue. From the personal experience detailed by this source, I have learned that a major reason black people don't remain in STEM is a lack of support from educators and a lack of role models within the system. This means that without intervention the problem will self-exacerbate as less black people chose to stay in STEM. Younger black people will have fewer and fewer examples to look up to and therefore be more likely to leave STEM themselves, completing the vicious cycle. Additionally this source includes data relating to retention rates of black students which I have found to be significantly lower (11% lower) than their white peers.

Testimony from a black teacher in STEM

Lastly to support my point I conducted a short interview with my mother who is a black woman who teaches science at a girls school in England. From this source I was able to learn that to an extent racial and gender stereotyping can be a barrier to entering STEM and it requires a degree of tenacity to overcome. Cultural differences between ethnicities can also have an impact on the perceived value of education, personal support can be critical in pursuing aspirations within STEM and education in general and without support battling barriers to entry becomes substantially more difficult. Lastly, that economic status can make a significant impact on whether or not someone pursues STEM due to the subjects generally high cost and course length post-16. From this I have come to understand that stereotyping and economic status are some of the primary reasons for black students not pursuing STEM

and that both of these problems are compounded when students are left under supported, which from my previous research I have found to be the case. Of course as this is a standalone testimony from a close relative it is, as always, wise to consider this as anecdotal; however I still find the personal nature of the source to be extremely compelling and useful for answering my project question.

A02
credibility

Review

Overall I have found that black students are not yet being encouraged enough to pursue STEM; however I believe that through the work of institutions such as the Meyerhoff scholars program and the positive action of governments not only in the UK and USA, but globally too, the opportunities to pursue STEM can become equally accessible for everyone. This is essential because despite the continued efforts of governments and educators alike, black students in STEM are still subject to poorer results in higher education, particularly in retention rates and I believe until this is no longer true STEM will remain undiverse.

A04
conclusion
with
reference
back to
aim &
evidence

In conclusion, completing this level 2 project qualification has been both challenging and rewarding in equal measure. I struggled at times to maintain my usual high levels of motivation and direction. It has sometimes been a source of stress particularly at the start when I could not find enough data to pursue my desire to carry out an investigation into integration in baseball. That said, I have learnt some positive things about myself too; I am good at learning new skills - how to write citations, how to write an inquiry question, how to research information and how to create and complete an action plan. I enjoyed the project most when I completed each section according to my timeplan. This project has helped me to realise that I am driven by deadlines and the associated stress which will likely prove to be useful as I develop as a learner.

A04
what
learned
some
sense
now
developed

Bibliography

Estrada M. *et al* Improving Underrepresented Minority Student Persistence in STEM
CBE-Life Sciences Education, vol. 15, No. 3 (2016)

<https://www.lifescied.org/doi/10.1187/cbe.16-01-0038>

Hubbard S. *et al* Equality of access and outcomes in higher education in England UK
parliament house of commons library (2021)

<https://commonslibrary.parliament.uk/research-briefings/cbp-9195/>

Lee, M.J., Collins, J.D., Harwood, S.A. *et al*. "If you aren't White, Asian or Indian, you aren't an engineer": racial microaggressions in STEM education. *IJ STEM Ed* 7, 48 (2020).

<https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-020-00241-4>

Maton I. K. *et. al*. Outcomes and Processes in the Meyerhoff Scholars Program: STEM PhD Completion, Sense of Community, Perceived Program Benefit, Science Identity, and Research Self-Efficacy **CBE—Life Sciences Education** Vol. 15, No. 3 (2016)

<https://pubmed.ncbi.nlm.nih.gov/27587857/>

Suran M. Keeping Black students in STEM PNAS Vol. 118 | No. 23 (2021)

<https://www.pnas.org/doi/10.1073/>

AB2
range resources