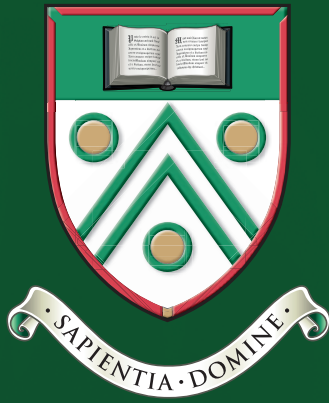


# Langley

## Grammar School

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SIXTH FORM  
Extended Project Qualification (EPQ)



## FOREWORD

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The Extended Project is the one qualification for which students can take all of the credit: it is entirely their own. It gives students the chance to explore their passions and become an expert in something that really interests them. Our students embarked on this journey in the autumn of Year 12. They followed their unique path and, at the end of the summer term, produced a cornucopia of projects.

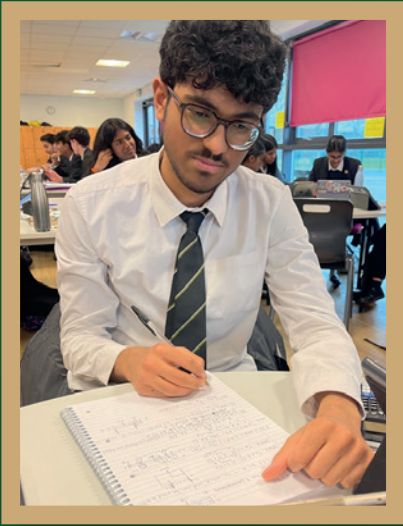
The journey was not always easy. The students needed to choose a question they could commit to, and then plan, research, implement and reflect upon their project. This required tenacity, decision making, problem solving, organisation, clear time management, the ability to work independently, and strong research and analytical skills. They kept a detailed log of their progress, recording their conversations with their supervisors and carefully noting any adjustments to their plan. At the end of the process, each student delivered a presentation on their project to a select audience. All of them rose to the challenge. The experience will be invaluable in the future. The study skills developed are an excellent preparation for life at university and future careers. This is why the EPQ is valued so highly by universities.

The students were the driving force behind the projects. Credit is also due to their supervisors who gave willingly of their time and provided invaluable advice, guidance and support through regular meetings with their EPQ students. On occasions, they would have to coax and cajole in order to keep them on track. They guided the students to an outstanding set of results. It was all worthwhile in the end.

The following summaries of the EPQ projects highlight the rich variety of topics. They show the level of engagement with deep questions and the integrity to see the project through to the end. The summaries are a celebration of the outstanding success and achievements of this year's EPQ students. They have completed a significant journey and, as all would agree, learnt so much along the way.

It has been a pleasure to be involved with such a talented group of young people. Their ability to overcome the challenge of studying four A Levels, as well as an EPQ, was especially pleasing.

**Kevin Langford**  
EPQ coordinator



# ACHINTHYA PRASHANTH

## To what extent has the global balance of power shifted from the West to the East?

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Throughout the majority of recent history, the Western world has been recognized as the primary centre of global influence, boasting robust economies, formidable military forces, and highly advanced societies equipped with cutting-edge technology and infrastructure. The West has wielded significant spheres of influence across the globe.

In contrast, many Eastern nations were often perceived as less developed, akin to third-world countries lagging far behind their Western counterparts. These regions predominantly relied on agrarian societies, while the West underwent industrial revolutions, ushering in factories, mass production, and other advancements.

However, over the past decades, some of these Eastern countries have undergone rapid transformations, propelling them to the forefront and directly challenging the dominance of the West. Transitioning from impoverished, primarily agricultural societies, these nations have evolved into some of the wealthiest globally, achieving technological prowess and comparable power to their Western counterparts and, sometimes, surpassing them.

The objective of this report is to analyse and determine whether the global balance of power has shifted from the West to the East. It will explore how the East has managed to acquire power, examining economic strength, quality of life, and the influence of the countries under discussion.



