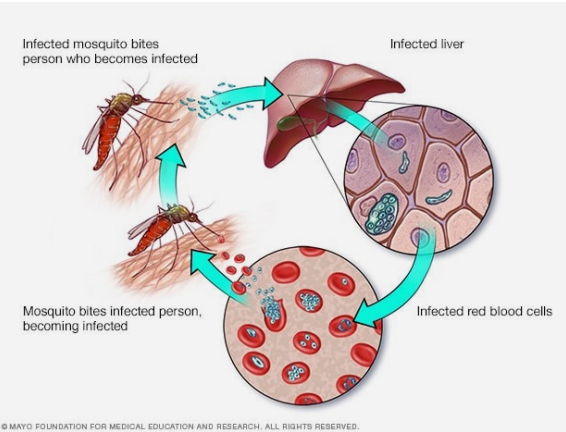# The Scholar

How Can Chemists Save the World?

+

Academic essays on pathogenic antibiotic-resistant bacteria to the importance of autism awareness
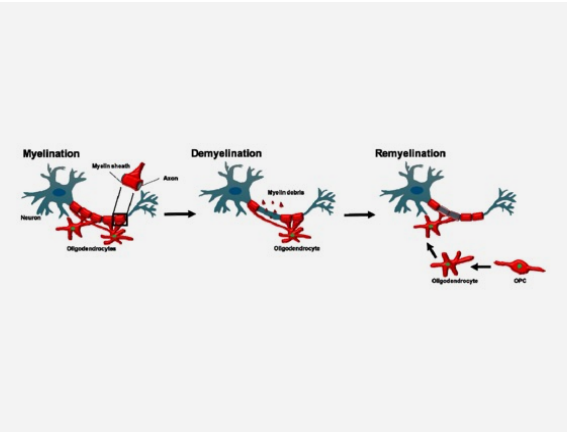
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Updates
Introduction from The Brilliant Club

We are delighted to be celebrating the incredible work of pupils who have taken part in The Scholars Programme from schools across the UK.

In this edition, you will find 30 outstanding assignments with course titles ranging from 'How can chemists save the world?' to 'Should the jury have to justify their verdict?' This edition of The Scholar features some of the most inspiring articles ever produced by pupils who have taken part in The Scholars Programme.

The university-style learning that pupils are exposed to on our programmes is designed to provide pupils with the freedom to develop their own ideas and approaches. Not only will this help pupils who go on to study at university, but we believe these are crucial skills to develop in the adult world. The development of independent study skills and support with critical thinking provides young people with a platform to share their ideas. We hope it will empower these young people to engage in debates that shape our world, whether they concern democracy or globalisation.

The Brilliant Club is passionate about exposing pupils on our programmes to these important aspects of university. We hope that these projects encourage pupils to dig a little deeper into subjects that matter to them and to seek opportunities to make unique contributions to their fields. In doing so, pupils can change their own lives by enriching them with opportunities for learning and being inspired by the topics they cover. This year, we had a record number of nominations for The Scholar, so we would like to say a huge congratulations to the pupils published in this edition and to the pupils who completed The Scholars Programme. All the pupils who graduate from the programmes should be very proud of themselves! On Page 4, we are delighted to have a guest article written by Scholars Programme alumna Mollie Ruane. Mollie took part in The Scholars Programme over a decade ago while she was in secondary school at Ormiston Park Academy in Essex. She has since gone on to graduate with a First Class BSc in Psychology from the University of Surrey and a MSc in Developmental Psychology and Psychopathology from King's College London, which achieved a Distinction. In her guest article, Mollie speaks about how The Scholars Programme played a key part in her decision to pursue higher education. A massive thank you to Mollie for taking the time to share her experience with The Brilliant Club.

The map above shows the locations of all pupils featured.

In pursuit of our mission, to support pupils from less advantaged backgrounds to have fair access to university and to succeed once they get there, we run four core programmes: The Scholars Programme, Make your Mark, Join the Dots and Parent Power. You can find out more about our programmes and how we support young people on our website: thebrilliantclub.org/about/

If you are a teacher who would like to find out how your school can get involved with one of our programmes, we would love to hear from you! Please get in touch via our website: thebrilliantclub.org/schools/

We are building a network of Brilliant Club Scholars to create a community of like-minded alumni. If you have completed one of our programmes, and would like to join our alumni community, you can sign up via our website: thebrilliantclub.org/alumni

Guest Article
The Impact of The Brilliant Club - Higher Education and Beyond

Mollie Ruane
The Scholars Programme Alumna, NHS Assistant Psychologist

Over a decade ago now, I was a secondary school student in Thurrock, Essex. At the time, Thurrock had just recorded the lowest levels of life satisfaction of any place in the UK in a government wellbeing survey (Office for National Statistics, 2012). In 2013, the school that I had attended had reported that 0 pupils at the school had accessed higher education in that year (Department for Education, 2013). This had coincided with the increase in tuition fees to £9,000 a year. It would therefore be fair to say, I did not think university would be for me.

My working class parents do not have any formal qualifications, so it wasn't like I had them to go to for advice or guidance – my dad, a builder, and my mum, a homemaker. Whilst two of my sisters were at university at this point, I had no interest in what they were studying and failed to see what subject would be right for me. My sisters are also ten years older than me and went to university when tuition fees were £3,000 a year and was therefore a lot more accessible.

I was quite happy with my plan to work in a nursery one day. This was a career that didn't require a university degree, plus my parents had raised seven children and my mum was a former nanny, so I could always ask them questions. That was until I was taken aside with a small group of my peers at school and asked if I wanted to join a scheme called The Brilliant Club. I had no idea what this was, but I was curious and always up for a challenge. We were told what the aims of The Brilliant Club were (to widen access to university for students from underrepresented communities by inspiring and encouraging them to aspire to higher education) and that as part of this, we had been invited to participate in The Scholars Programme.

Initially, I wasn't sure what to expect but I did know I was frightened by the prospect of a 1,500-word essay! What I also knew was that I didn't have the slightest idea of what university really was, let alone what it would be like to write at the level of someone who could one day attend one. I had always loved reading, but writing not so much, and I was right to think that writing is a pretty big part of academia. What I wasn't to know, was that the programme and the inspirational teaching of the PhD tutor would bring my love of reading to life, whilst also introducing a style of writing I could engage in. For perhaps the first time, I felt I was really trying, and pushing myself out of my comfort zone. My subject during The Scholars Programme was Law, and I wrote an essay focusing on the criminal justice system

and argued for rehabilitation within prisons. Writing this essay introduced me to the concept of critical thinking, research and the importance of engaging the reader through compelling arguments. All crucial skills that would become invaluable down the line.

As part of the research for my essay, I stumbled across the American psychologist Philip Zimbardo, and his book 'The Lucifer Effect: Understanding How Good People Turn Evil'. The book focuses on the controversial and unethical social psychology study, the Stanford Prison Experiment (Zimbardo et al., 1971). This was my first taste of psychology, and I was completely hooked. What a privilege it would be, I thought, to work to understand more about human behaviour and all the good this could do for the world. My essay was graded at something along the lines of 'excellent A-Level standard' and I remember feeling the rush of pride to this day when attending our graduation at SOAS, University of London.

Fast forward to today, and I have graduated from the University of Surrey with a first-class honours degree in Psychology and a distinction in Developmental Psychology and Psychopathology from King's College London. I have worked in the NHS for four years, in Community Child and Adolescent Mental Health Services (CAMHS), inpatient psychiatric wards, specialist services for care experienced young people. I have also been a research assistant for the '2021 Learning from lives and deaths – people with learning disabilities and autistic people review' (LeDeR). I currently work as an assistant psychologist in an adult eating disorder service and aspire to complete a doctorate in Clinical Psychology one day.

I worked hard for those achievements, but I know that my education and career may not be where it is if it weren't for the support of The Brilliant Club's Scholars Programme. Without the programme, I may not have known that higher education is, in fact, for the likes of me and that, more than that, it needs people like me. People like me, and people like you. People who have made sacrifices to achieve their dreams, people who know the value of working hard to support others, and people who know what it means to work their way up independently. The journey to higher education is often paved with challenges and obstacles, especially for those from underrepresented backgrounds, but I want to emphasise that no matter what your start in life, higher education, if you want it, is worth it.

To summarise, I have written this article to express

my gratitude to The Brilliant Club. The impact of your dedicated efforts in widening access to higher education cannot be overstated. Thank you, to the PhD tutor in The Scholars Programme who I unfortunately do not have the name of, and therefore cannot thank personally. Thank you for inspiring me, and a generation of young people, to know that we can break through barriers, we can make meaningful contributions and we can do whatever we put our minds to.

Mollie Ruane
The Scholars Programme Alumna,
NHS Assistant Psychologist

Arts and Humanities

Ancient Criticisms of the Roman Arena were often focused on the negative behaviours of the arena crowd. To what extent can these ancient criticisms be applied to Suzanne Collins' *The Hunger Games*?

Key Stage 5

Pupil Name: Alyssa Tonolete
School Name: St Paul's School for Girls
Supervised by: H. Barlow
Tutor University: University of Birmingham
Course Title: The Stoics and *The Hunger Games*: A Critique of Arena Audiences?

The Hunger Games is a young-adult dystopian fiction book series written by Suzanne Collins. In it, readers follow a young, impoverished girl named Katniss Everdeen as she navigates a society separated into twelve 'districts' (wealth levels). The wealthiest of them all, the 'Capitol', run an annual Hunger Games: two children from each district serve as 'tributes' who fight to the death in an arena to entertain the Capitol. Collins' idea is a modern interpretation of gladiatorial combat from the ancient world where gladiators were young men who'd also fight to the death in an arena to entertain the Roman crowd. In this essay, I will outline parallels between the Ancient Roman gladiator arenas and Collins' reception study of them. Where appropriate, I will analyse where Collins has adapted her interpretation differently from the ancient world to suit her modern target audience. Furthermore, I will evaluate the degree to which criticisms of gladiatorial entertainment apply to *The Hunger Games* – particularly those made by ancient writers and stoics.

Stoicism was an ancient Greek school of philosophy founded in Athens, Greece. People who took up the school's teachings were called stoics, and they believed happiness was achieved by reason and rationality rather than being controlled by desires. Stoics criticised crowds, especially those watching gladiatorial entertainment, as they were of the belief that life ought to be lived logically, not led by sources of pleasure or emotion. Somewhat similarly, Katniss does not approve of The Games, resenting the Capitol for their inhumane enthusiasm towards watching children kill and die.

Ancient writers judge the negative impact of entertainment on crowds, saying it makes them obsessive. These same judgements can be applied to the Capitol's behaviour towards *The Hunger Games*, their main source of entertainment. Katniss states, 'The arenas are popular destinations for Capitol residents to vacation. You can even take part in re-enactments.' Katniss is appalled that the arenas – the site of The Games (and so, the site of the deaths of

many children) – became tourist attractions. The citizens of the Capitol adore *The Hunger Games* so much, that they've glorified the arenas into famous, must-see 'vacation' spots. Watching the tributes die on their televisions wasn't enough to satisfy them; Capitol residents go to the extent of visiting the exact places that the tributes died and physically take part in 're-enacting' the murder. Katniss is judging their obsession and romanticisation of something that genuinely traumatised her. Likewise, Augustine of Hippo, an ancient writer, criticised the Roman crowd's obsession over gladiatorial shows. According to him, it causes them to act irrationally and emotionally until they spiral into obsession: 'He (his student) watched, he shouted, he burned.' The gradual rising intensity of verbs from 'watched' to 'burned' conveys his view that watching the show inevitably leads to becoming obsessed with it, using the example of his student, Alypius. By Augustine's criticism, similar to how a flame consumes something ('burned'), Alypius' life was consumed by the battle before him that it became nothing but a thirst for more violence, tension, and entertainment. This is akin to how The Games took over the Capitol citizens' lives to the point where they'd pretend to be part of it by partaking in 're-enactments'. They're wholly obsessed, that their way of being happy is to pretend they're living someone else's life. Therefore, Augustine's judgements over entertainment making crowds obsessive can be applied to *The Hunger Games* making Capitol obsessive to extremes such as tourism.

However, this begs the question: is it the entertainment that's obsessive to watch or are the crowds just over-indulgent? *The Hunger Games* involves a constant theme of Capitol being over-indulgent whether it comes to money, clothing, or food: '...the idea of throwing away food is abhorrent to me. And here in the Capitol, they're vomiting for the pleasure of filling their bellies again and again (Katniss).' To ensure she had enough stomach to try other delicacies, Katniss resists some food to prevent the unnecessary 'throwing away' of what she can't finish, but her Capitol companions make room in their stomachs by self-inducing nausea, completely wasting the nutrition it provided. Katniss expresses a stoic mindset here, as her description 'abhorrent' means she can't comprehend the wasteful lengths Capitol will go for the 'pleasure' of eating 'again and again'. This emphasises Capitol's endless cycle of over-indulging, which is perhaps what causes the obsession over The Games. However, Augustine of Hippo suggests that entertainment inflicts the fixation on the person: 'At once he (Alypius) was struck by a wound to his soul..., fixed his gaze and drank in the torments and was unaware.' . This person in the crowd was unaffected by the gladiatorial show until the moment he opened his eyes, suggesting the entertainment was what caused him to become 'drunk' and over-indulgent. Thus, Augustine's criticism on the Roman arena can't be applied to *The Hunger Games* as he suggests the entertainment is what absorbs the crowd, but Collins' depiction of the crowd suggests they were already over-indulgent in nature. If this is the case, can we really blame the Capitol audience for being avid fanatics of The Games? Katniss

briefly questions this by asking herself 'Who knows what I would talk about if I'd been raised in the Capitol?' . She acknowledges that if she was brought up only having known a world of excess, she might not be able to help becoming obsessed with The Games.

Seneca the Younger, another ancient writer, criticised the effects of entertainment on crowds from a stoic point-of-view, saying that it makes them 'empty-headed idlers'. This could be compared to Katniss saying, 'The audience in the Capitol will be getting bored, claiming that these Games are verging on dullness'. This suggests the Capitol have nothing else fulfilling to do when The Games are not as entertaining since it became the main topic they invested their time into, rather than becoming aware of its lack of ethics. Both of these criticisms argue that when one lets entertainment control them, they begin to only discuss topics that aren't relevant to self-improvement. They become 'empty-headed' because they're more concerned about pleasure, and 'bored' when that pleasure is gone. Watching entertainment for joy does nothing to improve one's life, or in Katniss' case, The Games do nothing to help the poorer districts. Similar to stoic principles, she might argue that The Games shouldn't exist as they only benefit the Capitol by entertaining them. Even then, they still cost the Capitol by making them dependent on it to avoid boredom. However, one might say you cannot apply Seneca's stoic criticisms to *The Hunger Games* because Collins sets it in the distant future so ancient principles would not have any meaning there. Additionally, stoics like Seneca are against entertainment as a whole, whereas Katniss is against *The Hunger Games* being a way in which the Capitol oppresses lower districts. There's little evidence in *The Hunger Games* to suggest she is against entertainment and indulging in pleasure / she is just against the murder of children for it. So, she might be for entertainment, just not the type that comes with the cost of harming innocent people.

Ancient writers such as Plato emphasised the negative influence of the Roman crowds on the individual. He wrote 'The poet who imitates... indulges the senseless element in the soul which cannot distinguish between the greater and the lesser.' We see a judgement of 'indulging' as it does nothing for your sense of virtue. In *The Hunger Games*, the quote 'The shift in (skin) shade is no doubt an attempt to stay abreast of the capricious fashion trends of the Capitol' is evidence that the people of the Capitol follow the crowd mindlessly, even when it comes to appearance with 'trends'. Plato expresses his belief that 'imitating' the crowd causes you to cast aside rationality and morality – the ability to differentiate 'the greater' from 'the lesser'. We can link this to the Capitol who appear to only have concerns about irrational and 'capricious' things such as the latest 'fashion trends', rather than problems like their socio-economic divide. Augustine of Hippo criticised the Roman crowd's effect on the individual by giving the example of his student: '...they used friendly force to drag him' . The juxtaposition of 'friendly' and 'force' highlights his view that liking something may seem harmless at the start, but entertainment can make a

weapon of curiosity, just as it did to his student. The citizens of the Capitol cast aside morality by blindly following The Games until the point where they do not comprehend the immorality of watching children die for fun. As Plato described, their souls cannot distinguish between 'the greater and the lesser' – what is moral and what is immoral. Seneca writes a similar criticism of crowds: 'The greater the mob, the greater the danger' , where 'mob' can also be interpreted as crowds being mindless. This is especially dangerous when the crowd is highly emotional, as this would arouse emotion in the individual which is not favoured by stoics. Therefore, Plato, Augustine, and Seneca's criticisms of crowd behaviour can be applied to the Capitol's behaviour.

Both ancient writers and *The Hunger Games* criticise society for disregarding what they should show concern for. Seneca the Younger says '...where the question discussed is: 'What is a good man?' and the lesson which we learn is "How to be a good man," very few are in attendance.' Here, he is criticising that people are missing what they should be discussing which is whether or not they are a good person, and if not, how they can be better. Collins writes 'They do surgery in the Capitol, to make people appear younger and thinner.' Here, Katniss is criticising Capitol residents for ignoring what they should be worried about / the health and survival of the lower 'Districts'. Instead, they have the privilege of being selfishly concerned about shallow subjects such as a 'younger' appearance. Parallel to the stoic opinion of Seneca, Katniss is critiquing the obliviousness of the Capitol because what they're concerned about is not logical. Both Seneca and Katniss want their societies to be worried about making the world a better place by solving realistic issues instead of being concerned about materialistic problems. However, more influential ancient writers were members of the Roman elite, meaning they were educated on issues such as morality. The majority of Roman society weren't part of this group, suggesting they weren't aware of matters like morality, so their oblivion cannot be criticised. The Roman crowd may not be actively choosing to ignore these issues, unlike Capitol where some residents are. Alternatively, the Roman crowds could have other problems to worry about such as earning enough to survive (which might mean resorting to immoral ways) which is also what Katniss argues is more important. Therefore, the stoic criticisms can be applied to *The Hunger Games* but only to an extent, due to the fact that ancient writers prioritise morality and Katniss prioritises survival.

Augustine, though not a stoic, expresses stoic ideas when he judges the emotional effects that gladiatorial entertainment had on his student. He wrote 'He was overcome with curiosity...he took with him from that place the madness that goaded him to return.' Augustine is criticising the strong emotions that Alypius, his student, was 'overcome' by because they permanently damaged his soul by fixating him onto the gruesome show. These are depicted to be the student's downfall and weakness as he was completely changed after experiencing the gladiatorial show, bringing the crowd's 'madness' with him. The moment

Alypius opened his eyes, he was swept up by the emotion to start encouraging the violent gladiator battle. Augustine believed this caused his immorality because he turned away from God, distracted by the entertainment before him. Conversely, Collins' *The Hunger Games* expresses that the lack of emotion, or rather the lack of empathy, shown by the Capitol towards the poorer Districts is what makes them immoral: 'All forms of stealing are forbidden in district 12. Punishable by death.' The Capitol makes the rules and punishing starving people for stealing food 'by death' shows they do not care about others – especially when we compare this law to the fact that the citizens at the Capitol feast had so much excess food that they 'vomited' just to eat again. The absence of empathy by the Capitol is one of the main causes of their immorality and one of their biggest flaws to the reader. The gladiatorial shows caused immorality in Alypius, and *The Hunger Games* (as well as a general lack of empathy) caused immorality in the Capitol. Collins may emphasise the disparity of attitudes and emotion towards death (whether caused by starvation or *The Hunger Games*) between the Capitol and the lower districts to further heed to her idea of a dystopian future. Alternatively, she might have highlighted it to provide a message to her modern audience and raise awareness of the privileges they might be unconscious of.

To summarise the arguments made, the ancient writers and stoic criticisms of Roman gladiator arena crowds can, to a certain extent, be applied to Suzanne Collins' *The Hunger Games*. Both crowds are depicted as and criticised for being obsessive over their entertainment source which drives them to extremes like tourism, showing how entertainment can consume one's entire life. However, ancient writers emphasise the entertainment's effect on the lives of its crowd whilst Collins emphasises how the crowd was already over-indulgent. Ancient writers, particularly stoics such as Seneca, criticise the way entertainment distracts people from logic and morality. Collins criticises Capitol's lack of concern over The Games' immorality, caused by the oblivion of most citizens and the lack of empathy from those with the power to make change. The common issue in *The Hunger Games* is that both the oblivious and the cruel participate in oppressing poorer districts. Another reason ancient criticisms may not be applicable to Collins' world is the time difference – one is from the past, the other is set in the fictional future. This limits the validity of any comparisons. Katniss does not show explicit aversion towards general entertainment like stoic ancient writers do. She is against The Games because they are sadistic, involving the brutal murder of children. Both ancient writers and Collins criticise the mindless nature of their crowds. Ancient writers negatively judge Roman arena crowds and their emotional, irrational behaviour. Likewise, Capitol's artificial trends and heartless encouraging of The Games' violence is negatively judged by Katniss and the readers of *The Hunger Games* too. Though contrastingly, the emotions of the crowd are criticised by ancient writers, whereas the lack of emotion from the Capitol is criticised by Katniss.