AMNEET  
JASWAL

## To what extent is the future of space exploration dependent on machine learning?

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Machine learning is a growing industry which has in recent years transformed various fields, from healthcare to finance, with the value of its potential impact on the future world being undeniable. Space exploration, in particular, has historically benefitted from all kinds of technological advances, with machine learning being no exception. The integration of machine learning technology into space exploration initiatives has already enabled significant progress in the industry, and this report aims to examine the extent to which the future of space exploration is dependent on machine learning.

The report begins by providing an overview of artificial intelligence and machine learning, along with its current uses in space exploration, including autonomous navigation, data analysis and self-maintenance. It then details some of the challenges faced in implementing machine learning systems into space exploration missions, including their reliability and cost, evaluating the degree to which these problems will limit their uses. The report also investigates the expert opinions of scientists in the field, before ultimately coming to a conclusion on how influential machine learning is likely to be through the coming decades and the ways in which it is expected to shape the future of space exploration.



DHRUV  
SHARMA

## To what extent are music therapy and education helpful in integrating people with Autism Spectrum Disorder into society?

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Autism Spectrum Disorder, more commonly known as autism or ASD, is a condition affecting the brain. Autism has a major impact on their social and communication skills, which affects their daily life, often leading to them being isolated in society. As a result, multiple fields are being explored as a means of aiding with this issue. One such area is the use of music intervention.

This project explored the extent to which music education and music therapy can help integrate young people with autism spectrum disorder into society. Firstly, it introduced what autism spectrum disorder is, and how experts have evolved their understanding of autism spectrum disorder. Then, through research, collection, and analysis of primary and secondary data, I investigated in detail the effect music therapy has had on two individuals who have been diagnosed with autism spectrum disorder – one is 21 years old, and one is 43 years old. Concurrently, I also explored published research and understand the science behind the currently perceived effect of music education and music therapy on those with autism spectrum disorder. I also looked at alternative options, such as play therapy and SALT, and the role of drugs and technology in providing treatments.

I concluded that music therapy has a significant effect on helping integrate people with autism spectrum disorder into society. There are many reasons for this – both neurological and social.



EMMA  
YOUNES  
HERNANDEZ

## The tortured artist: To what extent is this an accurate interpretation of the relationship between mental illness and creative expression?

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The tortured artist trope, deeply ingrained in literature and media, suggests that psychological suffering is necessary for great art. This concept traces back to ancient Greece, with Plato advocating that creativity is a divine madness, followed by Aristotle's theory that melancholy breeds creative genius. The Renaissance solidified this notion, through romantic poets who embodied suffering artists as tragically heroic figures. This perception persists today, potentially glamourising mental illness in the art world.

This project examines noteworthy studies by psychiatrists Nancy Andreasen, Arnold Ludwig, and psychologist Kay R. Jamison which have supported the idea that mental illness may fuel artistic brilliance. However, these studies face criticism for relying heavily on posthumous research, small sample sizes, limited diversity, and inconsistent definitions, raising doubts about their validity.

Recent studies have taken a different approach, exploring how art can positively impact mental health, particularly through the practise of art therapy. This contradicts the idea that mental anguish is a prerequisite for producing meaningful art. These studies suggest that while mild psychological symptoms may enhance creativity, severe symptoms can significantly hinder productivity and impede the creative process. These conclusions have led to experimental new theories about the potential relationship between mental illness and creativity, such as the idea that they have a U-shaped relationship. This report analyses the tortured artist trope in depth, through a variety of studies, and hopes to assess its validity, while also discussing what potential future research could focus on to further our understanding of the relationship between creativity and mental illness.



HASHIM  
SHEIKH

## To what extent are language learning techniques affected by psychological factors?

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The aim of this project is to investigate how people acquire and learn languages and to evaluate whether psychological factors help or hinder the speed of this acquisition. The written report will explore theories of second language acquisition (SLA) and their connection to and influence on language learning. Psychological factors such as motivation, cognition and emotion will be examined to understand how psychology affects each learner and makes their language learning journey different. By exploring the relationships between language learning techniques and psychological factors, this report will contribute to a deeper understanding of how language is acquired. It will provide valuable insights for language educators and learners to optimise their pupil's or their own studies and to create conducive language learning environments.

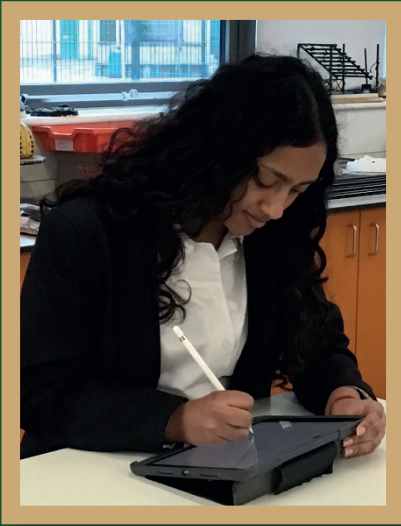


JERUSHA  
JAYASEKHAR

## ACL injuries – What factors result in an increase in their incidence within Football?

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Football is timeless. It brings people together in a special kind of way and will always be a game of exceptional moments. From Trent Alexander-Arnold's game-changing corner taken quickly, to Alessia Russo's stunning back-heel goal for the English women's national team. However, these were highlights, for England and Liverpool FC, and as incredible as they were, football also has its excruciating lows, many of which come from the shock and horror involved with watching players injure themselves. Data collected by BBC sport's injury data analyst Chris Coates showed that over the six-year period of 2011-16, the numbers of reported serious knee injuries in the Premier League were consecutively; 18, 20, 24, 25, 26, and 28. This project will begin with a brief overview of the anatomy of the ACL. This will be followed by an assessment of two case studies where athletes sustained injuries to this ligament. I will go on to examine two factors that have contributed to a rise in the number of injury cases, critically evaluating their respective levels of impact. I will also conduct an adjunctive section of research on the role of gender relating to this topic. This section will present reasons why female footballers are proving themselves to be more vulnerable to setbacks such as the one in question. The ultimate aim of my project is to investigate why we are seeing so many elite footballers suffering from severe ACL problems – and suggest what actions can be taken to resolve this. Former Liverpool captain, Jordan Henderson, said "I am worried about player welfare, and I don't think anybody takes that seriously enough. " The welfare of those who sacrifice so much to be the best, must be a priority, not an afterthought.



# KAVINAYA PUNNIYASEELAN

## To what extent was the government to blame for Sri Lanka's social and economic decline between 1983 – 2022?

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This project was prompted by the 2022 Sri Lankan protest movement against the government following a grave economic crisis that forced then-President Gotabaya Rajapaksa to flee to Singapore following decades of rule by the Rajapaksa family. This marked a pivotal moment in Sri Lankan history as the first head of state to flee due to protests. This project focuses on evaluating the extent to which the government was responsible for the fall in the standard of living of the Sri Lankan population in both the social and economic aspects in the period 1983 to 2022. The period to be explored is marred with violent struggles between different ethnic and religious groups, including the brutal civil war that lasted from 1983 to 2009, weak governance and an unprecedented economic crisis. It explores the social decline by looking at the threats to peace and security, rise in inequality - which includes the failure to protect minorities - and disruptions to social cohesion. The project also covers the economic decline and measures this through the rise in the fiscal deficit and national debt, a decline in the availability of essential goods, and a fall in GDP. Ultimately, this project argues that the government is mostly responsible for the socioeconomic dilemma of Sri Lanka. This was compounded by the external shocks faced by Sri Lanka throughout this period, such as weak macroeconomic conditions, inadequate governance, violations of human rights agreements and preferential treatment of connections.



KRISHNA  
LINGESWARAN

## To what extent could sugar tax improve public health amongst the UK population?

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The sugar tax (Soft Drink Industry Levy) was introduced in 2018, imposing a tax on drinks containing certain amounts of sugar per 100 millilitres. The tax aimed to improve public health by reducing the sugar intake of the population, by forcing manufacturers to change drink formulation and by making soft drinks less affordable to the public. This project will explore diseases that are brought about by excessive sugar intake and explain the link between excessive sugar intake and the diagnoses of these diseases. In doing so, the impact of changing consumer habits on health can be assessed by investigating disease rates pre and post sugar tax's implementation. Finally, the project aims to evaluate the potential the sugar tax has to improve public health in the UK.