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[4] Augustine Confessions 6.9
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[10] Seneca the Younger Epistles 7
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[13] Augustine of Hippo Confessions 6.9
[14] Collins 2008:33-34

Parent comment:
"Alyssa always puts great effort in her work and I am extremely proud of what she has achieved on The Scholars Programme. We give credit to her tutor who taught her the critical analysis skills needed to complete an exceptional piece of work. Well done Alyssa!" - Anna Tonolete

Vicious Vikings? Analyse the different representations of the Vikings in the texts we analysed on this course.

Year 5, Key Stage 2

Pupil Name: C.O.
Supervised by: S.Bankes
Tutor University: The Open University
Course Title: Friends or Foes? Vikings in Medieval England

What do we know about Vikings? Are they simply a brainless, murdering and thieving kind of culture? This essay will look at and examine whether or not Vikings are as vicious as most of the historical writings portray them as. It is from these many writings that we have the Idea of Vikings as cruel, mean and immoral people. From this essay I hope to be able to show and explain that the representation of Vikings is far more complicated than we are lead to believe and in fact I see them as a normal civilized people and they are simply misunderstood. I will refer to Havelock the Dane, the Sermo Lupi ad Anglos, the Anglo-Saxon Chronicles and Encomium Emmae Reginae, which provides us with important information about this period of history and how these texts contradict each other on the representation of the Vikings. So I ask you this: were the Vikings in fact dangerous and horrible people or were they simply looking for a better way of life in a country far away from their homeland?

The first texts we will begin to look at are the Anglo-Saxon Chronicles of both A.D.994 and A.D.1016 and the Sermo Lupi Ad Anglos. Both these text do not show favour to the Vikings and in fact show them in a very poor and horrible way. In the Anglo-Saxon Chronicles A.D.994, it states that Sweyn came to London with his 94 ships to burn, rob and kill people and were not only doing this via their ships but also on horseback along the coast of England. This suggests that they seemed deeply threatening because they were so mobile and could attack the coast and inland. This writing also portrays the Vikings as greedy vindictive people who only stopped doing unspeakable evil to the people in England, because they were paid.

In Anglo-Saxon Chronicles A.D.1016, we meet Canute who just like Sweyn Forkbeard, came to raid England with 160 ships, to burn, murder and pillage its towns for profit. In this writing the Vikings have come across as a very violent and mean people. Canute was not successful in gaining entry into the walls of London and so decided to change course and cause havoc on Gloucestershire. It was from this move that the councillors thought it best that Canute and King Edmund meet and make a pact to bring peace to the two nations. From this meeting King Edmund and King Canute became partners with Edmund holding court over Wessex in the South and King Canute would have governorship of the North bring peace to the country. As this shows, the violence of Viking attacks brought them success in gaining a foothold in this country.

The last text we are looking at that shows the Vikings in a negative light is Sermo Lupi Ad Anglos which is written in Latin the language of the church by the Archbishop of York who was better known as Wulfstan. It is unfortunate that we can see that Wulstan has no love for the Vikings and basically considers them nothing more than a punishment to the English for being hateful sinners. He suggests that this is what they deserved and the only way to rectify this insult to God was to repent and look to God and worship him in the correct way letting those who sinned become god-fearing men and women as they were before. It is important to recognise the context for his sermon since it suited his purpose as a bishop to encourage people to turn to God and so it could be that the emphasised the violence of the Vikings to help him to persuade them.

In contradiction to the previously mention texts that show the Vikings in a negative way, we see the change over time in both the eleventh-century romance writing of Havelock the Dane and the writings within Encomium Emmae Reginae which is better known as Emma's Book, on how the Vikings are represented in a completely different and positive way. Both of these writings show how good and kind the Vikings are. In Encomium Emmae Reginae we once again meet King Canute however there is a change in perspective within this writing and instead he is seen as a generous king who ruled with kindness and protected his people from those who wanted to do them harm. Canute was written as a man who brought his people together by allowing them free will and choice and that both the English and Danish Armies rejoiced at this decision. They were able to be as one working and fighting together for a better future for a two different cultures now seen as one. This contrasts with the depiction of the blood-thirsty, greedy invader we saw him perceived as in the Anglo-Saxon Chronicles A.D.1016.

We can see once again in Havelock the Dane a portrayal that opens our minds to a heroic Dane instead of a savage one. The writing of Havelock the Dane open to suggestion that if the Vikings were seen as hard-working people with strong moral values, then the people of England would be able to work alongside them and would be open to the many opportunities they would bring in helping the towns flourish. For this reason, Havelock is shown as being humble, hard-working, as well as heroic. Another reason represented in the writing of Havelock the Dane is that the Vikings would be able to aid and supply strong men, weapons and armour that would protect the town and its people from future attacks. But the main aspect of the writing would suggest that if the people of England were to work with the Vikings then all of the killing, damage and destruction would cease to be and would enable the beginnings of rebuilding what was lost. It is interesting to note that this account is very much presented from the perspective of the Danes rather than the Anglo-Saxons.

What I have noticed about the texts is that each is consistent in its portrayal. The negative outlook of the Vikings was just that: nothing was ever deemed good about them in the writing of the Anglo-Saxon Chronicles or Sermo Lupi Ad Anglos. Just as when you look at Havelock the Dane or Encomium Emmae Regina, the perception is always that the Vikings are loyal, hardworking, peaceful and caring people who brought great prosperity and wealth to the shores and people of England. The opinions of the texts again don't change it was only ever negative or positive there was no in-between that said yes they did good but they also did horrible things. I would like to have seen a text that outlined both the good and the bad so that the Vikings sounded like normal people. Moving on from this again, the negative perception only ever outlined the declining impact the Vikings had on England in the essence that all they did was destroy and kill everything in their wake. Whereas the positive perception of the Vikings' impact on England was that they brought peace, wealth and prosperity and made England a better place to live. It is generally the later, Viking texts that show a more positive portrayal of the Vikings once they had more influence in these islands.

As this essay has shown, there are two different perceptions of who the Vikings truly are. It is an interesting though to consider that there is not an intertwining account of both negative and positive aspects of to the Vikings. There is no in-between to the accounts only positive or negative. I found from the texts we considered that unfortunately the Viking are seen as more vicious than they are good particularly in the earlier, Anglo-Saxon accounts, written from the view of those who were attacked. So to answer the questions of this essay is yes Vikings are in fact vicious however they do have good in them when given a chance and their impact on our land has been enormous.

Tutor comment:
"I came to this placement late but really enjoyed working with this school. This article is the result of considerable hard work from C.: he listened carefully and put considerable thought into explaining his argument, supporting it with evidence. He also worked consistently hard throughout the course, producing work each week which allowed him to develop his ideas. Many thanks to Ms Blow for her support and congratulations to C." - S. Bankes

Is effective judging the bedrock of a stable society?

Year 9, Key Stage 4

Pupil Name: Emily Knight
School Name: Oasis Academy Sholing
Supervised by: Yusuf Sulayman
Tutor University: University of Portsmouth
Course Title: Are Societies Shaped by Their Formal Judging Models?

Introduction

If you lost faith in the judicial system, what would you do? What would other people do? Would people just get on with their lives in they weren't treated how they deserve to be or would they fight back? Would society stay stable or would it collapse? The questions are what this essay will look at.

What is a judge/judging?

A judge is a neutral third party who solves a conflict – they should listen to both sides of the argument before making a decision. Everyone is a judge at some point in their lives. For example, a teacher solving an argument between two students. A good judge is fair and just – they listen to both sides of the story before forming an opinion. Bad judging means that the judicial process was not fair. The judging could have been influenced or not everyone was listened to. Judging affects lots of people. For example, someone is sentenced to prison without fair judging – this not only affects the person but also their friends and family. Judging does not have to be in a professional and formal setting – however if it is, it should follow the effective judging model. Judging can included forming an opinion on someone you see walk past or making a decision about not looking at as book because you don't think it will be good because of the cover. Professional judging is about law and court cases and this type of judging has to have ideas and rules that have to be followed to stop unjust actions or unjust sentences.

What is effective judging?

Effective judging is judging fairly and without interference – another way to say effective judging is good judging. It require equity and equality to be used correctly. Equity is when people's needs are met – so people will get different things to meet their needs. Equality is when everyone gets the same thing even if it doesn't everyone's needs. An example of equity vs equality would be splitting six apples evenly even if one person needs four and the other only needs 2 (Equality) whereas you could split it 4:2 to begin with (Equity). Effective judging works and keeps a society stable because it's fair and most people agree with what is apart of effective judging. These features can be grouped together and are called an 'effective judging model'

What are the features of an effective judging model?

An effective judging model describes what effective judging should have when in a professional setting. It should have independence so the judge can not be influenced by the parties before hand or by another third party that is not neutral – a judge is meant to have no opinion on the parties before the judging starts. Another feature is accountability. This means that the judge is held accountable for their actions. A judge is not above the law. Fairness is also needed in effective judging. Fairness means people are all treated without discrimination. Fairness has a mix of equity and equality. Another important feature of good judging is: "thinking before acting and speaking and having the tools to make good decisions in a variety of situations. Judge's actions affect people so thinking before you act is important as to not effect too many people negatively when it is unnecessary. Judges also face different situations each case and so they need to be able to adapt their skills and knowledge too each situation.

What are the roles of justice and fairness when judging?

Justice and fairness play important roles in the judicial process – but why are they needed so much? If there is no justice then the judging is unfair and so it results in bad judging. Justice is about being moral and morally right – which is why it is often linked to fairness. Fairness is morally correct because it means people are not treated differently because of what they believe in or what they look like. If there was no fairness, then the judging would no longer be independent because people's opinions would affected their decisions. If there is no independence or accountability then there is no effective judging. Fairness and justice is to the pillar of fairness 'make decisions without playing favourites and don't take advantage of others. Don't blame others carelessly or unjustly' This means you can't use the power of being a judge in an immoral way and you have to be neutral to the case and the people involved before it starts.

Why are judges needed to have their own mind?

Judges need their own mind so they remain neutral when making decisions – but what does 'own mind' refer to? Does mean separating everyday life from the courtroom? Some interferences aren't caused by something from a judge's life outside of their job. For example, a judge may be influenced by something political rather than something personal about one or more of the parties. Separating each case and not thinking about how one case could affect another? Separating each case would be independence however some cases link together and need to be looked at together when judging another case. Separating each case could be useful in some scenarios but no all. These ideas and rules around a judge having 'their own mind' seems like they could be difficult to always stick to. However, having their own mind is part of their job and is required to not be influenced and having unfair and unjust judging. If their judging is unjust and unfair they can be held accountable.

Accountability

Because a judge does not equal being above the law, they will be held accountable for their actions. They need to be held accountable for their actions because lots of people are affected by a judge and their decisions. Being held accountable can have a multitude of different ways to describe it. However, the definition of accountable in the Oxford English Dictionary is 'required or expected to justify actions or decisions; responsible'. Using this definition, we know that judges have to hold responsible for their actions. But accountability can also mean just checking the judge and their power – making sure they are not abusing their power and them holding them responsible if they do so. There are 4 types of accountability, these are The Accountability of the Judiciary: 'Internal accountability to more senior judges or courts... External accountability to the public... Accountability to the executive branch of the state... Accountability to the legislative branch of the state... these forms of accountability overlap'. The judge determines how the complains will be managed and how the judge will be held accountable. This means that not every judge will be held to the same type of accountability for them doing different thing.

Justice in an influential environment

If the environment the judges are in is heavily influenced or where the judges have become too powerful, there is not the promise of justice. This is because there will be no effective judging and so there will be no justice. What is justice? The Oxford English Dictionary defines it as is 'the quality of being fair and reasonable' and 'just behaviour or treatment'. This means that justice is treatment without discrimination against a group/groups of people. They are impartial. If a judge was influenced by other people or their power than there is a chance that they will discriminate against one of the parties or have a preference for one of the parties over the other. Then the judge is no longer impartial.

What is a stable society?

'11 Examples of Social Stability' by John Spacey 'Social stability is the degree to which a society... remain predictable and reliable' is one way a stable society is described. But what keeps a society predictable and reliable? The loss of faith in judging can cause people to become unpredictable and unreliable. Places with higher crime rates might be more unpredictable however crime rates might be higher due to a lack of effective judging. If there is no effective judging then the people who are committing the crime could be influencing decisions or not being judged at all. Lack of good judging is not the only thing that can cause societies to become unstable. For example, rising social instability, a growing risk for global businesses, 'One of the main ingredients of social instability is economic disparity...coupled with political volatility'. These factors are not about the judicial system but how money is shared and how unpredictable the government of the country is. The people in charge are going to be unreliable then so will the people. However, the economic disparity has lots of matching features with bad judging. For example both are unfair and a group of people are not getting what they deserve/treated how they deserve.

What happens when people lose trust in the judicial system?

People lose trust in judging and the process if there is not the respect and treatment that they deserve. They will lose trust if there is no effective judging. Normally if people find an issue with the system they will report it to a higher power, this might happen a few times before they lose faith. If people lose faith then they become unhappy and restless. People begin to protest and they become unpredictable and there is chaos. An example of protests are a group was oppressed by their judging system was the 'Black Lives Matter' movements. This was caused after the arrest and murder of George Floyd in America in 2020. However, loss of trust doesn't always end in chaos.

UNODC – Judicial Misconduct and Public Confidence in the Rule of Law 'Judicial misconduct breaks down the very fibre of what is necessary for a functional judiciary – citizens who believe their judges are fair... judiciary cannot exist without the trust and confidence of the people.' This shows how effective judging needs to have support of people otherwise it will not exist or work – people's faith is what stops the judiciary from not working. However, if people lose faith in the judiciary system then it will be difficult to restore order and people cannot be relied on to uphold a system that doesn't work and is not fair.

Conclusion

In conclusion, a stable society is held up by many factors however effective judging is one of the largest factors and if removed could lead to chaos. This is compared to other factors where two or three would have to be removed before the society spiralled to violence and protesting. However, all elements of the effective judging model are need for effective judging to work smoothly and not fail anyone.

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Parent comment:

"I am really proud of my daughter's accomplishment. She really enjoyed this programme and not only has it boosted her confidence but it has piqued her interest in the justice system."

An Analysis of an Advertisement using the Fairclough Model

Year 10, Key Stage 4

Pupil Name: Emily Marshall
School Name: Reddish Vale High School
Supervised by: N. Khorramrooz
Tutor University: Manchester Metropolitan University
Course Title: How does language contribute to the use of power in society?

In this essay I aim to analyse the provided text, an advertisement regarding the 'Whitechapel Mission', thoroughly using the Fairclough model, and consider its effect on the recipients. Created by Norman Fairclough, the model will allow me to assess the content of the text, and help my critical analysis on three levels: Textual, Discourse and Social. It will assist with structuring my points, to ensure that my explanation is clear and easy to read, and that my arguments are demonstrated well.

The body of the text is an advertisement which gives endorsement for the 'Whitechapel Mission' and is positioned on the London underground. [1] Whitechapel Mission, (2022: online) states that "The Whitechapel Mission has been serving the homeless and marginalized since 1876" and that they provide services such as "day centre, skills training and career advice, activity programmes and specialist support". We can understand that this charity organizes a range of services that benefit those without homes or in worsened situations.

I will begin by exploring the textual level of Fairclough's model, and analysing the text itself, specifically any literary devices and the language used, along with how the advertisement looks at face value. The poster is presented in a minimalistic way, using a lack of images and large, bold writing. It appears the text gives an insufficient amount of information, due to it being displayed in a concise way, however this allows all messages within to be processed quickly. Those reading would understand what the advertisement is asking immediately, despite there being no eye-catching images or vocabulary. This keeps a professional feeling towards the poster and demonstrates to the recipients that the organisation is credible and serious — it has true intentions to help the marginalised. The simple colours work cohesively and provide a significant amount of contrast; the dark blue writing displayed on a white background allows for easy and accessible reading, even from extended distances. Furthermore, this style of advertisement is almost trademark for the London Overground. Other posters in this location, for example, ones announcing the need for face coverings, are also formatted in this way — blue and white writing. While seemingly irrelevant, this allows frequent travellers on the underground to immediately notice these company documents, thus providing focus, due to these advertisements having significance in relation to the underground itself. In addition, the advertisement uses a range of simple but meaningful vocabulary to further demonstrate its purpose. The key word of the poster being 'begging'. Not only does this have instantaneous relevance to the subject of donation and homelessness but creates a sympathetic atmosphere for the readers; there is

an understanding that those who must resort to begging have no other choice due to their dire situation. However, the verb, 'to beg' often has negative connotations, and relates to unfortunate events and the act of asking for assistance from the more fortunate members of society. Many disregard beggars and view this act as shameful and almost embarrassing. This negative view may be due to the nature of the word itself. The motion of 'begging' could be linked to the orientational metaphor, 'down is bad' as the posture while pleading is low to the ground, crouched over or kneeling. This link explains the negative stigma that surrounds begging or beggars. The pessimistic view of these 'beggars' contrasts with the aim of the advertisement, to gain donations, and therefore must be combatted in order to achieve sympathy rather than indifference. Therefore, the poster contains a semantic field of hospitality and kindness. Vocabulary such as 'donations', 'generosity', 'carefully' and 'welcomed' are used, which comes off as both inviting and persuasive. While affection may not be a common persuasive tactic, I believe that a warm approach is the optimum strategy regarding receiving donations — often people will respond to kindness with their own. Additionally, harsh and demanding language would deter the reader, therefore proving the effectiveness of a less commanding and pressuring approach, replaced with praise and invitation. On an extra note, the emphasis of 'carefully' gives a sense of security to the reader. They are convinced that their money, if they choose to donate, will be well spent, thus also increasing potential donors to the cause.

In this section, I will use the Fairclough Model to analyse the text at the discourse level and emphasise how the advertisement may be interpreted by the recipients. I will also explain the purpose of the text from the designers' point of view. It is evident that the apparent aim of the advertisement is to encourage donations to the Whitechapel Mission to reduce the number of people living without adequate housing, or any at all. They aim to improve the wellbeing of this class of people and ensure that they achieve the correct help to emerge as citizens. The advertising methods explained above demonstrate how the designers were selective in their choices of promotion and persuasiveness, and how their posters are geared towards gaining the most donations possible, in order to be useful to the largest number of people. However, an overlooked message in the poster could be that it acts as a deterrent — by encouraging charity, there is a less prominent need to donate directly to the "beggars". This is seemingly to prevent their expenditure on harmful or addictive substances, such as alcohol or tobacco, which is made clear in our society; homelessness leads to desperate methods of escape. Some may question whether this is truly helpful, by redirecting the donations to the charity, is it instead only benefiting a smaller amount of people who have been deemed as exceptionally bad cases? Will the donations reach a wider amount of people, or will they be unable to provide welfare for most due to budget issues? Despite this, the designers want the recipients to believe that their cause will supply a significant amount of assistance, and donating is the best decision to help anyone who may have to resort to begging on the streets due to their homeless situation. The public will consume this media in all probability as a small poster. The

text in question is placed on the London Underground, simply on the wall. Therefore, the recipients and those most likely to donate will be travelling on the Underground, hence why the poster was made to be noticeable and contains contrast between the writing and background — this is most convenient and accessible for the area it will be placed in. Furthermore, the readers may glance at the advertisement for a short period of time, meaning the information must be concise (as stated before, the advert has achieved this) — otherwise, it would be difficult to understand, and the recipients would likely not retain any crucial details. Additionally, I believe that the underground is a carefully chosen location for this advertisement. If we were to compare it being placed in another area, such as an entertainment or leisure facility, the poster would undoubtably be less relevant. The public here would have no concern for the advertisement, as it is not relevant to their activities and their focus would be contained elsewhere. This would overall decrease the amount of donations and be a waste for the charity- Their efforts would not see results. Because of this, the Underground seems to be an excellent location choice. First, it is appropriate for the subject of the advertisement, as underground stations may provide sheltered areas for the homeless, and the passengers may have experienced their presence first-hand. Secondly, while travelling on the underground, there is a high probability that the advertisements will have their undivided attention, due to the nature of traveling by this method for moderate periods of time. Thus, a large amount of people will see the advertisement each day, as hundreds of thousands commute to work on The Underground, proving the immensely public area to be perfect for this brand of advertisement. Overall, we understand that the location of an advertisement is significant in achieving a certain goal, in this case retaining donations.