# MARLON DASSANAYAKE

## Quantum computers will render the RSA cryptosystem obsolete within fifteen years. How valid is this claim?

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Over the past few decades, several companies (and governments) have been racing to produce the first scalable, fault-tolerant quantum computer. The excitement around quantum computers is due to the fact that they can (in theory) solve mathematical problems exponentially faster than classical devices. However, this poses a significant threat to modern security, which relies on encryption methods based on mathematical functions that, although theoretically possible to break, cannot be broken in a reasonable time period by a classical computer.

The RSA (Rivest-Shamir-Adleman) cryptosystem is a widely used encryption algorithm which takes advantage of the mathematical properties of prime numbers in order to secure communication and protect sensitive information online. If the RSA cryptosystem were to be compromised, catastrophic data breaches would occur, leading to national security threats. There is significant controversy about when a quantum computer capable of breaking RSA will be built. Some experts believe that this will occur within fifteen years, others are of the opinion that it will take far longer, while a number believe that building a powerful enough quantum computer is an impossible task. My report evaluates the obstacles that must be overcome to build a quantum computer capable of decrypting a message which has been encoded using RSA and investigates the time frame that this will most likely occur.



MATHICHUDAR  
MANIVASAGAM

## To what extent should the inclusion of mediation into the legal framework be mandatory?

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Despite the prominence of the law within our society, the functionality of law has been a prevailing question. Currently, mandatory mediation has been brought to light by the government to aid in the dispute resolution process. Mediation had not been intertwined with the legal system. The aim of this project is to evaluate the value of mandatory mediation within society and whether it should be proposed more intensively. By evaluating different areas of society and possible benefits of mediation, this paper examines the potential of mandatory mediation. Research through the means of dissertations, analysis of relevant books and interviews conducted from mediation and legal experts has concluded that mandatory mediation is a multifaceted topic. The research primarily based itself on the current state of play, mediation's role within civil and criminal areas of the law and made use of professional viewpoints. An interesting note of the contradictory nature of the interview results, provides a discussion point into the relationship between mediators and lawyers. The conclusion summarises the 'three C's' of: criminal, commercial and choice. This conclusion reflects on how this topic interplays into society as a whole and there are more bottlenecks such as ethical considerations that must be deliberated upon before mediation becomes mandated.



# NEHA POTHINENI

## To what extent do psychological factors play a role in the development of adult criminality?

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Psychological factors include personality traits, cognitive processes, mental disorders and more. They are the main reasons which cause individuals to engage in criminal behaviour. Sigmund Freud's concept of the superego as the morally upright portion of someone's psyche suggests that when a criminal has committed a crime, they then feel some sort of guilt or remorse. However, Charles Manson, the notorious killer, felt no such emotion and in fact never lost the belief that he was never in the wrong. Mental disorders have shown consistent associations with criminal behaviour which then affects the emotional regulation of a person, their impulse control and social interactions. A psychological factor that I found the most intriguing was the effect of childhood experiences, which cause psychological disturbances. One could disagree what constitutes criminal behaviour and whether there is a set definition. If members of the underprivileged community who suffer from psychological illnesses and struggle to seek help commit a crime, is it understandable and should they face the same consequences as other offenders? Poverty also plays a large role in the involvement in criminal behaviour as it is linked with many mental illnesses, for example schizophrenia, depression, substance misuse and anxiety. Therefore, more attention should be given to the underprivileged as they face obstacles which are more challenging to overcome without sufficient resources. Moreover, there are other factors which determine someone's involvement in crime including psychosocial and environmental factors. However, even after analysing both of these, I came to the conclusion that it's the psychological aspects which effects someone's mind, and leading them to become involved in crime. Understanding how psychological aspects influence criminal behaviour can help develop preventative plans, early intervention initiatives, and therapy treatments.



# PRIYA BRANJA

## To what extent is CAR-T Cell Therapy the most effective treatment for Haematological Malignancies?

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Emily Whitehead, a five-year-old girl, was diagnosed with acute leukaemia, a common childhood cancer. At only seven she had exhausted every approved treatment option, relapsed twice and given just a few weeks left to live. In an effort to help their daughter, her parents enrolled her in a phase 1 clinical trial for an emerging treatment, CAR-T cell therapy. Having only been tested on a small handful of adults and been known to cause fatal complications, the risks were high. However, two years later, not only did she survive, but she also achieved complete remission of her cancer. Emily became known as the first child to ever receive CAR-T cell therapy. To date, she remains cancer free.

The treatment Emily received, CAR-T cell therapy, represents a paradigm shift in modern medicine, known as the 'fourth pillar of oncology'. Standard treatments for haematological malignancies have historically relied on the first 'three pillars', namely chemotherapy, radiation therapy and surgery. These treatments often entail life-threatening side-effects, severely deteriorating a patient's quality of life, and have low prospects of providing curative benefits. In contrast the fourth pillar, CAR-T cell therapy, involves the genetic engineering of a patient's own T-cells to express specific antigens, enabling targeted recognition and destruction of cancerous cells. This report aims to evaluate the extent at which this treatment is the most effective approach to haematological malignancies, where 'effectiveness' is defined as a treatment's ability to extend the length of life and to preserve the patient's quality of life.



RISHITA  
RALLABANDI

## To what extent should thalidomide be prescribed and used today?

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Thalidomide is a sedative drug which was also found to have teratogenic effects (causing birth defects in infants) due to its enantiomers. It was initially banned in 1961 in Germany but now it has gained clinical interest due to its unique properties in acting against several intractable diseases. Thalidomide is currently undergoing clinical testing in the US to inspect its efficacy in treating a range of immunological and inflammatory disorders. It is presently only approved for use in the treatment of multiple myeloma, a cancer of the bone marrow, and leprosy. This project investigates the uses of thalidomide in prescriptions in the 21st Century and its controversy concerning the Thalidomide Disaster which occurred over 60 years ago. This includes the details regarding the main causes of the tragedy and how it came to be and, particularly, how thalidomide's chemical properties play a role. The report will refer to and discuss previous and on-going clinical trials concerning thalidomide to support and evaluate my points and ideas.

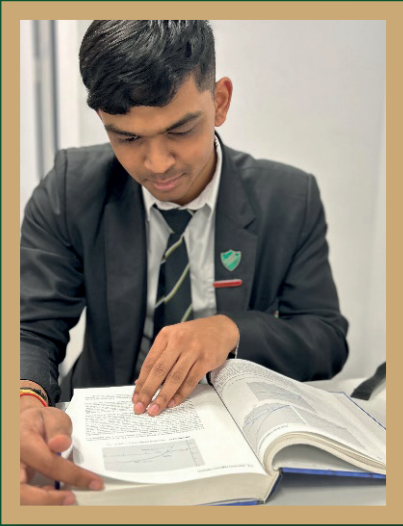


RUDHRESH  
KANNAN NARAYAN

## To what extent do cryptocurrencies possess the capability to replace the fiat monetary system?

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Through a comprehensive analysis, my project investigates the role of central banks, historical incidents, and developments within the cryptocurrency field, and evaluates the distinct attributes of cryptocurrencies and fiat money. By exploring the evolving landscape of digital currencies and their fundamental technologies, this paper provides a comprehensive assessment of their transformative potential. Factors such as regulatory frameworks, environmental impacts of cryptocurrency mining, and the security challenges faced by cryptocurrencies are meticulously considered. The findings contribute significantly to the ongoing debate on the future of money, revealing that while cryptocurrencies offer unique advantages such as decentralisation and transparency, substantial obstacles remain. The evidence and analysis strongly suggest that cryptocurrency is unlikely to replace fiat money in the immediate future. However, it is imperative to recognise the profound long-term potential that cryptocurrency holds, contingent upon the resolution of key challenges that currently impede its progress. The challenges identified throughout this study – public adoption, volatility, security and safety, environmental concerns, and regulation – are formidable barriers to the widespread adoption of cryptocurrency as a mainstream currency. It is essential to emphasise that these challenges demand collaborative and coordinated endeavours from diverse stakeholders to overcome them effectively.