In this final section I aim to place my points into the context of our current society and explain my arguments in relevance to how the advertisement will affect the public, and how the events of modern day change the way the advertisement is viewed. Some say that England is a capitalist society, and that it thrives off businesses and the economy, despite there being a prominent socialist backbone. This undermines the concept of charity. As it seems, charity follows a more socialist path, as the ideology promotes a fairer distribution of wealth through taxing the more fortunate to help the underprivileged. As we describe charity in this way, it can be related to other socialist advancements, such as the welfare state and NHS, which in harmony provide a better wellbeing for the marginalised. This relation therefore describes the act of charity in an increasingly positive light, and with this positivity, increases the number of people willing to commit charitable acts, such as donating to the Whitechapel Mission or directly to the homeless. On the other hand, however, because of the current issues with society, specifically regarding the economic crisis, for example energy and gas prices rising exponentially, along with inflation, many will be less inclined to contribute their money to the cause. Therefore, the advertisement process itself is significantly more important. By spreading awareness of the ongoing and ever-expanding homelessness problem, despite the unfortunate societal state, will cause an increase in donations, especially since London is a hotspot for people living in

rough conditions on the streets. According to [2] Shelter England, (2021: Online), "one in 53 people… homeless in the capital". It is also stated that London has the highest percentage of homelessness in all of England. The evidence continues to solidify that homelessness is a raging issue and must be resolved, which demonstrates the serious need for these charities, the Whitechapel Mission being one of many. Additionally, this expresses why their advertisement is crucial to their message; charities are perhaps one of the only ways the general public can guarantee help to the unfortunate members of society. Some people have shown themselves to be naturally charitable and kind, so organisations must work with sympathy and guilt to truly ensure a change for the homeless. As we know, only the higher and favoured members of society have the power to help, thus explaining why these posters are geared towards them. Each persuasive technique and designer's message aims to convince these people to donate. To do this, the negative stigma surrounding begging and homelessness must be removed, and the recipients of the advertisements must emerge with a new mind and positive view of the world.

In conclusion, the advertisement is extremely effective in following the message of the designers; to gain a significant amount of donations to their cause and improve the lives of people living on the streets. They utilise persuasive techniques well and can convince the audience of helping one of the most marginalised categories of people. Overall, combining the advertisement itself, how it is interpreted and the context it is placed in, it is evident that the advert does exceptionally well at conveying its main messages.

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Parent comment:
"The Scholars Programme has given Emily an insight into the university experience and helped her realise her potential. It has increased her confidence in understanding that she can be whatever she wants to be, and that a university place is an option for her future. Thank you for mentoring Emily and giving her this amazing opportunity."
- Melanie Marshall

Evaluate the extent to which poets and dramatists in the period 1618-1625 used the technique of 'Othering' to encourage the popular distrust of Anglo-Spanish relations and undermine King James I's efforts to maintain peace with Spain.

Year 9, Key Stage 4

Pupil Name: Evie Cann
School Name: King's Norton Girls' School and Sixth Form
Supervised by: W. Green
Tutor University: University of Birmingham
Course Title: Creating the Enemy: 'Othering' in Anti-Spanish Drama in England, 1618-1625

Following the outbreak of the Thirty Years War in 1618, King James I went to great lengths to maintain peace with Spain, including exploring a proposed marriage between his son, Charles, and the Spanish Infanta Maria. Negotiations surrounding this alliance took place over the period 1614 to 1623. However, at the time, the distrust of Anglo-Spanish relations was widespread amongst the English population, and James soon found the country questioning his authority as king.

Parallel to the onset of the war came the rising success of various platforms which allowed the people to communicate their dislike of the Spanish, amongst these, the theatre. The theatre's ascendency throughout this period provided an opportunity for poets and dramatists to cause further uproar, by influencing their audience's political beliefs.

Anti-Spanish portrayal of real-world figures and events was considered unacceptable by the king, and therefore underwent strict censorship. In response, playwrights used a breadth of techniques to translate their negative ideas surrounding these figures and events into a permissible form. As a result, characters of Spanish descent were often portrayed as antagonistic and inferior to the white social majority; this is a concept we now refer to as 'Othering'.

'Othering' took place in many plays written during the early thirty years war, such as Thomas Middleton and William Rowley's 'The Changeling' (1622), and Phillip Massinger's 'The Renegado' (1624). Both plays are concerned with the perceived sexual immorality of women of colour and encouraged the popular distrust of Anglo-Spanish alliances by exploring twisted relationships between characters of English and Spanish descent. In this essay I will compare Middleton and Massinger's theatrical works and analyse their contrasting uses of 'Othering' to express and shape attitudes towards the Spanish.

The first play that this essay explores is Phillip Massinger's tragicomedy 'The Renegado', which provides a good example of the use of overt 'Othering' in Jacobean theatre. I will look at the character of Donusa, and how Massinger's portrayal of her race influences the audience's perception of her relationship with the play's 'hero', Vitelli.

The play follows Vitelli, a Christian gentleman who has come to the city of Tunis disguised as a merchant, in search of his kidnapped sister. He meets Donusa, the Turkish niece of the Ottoman Emperor, in church, and falls instantly in love. However, once it is discovered that they have slept together they are imprisoned, as any Muslim woman who sleeps with a Christian is harshly punished unless she can convert him to Islam and marry him. Donusa fails to do so, and instead converts to Christianity. She is condemned to death for betraying her religion, as is Vitelli for encouraging this. Ultimately, they escape the prison and leave Tunis, with the help of his sister and her pirate captor.

Whilst onstage Donusa's skin is painted dark to emphasize the racial differences between herself and Vitelli. Throughout the play this interferes with how she is perceived by Jacobean audiences, as their negative convictions about 'Moorish' people lead them to interpret Donusa as the villain of the narrative.

This is most apparent later in the play, as she tries to persuade Vitelli to convert Islam. Despite their equal efforts to convince one another, Donusa comes under scrutiny for attempting to coerce him into betraying his religion. In Act 4, Scene 3, she reasons with Vitelli, urging him to 'Quit your shoulders of a burden under whose weight you wilfully hath too long groaned,'(4.3.19-21) to which Vitelli responds with a scornful retort. When viewed by modern audiences, it is understood that Donusa is much wiser and more willing to reason than Vitelli. However, to Jacobean audiences, whose judgements have been clouded by their preconceived ideas surrounding 'Moorish' women, Vitelli is heroic, having risen above her efforts to intimidate him.

In Massinger's The Renegado (1624) and the Spanish Marriage , C.Jowitt draws parallels between Donusa and Vitelli's relationship and the proposed marriage of Charles and the Infanta Maria, which was unpopular with James' subjects. She describes 'His (Vitelli's) own narrow escape from "Turning Turk"' and how this 'Resonates against aspects of the proposed marriage'. This was intended to lead Jacobean audiences to associate Donusa with the Spanish, and the plotline with Charles' own 'narrow escape'.

Towards the beginning of the third act Donusa comes under further criticism for not only having betrayed her religion, but also for having given up her virginity. Massinger encourages the audience to now view her as a wicked woman, which is mirrored in her hostility towards Mustapha (a potential suitor). This sudden change of character is intended to reflect her loss of innocence and is emphasized by Massinger's use of exclamatory language. For example, upon discovering Donusa's secret Mustapha declares 'O land Crocodiles, / Made of Egyptian slime, accursed woman!'(3.1.121-2). This language provokes an anger in the audience and reaffirms their initial disliking for the character (and her race).

J.H.Degenhardt explores Vitelli's decision to 'relinquish' his virginity, and suggests that Massinger considers this justifiable because of Donusa's sexual power over Vitelli. Degenhardt references Massinger's referral to Donusa as 'the Devil'(2.4.134), how this coincides with the belief that 'Moorish' women were sexually immoral, and highlights the wildness of her ways.

From a modern perspective she is no more immoral than Vitelli, however the way in which her character was digested by Jacobean audiences was heavily influenced by Massinger's focus upon her race. The wildness of her ways often directly links back to his perception of 'Moorish' women, and his personification of the negative, preconceived ideas surrounding people of colour reflects the significance of judgemental attitudes towards the Spanish during the early Thirty Years War.

Massinger was one of many dramatists who overtly encouraged the popular distrust of Anglo-Spanish relations by 'Othering' characters of a different race, and his audience's blindness to such clear 'Othering' suggests that similar attitudes surrounding the Anglo-Spanish alliance were common amongst the general population. In contrast, some other playwrights believed that the English should take pity upon Spanish characters for being burdened by their heritage, rather than looking down upon or fearing them, which was translated into their onstage portrayal of Spanish characters.

An example of this can be seen in Thomas Middleton and William Rowley's 'The Changeling'. This part of the essay further explores how race influences the audience's perception of a character, and how Middleton's portrayal of race contrasts with Phillip Massinger's interpretation. I will look at the character of Beatrice-Joanna, and how her purpose in the narrative impacted how she was racially perceived by the audience.

'The Changeling' follows a young, wealthy Spanish woman named Beatrice-Joanna. Beatrice-Joanna has recently become engaged to Alonzo de Piraquo, but upon meeting a man named Alsemero in church she falls instantly in love. Afraid of disappointing her father, she knows she is unable to end her engagement to Piraquo, so she enlists the help of her father's servant, De Flores, to kill him. Beatrice-Joanna strongly dislikes De Flores, as he is hideous and obsessed with her. However, she decides to ask for his help and offers to reward him with riches, as she knows he will have no choice but to flee once he has committed the crime.

De Flores brings Piraquo's ring to Beatrice-Joanna, with the finger still attached, as evidence that he has done as he was asked. She is horrified to learn that De Flores expects her to sleep with him as payment, but complies once he threatens to reveal what she has done. Soon after, Alesmero discovers her adultery with De Flores and, when she admits to the crime of the murder, has them both locked up. De Flores, distraught, stabs Beatrice-Joanna and then kills himself.

Middleton's use of 'Othering' is more covert than Massinger's and portrays race in a different manner to most playwrights during this period. The story itself is set in Alicante, Spain, meaning that all the characters are somewhat racially 'other' to the English, and therefore their racial differences are less obvious to the audience. However, the characters Beatrice-Joanna and De Flores differ both racially and in terms of social class. De Flores, whose race is emphasised in a similar manner to Donusa's, is illustrated throughout the text as grotesque, in both character and appearance. He is looked down upon for this most of all by Beatrice-Joanna, who is portrayed as fair skinned and disconnected from her Spanish roots. In emphasising this, Middleton is encouraging the audience to sympathise with the young, beautiful Beatrice-Joanna, who is in the unfortunate position of being considered racially equal to the wicked De Flores. In 'The Spanish Race', Barbara Fuchs describes how 'Sympathetic depictions of Moorish women in literary or historiographical texts occasionally portray them as blonde, Petrarchan beauties.' Middleton uses this technique in his portrayal of Beatrice-Joanna to make her a more appealing character and encourage the audience to look past her Spanish roots, making them feel morally superior.

This influences how she is perceived by the audience in Act 3 Scene 4, after De Flores has returned with Piraquo's ring. When Beatrice-Joanna offers De Flores gold as a reward he asks, 'Do you place me in the rank of verminous fellows, to destroy things for wages?' (3.4.66-7) Confused, she offers him double the sum, in the hopes that he will flee, but he instead kisses her. Beatrice-Joanna is repulsed when she learns what he wants, and cries, 'Why 'tis impossible thou canst be so wicked,' (3.4.123). De Flores tells her, 'You must forget your parentage to me, / You're the deeds creature; by that name you lost' (3.4.139-40). She proceeds to sleep with him, to ensure he will keep quiet, and therefore, loses her virginity.

In contrast to Massinger's approach, by portraying Beatrice-Joanna as 'white', and 'Othering' De Flores, Middleton encourages the audience to identify and sympathise with Beatrice-Joanna, despite her Spanish origins. As De Flores stands over her, she kneels and cries, 'Let me go poor unto my bed with honour,' (3.4.161) as though she is a victim, being held captive. She is victimised in this way so that the audience feels sorry for her, as she is vulnerable, and under the influence of the wicked De Flores. In Shame and Pleasure in The Changeling, Jennifer Panek argues that this approach was particularly surprising, as it differed from standard portrayals of women in similar circumstances. She describes 'a certain difficulty in disentangling […] the modesty, bashfulness, or "shamefastness" that is supposed to stem from purity, and the shame that arises from wrongdoing or the perception thereof.'

The audience's sympathetic perception of her character therefore links back to Middleton's presentation of her race. He disconnects her from her Spanish roots to encourage the audience to identify with her, and to look down upon the villainous (and 'more Spanish') De Flores.

Similarly, the difference between the way in which Beatrice-Joanna and Donusa were perceived by the audience after they had lost their virginity was primarily down to their racial differences. Although the two were both racially 'other' to the English, Donusa's differences were heavily emphasized onstage. As she was unfamiliar to the civilized, white social majority, perceptions were influenced by her race, and therefore she was looked down upon for being different. Beatrice-Joanna, however, was similar in appearance to the average white person, and therefore the audience was more inclined to feel sorry for her.

Although these two plays approach race in very different

ways, both encouraged the popular distrust of Anglo-Spanish relations, by 'Othering' characters of colour. These varied approaches are reflective of the diverse attitudes towards the Spanish in England at the time, however both plays were written with the intention of enforcing the belief amongst English audiences that people racially 'other' to the white population were inferior. These dramatists, like many others, translated the negative ideas surrounding the Spanish into narratives which could be digested by regular people, and in doing so undermined King James I's efforts to maintain peace with Spain.

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> **Parent comment:**
> "Evie works hard at everything she does and enjoys pushing her academic boundaries. The Scholars Programme allow her to do that and should give her more confidence going forward. I'm very proud of her!" - Richard Cann

Part One: Produce a piece of creative writing that describes a natural setting as an introduction to a story.

Part Two: Write a commentary analysing your creative writing – this should cover how your piece of creative writing represents nature, how you would like your reader to think and feel about nature and what choices you made to create that effect.

Year 5, Key Stage 2

Pupil Name: Layla Smith
School Name: Ryecroft Academy
Supervised by: S. Richardson
Tutor University: Royal Holloway, University of London
Course Title: Into the Deep, Dark Woods: A Journey Through Literature

Part One: Original Creative Writing – What Lies Beneath

Sydney was looking for an adventure. One calm, relaxing morning, Sydney was walking down the beach. Pale white sand was crunching through her toes, slightly burning the arches of her feet. The sea was a still as a frozen lake on Christmas Eve. As she looked up, the sky had so many shades of blue. Fluffy, marshmallow-like clouds soared gently through the sky. Not a single noise was heard but the calls of the seagulls squawking.

As she gazed around with delight, a vessel approached her. It was a small coral boat with a variety of coloured snorkels. Cautiously, she stepped onto the boat. It was time to dive!

Whilst they sailed, Sydney stared in awe at what she could see: vibrant, turquoise and teal. The water moved indescribably. With frustration, Sidney waited for her signal.

With a splash she entered the water! It was a different world down there: only a glimpse of light shone on Sydney. Deadly creatures roamed around her, snapping at her feet. When she looked up, the boat was gone!

An undiscovered cave lurked in the murky water. As she swam towards it, her heart was beating out of her chest. Every now and then she could only see a speck of colour. The silence was deafening. No fish, no colour, just predators. It was lifeless. Dark sand was plastered on the floor. As she swam deeper, the water got darker. Until she saw a cave! Black rocks covered the outline of the cave. She carefully stroked the rocks, covered with algae and bones.

Finding her inner courage and remembering she was looking for an adventure, Sydney entered the cave. Only the headlight from her hat could provide enough light to see in front of her now. The further she got the narrower it got. She heard a noise from the bottom. She tilted her head… down… towards the noise… and there it was…

Part Two: Critical Commentary and Self Reflection

It is important for writers to use the right settings in their story because it helps the reader to build the correct image for the story. If writers use the wrong settings, readers would be confused by the story and may feel the wrong emotion towards a setting. To explore the importance of natural settings, I wrote an original piece of creative writing called 'what lies beneath.' I chose the setting of a beach both on top and below the world. In this essay, I will be evaluating my own creative process, and I will be explaining how my writing represents nature. I will also explore how I am trying to make the reader feel about nature in my own writing.

First I am going to analyse some language I used in my creative writing, and explore how it represents nature. One interesting adjective I used in my creative writing is 'fluffy.' I used the adjective 'fluffy' because I wanted to make the reader feel relaxed, and make the reader feel safe and comfortable about nature. Another interesting adjective I used in my writing is 'vibrant.' I choose the word 'vibrant' as it is a powerful word giving the reader a clear image of the colours turquoise and teal. I did this to make the reader feel excited about nature.

Next, I'm going to analyse some of the imagery I used in my creative writing and explore how it represents nature. I decided to use juxtaposed imagery to create a contrasting effect. I used 'soared gently' in my writing to create peaceful imagery, to make the reader feel at ease and secure about the setting. It is designed to represent something beautiful, to make the reader like nature. In contrast, in the second part of my story I used the phrase 'deadly creatures'. I chose this piece of imagery to insure I captured the correct animals for the second part of my setting, and also because it makes the reader feel nervous or tense and has the effect of being scared. It is designed to make the reader fear nature.

Finally I am going to analyse the use of simile in my writing. I used a simile to create a clear image of nature for the reader. In my writing, I used the phrase 'marshmallow-like clouds,' and I chose to write this to create a sense of excitement, and to make the reader feel like the clouds are too good to eat. It is designed to make the reader like and respect nature for the pureness of its beauty.

In conclusion my piece of creative writing creates a contrasting representation of nature. It begins beautifully and calm, but ends dark and mysterious. This in turn makes the reader feel safe and also nervous about nature. I chose to create this effect by using strong adjectives, powerful similes and clear imagery.

Nature is important because we need it to survive: the natural world was here long before humanity, and will be here long after it's gone. A natural setting can have a deep impact on a story, as it can determine how the reader feels, what they think, and how they perceive nature.

> **Parent comment:**
> "The programme really helped Layla to dig deep to find her resilience with the most amazing outcome!" - Jennifer Smith

Write a Literary Analysis of one of the extracts through the lens of two literary theories evaluating its usefulness for studying literature

Year 7, Key Stage 3

Pupil Name: Millie Boswell
School Name: Esher Churcher of England High School
Supervised by: S. Bankes
Tutor University: The Open University
Course Title: Through the Looking Glass: Introduction to Literary Theory

Introduction

This essay will analyse "Little Red Riding Hood and the Wolf" by Roald Dahl, using ecocriticism theory and feminist theory. "Little Red Riding Hood and the Wolf" was a poem written in 1982 and it was a modern take on a centuries-old traditional tale originally collected by Charles Perrault in 1679. Literary theory helps us have a deeper understanding of the text. It encourages us to think about stories from different angles and perspectives while also getting us to look at more global and sweeping themes in the multicultural societies of our world. Literary theory causes us to read between the lines and consider a text through a different critical lens to look at the assumptions and values that lie embedded within language and cultural expression.

Ecocritical Theory

Ecocritical theory looks at the relationship between literature and the environment. It examines how literature reflects and shapes our attitudes towards the natural world, and how it can be used to promote environmental awareness and activism. Ecocritics analyze literary texts for their representations of nature, and explore how these representations reflect cultural values and beliefs. They also examine how literature can be used to inspire environmental action, and how it can help us to understand and address the environmental changes we face today. Overall, ecocriticism seeks to deepen our understandings of complex relationships between human culture and the natural world. It assumes ALL life forms are intertwined and demonstrates how human culture is related to the physical world. In ecocriticism, "the world" is the entire ecosphere, and scholars applying it can investigate the global ecocrisis through the intersection of literature, culture and the physical environment.

To properly compare Dahl's modern tale using an ecocritical lens, we must keep in mind the traditional tale. By the time Roald Dahl writes his version of the story, we no longer just have human woodcutters to take away the forest as was described, we have guns and other post-Industrial Revolution items that seemingly have come to dominate nature. If we make a direct comparison, in Perrault – humans were trying to tame nature but were ultimately still dominated by it; for Dahl – nature had been overtaken by humans and their technology. From an ecocritical perspective, where does this domination end? Much has occurred even since Dahl's 1982 version when it comes to humans and technology. What has human domination become in its force over nature? Concrete jungles where "nature" is artificial and fake? The metaverse? The end of anything "eco" where everything is "computerized"? Does human domination come to an end? These are very deep thoughts that will be interesting to observe during my lifetime this century, and an ecocritical view can help give me a less self-centered human perspective.

However, before being able to properly analyse these deep thoughts, how does Dahl's verses connect up human culture and the natural world? The narrator describes how after Miss Riding Hood shoots the wolf dead, a few weeks later in the wood there she was, but without her red hood and instead in a "lovely furry wolfskin coat." This is her not only wearing the wolf's skin as a trophy but again making a human an animal. We have to realize in Dahl's poem society has advanced over time, so we have used humanity's collective experience to be more prepared and have more knowledge. By the time of Dahl, Little Red Riding Hood can already expect what might happen. Therefore, she comes prepared with a gun. The background of Dahl's version has a base that is the folk tale, and not the forest. This 1982 version somehow has more of a comedy feel, and this is not what we might expect since our own first understanding of this story

may have been one of darkness and fear. Back to the ecocritical lens, we can probably also say the comedy is not just funny. The comedy can be dark when the ultimate victor is the "smarter" and more prepared human that has now dominated nature.

Feminist Theory

Feminist theory encourages us to look at the text in a slightly different way because it focuses on the relationship between men and women and their roles in society. It draws our attention to the idea that the relationship is often unequal and favours men and their ideas. It also encourages us to recognize that writings about women often misrepresent, underrepresent or criticise them. It is important to know that the writers doing this do not have to be male. This is what bell hooks tries to point out in her definition of feminism when she points out her opinion that we have been "socialized from birth to accept sexist thought and action." Therefore, females can be as sexist as men. This definition helps with the mindset of being a feminist critic when looking at stories, poems or any cultural expression.

Looking at Dahl's modern twist on the traditional tale through the feminist lens, perhaps Dahl can be promoted as a feminist champion. Where the traditional tale makes Little Red Riding Hood and her grandmother victims and maybe much weaker and less intelligent, the modern tale gives Little Red Riding Hood power. The reader can now see Little Red Riding Hood outsmarting the wolf, and even using sarcasm to show this. It is now Little Red Riding Hood luring the wolf into a trap, as opposed to the wolf dominating Little Red Riding Hood. Little Red Riding Hood calls out the eyes and ears, and then pivots with a "BUT" to point out the "lovely great big furry coat" – the wolf now questions why Little Red Riding Hood has not mentioned his "BIG TEETH"! Instead, Red Riding Hood rewrites the narrative (with which she appears to be familiar) from a very much more feminist perspective as she takes action to defend herself.

"She whips a pistol from her knickers" and within seconds has killed the "creature" – here, the female of the story has full control and displays the character of one who will defy. The reader can see an independent and fearless girl or woman. The old fairy tale world of hundreds of years ago where males/men dominated, has now been reversed. This causes us to open our minds and throw out what we might have originally thought on stereotypes.

Reflection Paragraph

On reflection, while a comparison of Little Red Riding Hood's traditional fairy tale to Dahl's modern poem is very powerful from a feminist lens, applying the ecocritical perspective for this tale seems more powerful and I am fascinated by the overarching science elements tied to this theory such as the advancement of human "progress" over the course of a few hundred years that appears to produce a very real threat to the natural world that we observe and are taught about from a very young age. Looking at the late 1690s telling in comparison to the 1980s version should produce a thought of conservation and preservation of the natural world for those who read and compare from the ecocritical lens. The comparison

highlights how quickly, when looking at the time across the entire history of the world, humans can make an impact that seems hard to reverse. Could it be though, that this human impact is working to actually be more harmful to humans than the natural world over a longer time period? It may seem that humans dominate nature now, but perhaps we should think about the big picture.

Conclusion

As this essay has shown, ecocritical theory encourages us to reflect on the way that ideas about the global ecocrisis through the interaction of literature, culture and the environment are presented in this text. Specifically, Dahl's modern tale through the ecocritical lens draws attention to how humans consider themselves to have dominated nature, and have used industrial advancement and technology to do so. Indeed, Dahl's Little Red Riding Hood takes the fight to the wolf's territory, easily kills the wolf and even wears the wolf's skin demonstrating full domination of nature. Feminist theory, meanwhile, helps us to consider when examining Dahl's poem the fact that old stereotypes about females, girls or women, are not the same in the modern age. Dahl challenges our thoughts by stating a pistol has been pulled from Little Red Riding Hood's knickers. In this way, he has flipped old ideas about strong and weak in relation to men and women, on its head. What comes across to me as a stronger theory to examine this poem in the year 2023, is the ecocritical perspective. Strong women have been around since the time of Cleopatra, Joan of Arc, Annie Oakley or even Bonnie. Humans continuing to dominate nature and turn the world into a wasteland, seem more of a pressing matter in the year 2023. There is a tipping point where humans who are thinking they are so smart, actually become stupid. The technology used by humans, in dominating nature, will reach a point where it may backfire on humans. This would lead to nature actually showing that all along it has been more powerful than humans. Mother Nature is tougher than people like to give her credit for, and Mother Nature always wins.

Parent comment:
The Scholars Programme has positively pushed my daughter to believe in herself and her abilities. It has increased her confidence in more than just the area of essay writing, and has motivated her to be her best as she pushes through secondary school toward GCSEs, A-Levels and university age. Thank you, Brilliant Club and PhD tutors! - Kent Boswell

To what extent are language and social norms important when planning emergency communication strategies and responses, specifically, how can we use both language and social norms to encourage or support positive behavioural responses?

Year 10, Key Stage 4

Pupil Name: Nicole Creado
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Course Title: "Help!!!": How should we plan emergency communication?

This essay will evaluate the importance of language and social norms, and how they can be applied to encourage positive behavioural responses in emergencies through emergency communication strategies and responses. Many emergencies have resulted in deaths such as the September 11 attacks, where there were 2,977 victims, and so have led to research on how people are expected to behave with other people (during emergencies), known as social norms, and the expected linguistic practices that are used in communities, known as language norms. These norms often supersede the myth of mass panic that is expected to be prevalent in emergencies, such as unity that is displayed, where communities will often "rise to the occasion" and assist each other rather than acting irrationally for their own benefit. Therefore, it may be reasoned, these language and social norms may be applied to planning emergency communication strategies to encourage positive behaviours. This essay will critically analyse techniques used in emergency communication and explain their connection to language and social norms. Additionally, these will be critically applied into the examples of COVID-19, 9/11, Hurricane Katrina and the 7/7 London Bombings, and some of the perspectives of people within them and their responses.

COVID-19, a recent pandemic that caused widespread disruption and casualties, can be analysed to assess the importance of social and language norms. When lockdown was ordered, there was a surprisingly high level of adherence, where 81.8% of the 5573 total respondents reported that they had followed the guidelines. This demonstrated that the predicted social norms were inaccurate, showing that most of the public were inclined to follow guidelines, instead of acting irrationally and disregarding them. This belief in social norms led many world leaders to downplay COVID-19 to reduce panic, such as authorities in Denmark who initially attempted to make preparations outside of public view. However, COVID-19 was very hazardous, resulting in millions of deaths worldwide. Because of the expected social norms, authorities worked to hide the severity of the pandemic to reduce potential outrage, which instead spread the virus further, putting more people at risk.

Sandman's Outrage Model is a model that measures the risk of emergencies by the combination of the hazard (risk of death) and outrage (the response). The beginning of COVID-19 would be placed in Zone D of the model. This is Precautionary Advocacy, where the level of outrage is not appropriate to the level of hazard, being too low. People were not aware or were disregarding the hazard, which led to unnecessary deaths that could have been avoided if people were aware of the dangers present: a limitation of social norms.

Understanding the language norms of the area was important during the COVID-19 outbreak, since it had a huge effect internationally. The government needed to communicate with the public regularly with updates, and more people than usual listened to the news for more details, so the way those details were given were vital; communication had to be understandable to most people. In the news, presenters avoided using slang so that the information could be understood easier, and they reported important statistics such as daily death tolls and infection rates with veracity, keeping the public informed, which is crucial in emergencies to make sure people understand the situation. Some strategies that were employed were being clear, firm and in command, demonstrated when countries went under lockdown, drastically reducing death tolls and infection rates. By announcing the lockdown, the government demonstrated their command, and they communicated the severity of the situation by being firm, threatening fines up to £10,000 if people did not comply with the restrictions, ensuring a high level of compliance.

Hurricane Katrina was one of the deadliest and most expensive hurricanes to hit the United States, killing an estimated 1,833 people in 2005 and causing approximately $161 billion in damages. The United States was completely unprepared for the mass devastation that followed the hurricane, and with that, they made some critical mistakes.

Situational Crisis Communication Theory or SCCT is a theory by Coombs that focuses on the crisis responsibility, history and reputation in crisis responses, and highlights the negative and positive aspect in the responses. Using this, mistakes can be identified by finding the failed effect, the root and the cause. SCCT has a basis in social norms because it explains the reasons for people's behaviour or their actions. For example, in Hurricane Katrina, one failed effect (the unwanted response) is the levees or I-walls being breached, the root of that (the reason or belief behind the behaviour) is the lack of prior history with such devastating and powerful hurricanes and the flooding that comes alongside them, and the cause (the influence and experience resulting in the failed effect) is the engineers not accounting for the erosion that comes with the flooding, leaving levees to be scoured away, allowing water to flood through. Using this, we can understand what led to the levees being breached (people not expecting a hurricane at that calibre), and predict what could happen next time, as now there is prior history where there was not before, and so this failed effect is unlikely to repeat and instead more positive behaviours are likely to occur.

In the aftermath of Hurricane Katrina, altruism prevailed, as ordinary citizens strove to help their neighbours, and the Coast Guard even rescued around 34,000 people in New

Orleans. With this proving to be a trend, it could be stated that this is the social norm for the aftermath of emergencies, and so that can be used to encourage positive behaviours like everyone helping each other. However, with that, negative behaviours will come too, and those need to be discouraged somehow. One such consequence is people with a hero complex, which is where people strive to be the hero of the situation, which could put themselves and others at risk. For example, someone could go into the dangerous situation to save someone else, but end up being injured or even dying in the process.

Before 9/11, people did not want to consider severe emergencies and crisis responses, as they saw it as improbable and unneeded, and there had never been emergencies with that level of outrage before. 9/11 completely paved the way for new and improved crisis communication. 9/11, or the September 11 attacks, were terrorist attacks of airline hijackings and suicide attacks associated with extremist group al-Qaeda.

Language and social norms are connected, as language reflects and shapes social norms. Language can help reinforce existing social norms by using terms that resonate with the community's values. After 9/11, President George W. Bush appealed to the Americans by saying "when all Americans from every walk of life unite in our resolve for justice and peace." This resonated with a community that valued solidarity and patriotism, and a country founded on peace. This type of language appealed to the existing social norms and encouraged individuals to act in accordance with those norms. Language can also be utilised to challenge and reshape social norms when necessary. In certain cases, social norms may hinder positive behavioural responses during emergencies. For example, reluctance to evacuate due to concerns about property, which was prevalent in 9/11. Communicators can reframe these norms and promote alternative behaviours that prioritise safety, cooperation, and preparedness, by emphasising the need to evacuate.

Individuals are often influenced by the behaviour and attitudes of their peers. During 9/11, communication strategies could utilise peer influence to encourage positive behavioural responses. By highlighting examples of community members supporting each other, and being unified, communicators can emphasise existing social norms and encourage individuals to conform to positive behavioural responses.

9/11 brought out a huge level of heroism in the beginning, with people like Thomas Burnett Jr, Todd Beamer and Sandra Bradshaw who prepared to fight back against the hijackers on Flight 93, and were all willing and ready to die. One way to encourage positive behavioural responses is by highlighting positive hero narratives within the community by sharing testimonies of individuals who demonstrated bravery and selflessness during the attacks. This can inspire others and reinforce that such actions are achievable. These narratives help establish positive behavioural norms and encourage individuals to emulate these role models in similar emergency situations. One example is of ex-marines Jason Thomas and David Karnes who rescued officers buried in rubble in the aftermath of 9/11.

The 7/7 London Bombings were where 4 suicide bombers hit London, specifically the transport system there, killing 52 people and injuring over 770 other people. Emergency services were not prepared, and so using language and social norms to encourage positive responses is even more important, so we can respond more efficiently if such an atrocity ever occurs again.

Language is important for conveying clear and accurate information during emergencies. Communicators must use language that is easily understandable, avoiding technical jargon or ambiguous terms. Clarity in communication helps individuals understand and comprehend the risks, instructions, and necessary actions, allowing them to respond properly and rationally to the situation. Empathetic and compassionate language can also have a significant impact on individuals' emotional well-being and their willingness to cooperate, especially through injuries. Communicators should use language that acknowledges the experiences and emotions of those affected, and providing reassurance and support. Such language fosters trust, promoting positive behavioural responses and encouraging individuals to seek and accept assistance. During the 7/7 London Bombings, many people were injured and needed to be talked to empathetically, and needed urgent care to stay alive, like Daniel Biddle, who got blown out of the carriage during the bombing.

The multicultural and multilingual nature of London necessitated inclusive communication strategies as there are over 250 languages spoken in London, making it the most linguistically diverse city internationally. Bilingual resources and interpreters helped bridge language barriers, ensuring that vital information reached diverse communities. Inclusive communication promoted positive social norms by valuing and respecting linguistic diversity, ultimately leading to more cohesive and cooperative behavioural responses. Bilingualism plays a significant role in emergency communication in diverse communities. Communicators must recognize the importance of language diversity and provide inclusive communication strategies. By utilising multilingual translators and interpreters, it ensures that crucial information is accessible and promotes positive behavioural responses across all demographics. This is important because understanding the situation is crucial in emergencies like the 7/7 London Bombings, to limit casualties and injuries.

Sandman's Outrage Model can guide communicators in addressing public outrage and concerns. By understanding the public's emotional state and adapting language and messaging accordingly, communicators could address sources of outrage and rebuild public trust, leading to more positive behavioural responses. The 7/7 London Bombings would be in Zone B of the model, Crisis Communications, where both hazard and outrage are high. By understanding this, responders can better gauge how to act, both socially and linguistically.

In this essay, many emergency communication strategies based in social and language norms, such as Sandman's Outrage Model and Situational Crisis Communication Theory, have been applied to four famous, emergencies: COVID-19, Hurricane Katrina, the September 11 Attacks (9/11), and the 7/7 London Bombings. Social norms

are important to consider when planning emergency communication, as they hold firm amidst the chaos of emergencies, and so communication can be worked around them. However, it must be made clear what the social norms are, as they vary within demographics and can change over time, and if the social norms are misjudged, then relying on them will lead to severe consequences. Language norms are also important as when you communicate, you use language, so emergency communication is upheld by language norms. The language norms also affect the social norms, as they are interlinked, because the linguistic practices of a group are part of their social norms. Therefore, social and language norms are important when planning emergency communication strategies and responses, as they help with the understanding of the public during the emergency, and being able to predict their behaviours is crucial in emergency communication to encourage positive behavioural responses and to minimise injuries and casualties, however they should not be the only things considered.

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Parent Comment:
"I think that The Scholars Programme has helped my child to work harder and become more confident."

How can we make heritage buildings eco-friendly and comfortable?

Year 10, Key Stage 4

Pupil Name: Paloma Fonseca Joaquim
Supervised by: O.F. Adekeye
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Course Title: The Beauty of Going Green: Making Heritage Buildings Eco-Friendly and Comfortable

The key goal of eco-friendly building constructions is to, I believe, lower our carbon footprints as much as we can and eventually create a sustainable future. (1) Eco-friendly building constructions involve the use of materials and processes that are resource efficient and environmentally responsible throughout the lifetime of a building. The use of eco-friendly building constructions is honestly one of the best ways we can all reduce our carbon footprints just by making changes in our homes and how they are built. Which over time, is a lot better than using uneco friendly building constructions. The use of different building techniques for example, using eco-friendly materials like wood and stone is beneficial, because these materials can be found and remade (or grown) all around the world. One of my personal favourite building materials, is bamboo because of how quickly it grows, its strength and the fact it can also be grown all over the world. Bamboo is quickly making its way up to being one of the most sustainable building materials, due to its durability. Another one of my favourite building materials would have to be repurposed steel too. Did you know that (2) the reclaimed steel from only 6 junk cars provides enough recycled steel to build a 2000 square foot home? Which I believe is honestly incredible for perhaps the structures of the buildings and recycling steel also saves 75% of energy costs and is overall better for the planet than mining steel components and creating it from scratch.

Another key goal of eco-friendly buildings is to reduce our dependency on non-eco-friendly building materials like concrete and lead. Obviously, concrete is an extraordinarily strong, flexible (as in you can create many things with it) material. But unfortunately, (3) the creation of cement – one of the main ingredients in concrete, accounts for around 8 percent of global greenhouse gas emissions and not to mention, lead is a very toxic substance to humans, animals, and plants; and it is used for things like plumbing, paint, and insulation common things we have in everyday life. Lead is also in the Clean Air Act's list of toxic air pollutants which means it plays a big part in air pollution and global warming. One of the only reasons lead is still used is because it is supposed to be the most effective material at doing its job. These materials are mainly used due to them being inexpensive, durable, and easy to work with. In my opinion, alternatives can most likely be found as long as we stay innovative and continue to try and find different solutions to this problem. Materials like these are actively contributing to climate change and global warming which is exactly why we need to reduce our use of these materials as quickly as possible.

Not only is it that eco-friendly buildings reduce our dependency on eco-friendly building methods, but they also allow us to be more comfortable in our homes and allow us to not have to spend as much money since eco-friendly building houses also happen to be very energy efficient. Renewable energy sources are another technique used in order to create eco-friendly building constructions. Things like solar panels, are really good since they use the suns energy for the purpose of converting the energy into electricity and is more energy efficient even things like loft insulation, could help save you up to £590 a year which is actually way better considering that you have to spend less money but get more comfort. But there are also a few downsides to these methods too like with rainwater harvesting systems (4) they can: take up a lot of space on your property, the system may attract mosquitoes and waterborne illnesses and there is also the fact that rainfall is unreliable, so it is not guaranteed to be working all the time. Therefore, these reasons can all lead to discomfort for you in the long run. Even with (5) solar panels, it can take quite a while for them to pay themselves off and saving you money, since getting them installed can cost a lot of money and depending on the size you get, it can cost you up to £11,000. But before purchasing these we must see what is better: saving the environment, or saving money? Obviously, the priority is the environment, because it's where we and thousands of others live in, so it should be what we are all most concerned about. Furthermore, the solar panel WILL eventually start saving you money and will pay itself back after around 4 years or more and ultimately become a big win for you. So, people must remember to make informed decisions when deciding which systems, they want to incorporate into their lives.

Heritage Buildings are older buildings that require preservation. A big part of heritage buildings is that they help people connect to the past. One of their core values is the fact that they are visual reminders of what life was like in the past and for locals who have lived in these areas (nearby these heritage buildings) they honour people's pasts and different timelines in their lives which I believe is especially important and somewhat magical that people are able to connect to their pasts and even family members that have passed through these heritage buildings so yes, one of their many purposes is to educate us on the past and allow us to reminisce. Another core value of heritage buildings is that they educate us on how we can move forward in various kinds of building constructions since, a lot of these heritage buildings were built with natural materials like wood and stone, we can see what went wrong with their original building structures, and how we can improve our eco-friendly constructions so they can stand for even longer and always have maximum comfort and with this knowledge we can even upgrade our non-eco-friendly constructions with future renovations, so that from now on we can do our best to be as good as possible to the environment. Heritage buildings are evidence that buildings built with natural materials can last quite a long time for example the Pyramids of Giza were built with natural materials such as limestone, granite, and mortar and they have been around for hundreds of years which I think is an excellent example to show people how good natural materials can defend

themselves against things like weathering. Buildings like these are good places to learn about the durability of materials, like in Yemen's city of Sana'a (a UNESCO World Heritage site) an entire city was made from mud and bamboo structures (6) the buildings are a thousand years old and still inhabited today. Salma Samar Damluji calls mud buildings, 'the architecture of the future.' Mud is a sustainable alternative of concrete and fully recyclable. Homes can easily be changed and renovated, and we learn all this from heritage buildings.

Cultural heritage buildings are heritage buildings, with cultural value. One example of a cultural heritage building would be the Leaning Tower of Pisa. With it being built in 1173, the Leaning Tower of Pisa has been around for a long time it has a cultural identity tied to Italy and is known around the world as a famous monument mainly because of its renowned tilt. Many heritage buildings like the Leaning Tower of Pisa, are well known due to their consistency, they are always there in people's memories – especially the locals' memories, linked to various times in their lives, and due to our efforts of preservation it has had the opportunity to be around for so long. Furthermore, the Leaning Tower of Pisa is important to the community of Italy due to its reliability and its incredible beauty. The building itself even has traces of (7) Romanesque Architecture so the style of the building has connections to the history and past of Italy too. The Taj Mahal is my favourite cultural heritage building of all time. Built in India, The Taj Mahal is a beautiful building with a wholesome story behind it, a man's indescribable love for his wife. The Taj Mahal is known all around the world for its beautiful love story and for being one of the national treasures of India. It is important to the community because of the recognition it has gained from all around the world. Revealing to everybody how stunning (8) Mughal architecture really is. The Taj Mahal is one of the 7 Wonders of the World which puts India on the map for a lot of tourism so others can admire the Taj Mahal too.

Including insulation is a way in which eco-friendly materials and building techniques can be used to promote thermal comfort. Insulation helps protect your home from any cold and reduce heat transfer. By reducing the amount of cold coming into your house, it helps you create a more thermally comfortable space. Another benefit of adding insulation, is that less energy is wasted on trying to heat your home which overall lowers your carbon footprint. We can also try and use alternatives to lead insulation and use sustainable replacements such as: (9) sheep's wool, recycled denim, and cotton as substitutes for lead; since they too can effectively keep your house warm in the winter and cooler in the summer whilst still being eco-friendly. This promotes thermal comfort because, your home or workplace can always stay at a desired temperature that is neither too hot nor too cold which is basically the definition of thermal comfort. These materials can also be used to replace or add insulation in any heritage buildings and by making the heritage buildings more thermally comfortable, tourists may be more likely to go there and bring attention towards the heritage buildings so the buildings end up getting the funding they need.