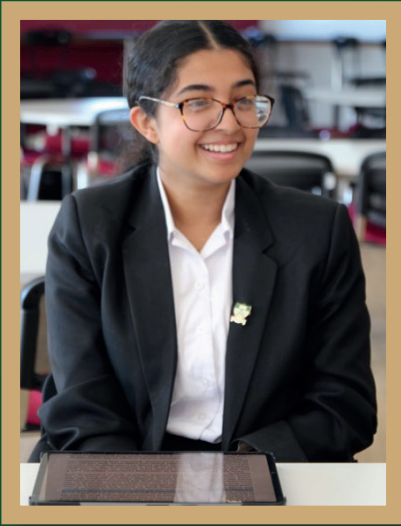


SAARUJAN  
SITPARAN

## How far are we from a theory of everything?

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My project aimed to evaluate the scientific journey towards a theory of everything – a single unified theory to describe all physical phenomena – and what needs to be done in order to complete it. In order to do this, I first identified the faults present in our previous approaches toward a theory of everything and compared them to our current approach to gauge how far we have yet to go. The main bulk of my project was about evaluating the usefulness of the Standard Model – the best representation of subatomic physics we have to date. A great deal of data analysis was used to construct these mathematical ideas into a visual format, which gave me an alternative way to compare and analyse these models. Research into this area of physics is vital as it lays the foundation for the cutting edge technology that is being developed, such as quantum computing. Finally, my report concludes with a critique of the approaches used in modern science to formulate new theories.



SAKSHI  
UPADHYAY

## To what extent do mathematical concepts affect our aesthetic perception of music?

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This project aims to identify the extent to which mathematical concepts affect our perception of music, through the investigation of their application within specific aspects of harmony, waves and temperament. As a result, it explores aesthetic perception based on fundamental mathematical ideas: the harmonic series and waves – the former of which can be extended to all sound. The link between the art of maths and of music has been briefly discussed before and, as this essay examines and establishes, is strong and undeniable. However, the question of its direct impact in reference to music perception has yet to be convincingly tackled. This analysis will focus on the harmonic series and overtones, using Pythagoras' ideas to explain temperament and waves to explain consonance. In theory, for the "extent" to be ascertained, it would have required every aspect of music to be considered and dissected, but this project views music predominantly through the lens of western tonality, more namely the harmonic style of 18th century European musicians. Through the comparison of relevant existing literature, the body of this essay demonstrates the complexity of music perception and its subjective nature, ultimately leading to a conclusion that music does, to some extent, affect our aesthetic perceptions of music.



SWAPNIL  
JHA

## Controlled Communism vs Imperial-Origin Capitalism: Evaluate which approach to growth Economic Growth and Development has been most successful

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Communism and Capitalism are two of the most prominent socio-political structures of economies around the world. In the last 300 years, much of the major economic policy decisions taken by economies have been shaped by which approach to growth was taken. Both restrictive forms of Communism, and Imperial-Origin capitalism have formed some of the most prominent and successful economies. This project aimed to evaluate both approaches to growth through case study examples of India and Japan for Imperial capitalism, and Russia and China for Controlled Communism. For each approach, I purposefully selected one developed and one emerging economy to create a better balance. Using defined parameters of Purchasing Power Parity, GDP, HDI, GINI coefficient, and GNI per capita, in-order to measure the changes in Growth and Development. I justified the selection of these measures specifically through my research. Through the process I wished to understand typical characteristics seen in both types of policy making and try to analyse a trend in the approach economies adopt to obtain growth in the long run. In-order to learn more I researched various books, journals, databases and historical videos, and developed my referencing skills. To conclude, I realised that eventually economies will tend towards individual liberty with effective intervention as neither approach solitarily produces ideal growth and development. Particularly evaluating China, the One Child Policy stands as an example of how forceful intervention only leads to short term benefits. Thus, one of my key learnings was of the need to account for long-term sustainability, regardless of political approach to achieve long term growth and development.