Using eco-friendly materials and building techniques can

be used to preserve heritage buildings easily because many heritage buildings, are already built out of eco-friendly materials like stone, wood, marble, and mud making it quite easy to obtain these materials. Preserving heritage buildings does not require a lot of energy unless there is quite a lot of damage. For example, Big Ben recently had a large restoration to bring it back to the 21st century and modernize it. According to parliament.uk (10) the building was suffering from a leaking roof, rusty ironwork, and an aging clock. There were also issues with asbestos which they removed making the building environmentally friendlier and they also had to make the building safer. Energy efficient lighting was also added as well as better workplaces for staff. In my opinion, the restoration added a lot of character, and the building looks spectacular. I hope many more heritage buildings are restored so we can admire and enjoy them as much as people did in the past. Overall, I think some of the best ways to make heritage buildings eco-friendly and comfortable, is by updating them as this will improve heritage buildings and make sure they fit health and safety standards, so people are able to go inside without there being any risks. In my opinion, security plays a big part in comfort. If you do not feel safe you most likely will not be able to feel comfortable. (11) In France, the Eiffel tower has recently undergone a huge renovation to help fix its elevators; even minor changes like these make a massive difference in heritage buildings and help the buildings be suitable and safe for use today attracting more visitors and helping boost their community's economy. Many different eco-friendly materials can be used to create safety, it just depends on what you are adding, and which eco-friendly material is best suited to the job. Another way we can make heritage buildings eco-friendly and comfortable is by using renewable materials for any restorations they may need. We can also try and reduce the number of non-eco-friendly materials used and consider how much money it will cost because these restorations can cost a lot of money with the cost of the Eiffel Towers renovation costing 300 million euros. I think making heritage buildings eco-friendlier and more comfortable is important since these buildings are so significant in people's lives and should continue to be significant and this will only happen if we use our best efforts to preserve them, their stories, and their cultural values. By using them to investigate into the past of construction we can move forward with modern construction.

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Tutor comment:
"Paloma is an extremely motivated learner despite being a little shy and I valued her contributions in the classroom. I was impressed by her exceptional level of engagement and in-depth knowledge shown in her well written essay which was well-researched, articulate, and a comprehensive exploration of the topic. This showcased a mature understanding of the complexities surrounding eco-friendly building practices and their application to heritage preservation. She earned a high 2.1 grade, indicating that without a doubt, she would contribute greatly to any undergraduate programme." - O.F. Adekeye

Myth or Reality – To what extent can wartime portrayals of the soldier and his horse be trusted?

Key Stage 5

Pupil Name: P.N.
Supervised by: Dr. J. Flynn
Tutor University: University of Derby
Course Title: Myth v Reality?

The presentation of the soldier and his horse is questionable on its reliability. Reality is the truth and exists. Wartime portrayals of the soldier and his horse are less reliable because in reality, wartime portrayals of the soldier and his horse may have been only a piece of the truth. Myths are collective beliefs that are unproved and because of censorship, people believed in false, inaccurate information and as well as this, their unwillingness to uncover the truth meant that news was unreliable and was only meant to ease the mind of the people.

A soldier and his bond with his horse is unbreakable, a true companionship as together, they both face the dangers ahead. The image in the source 'Good-bye Old Man' shows the bond between a horse and a soldier, it depicts a soldier mourning the death of his horse and saying goodbye for one last time. The image shows how deeply the soldier cares for his horse. His face is touching the horse's face showing the powerful connection and respect they have for each other. A soldier in the background seems to be calling for the soldier but the soldier appears to be attached to his horse even as there are explosions in the distance, showing how the soldier feels that they are equals and have a bond so powerful that even death cannot break it apart. This source was drawn by F. Matania, who may have altered the picture to fit the view that all soldiers have strong bonds with horses. This makes the image less credible than it would have been if it were a photo. It could also just be showing one side of the relationship between soldiers and horses.

Word usually travels by mouth, whilst it travels around

quickly, information becomes distorted so people receive inaccurate information. 'Myth hides nothing: its function is to distort, not to make disappear'. This means that myths' job is only to twist information and Barthes means that myths don't conceal anything, they just alter people's perception of reality. People believing in the distorted information would unknowingly carry on misinformation, creating misconceptions which, after a long period of time, would create myths. This means wartime portrayals of the soldier and his horse could be misleading and words could have been misinterpreted.

The government implemented a way to prevent any possible, valuable information from being exposed to the enemy and ensured that information that could be used against them were disguised by introducing censorship to all post. Any information that implied a weakness or included war tactics and plans was censored. Officers were expected to censor their soldiers' letters. Every letter had to have the censorship stamp to be posted. The letters were observed and if there was any sensitive information, it would be censored to the receiver. The use of vague information ensured that information like location and dates were concealed and unclear. As a result, some accounts written by soldiers to communicate with their loved ones were indecipherable and this made them unable to be relied upon.

The news was controlled and left the public uninformed about the details of the events of war. Dreadful news was what 'all wanted to avoid'. Bad news instilled fear and worry to the public and chaos would erupt so information on the war was only published if it was good news to comfort the minds of the public, so there would be order. Dreadful news was downplayed to keep people's morale and optimism up. The 'absence of news' created a false perception of reality and no one wanted to highlight the truth. Not publishing anything negative kept spirits positive. The soldier and his horse war portrayals, therefore, could have been reinforced upon the idea of companionship, even if it was not always the case, to keep the public hopeful and satisfied so wartime portrayals of the soldier and his horse are not trustworthy when it comes to knowledge provided to the public.

Horses' capabilities ranged far more than what an average soldier could do and these abilities were utilised. Galtrey S. lists what horses were transporting – '18-pounder guns, the 60-pounder guns, a siege battery of still heavier guns … and with them all, their limbers and transport' and this highlights the strength that the horses had and it shows the extent of what they had to transport. They transported watercarts which was crucial for the survival of both soldiers and horses because water was needed to drink, cook, wash and keep hygiene. They would also carry ammunition, portable kitchens and cable sections of a signalling company which were all necessary to contribute to winning the war. Horses' ability to adapt made them useful and a stronger, more durable soldier with longer-lasting stamina creating a significant advantage against the enemy. Soldiers may have built resentment towards horses because in comparison, a soldier contributes considerably lower than the extent of how much a horse can contribute. This would make wartime portrayals of the soldier and his horse not as trustworthy due to possible

hatred of horses from being not as valued or less valued than a horse who soldiers may have considered beneath them.

Sir John Moore described the horse as a 'weapon'. He believes that horses are 'the most useful war animals … that went a long way towards the fall of the enemy' because they were a crucial factor in winning the war: their strength was utilised effectively and their ability to adapt in different circumstances made them a formidable 'weapon' against the enemy. Their efficiency made travel easier because otherwise soldiers would have to travel on damaged, uneven ground which would slow them down. Soldiers could ride the horses to keep their strength for battle as well as travelling quicker and for longer. This would aid in quicker location changes and transporting supplies. Moore expresses how he believes that horses were the most significant animals in the war and that without horses they would not have defeated the enemy as easily. Moore sees horses as dangerous instruments with advantageous abilities to be utilised so he would associate horses as weapons with a purpose to win the war. This could make wartime portrayals of the soldier and his horse less reliable because although horses were seen as allies and powerful assets, they could have made soldiers feel inferior because horses' capabilities outmatched soldiers. Moore does not seem to acknowledge the relationship between soldiers and horses and is more interested in the horses' role in the war.

A horse's routine consisted of grooming the horse thoroughly. There were specific places including legs, belly and fetlocks where mud had dried and hardened that soldiers had to carefully clean which would becoming exhausting over time. Inspection on feet and shoes was at least once a day and appointments to make sure shoes were not worn down could be made with the farrier. Any cuts or sores were cleaned and tended to. Capron addresses how this routine was incredibly demanding as much time was spent in the stables grooming horses. For example, Capron states that it was 'hard work physically'. He highlights the stressful and wearisome responsibilities that comes with working with horses. Capron states that the horses 'HAD to be kept as fit and well as possibly could be done'. This tells us that soldiers may have resented maintaining horses' physiques and health because of the exhaustion and challenging daily tasks. Reid explains that it 'was not all beer and skittles' saying that being a mounted soldier was not an easy life of entertainment when looking after horses which reinforces what Capron has said about the daily routine of soldiers being stressful and overwhelming. Reid continues to list some tasks that the soldiers had to deal with. This would make wartime portrayals of the soldier and his horse less reliable because the physically demanding daily jobs that the soldiers had to endure could have made soldiers physically and mentally drained and this would create a subconscious negative relationship with horses. The priority on horses could also have made them loath horses and feel insignificant compared to horses.

Horses were prepared for action on short notice and they were mostly in trench conditions. An official photograph of the conditions shows the advantages of horses. The horses appear to be moving bulky items that were difficult

to carry or a soldier could not carry. This meant that the soldiers could be more focused on fighting instead of transport. The photograph that depicts numerous horses sheltered near a ruined church displays the type of conditions the horses were in. There are soldiers who seem to be taking care of the horses, prioritising the horses' needs over themselves which could have built feelings of hatred and contempt. Wartime portrayals of the soldier and his horse could not be trusted because soldiers could feel pressured to keep horses in the best physical condition and could have 'personal problems of responsibility'. However, you could interpret the soldiers taking care of the horses as having an unbreakable bond because they are caring for the horses' well-being.

Capron describes horses as 'vulnerable target[s]' because of their size and the high risk of enemy detection. He explains that this was incredibly 'nerve-wracking' for the soldiers who were terrified in the event of an enemy attack due to the situation they would encounter if horses were wounded. In these circumstances, if the injured horses were judged to be too badly wounded, they would be shot. Wartime portrayals of the soldier and his horse would be unreliable because the life of a horse depended on the soldier and these decisions were to be avoided at all costs so to say they had unbreakable bond whilst they had to determine if a horse's life had to be taken would be insensitive. Just the thought of having to take a horse's life alone would have negative effects on a soldier's mental and emotional well-being. If a horse was considered to have an irreversible injury, the soldiers had to constantly be troubled by the overbearing mental burdens of taking a life.

Horses were loved by some but hated by others. Johnston wrote 'I believe my saddle horse knew more than I did'. This suggests that Johnston had a beneficial, mutual friendship with his horse. 'Why I lasted as long as I did. He took care of me' shows that he believes that without his horse then he would not have gotten through the war and probably would have died. It also shows the connection between Johnston and his horse. However, in contrast to this perspective, Wright 'refused' orders to feed horses and 'was put under arrest'. The penalties for disobeying orders were harsh and unforgiving and yet Wright considered punishment 'better than slavery'. This displays the hatred Wright has for horses and how he does not see horses as equal allies as he believes that his value should exceed a horse's value. He communicates his malnourishment (living on minimal rations) and he believes that feeding a horse should not be higher in priorities. These two sources contrast and questions whether soldier and his horse war portrayals were deceptive and misleading or if they were genuine.

Overall, I believe that wartime portrayals of the soldier and his horse can be trusted to an extent. There are many sources that show that the war portrayals of the solder and his horse can be trusted because there are many accounts of positive relationships with horses like Johnston who cared deeply for his horse and felt that that his horse felt the same way. However, censorship led to misinformation and no one wanting to expose the negative news about the war left the public unaware of negative news so if there were soldiers that despised horses, it would not have been

publicised. This therefore shows that positive war portrayals of the soldier and his horse were relevant to many, but not all. It also shows that some myths about the soldier and his horse were created from censorship and the distortion of information. Soldiers may have resented horses or even loathed them because soldiers did not have as much to offer so it made soldiers feel inferior whereas horses were thoroughly tended to at all times to be kept in pristine condition. All the strenuous work made soldiers like Wright feel disregarded and others may have felt the same.

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Tutor comment:
"P. is a highly conscientious student who worked hard throughout the course. Her final assignment dealt confidently with questions around myth and how the soldier-horse relationship was portrayed during The Great War. I was particularly impressed by the empathy she showed when discussing the experiences shared by soldiers and their horses. Congratulations P!" - Dr J. Flynn

Social Sciences

How can social inequalities be examined using quantitative data whilst being aware of data biases and ethical limitations?

Year 9, Key Stage 3

Pupil: Arisha Javid
School: Eastbury Community School
Supervised by: L. Sheppa
Tutor University: University College London (UCL)
Course Title: How can we use data science to understand social inequalities?

In this essay, I will describe how the issue of racial discrimination heavily impacts wealth across the UK by examining different articles and supplying relevant data. I will also analyse if there are any data biases and ethical limitations that affect my research and discuss the issues raised by data ethics and bias.

Firstly, what is racial inequality?

It is when people have unequal access to resources, services, and positions in society (housing, education, employment, income) due to ethnic or racial background. Racial inequality is classified as a form of social inequality as it impacts society. Other examples could include, health inequality, gender inequality and economic Inequality. Through my research, I will provide key points and reliable data, as well as link all topics and come to an overall conclusion for the question of how social inequalities are examined using quantitative data whilst being aware of data biases and ethical limitations.

My research question is: how does racial inequality in the UK affect wealth among middle class citizens?

Racial inequality: what is it, how does it impact us and Why did I choose to discuss it?

Racial discrimination is one of the many issues faced by society today and causes prejudices that affect the distribution of wealth and opportunities. These prejudices are caused by intersectionality; intersectionality is a term that describes the overlapping social problems that occur, along with racism. For example, a woman of colour may experience more racial injustice than a man of colour due to her gender. However, a Muslim woman who wears religious clothing may experience more racial injustice due to her gender, ethnic background, and religious belief. [1] Additionally, two aspects of racial discrimination increase the severity of the inequality. One of them is when people are taught inequality due to policies or rules. This implements inequality in our society as it promotes the idea of injustice and treating people differently. Moreover, the sense of stereotyping and creating biases about individual racial groups has become more common and this encourages Intersectionality in society[1]. As a result of this, individuals have to face inequalities in their income,

health, and social life. Therefore, I have chosen to discuss this specific type of inequality as it creates issues within our community which need to be solved promptly. Moreover, inequality affects people and their mental health which shows how important it is for everyone to feel confident about their ethnic/ racial background. In my opinion, speaking about racial inequality will raise awareness and ultimately help to reduce injustice. Even though racism is said to be not as severe in the UK, data still does show differences in wealth and treatment.

Analysing my data: why did I choose these articles?

The articles I chose are suitable for my research because it supplies graphs and appropriate data regarding my question. Moreover, it explains why the UK has a racial wealth gap with supporting evidence. The author of my first article is Ricky Kanabar, a Professor of Social Policy at the Department of Social Policy, and Social Sciences at the University of Bath. [2] This article was released on the 6th of June 2022 and explores racial inequality within the UK. It is titled, "Inequality and Poverty - What explains the UK's Racial Wealth Gap?" [2]. Throughout this article, multiple graphs and statistics show ethnicities by region and the overall wealth gap across races.

Table 1: Housing tenure by ethnic minority group and white British, 2016-18

	Homeowner (%)	Private renter (%)	Social housing (%)
All	**63**	**20**	**17**
Bangladeshi	46	21	33
Chinese	45	45	10
Indian	74	19	7
Pakistani	58	29	13
Black African	20	36	44
Black Caribbean	40	20	40
White British	68	16	16

Source: Ministry of Housing, Communities and Local Government, 2020; 2021

Note: Figures based on English Housing Survey, 2017 and 2018

[2] 'Table 1 shows the number of people who are either homeowners, private renters or is in social housing. Overall, the data indicates that White British and Indian people are more likely to be homeowners than to be in social housing, whereas those of Black Caribbean origin and Africans are more likely to be in social housing [2]. This raises the severity of racial inequality for people of black Caribbean origin who live in social housing as they will experience wealth inequality.

Figure 1: Ethnicity by region (England and Wales only) in 2011
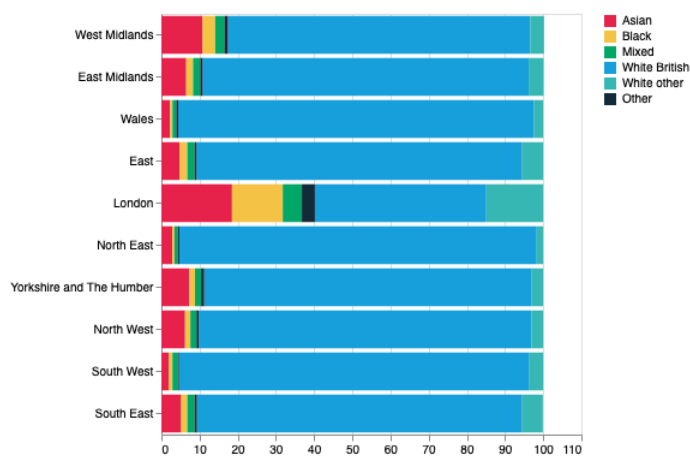
Source: Office for National Statistics, 2020

Note: Figures based on England and Wales 2011 census

This table shows that certain ethnic minority groups populate different regions. For example, Black groups are more likely to live in London, and Asian groups live outside London in places like Yorkshire and the Midlands[2]. [4] This creates inequality in wealth as racial segregation develops. Racial segregation raises concerns because it restricts individuals from accessing resources and having equal opportunities. As a result, employment rates can change dramatically and affect wealth distribution among people [4].
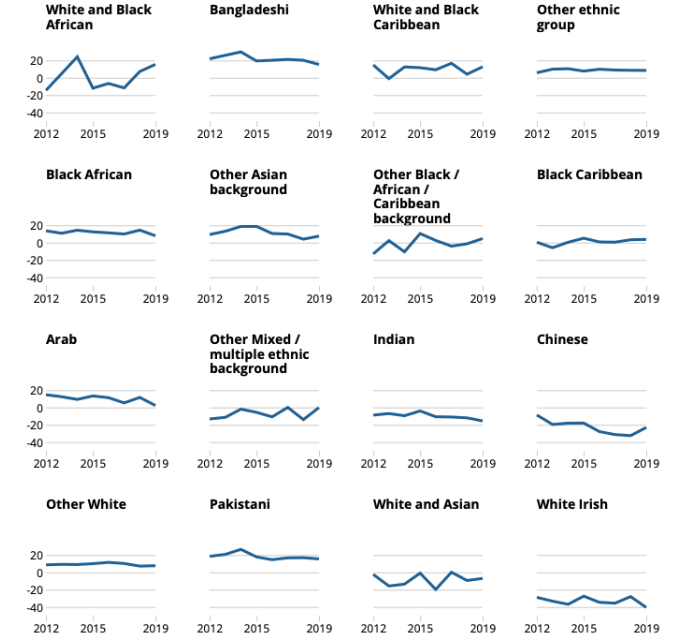

Figure 2 : Within the ethnic minority group, the median hourly pay rate differs widely between different ethnic groups Pay gap, 17 ethnic groups, England and Wales, 2012 to 2019

[3] My second article is from the Office of National Statistics. The title is 'Ethnicity pay gaps: 2019' and also focuses on the UK. In summary, the data provided by the article informs us Chinese, White Irish, White and Asian, and Indian ethnic groups earn higher hourly pay than White British employees. However, the article mentions that the ethnic wealth gap has decreased since 2012 in England and Wales [3]. The decrease in the ethnic wealth gap implies that the economy is growing as they are

increasing the wage of people with ethnicities. Moreover, it shows a decrease in racial inequality.

Altogether, I think the data I have chosen is suitable for my research as both articles provide information regarding how race influences wealth among middle class citizens and supply graphs and statistics. As well as this, both reports are trustworthy as they have been published on secure websites. Finally, both articles share the same purpose which is of educating people about the UK's racial wealth gap

Data ethics: is there key data missing?

What is data ethics?

Data ethics is the evaluation of moral problems related to your data, algorithms and corresponding practices to formulate and support morally good solutions. Using data ethics can be crucial as it helps examine if there are any issues with data. It also allows us to question whether the origin of the data was ethical. Upon analysis, I have found that there are some issues regarding the graphs and statistics which my sources have provided. [1] The article written by Ricky Kanabar, although published in 2022, doesn't supply up-to-date data. Table one shows the housing tenure from the years 2016 to 2018. Unfortunately, this doesn't provide accurate results because there is a possibility that the rates have changed during the 7-year gap, thus making it hard to generalise data from those years to our current period. However, the data collection was ethical as both figures/graphs were obtained from secure websites. Furthermore, data from 2020-2022 was not included which comes under the category of missing data. On the other hand, my second piece of data is a representative from the year 2020 and has graphs showing the ethnic wealth gap from 17 ethnic groups. Although there is no data representing the years 2021-2022, there is a higher chance of getting accurate information from this article as it is from a recent period and supplies data from multiple ethnicities. Data collected from different ethnicities gives further insight into the racial wealth gap as you can identify which ethnicity experiences a larger wealth inequality in comparison to others.

Data bias: is it a representative?

Another pivotal feature to examine for data is whether there have been any data biases impacting data collection. Data bias is when data gathered from different sources is flawed and does not provide an accurate representation of the general population. For example, qualitative data is frequently criticised for data bias because it is heavily subjective. As well as this, the data would not include variables that help capture the topic being studied. Reviewing my data, Ricky Kanabar may hold a biased view on whether the UK has a racial wealth gap as he is a man of colour. This impacts my research as it makes it hard to identify the validity and reliability of my findings. Unfortunately, this leads to misinterpretation of the data. On the contrary, I haven't found these issues in my second article; I believe this is because the second article provided data which was from a range of sources that holds no bias. Expanding on this, the information gathered was from recent years. This doesn't reinforce inequality as it supplies useful data and raises awareness.

My essay discussed how wealth is affected by race across the UK and how racial prejudice plays a significant role in most of our lives. Due to this, my essay surrounded the topic of racial inequality because I find it an intriguing subject that raises issues which need to be eradicated. I analysed data collected from multiple articles to answer my research question which asks how racial inequality affects the wealth of middles class citizens. During my research, I found that racial inequality heavily impacts society as it creates issues like racial segregation and restricts people. Following this, data shows that Black people of Caribbean and African origin are likely to be in social housing which shows the difference caused by the ethnic wealth gap. However, it is expressed that since the year 2012, the ethnic wealth gap has decreased. Moreover, issues raised by data statistics and bias show that data is missing from the years 2020-2022 in the article written by Ricky Kanabar and may hold biased views. Conclusively, I have established that racial inequality in the UK affects the distribution of wealth greatly. Although one article was missing crucial evidence, the other proved that the ethnic wealth gap affects a variety of ethnicities through graphs and figures.

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Parent comment:
"I am really proud of my daughter for this achievement and I feel like this has given her lots of experience. I would also like to thank the teachers at Eastbury for being so supportive and giving my daughter this opportunity."

Does Cultural Capital Affect Our Life Chances?

Year 9, Key Stage 4

Pupil: I.M.
School: The Green School for Girls
Supervised by: R. Wattam
Tutor University: University of Manchester
Course Title: Do our interests affect our life chances?

Does cultural capital have an impact on a person's life and career, or is it simply a question of their talent and hard work opening up opportunities? In other words, do we live in a meritocracy, where a person's progress is determined by their abilities and application? Or, alternatively, does a person from a 'privileged' background have an advantage? Further, is this simply because of cultural capital, or are there other factors such as financial and social capital? So, what is cultural capital? This phrase comes from the work of Pierre Bourdieu. He understood cultural capital as arising from the culture that people are exposed to in their families and schooling, the interests they have and their leisure activities. This capital

includes such dispositions as accent and posture, styles of dress, the use of elaborate vocabulary, 'correct' grammar, and abstraction and 'a particular detached, knowing aesthetic orientation to culture and taste' [1]. Through this, the children of upper-class parents gain an advantage through being exposed to 'high culture' in their upbringing, which, in turn, facilitates their career development amongst their peers. This essay will consider this work of Bourdieu, and then examine the impact of the growth of technical professions on upward social mobility. Next, the essay will look at the evidence for social mobility in early 21st century Britain, including the existence of a 'class pay gap', going on to explore the reasons for this.

Bourdieu [2] was interested in explaining how the elite in France were able to maintain their position in society across the generations. Bourdieu was upwardly social mobile: his roots were working class and lower-middle class; his grandfather was a sharecropper and his father didn't finish his schooling and became a postal worker and, later, a post master [3]. However, Bourdieu became a top academic in France. He was outwardly successful, though felt excluded by the cultural elite of the educational world, and experienced mocking at school because of his accent and attire. This, no doubt, informed his idea of cultural capital where privileged parents pass onto their children their engagement with classical literature, high art and theatre which helps them find their place in prestigious schools and universities, and highly-paid jobs, where there are many people of the same cultural background. This cultural capital of some could exclude other talented, hard-working people, but who are from lower classes.

Bourdieu gives us a glimpse of the factors limiting social mobility in post-war France. John Goldthorpe offers a different emphasis in his work about the same period in Britain [4]. He was an established British sociologist introducing the theory of social mobility, and he called the period after World War 2 the 'golden age of social mobility'. This period saw an increase in the numbers of well-paid and well-respected professional and managerial jobs. Science and engineering jobs required technical expertise which many working class people acquired easily. Therefore, the upwardly mobile working class people joined gentlemanly middle class people in these admired jobs. Further, not only did people from the post war period become upwardly mobile, but their presence in respected positions and professions altered the social climate there, and the aspirations of today's working class people, contributing to further social mobility. Technical capital is also significant in contemporary Britain because it is valued in reputable sectors such as medicine, law, accountancy and IT. This indicates a fairer jobs market with people being recruited according to their ability as opposed to their cultural prestige.

Bourdieu shows the limitation of social mobility through factors like cultural capital, whereas Goldthorpe is suggesting considerable opportunities for social mobility. What picture do the statistics from 21st century Britain present? Friedman and Laurison [5], using data from the Labour Force Survey, give the statistics for social mobility in Britain. They classify people into 'three different class origins based on the occupation of the main breadwinner

in a person's household when they were growing up' [6]. Upper middle class parents with professional or managerial jobs, lower middle class parents with intermediate jobs like police officer, office manager or secretary, and working class parents working as labourers, drivers or cleaners etc. These three groups are of similar size representing, respectively, 31.2%, 35.3% and 33.3% of the population surveyed. For the destinations of people there are four groups, with elite professional (academic or architect) being distinguished from lower professional occupations. Each of the three origin groups provide people for each of the four destination groups. So, some people with working class origins enter the elite occupations and equally some people with professional/managerial origins do working class jobs. At first glance, this paints a picture of social mobility both upward and downward.

However, if we take a closer look at the statistics, the main trends are for people to have a job which parallels their class origin, for example, 45% of working class background people end up in working class jobs. Those of intermediate origins are more evenly spread between the destination groups. When surveying the elite occupations, 28.5% of those from upper middle class backgrounds have these jobs, 15.9% of those from intermediate backgrounds, and only 9.9% of those from working class backgrounds. Friedman and Laurison claim that people from upper middle class backgrounds have around 6.5 times the chance of an elite job compared to people from working class origins [7]. However, my calculations show that 28.5/9.9 is 2.87, so it would be better to say the ratio is around 2.9 times [8]. Either way, these statistics point to factors constraining social mobility to some extent. The statistics given above relate to entry into occupations, 'getting in'. Friedman and Laurison went on to analyse progress through elite professions, 'getting on', and this is where they found evidence of a 'class pay gap' [9]. Even if people have the same level of educational attainment, there is still a gap between the pay received by people from different class backgrounds. Also, for elite occupations, people from working class backgrounds earn on average nearly £6,400 less a year than those from privileged origins (£40,758 as opposed to £47,131), and for those whose parents are not earning there is a £10,000 deficit [10]. Thus, there has been and is considerable social mobility in Britain, whilst, at the same time, there is evidence of class origin impacting the entry into and progression through elite professions.

So, what are the mechanisms limiting social mobility at the upper levels of society; is cultural capital playing a role in this? For elite occupations, in many firms, though not all, cultural capital plays a role in facilitating the progress of certain people into high positions. In an accountancy firm, to get beyond manager grade a person needs 'polish' and 'gravitas'. Polish involves preferably using 'Received Pronunciation' and 'correct' grammar, conforming to the corporate dress code, and being at ease in conversations and able to put others at ease. Some sociologists trace having polish to a privileged upbringing [11]. Gravitas is about having the ability to command the respect of a potential client, for example, and is held to be also related to having a privileged background [12]. In occupations like accountancy, partners need to be able to relate well

with top executives from client firms. These executives often have the cultural capital of the privileged classes, therefore to be a partner in an accountancy firm, one needs similar cultural capital [13]. In contrast, the clients of an architectural firm are often people with a more technical background and come from a varied class background. Also, in that architectural firm, the leading partner had come from working class origins, and the executive culture was open to people of all backgrounds [14]. In this case, cultural capital doesn't play a significant role in the progression of people to high positions.

Thus, cultural capital seems to play a role in enabling people from privileged backgrounds to progress in many, but not all, elite occupations. However, do other factors also impact social mobility? Do the other Bourdieusian capitals play a role; social capital and economic capital? Sponsorship of 'partnership material' can be key to a person being promoted to higher levels. In several firms these sponsorship relationships often develop on the basis, not simply of perceived talent, but of some shared interest. For example, in an accountancy firm the sponsorship relationship between James and Martin was significantly deepened through shared skiing trips. Here, shared interests, a form of cultural capital, is impacting the development of social capital, which in turn leads to higher earnings, and greater economic capital [15]. Economic capital, itself, can also facilitate 'getting on' in elite professions. In several different occupations, people in high positions acknowledged that having rich parents to fall back on enabled them to take risks which resulted in them gaining the experience needed for further promotion. For example, Dave, who was a senior commissioner in a TV company, stated that as he was from an affluent background 'you can always get bailed out by Mum and Dad if it all goes wrong in the early stages' [16].

Other factors that impact social mobility are not related to how people are enabled to progress, but how they are discouraged from trying, and so self-eliminate. Diane Reay argues that for children from poor backgrounds school test results can start to define how they view themselves and their prospects or lack of them [17]. Also, poor test results can lead to them ending up in a bad set, with children who behave badly, pulling them down further.

The essay, so far, has looked at the factors that impact social mobility, and the possibility of reaching a high position in a prestigious profession. However, simply having a good job does not mean a person will have a fulfilling, rewarding life. Some people choose not to pursue promotion, or even to have paid employment, and instead devote themselves to their families or some kind of calling, for example, in a monastery. These people are, themselves, immune from the effects of cultural capital and other influences on social mobility.

In conclusion, this essay has presented contrasting pictures of the impact, or lack of impact, of cultural capital on social mobility. Bourdieu developed the idea of cultural capital to explain how the elite in France were able to maintain their position in society across generations. He himself was able to overcome his working class origins to attain a high position in academia, but experienced

difficult relationships because of his accent and the clothes he had to wear at school. As opposed to cultural capital limiting social mobility, Goldthorpe found in post war Britain a 'golden age of social mobility'. This was due to the impact of more technical jobs being available, opening the way to working class people accessing traditionally middle class positions. Also, the Labour Force Survey data portrays a 21st century Britain where there is considerable social mobility. People from each of the classes, working class, intermediate or privileged, find employment in all of the grades of occupation; working class, intermediate, lower professional/managerial, elite. For example, working class background people could reach elite jobs and vice-versa. However, people from privileged backgrounds have a much greater chance than people from working class backgrounds of landing an elite job. Furthermore, there was a class pay gap in the elite jobs between those from different upbringings. Cultural capital, sometimes through the medium of social capital, was found to play a role in who was able to progress to the highest paid jobs in many, but not all, of these elite occupations. Thus, there is evidence of much social mobility, however, cultural capital plays a significant role in limiting this mobility for certain elite occupations.

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Tutor comment:
"I really enjoyed my time teaching at The Green School. The staff and pupils were welcoming and incredibly enthusiastic about the programme. I's essay showed a level of sophisticated thinking and an in-depth understanding of the complexity of the issues we studied. She dealt with the theories on social mobility very well, and used good examples to substantiate her argument." - R. Wattam

What is human wellbeing? And how should we measure it?

Year 10, Key Stage 4

Pupil: Johannah Matthews
School: Ark Burlington Danes Academy
Supervised by: T. Stephens
Tutor University: London School of Economics and Political Science
Course Title: Human Wellbeing: Philosophy and Measurement

Human wellbeing is defined by the Oxford Dictionary as "general health...Emotional/physical/psychological". This implies that in order to be in excellent wellbeing—both physically, and psychologically—you need to be in good emotional health. These three factors will be used in my article to examine how wellbeing should be measured. I will examine the concepts of Utilitarianism, the Resources Approach (RA), and the Capability Approach (CA) as three diverse ways to measure human wellbeing in this essay.

Philosophers named Jeremy Bentham (1748–1832) and John Stuart Mill (1806–1873) established the concept of Utilitarianism - philosophy of happiness. According to Bentham, wellbeing is dependent on happiness and as a result, through examination, he believed that moral and ethical choices were an instrumental factor. He developed the Hedonic Calculus, which "weighs up the pain and pleasure created by the available moral actions to find the best moral and ethical solution" [1]. In utilitarianism, people are physically free to make the greatest moral decisions that are subjective to their own happiness, and thus it is intrinsic to a persons wellbeing. In addition, Mill says, "happiness is intended pleasure, and the absence of pain" [2]. According to Mill's philosophy, individuals "are justified in ascribing to the preferred enjoyment a superiority" [2]. Here, Mill is advocating for individuals to prioritise pleasure over all other considerations. This demonstrates how utilitarianism is beneficial for emotional wellbeing since it enables people to prioritise their personal happiness and pleasurable feelings.

Critics may claim that utilitarianism is the greatest approach to judge wellbeing since it presents principles and clear directions for behaviour in society. Utilitarianism essentially argues that every action has a result, and that the result is more important than the action itself. For example, according to utilitarian principles, no driver will drink and drive because it might cause harm or death. [3]

Utilitarianism and human rights politics, such as those found in The Universal Declaration of Human Rights, are intimately related in contemporary society. The Declaration of Human Rights is the first attempt to outline the fundamental freedoms and rights that all people share on a worldwide scale [4]. These rights adhere to utilitarian ideals since they were both determined by how pleasurable and morally just the "act" is.

Both Bentham and Mill made the case that the government should be in charge of measuring and promoting happiness as a priority. Nevertheless, a lot of nations have neither the resources or capacity to

finance happiness. For instance, Afghanistan, which was named "the least happy in the world" for 2021, has a poor life expectancy rate and a low Gross Domestic Product (GDP) per capita, which contributes to its 149th place score of 2.523. It's important to remember that the study was published before the Taliban recently took control of Afghanistan, which will surely have an effect on subsequent scores [5]. In this low-income nation, where there are several other issues, including a short life expectancy rate and most recently the Taliban takeover, happiness and wellbeing cannot be morally prioritised over these issues. As a result, utilitarianism is a flawed indicator of physical wellbeing since it ignores other aspects like the country's resources and capability. The Hedonic Calculus is another flaw with using utilitarianism as a measure of wellbeing. As it is used to determine the decision that will give you the maximum pleasure while remaining moral. [1] Nevertheless, this strategy frequently contradicts itself; "The Train Track problem" is an illustration of this. In this scenario, a train is speeding down a track towards five strangers. It would only strike one person if you threw a switch to send the train onto a different track, but that person is your closest relative. So now it's up to you: should you actively choose to murder the person you love? Or should you choose to let the five people die? [6] Philosophers have been discussing a solution to this issue for decades. If you choose to murder your nearest relative, the result would not be pleasurable for you, but if you murder the five strangers, your choice won't be morally or ethically right. The Hedonic Calculus is incompatible with the circumstance since there is no result where the outcome can be both morally just and pleasurable. Thus, demonstrating why utilitarianism is a poor indicator of psychological wellbeing. It is important to emphasise that while the utilitarian approach is beneficial for emotional wellbeing, it does not assess overall, the psychological, emotional and physical state of wellbeing.

Another measure that can be used is the resources approach (RA), which was primarily established by John Rawls (1921-2000).

Rawls believed that resources, such as money, are intrinsic to wellbeing. In his "veil of ignorance" thought experiment, Rawls had participants visualise the perfect society, and then he informed them where they would end up in that society (randomly rich or poor). The equality principle and the liberty principle serve as Rawls' resulting theories from the experiment [7]. These ideas of liberty and inequality, lead Rawls to come up with the philosophy that the least advantaged should profit the most from economic inequalities [7]. This suggests that as long as the poor are benefiting the most, income inequality is tolerable. Equal rights, free education, a nice house, and quality healthcare are some of these advantages. The resources approach measures physical wellbeing by taking into account a nation's economy's size, relative poverty, and income inequality.

GDP per capita is used to measure the size of a country's economy by determining how much money is distributed throughout the nation per household. This does not, however, accurately reflect every individual in the country, nor does it account for income inequality. For instance, the USA has one of the highest GDP per capita rates in the

world, over $25,000 [8], but 48% of the nation's economic production belongs to the upper class [9]. This significant income inequality statistic is clearly not reflected by the measure of the RA thus making it unreliable.

The RA, also examines the relative poverty of a country, but once more this does so by looking at household income rather than individual income.

The last measurement used within the RA is the Gini index (Global Income Inequality). This index can be used to determine the average distribution of income, however, just like the other methods, it only counts the general population, not specific individuals, therefore it may not be accurate. There needs to be a measurement that prioritises individual wellbeing rather than the wellbeing of the entire population, if Rawls is correct that resources are intrinsically linked to wellbeing.

One could argue that an advantage of the strategy, is the fact that the RA allows the assessment of which countries could gain a "priority of goods" [7] on an international scale (meaning that the country in question would have an increased wellbeing due to the aid of having better resources). As of 2017, Romania, a nation in southeast Europe, has the greatest percentage of its people living in relative poverty in Europe, at over 20% [10]. The UK has a relative poverty rate of about 17% [10], which is 3% lower than Romania, when comparing the two countries. Romania has an income inequality rate between 30% and 35%, compared to the UK's range of 35% to 40% [11]. According to Rawls' philosophy, the UK should have a "priority of goods" above Romania as their poverty rates differ, even though these two countries have similar statistics, as there are more people living in relative poverty in Romania than in the UK. This logically, indicates that Romania should receive more resources to improve the wellbeing for the greater number of people, this demonstrates the irrationality of Rawls' method. As a result, the RA, developed by Rawls, contains several errors in its reasoning and methods for measuring wellbeing. Moreover, the RA solely considers the physical dimensions of wellbeing. Because of this, the RA is an inadequate measurement for wellbeing.

The capability approach (CA), which was primarily developed by economist Amartya Sen (1933-), is the last indicator we shall analyse. This philosophical approach criticises both the RA and utilitarianism. Sen says that 'functionings', conversion factors and capabilities are intrinsic to wellbeing over happiness and resources. Sen argues, happiness-based wellbeing, is subjective, instrumentally important, and should be dependent on an individual's capabilities instead. 'Functionings' are items or actions which we reasonably value in daily life, like money, happiness, and health—which can all contribute to our wellbeing. Depending on our individual circumstances, conversion factors determine how we utilise or are able to use these resources. As the objective capabilities (e.g the ability to walk) of the individual are intrinsic to their welfare, the 'functionings' may be used to make the connection between them and their capability, thus observing wellbeing.

In Sen's "The Hopeless Beggar Critique," Sen rejects

utilitarianism. Sen writes that "...[A] person who has had a life of misfortune, with very little opportunity, and rather little hope, may be more easily reconciled to deprivations than others reared in more fortunate and affluent circumstances". This implies that someone who has experienced great hardship throughout their life won't be as negatively impacted by more adversity. Sen continues, "The hopeless beggar, the precarious landless labourer, the dominating housewife may take all pleasures in small mercies, and manage to supress intense suffering for the necessity of continuing survival" [12]. This illustrates the idea that having a wellbeing doesn't require happiness to be a priority in your life, and therefore further proving that utilitarianism is a negative indicator of wellbeing.

Sen rejects the RA, in particular the resource of income. Sen claimed that having an income is instrumental. He wrote that "[T]he relationship between income and capability would be strongly affected by the age of a person, by gender and social roles, by location, ... Handicaps, such as age or disability or illness, reduce one's ability to earn an income." [13]. To evaluate wellbeing by a component that not everyone can access would thus be unjust. This is why Sen employed the Human Development Index (HDI) and the Global Multidimensional Poverty Index (GMPI) to quantify wellbeing.

The HDI, which considers a person's life expectancy, anticipated years of education, and standard of living (GNI per capita (Gross National Income)), is a commonly used indicator of development. Although the GNI examines household income rather than individual income, other aspects of the HDI examine people, which the RA does not. Also, the HDI considers both physical (via the GNI) and emotional (through life expectancy) perspectives on wellbeing, which are two factors to assess overall wellbeing.

The HDI is a fairly simple tool for learning more about a country. For instance, you can infer that Guyana, a country in the northeast of South America, is a newly emerging economy with an average standard of living based on its HDI of 0.700–0.749 [14] and its yearly increase in HDI of 0.6%–0.8% [15]. This also tells you about the health of a country, as the more developed the country is the more capability it has.

The GMPI, which contends that poverty is multidimensional and that individuals might be in poverty due to the capabilities they have, is another method Sen uses in his strategy. People may be living in poverty, for instance, due to their health or even their lack of education. In order to determine poverty identification, this index considers all aspects from an emotional, physical, and psychological standpoint. It examines healthcare (including mental health), electricity, child mortality, and many other factors. Sen claims that contrary to what Rawls said, using the concept of relative poverty, the identification of poverty is not just a function of low income. All potential capabilities are represented by the GMPI and HDI. Whereas utilitarianism and the RA focus on what may be accomplished to achieve good wellbeing. Thus, this method measures the world and its wellbeing as it is.

In conclusion, the ability to experience emotional, physical,

and psychological contentment, I think is the true definition of wellbeing. Out of the three measures I've examined, the CA appears to be the best at assessing wellbeing since it considers emotional, physical, and psychological wellbeing. The CA evaluates people's ability for wellbeing rather than their potential for wellbeing. It is an easier method to assess wellbeing due to the measurement of capability as an objective concept. Overall, I believe that the CA is the best way to have a representable measure of wellbeing.

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Tutor comment:
"It's been a huge pleasure to teach Johannah during The Scholars Programme. Throughout all the classes, she showed a real passion for the subject and consistently high engagement with the lessons. Her passion shone through in this excellent essay. She'll be a real asset to any university programme." - T. Stephens

Should the jury have to justify their verdict?