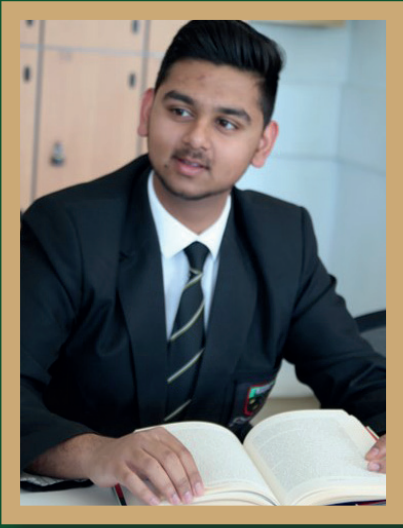


TANISHA  
SRIVASTAVA

## 'Better gender representation between males and females will significantly improve the development of STEM fields.' How valid is this interpretation?

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According to the Massachusetts Institute of Technology, women comprise only 28% of the entire STEM workforce in 2023. This gender disparity is concerning, particularly considering that STEM careers are often seen as the jobs of the future, leading to innovations. Innovation has been the driving force behind our transition from a life reliant on animal carts, fur, and raw meat to one characterised by bullet trains, raincoats, and vegan meat. Innovation is undeniably a crucial element of our existence. The term STEM, an acronym for Science, Technology, Engineering, and Mathematics, is synonymous with innovation itself. It serves as the catalyst for groundbreaking advancements that have revolutionised countless aspects of our lives. The report begins by analysing the gender proportions between males and females across various career fields and within STEM disciplines, aiming to understand the existing gap. It examines the reasons behind this gap, recognising the importance of comprehending its roots to assess the impact of reducing it. This analysis sets the stage for validating the statement, "Better gender representation will significantly improve the development of STEM." It explores the differences and similarities in thinking and behaviour between males and females, highlighting the potential impact of changing the current gender representation on the skill set of the workforce and the quality of STEM innovation. Additionally, the report considers how increasing gender diversity can influence work culture, ultimately affecting the growth of these fields. It examines the effects on innovation and work culture while also acknowledging the potential challenges involved in achieving better gender representation in STEM.



VINAY  
LADWA

## 'Photodynamic Therapy will become the most effective treatment for lung cancer.' How valid is this statement?

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Research into new treatments for cancer is ongoing. Photodynamic Therapy uses chemicals called photosensitisers to kill cancer cells. This type of treatment creates a localised response as light is needed to activate the chemicals, therefore reducing the harsh consequences that other treatments may cause. Currently, Photodynamic Therapy can only be used for a small number of cancer cases, meaning it has not received as much usage or media attention as other therapies. Now, scientists are combining techniques such as immunotherapy and nano delivery with Photodynamic Therapy to increase the effectiveness of cancer treatments, with current research likely to save many lives in the near future.



YAMAN  
HAFEDH

## To what extent is the anthropogenic acceleration of antibiotic resistance a significant threat to modern medicine?

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For almost a hundred years, antibiotics have been at the forefront of medicine and therapeutic treatment. Antibiotics are humanity's most significant weapon in the everlasting and evolutionary battle against bacteria and their consequent diseases. They possess almost miraculous properties in killing bacteria and so have been used extensively in the treatment of bacterial infections. Initially, these infections were treated with relative ease, thanks to the use of antibiotics, revolutionising medical treatment, whilst simultaneously saving and changing countless lives. However, in recent years, the potency of antibiotics has come under substantial threat due to significant anthropogenic activity, which is causing an exponential and almost uncontrollable acceleration of a process called antibiotic resistance. Through extraordinary genetic capabilities and mechanisms, bacteria have been able to exploit our prolonged misuse of antibiotics to develop almost complete resistance to these medications, causing some of our previously unstoppable antibiotics to become completely ineffective. There is a significant risk that diseases will become more challenging to treat, perhaps resulting in longer hospital stays for patients, increased healthcare costs and hugely increasing levels of morbidity, along with higher levels of mortality. Intensified by a lack of action from pharmaceutical companies and governments across the world, antibiotic resistance could have disastrous consequences for the lives of current and future generations.

This report will be evaluating the extent to which the anthropogenic acceleration of antibiotic resistance is a significant threat to modern medicine, specifically using data sourced from clinical trials and objective research to identify the relative threat.