Year 9, Key Stage 4

Pupil: Luke Deering
School: Bishop Fox's School
Supervised by: M. Millar
Tutor University: University of Exeter
Course Title: Guilty or Not Guilty: Understanding Jury Decision Making

In the United Kingdom, the verdict for trials in the courtroom are decided by a jury, a group of twelve members of the public on the electoral register. Juries do not have to justify their verdicts (Thaman 2011). This means that when a jury returns a verdict of either guilty or not guilty, they do not provide any reasoning or point to any pieces of evidence that affected their decision. Whether their decision is a fair verdict that considers all evidence or not, it is final. Only in certain situations where clear evidence arises that the jury broke the rules (for example using chance to decide the verdict, ignoring certain pieces of evidence, or using biases such as prejudice) has the judge overturned a verdict (University of Law, 2021). This system has raised questions about whether the jury should have to give reasons for their verdicts, after cases such as R vs Young (1995) in which a retrial had to be called after a member of the jury admitted that the verdict had been reached using a Ouija board. Situations like this have led to questions being raised over whether the typical jury can be trusted to fulfil its role properly, and have instigated the debate as to whether juries should have to justify their verdicts. This essay will discuss the key points against and in favour of juries having to justify their verdicts, but does identify that further academic research is necessary to reach a definitive conclusion. The essay will then conclude with my personal thoughts on the topic, weighing up either side of the argument.

A key argument in favour of juries justifying their verdicts is that the frequency of jurors using biases during the decision-making process would be reduced, especially prejudice and confirmation bias. Prejudice is a preconceived opinion someone may have about a group of people, and is linked to confirmation bias, which is the tendency to perceive new evidence as confirmation of one's existing beliefs or theories (Millar, 2023). This can mean that if a juror believes that a certain race or ethnicity is more likely to have committed a crime, and the defendant is of that race or ethnicity, the juror may simply ignore conflicting pieces of evidence as they are prejudiced against the defendant and have made up their mind about the verdict already. If juries had to justify their verdicts, having to find a reason for a decision that was based heavily on bias could deter biased jurors, and make them simply come to a rational conclusion using the evidence. Additionally, the use of chance to decide the verdict would be greatly reduced, as real reasons would be needed, and the jury would have to fabricate reasons for why they had made their unfair verdict. It can be argued however, that there are other ways to reduce jury bias, such as keeping the race and gender of any victims, witnesses or the defendant unspecified (Kirshenbaum & Miller 2020). This would also reduce how often prejudice

has an impact, while potentially keeping a much stronger grip on jury finality, which can be argued is an essential part of the justice system.

Jury finality is the term used to express how the decision made by the jury is final, and cannot be appealed. This is important as it means that a trial cannot be dragged out through repeated objections to the verdict or verdict reasoning, which could slow down the justice system and make it less effective. Making juries justify their verdicts could directly lose jury finality, and without strong rules that limit what could be appealed, a trial could be easily extended by appealing the reason given by the jury as unfair or not sufficient. These rules could potentially take time to introduce, and could then, if not thorough enough, lead to the whole trial system being exploitable, for the purposes of keeping a final decision from being made for as long as possible. Having loopholes such as this is in the justice system could lead to bigger problems down the road, as trials that last extended periods of time would slow down the justice system, and increase the legal costs. Furthermore, if a system where juries' reasons could not be appealed was implemented, then the use of bias when juries made their decisions most likely would not reduce, as there would be no consequences.

Despite all the potential problems that verdict justification could bring, some argue it is only fair, as the defendant must be able to understand why the verdict was made. In the case of Taxquet v Belgium the European Court of Human Rights found that although juries do not have to give reasons for their verdict 'the defendant must be able to understand the basis for their verdict'. Spain is a country where jurors do have to have to explain their verdict, by pointing to the charges and factual assertions that they believe have been proved, and give a written explanation of why certain pieces of evidence proved or disproved certain facts. This has been seen as having the potential to make juries more accountable for their verdicts, and has also been seen as instrumental in ensuring transparency of the case (Helm & Millar, 2022). This level of transparency is important for the defendant and the prosecution, as understanding why a verdict was reached, through a written piece of paper and a direction to the most important pieces of evidence, could help make a confusing decision clearer. In cases where corruption is involved, it could also hold the main players in the justice system more accountable – jurors, police, the judge and lawyers. If the public cannot trust the main people behind a trial, then they cannot trust that the verdict is fair (Santa Clara University, 2023). Making the jury give a reason for their verdict can also be seen as a form of quality control: 'A major criticism of the jury system is that jurors frequently lack the capacity or competence to understand all aspects of the evidence, particularly in longer and more complex trials' (Tinsley, 2001). The courtroom has no way of knowing if the jury has even attempted to hold any sort of debate over the verdict, and so it has been argued that verdict justification would be an effective way to ensure that the jury has held a debate and assessed the evidence of the case, and could be crucial for trusting the competence of the jury. The justice system relies on the integrity of the jury, so it is argued that juries should be held fully accountable for their decision, as members

of the public. If the jury mistakenly sentence someone or knowingly break the rules, they should be held responsible for the consequences.

On the other hand, an argument can be made that the safety and protection of the jury is of high importance. Cases often deal with organised crime, which is defined as 'planned and co-ordinated criminal behaviour and conduct by people working together on a criminal basis. Their motivation is often financial gain' (the Crown Prosecution Service 2023). It can be argued that if a jury were to sentence a member of a crime organisation, the organisation could target and potentially attack members of the jury digitally or physically, in retaliation. Therefore, it can be seen as the duty of the court to protect the jury by not disclosing additional information about jury members by making them justify their verdict and show their reasoning. The jury facing persecution for delivering a fair verdict could be a dangerous and problematic consequence of the transparency which it is argued would improve the fairness of trials.

Additionally, if the jury is informed that they have to justify their verdict at the end of the trial, jurors could be less likely to share information they know during the decision-making process out of fear of their words being brought up in front of the court and analysed, especially if it is personal information. Furthermore, they could be afraid that the point that they brought up could be misunderstood or miscommunicated and interpreted as discrimination by the court, even if it is a proven fact or statistic that could be useful for the debate. This fear of ideas from the jury room being said aloud in court could be a large problem for jurors with social anxiety as well, which could lead to situations where the jury is unable to give reasons for the verdict. To combat this, the rule could simply require jurors to point the pieces of evidence that led to their decision, but this most likely would negate the quality control aspect of giving reasons for the verdict, as any jury could easily point to a selection of facts.

Overall, I feel that juries should have to justify their verdicts. If I was on trial, I would want to know exactly how the verdict was reached, and if the jury really had a thorough debate, or had simply gone off their biases or a coin flip. The argument both for and against juries justifying their verdicts is very complex, and has valid arguments on either side. Arguments in favour of juries justifying their verdicts include that it would reduce the frequency of jurors using bias when reaching their verdict, which would make the justice system fairer. It can also be seen as a quality control of the jury, to ensure that jurors consider the evidence and hold a discussion, instead of using chance, for example. The defendant knowing that the verdict is fair can be seen as a requirement by some, and for that reason I feel that juries should have to justify their verdicts. Maintaining the justice system as it currently is, has a number of benefits previously mentioned in the essay, such as the preservation of jury finality. Keeping it so that trials cannot be extended through objections to the verdict or its reasoning is a large factor against verdict justification, and is large drawback in my opinion. Furthermore, keeping the safety of the jury by not making them reveal their reasoning could be very important in certain cases such as ones dealing with organised crime.

Overall, however, I feel that the advantages of verdict justification outweigh the disadvantages. The lack of knowledge about how the jury came to their conclusion is a big drawback in my opinion, as I feel that biases can have a large impact on the fairness of the justice system. As I mentioned earlier on in the essay, I believe further research into whether juries should justify their verdicts is necessary for reaching a definitive conclusion. With the current information available, however, my view is that juries should have to justify their verdicts, and this change would make the justice system fairer and more transparent for all.

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Parent comment:

"The Scholars Programme gave Luke the opportunity to develop his skills research and writing on an academic topic. He gained confidence in how he expressed and discussed his views and came away from the programme with both new knowledge and a range of transferable skills. He really enjoyed taking part, visiting universities and getting an insight into a different way of learning and applying knowledge. I was really impressed by his dedication in the doing the assignment and his overall motivation and think he really deserved the high marks he earned on his final essay." - Bel Deering

'Having an awareness of autism is pivotal to the psychological wellbeing of autistic individuals'. Critically discuss this statement in terms of both self and societal awareness of autism.

Year 10, Key Stage 4

Pupil: Molly Woodcock
School: The Stanway School, Colchester
Supervised by: G. Overton
Tutor University: University of Suffolk/University of East Anglia
Course Title: Autism: Why Is an Accurate Awareness Important?

The purpose of this essay is to critically discuss whether 'Having an awareness of autism is pivotal to the psychological wellbeing of autistic individuals' and to recognise the strengths and weaknesses of both sides of the arguments. However, before this can be debated, it is vital to confirm that the terminology used is properly understood. To begin with, 'Autism' is a well-known, lifelong, neurodevelopmental disorder that consists of three main impairments: communication, social interaction, and repetitive behaviours [1]. Autism is a hidden disability – meaning that it cannot be noticed through physical signs, nor is it immediately discernible [2] – and it is unique for every autistic individual. This means it is often referred to as ASD (Autism Spectrum Disorder) as the individual may recognise the severity of their symptoms anywhere along the spectrum. Another term used in the above statement is "psychological wellbeing" which is described by psychologists as a lack of the negative aspects of human life – such as, yet not limited to, depression or fear – and alternatively the presence of more positive ones – positive emotions or a good quality of life [3].

With this understanding, it is now possible to begin enquiring as to how awareness by the self (referring to the person with autism) and others (society) can allow an autistic individual to achieve this essential good quality of life and maintain their psychological wellbeing.

To start with, an awareness of autism by the individual is crucial because, by knowing what the root cause of an issue is, a way to combat it or create coping strategies to resolve it can be found. The story of Temple Grandin is an example that perfectly demonstrates this: Temple is an autistic individual who, when she was younger, used to have to attend church wearing skirts and stockings every Sunday. However, during the week at school she was used to wearing trousers and so the change was difficult for Temple to tolerate, resulting in her frequently acting out and her parents being unable to determine the cause of the bad behaviour. Had Temple known, at that point in time, that she was autistic, she would have known why the clothes were such a bothersome issue and would been able to resolve it [4].

Furthermore, having a self-awareness of autism can allow the individual to discover an entire community of other people who have the same condition as them. This greatly increases their psychological wellbeing in many ways with the most prominent being reduced loneliness and being able to talk to other individuals who can understand challenges that they have faced. This provides them with an effective support system that they may not have had before and gives them a safe space where the individual will not feel as pressured to conform to neurotypical (relating to or showing typical neurological behaviour and development) behavioural standards.

One particular biological approach to research by psychologists Susan Folstein and Michael Rutter begins to suggest that the cause of autism is at least partly genetic. They conducted a study of 21 same sexed twin pairs, 11 of whom were monozygotic twins (identical twins) and the other 10 dizygotic twins (non-identical twins) where one or more of each pair had ASD. The outcome was that for 36% of monozygotic twins where at least one of the pair had autism, the other also had it. But, in dizygotic twins, this statistic was 0% [10]. In the end, this test actually produced very few definitive results but is well known for being one of the first experiments that strongly suggested that genetics played a major role in being responsible for autism, motivating more research on the subject. This now allows an autism awareness to also validate a person who is on the spectrum, confirming that they are not at fault for the difference they potentially observe between themselves and those around them. It also acts to remove any guilt they might feel for neurodivergent behaviours that they exhibit.

Additionally, awareness by others through education is pivotal towards preventing bullying as it hinders prejudice born of misconceptions and encourages support and help. This is supported by another event from the life of Temple Grandin from when she began school at the age of five. Her teacher took the time to explain autism to Temple's class and those few minutes of discussion – taking a miniscule amount of time out of their day – resulted in Temple Grandin receiving support as opposed to being made fun of for the rest of her time at her elementary school [5].

Another way that the positive impact societal awareness has on the psychological wellbeing of a person on the spectrum can be made apparent is by focusing on what past ignorance of autism has led to. When researching autism in the 1940s, one approach was the psychodynamic theory where psychologist Leo Kanner suggested that many parents of individuals with autism seemed quite cold in personality and the majority of them tended to work in scientific fields or other at the very least occupations where workers are not associated with being emotional nor tender. This caused Kanner to question whether there was a correlation between autism and emotionally uninvolved parents who came to be labelled as 'Refrigerator mothers' [6]. Unfortunately, this study had numerous negative consequences for both individuals with autism and their families. One example of this being that psychologist Bruno Bettelheim insisted that autistic individuals should be separated from their parents [7] which would be incredibly detrimental to a child with ASD's psychological wellbeing. Bettelheim also compared mothers of autistic individuals to Nazi prison guards and compared their home environments to concentration camps [7]. Overall, this created a lot of blame towards the parents of autistic individuals and resulted in many children being left undiagnosed and without the help they need to live a good quality of life because their parents do not want to be judged. It has also created a stigma that is still prevalent today and further proves the necessity for education on the topic to avoid such misconceptions and instead lead to the creation of programmes like TEACCH (Treatment and Education of Autistic and Communications-Handicapped Children Program) who make it their goal to devise a good quality of life for those with autism.

On the other hand, there are many instances in which an awareness of autism is, instead, harmful to an individual's psychological wellbeing. One example being how the label of autism itself can be viewed as discrediting or oversimplifying the diagnosis. Autism is an incredibly complex condition that comes across in a multitude of different ways. Therefore, to use a large umbrella term (a term used for a broad range of items that come under a particular category) to classify an individual based on a few specific traits can undermine an individual's entire identity. It also fails to convey the true extent of the challenges that an ASD individual has to face on a daily basis, due to their condition, that neurotypical individuals are fortunate enough to not have to deal with. It can also be argued that the very notion of the spectrum

overlooks the complexity of the condition as a whole.

As well as this, an individual's first reactions to an autism diagnosis can include a sudden multitude of negative emotions and repercussions in terms of identity with can be challenging to manage and deal with [8] which will have a negative effect on their psychological wellbeing for many weeks following the diagnosis.

Furthermore, others being aware of an individual's autism is likely to lead to bullying and discrimination. They may face bullying at school, in the workplace, at a club, it could happen anywhere. Regardless of the fact that they have autism, the idea of the potential for harassment and being made fun of no matter where you go or what you're doing is an outrageously daunting prospect. No one should ever have to put up with this, never mind live their life with it. Not only this but being faced with constant discrimination and underestimation or prejudice due to something that you were born with and cannot change, nor control, is hardly fair and is unfortunately still extremely present in today's life. Both together and on their own, all of these disadvantages greatly hinder the potential for an individual with ASD to lead a good quality life and subsequently maintain their psychological wellbeing.

Over the years, there have been a myriad of debates as to what actually constitutes as autism [9] or the symptoms that must be present in order for a diagnosis to be considered. This has meant that many different ideas – some correct, some incorrect – have been published. Regrettably, with decades worth of rumours and explanations being discussed, society has formed its own prejudiced and/or misconstrued ideas of what autism is, why some individuals have it, and what causes it. Many people have their own preconceived stigmatisations and stereotypes towards the different labels, each one having the potential to differ drastically from individual to individual. In order to understand the extent to which this unpredictability can cause turmoil for someone on the spectrum, it is necessary to first understand their perception of the world and other people. To achieve this, there was an experiment performed – known as the Sally Anne Test – which was used to test a child's theory of mind (how well they were able to understand the difference of perspectives between people). In this test, two dolls, one named Sally and one named Anne, were presented to the children. Sally would place a marble inside a basket and then leave the room. Then, Anne would remove the same marble from that basket and place it somewhere else. The children would then be asked three questions: "Where does Sally think the marble is?", "Where will she look for it when she returns to the room?", and – as a reality question – "Where is the marble?". This experiment was completed by two group of children with the first group being neurotypical and the second group containing children who are on the spectrum with both groups being made up of boys and girls. The first group, with neurotypical children, resulted in 80.3% of them passing while in the group of autistic individuals, only 28.6% passed [9]. Ultimately, these results show that autistic children are – for the most part – unable to distinguish between what they know or are aware of and what other people know. With this in mind, it becomes apparent how daunting the idea of being unable to work out how others may perceive you can be, especially when combined with the fact that someone on the spectrum cannot interpret the assumptions that other people will have made of them and how they will be treated.

In conclusion, having an awareness of autism can be incredibly beneficial to the psychological wellbeing of autistic individuals as it provides them with validatory knowledge of the reason as to why they may perceive themselves as different to their peers. This can empower them to not only seek help but also know what the help is that they require. Awareness can also educate others in order to reduce bullying and avoid misconceptions. However, awareness can also lead to discrimination and never knowing what prejudices others may hold about them. Not only this but someone with ASD must also contend with a new life-long label that may seem invalidating or overwhelming. Either way, it is evident that any type of an awareness of autism will be pivotal to an autistic individual's psychological wellbeing.

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Parent comment:

"We're extremely proud of Molly and of the effort and dedication with which she approached this course. We'd like to thank everyone involved for providing this opportunity." - Sarah Woodcock

My Currency

Year 8, Key Stage 3

Pupil: Oyin Famakin
School: All Saints Catholic School and Technology College
Supervised by: W.Awais
Tutor University: University of Kent
Course Title: Economics: What is Money?

On my island, the currency which I have chosen to be used will be named the Culum, and will be the operculum of a whelk – a tough elliptical object that is found in the opening of the shells of some land snails and most sea snails, including whelks, and is a crucial part of their bodies as it acts as a door or a cover to keep them safe [1]. I have decided to use this because opercula are durable and long-lasting, as well as easy to obtain from a place near the ocean, like an island. Furthermore, I will set up and build a Central Bank on the island which can be used to keep all of the Culum, distribute them to people accordingly, and deal with anything relating to the economy.

As whelks are common in the ocean, especially in shallow waters, obtaining them and their opercula would be quite easy from the island. This would be done so by fishing for them in mass amounts, removing the opercula carefully from each whelk, and then storing them securely within the island's Central Bank as the Culum. Another way in which opercula can be collected is through finding them on the shore where they may be possibly left behind by whelks after they have been hunted by other animals, or after people on the island eat whelks and remove their operculum before giving them to the Central Bank to be used.

However, there is a disadvantage in that, due to the commonness of whelks on and near the island, island residents could be able to get the operculum themselves and use them as money despite those opercula not being distributed by the Central Bank. To prevent this, the currency will have to be differentiated from regular opercula in some way, and so the currency will function by having its value be determined by the opercula's features. These features will be the colour and a number engraved on each operculum to show its value in numbers – for example: an operculum could be painted white and have the number 20 written on each side of it to clearly show that an operculum painted white is worth 20 Culum on the island. The resources for colouring the opercula can be obtained from various plants that will likely be available on the island, which can then be used to create dyes or paint. To make the currency fair, I will also ensure that each operculum is carefully shaped to be the same, or very similar shapes and sizes, preferably by using a sharp object.

The Culum should be a very good and reliable store of value, as it is hard, tough, and will not break easily. Also, the opercula's small, elliptic shape makes it efficient for people to keep and carry around due to not being heavy or taking up too much space.

The currency must be managed by a responsible person, or group of people who are knowledgeable about economics and how money should work in a community. The Central Bank should be regulated by such people, and those people should be able to control the currency and make reasonable decisions about matters such as the money supply, how interest rates are adjusted, and how other banks on the island will operate once they are set up. The supply of money will be high but limited so that there is not too much money on the island, leading to an increase in the currency's value, and there will also be a high stock-to-flow ratio to ensure this by keeping the amount of money available at an approximate limit and not storing too many opercula. The interest rates should also be adjusted properly in accordance with the Monetary Policy which is used worldwide, as well as according to the needs of the people and the overall demand for money. I, as the Head of the Central Bank, will make the interest rates start off fairly low so that people spend money and trading can occur between residents of the island to improve the economy.

As mentioned earlier, fraud could possibly happen as whelks are very common around the island and people could easily use their opercula as a false currency, or people could steal other people's money and do other immoral things with money in different situations. Although the money provided by the Central Bank will be coloured and marked with numbers to show that they are genuine, island residents may find a way to replicate the money and to use it to their advantage, for their own personal benefit. To hopefully prevent such things from happening, I will put rules and laws in place which will make fraud illegal, and will also result in punishments for breaking laws. An example of one such law could be something similar to the Fraud Act 2006 in the UK, which states that "a person is guilty of an offense if he has in his possession or under his control any article for use in the course of or in connection with any fraud" [2], meaning that a person has committed a crime if they have anything, such as a fake or stolen piece of money, which is to be used for fraudulent reasons. The punishments for breaking the laws could be that the criminal receives a fine, and/or a prison sentence for a few years. These laws and and the threat of possibly having a prison sentence or a fine for not following them could prevent people from attempting to commit fraud or any other crimes, so that they don't receive any sort of punishment.

As my currency continues to develop even further along with the economy and the island as a whole, things like interest rates and laws may need to be adjusted to accommodate the needs of the expanding population and growing demand for money. Interest rates will probably be raised slightly to encourage more spending by the people to benefit the economy, and the currency could also gradually be made slightly stronger if the economy grows very quickly, and to promote the purchase of local products by foreign buyers. Increasing the money supply may also be helpful in the future, as foreigners may come to the island and wish to trade using the currency, therefore there will be a much higher demand for the currency – this can be done by using something like a 3D printer to produce the currency in mass amounts, though of course the supply and money distribution from the Central Bank must still have to be controlled and have a reasonable limit to keep the stock-to-flow ratio high. It would be useful to begin building more banks across the island to help manage the monetary needs and concerns of the growing population too. Additionally, all of these changes could affect the currency's value and hopefully make it stronger.

Moreover, there will be the possibility of trading with other countries, exporting items across the world and importing goods from foreign areas. I will allow global trade with countries that are accepting, have products of good value and will benefit the island through trade. Trade will have to be secure to ensure that nothing illegal is imported and exported, and that all goods pass in and out of the island safely and legally, without any problems such as an unfair loss of money after paying for resources. Furthermore, buying and selling in other countries will require island residents and visitors to change their currency to other countries fit for the country they happen to be in. For this reason, the Central Bank will have to decide and set exchange rates for other currencies with countries worldwide according to other currencies' supply and demand [3] and should be accurate enough for a specific item to have the same value in two different countries, despite being worth a different price.

For example, the value of 1 Culum could be similar to that of one Hong Kong Dollar, or HKD, which would equal approximately £0.10 when converted to British Pounds, or GBP (1 HKD = 0.102862 GBP; 1.00 British Pound = 9.7174973 Hong Kong Dollars [4]), so the Culum could be worth around the same amount.

When it comes to the digital world, the Culum could become a currency which can be used online to buy and sell goods using the internet to pay, receive money and communicate with people. Firstly, people could have bank accounts which will be managed by the island's banks, and so that money can be stored in the form of a digital currency instead of as a physical object. Though there may be some problems with bank accounts, like the possibility of online theft by hackers, the banks will make the people's accounts secure, probably by supplying them with things like passwords which can be kept by them and used whenever they want to use their bank accounts, and to lessen the chance of their accounts being hacked into. Secondly, the digitized currency could also have a physical form that can be used to pay both online and in person, and can store money within it.

As the monetary system around the world continues to develop and change with technology, the way that the Culum and the island's banks operate will be affected, so the currency will have to change in the future as well.

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Parent comment:
"I subscribe to our young minds expressing and sharing their thoughts about the world in which we live. As a parent, it's an opportunity to look through the window of their mind."

"To protect nature, humans should leave no trace on their environment." What kind of assumptions does this statement make about the relationship between humans and nature? To what extent do you agree with what it suggests? Explain your reasoning, using examples.

Year 10, Key Stage 4

Pupil: Piranavi Chandrasekaran
School: Chislehurst School for Girls
Supervised by: H.Reeves
Tutor University: Birkbeck College, University of London
Course Title: We are the weather: understanding humans and nature in a climate-changed world

In this paper, I will be discussing what impact humans should have on the nature to protect the environment. I will be talking about whether it is possible for humans to leave no trace on the environment, the time difference between each epoch over human history and how it conflicts with the start date for the anthropocene. I will also be introducing some examples of humanity decisions such as The Willow Project and the new emergency alert system for UK residents.

Before arguing deeper into this paper, it is important to recognise the difference between the terms 'Environment' and 'Nature.' Although these two terms are not the same, they are closely related concepts that refer to different aspects of the natural world. Nature refers to the more physical part of our world, the mountains, oceans, forests, rivers to plants, animals, and humans [Cambridge dictionary, no date]. However, the environment refers to the surroundings that we live in, both natural and human–made, such as the air, water, buildings, and the infrastructure we see in our day to day lives (Cambridge dictionary, no date). Essentially, the question in this paper is asking us to assess the impact humans should have in the surroundings we live in to protect living species, and natural landscapes . Another considerable aspect of this question would be what impacts we make on the environment that is detrimental to nature. The problems we would have to solve would be climate change, deforestation, pollution, overfishing, and natural disasters. And even with all these examples, it is undeniable that there are more problems to come in the future as our world develops. Therefore, to solve these problems, we would have to change significant aspects of our day-to-day life. For example, right now with our current technology and development, the changes we would have to make is reduction in our meat consumption, usage of petrol, non–renewable energy resources, use of trees and other natural resources for our benefit.

One thought that should be considered when debating this question, is whether it really is possible for humans to be able to leave no trace on the environment. Humans have heavily become reliant on things such as electricity, energy, and even paper over the years. We could not consider ourselves in a world where we would not be able to heat our homes or charge our phones. Even something as simple as paper, which we use to our convenience everyday being available in large quantities in many shops, would have to be cut if we truly want to leave no trace on the environment, as it accounts to up to 26% of solid waste filling landfill sites [Paper waste facts, no date]. Based on the evidence, its simply not possible to create an environment where humans can leave no carbon footprint in this world, at least not yet.

Moreover, even if this technological takeover would happen, how soon would it happen compared to how fast we are destroying this planet? Over time, it has been obvious how fast technology has been advancing, the first computer was made in 1943 called the Colossus (Robledo, E, 2022), and now there are over 2 billion computers, servers, and desktops in the world not including smartphones, and televisions (SCMO, 2019). However, it can be said that we are destroying the environment at a faster rate. From figure 1, we can see the exponential growth rate in the global average temperature from 1850 to 2019. This growth in average temperature increases the risk of heatwaves, floods, droughts, and fires (Met Office, no date). It can be said that the growth of technology we need in order to gain renewable resources is not advancing as fast as the rate at which we are destroying our planet. Therefore, the technological advance we are waiting for to help reduce our carbon emissions is unlikely to come in the near future, so humans must cooperate with each other to save the planet before it is too late.

Figure 1: Global Average Temperature 1850- 2019
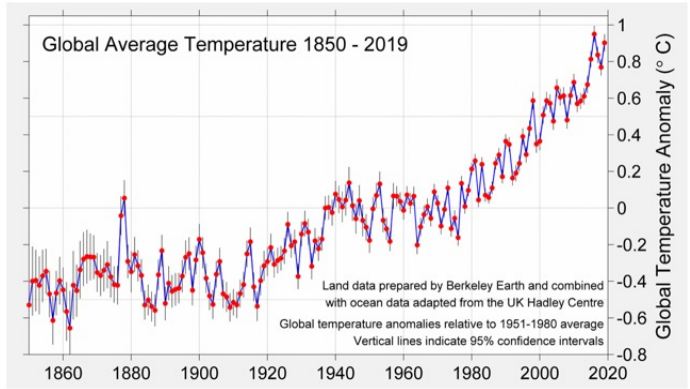
Source: Berkeley Earth, 2020

The Anthropocene is a proposed geological epoch that describes the time during where humans have started to have a significant impact on the planet's climate and ecosystems (National Geographic, no date). This idea leads on to the issue of whether the Anthropocene has started or not? The start date of the Anthropocene is quite a controversial topic to consider when we look at the statistics of the earlier epochs.

- Palaeocene Epoch: 66-56 million years ago.
- Eocene Epoch: 56-34 million years ago.
- Oligocene Epoch: 34-23 million years ago.
- Miocene Epoch: 23-5 million years ago.
- Pliocene Epoch: 5-2.6 million years ago.
- Pleistocene Epoch: 2.6 million to 10,000 years ago

And then we have the most recent epoch, the Holocene, 11,700 years ago to the present. When we consider this regular pattern of trends with time, it is guessed that the Holocene should last for at least one more million years. But if it doesn't and instead only lasts a thousand or more so years, we can observe another pattern within the epochs, which is that the time each epoch is lasting is gradually decreasing, and if it continues, the end of the Anthropocene can mark two possible outcomes. One, that the environment recovers somewhat to what it was like before, ecosystems and biodiversity flourish, and humanity progresses into a new stage, Or, two, the Anthropocene will mark a stage in humanity where people have made an irreversible mistake, and we set onto what could possibly be the end of human civilisation (USGS, no date). These outcomes show us that it is near impossible for us have no effect on nature, not when we can be considered as a part of nature as well, and our downfall would be closely related to the downfall of nature itself.

However, is it really possible for the end of the Anthropocene to be a new start for all of humanity after all we have done and are still doing? It is undeniable that capitalism is growing, and the wealthiest of people hold the most influence over state affairs. So, when people are so led on by money and profit, what is the guarantee that even if a petition is raised for a large-scale cooperation to save the environment once and for all, people would actually agree and move on with this goal? COP (Conference of the Parties) is a series of United Nations climate change conferences, which have been running since March, 1995 (Met Office, no date). COP has been going on for 28 years now, which shows for just how long climate change and the environment have been emerging issues. And yet, figure 2 shows exactly how it still worsens every year, despite major protests, conferences, and petitions going around all year round . One example of such a recent event is The Willow Project. The Willow project is a $6 billion proposal from ConocoPhillips' (COP.N) to drill oil and gas in Alaska (Internet geography, no date). This project has spiked anger in many citizens, and receiving a lot of media attention, for example, 50 million views of #StopWillow on TikTok alone. Going through with this project would generate enough oil to release 9.2 million metric tons of planet-warming carbon pollution a year (Nilsen, E, 2023). This shows just how little some politicians and business owners care about of the environment and the possible extinction of human species in the face of more money and profit. So, it would be even harder to convince people to leave the environment alone than to work with nature to reverse the onset of the Anthropocene, therefore working with the environment would be a more realistic choice in the near future.

Figure 2: Global Average surface Temperature

GLOBAL AVERAGE SURFACE TEMPERATURE
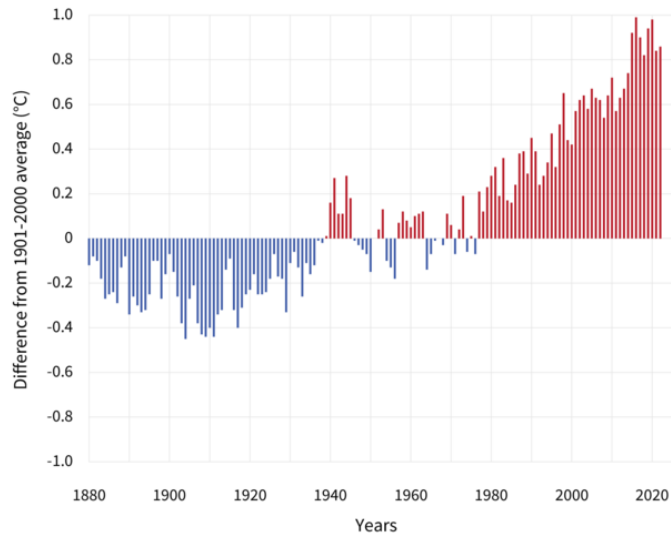
Source: National Centers for Environmental Information

Despite that, what if we're too late? What if we have already damaged the environment too far to reverse the onset of the Anthropocene? Statistics show that 70% of our environment has already been altered and changed by human activity for the worse in the past 30 or so years, where we have been polluting our land and oceans with plastic and harmful chemicals. Scientists argue that we are only 10 years away from the catastrophic climate change, after our global gas emissions reach a tipping point (Green, K, 2022). Moreover, most argue that after we have gone this far in harming our planet, it is an inevitable event, and there is no more we can do than try to postpone this event that might most likely be the end of human civilisation. And even if we were to consider the extent of ecosystems naturally restoring themselves, it isn't possible to stop the extent of climate change. Therefore, humans leaving no trace on the environment is a stage that is no longer possible.

An example to look at related to the current state of our environment, is the new emergency alert system, which is being tested on the 23rd of April. The siren sounding on the 23rd of April will be used to test a new emergency alert, that will be used to warn people about floods, natural disasters, and other life threatening situations in the future [BBC, 2023]. This event shows us how climate change has caused a rapid increase in natural disasters due to climate change and carbon emissions. This increase in destructive activities has laid out for us how much we have harmed the environment and how far its interfering with nature's natural course.

However, what exactly is meant by the term 'environment' and what exactly do we have to stop to save it? When we consider the environment, we think of our wildlife, vegetation, ecology, habitats, and even humans can be considered to fall into the category of the 'environment'. So it would be hard to interpret what is actually meant by leaving the environment alone, to protect nature. But a few things are given, countries would have to set up international agreements with each other and cooperate to ensure that they are working towards the same goals, we would also have to stop the burning of fossil fuels, this is one of the main

reasons why there is so much controversy around the topic of saving the environment, the same people who petition for this also use electricity and heating in their home which is most likely used from non-renewable energy sources, which are harmful to the environment. And this is mostly because they don't have a choice, statistics shows that only 30% of the energy used in the world is from renewable sources [Duggal, H and Hussein, M, no date]. From this data, it is proven that humans are still a long way from becoming non – dependant on the environment to provide us with day-to-day resources. So, it is not possible to leave no trace on the environment, not when we still so heavily rely on nature to provide us with things, we take for granted today. Therefore, humans leaving no trace on the environment is a stage that is no longer possible.

Even if nature still has the ability to naturally restore itself, can it? Scientists have been looking at the regeneration of nature since the year it first became a problem. And over time, one solution they came up with was the rewilding of extinct species to bring back biodiversity. This is one of the solutions that has brought expectations into bringing nature back to what it once was. But will breeding sub species of an extinct animal really bring back a 100% genetic copy of it? And this solution is also controversial as it holds some ethical issues. It is arguable that rewilding can essentially be counted as abuse towards the sub species, as we are taking away their choice on whether they want to take part in this. However, this rewilding does hold a lot of potential in the conservation of nature if we had not already harmed the environment past its tipping point.

Overall, from the data given, I believe that for us to protect nature, we should work with the environment. It is arguable that nature is past the point of naturally restoring itself, and we are not yet at the stage where we can live without having to rely on the environment to provide us with the most basic things in life, we take for granted every day. But saving the planet has to come first, as the destrcution of nature would mean the demise of humanity. Some examples of how they could do this is by setting international agreements, cooperating with each other, limiting our energy and natural resources usage until we have the technology to overcome these barriers. To achieve this, people must all agree that climate change has reached a tipping point and it has now become an issue that we must all at one point in our lives consider as our future, a planet ruined by natural disasters and pollution, and this has already been shown by our current decisions such as 'The Willow Project' and the new emergency alerts for the UK. Although leaving no trace on the environment is a highly unlikely task, as our existence itself interferes with the environment's natural course, we can reduce the impact we make by cutting our carbon emissions, using less non-renewable energy, and reducing our usage of natural resources that harm the environment. Although this alone may not be enough to completely save our planet, I believe that over time,' if humans work with each other and the environment, they will be able to provide this generation, and the future ones to come with a better life.

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Should the jury have to justify their verdict?

Year 9, Key Stage 4

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Course Title: Guilty or Not Guilty: Understanding Jury Decision Making

A court trial is a long and difficult process but in the end, whether or not the defendant is guilty is in the hands of the jury. Jurors are randomly selected eligible members of the public chosen to decide in court trials whether or not the

defendant is guilty. A jury is generally made up of 12 people in total. Ultimately the jury makes their decision based on the information and evidence collated throughout the entire case and is presented in court. During the trial, jurors have a legal responsibility to only base their verdict on the evidence given in court and not on outside information or anything they learn about the defendant or witness online and they are not allowed to leak details of the trial to anyone including family members, friends, or the press. Not following these rules is illegal and if you, as a juror, are found breaking any of these rules you may be prosecuted for it. At the end of the court case this group of people must make a final decision as to whether the defendant is found guilty or innocent of their crime. This final decision is known as the verdict. Sometimes all the members of the jury will agree on a verdict which is known as a unanimous decision.

However the public and those involved in the trial do not always agree with the jury's verdict (final decision) or their reasons for it. Some brief reasons for the jury not agreeing on a verdict might be because of their moral beliefs, religion, background or members of the jury may be biassed from external factors. Any type of bias is not allowed in a court of law. Although, Some do not think the reasons behind their decision matter, others disagree and believe the jury should always give valid reasons for whether or not they convict the defendant. So this begs the question; should the jury have to justify their verdict?

As previously stated, many people do believe the jury should have to justify their verdict. This is because knowing the reason behind their verdict allows the court to rule out any possibilities of the jury being prejudiced within the trial. Examples of the jury being prejudiced could be if the jurors were racist, sexist, homophobic these are but a few examples of the many ways people can be prejudiced. This was shown in the trial of the murder of 14 year old Dea-John Reid. 'Dea-John Reid was "hunted down" by a group shouting racist slurs and attacked following a confrontation over a bag in May last year, jurors were told. A 15-year-old was convicted of manslaughter and four people were acquitted of murder.' 'The jury at Birmingham Crown Court was made up of 11 white people and one of south Asian heritage.' Helm, R. K., & Millar, M. Jury decision making in the criminal trial. In this trial it is obvious that the ethnicity of the victim, jury and defendants all played a large part in the jury's decision, which should never happen in any trial, because the majority of the jury and the defendants were white and therefore it was not taken into consideration the different racial backgrounds and experiences with outside the court pre-trial.

However in this case the jury did not have to justify their verdict and Crown Prosecution guidelines will not allow challenges of the jury based on ethnicity, therefore there was no solid ground to support the need of a re-trial. This case sparked mass anger in the victim's home town which led to a campaign being started in his honour. 'The Justice 4 Dea-John Reid Campaign group' has dedicated itself to making sure injustice like this does not continue to happen and has set up a petition asking for guidance to be changed. This change should include making sure the jury is much more equally diverse in future and hoping this potentially will have an impact on the way the jury comes to their verdicts and reduce the possibility of prejudice in future court trials.

Furthermore, Dea-John Reid's case is also an example of jury nullification. Jury nullification is when the jury as a group come to a non-guilty verdict when all evidence within the trial suggests that the defendant is guilty. Although in Dea-John Reid's case the jury decided to nullify for most likely the wrong reasons, reasons for jury nullification can be less about prejudice and more about the morals of the defendant.

This is often seen, for example, in trials against protesters when criminal damage has been done. If the jury agrees with what the defendant is protesting for or believes in the cause, the jury may decide they are innocent and to nullify therefore allowing the defendant to go free, when the defendant is in fact guilty. Because of both these reasons however, if the jury were to nullify in any trial, having to justify their verdict would allow us to know exactly why they have chosen to do this and this could be important to rule out any biases or to open up a new, outside point of view on the case.

Generally, the jury having to justify their verdict also gives the case more transparency, allowing the defendant to have a better understanding of their verdict, whether they were found guilty or not. "Conversely, the more that values within the community diverge and a normative rift opens up between different sections of the community, the more likely a sense of injustice may be created by a verdict that is unexplained" jackson, j. (2016)

On the other hand, some disagree and do not think the jury should justify their verdict. One argument for this is that if the jury needed to justify their verdict, they would need to make sure their verdict was based within the law. The problem with this is that for the jury to then come to a verdict, because they are selected as random members of the public, they would most likely need legal advice which could have a large impact on the case and their verdicts. "Jurors are lay fact-finders, untrained in the complexities of law and legal rules, and yet reasoned verdicts require that their reasons conform precisely to the law. This difficulty is the impetus for additional interaction with the court, as jurors must often call on legal assistance when drafting their verdicts. This necessity undermines the independence and power of jurors." Burd, K. A., & Hans V. P. (2018)

In this reference the point is also made that needing legal professionals to assist the jury while coming to a decision would almost make the jury itself pointless; that if professionals were brought in to give legal advice to jurors specifically for the verdict then there is almost no way for it to be entirely unbiased. Additionally, considering the impact legal advice would have on a verdict there would be no reason not to leave the entire deliberation to those who specialise in this specific area of court, for example lawyers, defeating the point of the jury entirely and removing the courts chance to bring in a fresh point of view from outside the court.

The law currently in the UK does not require the jury to justify or explain their verdicts to anyone, the panel of 12 are trusted to come to a decision amongst themselves and the verdict to be given, in the majority of cases this seems to have worked well. Moreover, in Spain many cases have been overturned due to the jury's reasoning behind their verdicts not being within the standards of the law. 'In Spain, for example, where substantial numbers of cases have been

overturned as the courts found jurors' written documentation of their reasoning to be inconsistent or insufficient.' Burd, K. A., & Hans, V. P. (2018)

Another thing to consider is to make certain that the trial is fair in all aspects throughout. This includes ensuring that jurors follow the rules and uphold their legal responsibilities at all times during and after the trial and staying true to the oath taken by jurors while in court. These rules are extremely strict and are part of criminal law meaning failing to abide by the rules can have a maximum sentence to two years in prison. The rules include not being able to look up anything about the case or people involved in the case and only being allowed to use evidence presented in court, only being able to discuss the case with the other jurors you are working with and only when you are all together, you are not allowed to discuss with anyone what was said by you or any other members of the jury while in the the deliberating room even when the trial is over.

A huge risk of not following the rules above is that if it is reported to a judge that a juror has broken any of the rules the entire trial could be stopped and restarted with a completely new jury, wasting a lot of time and money for many people involved in the trial. An example of jury members breaching rules during the trial is the case of Phillip. J Givens II. Givens was on trial for the murder of his girlfriend Monica Briggs, however the members of the jury could not decide whether or not they should convict him of manslaughter or murder. The group of 12 collectively decided to flip a coin and base their verdict on the outcome of the coin toss. As a result the defendant was almost sentenced to life in prison if it had not been for the fact that the jury foreman had come forward about the coin toss. Luckily, the judge ordered a new trial and all was well yet this could have been a very different outcome if the truth had not come to light. The issue legally with using a coin toss or anything similar to base a verdict on is that juries' verdicts must be based on evidence presented within the court and a coin toss is not evidence and therefore cannot be considered sufficient ground to base a verdict on.

In conclusion, I believe the jury should justify their verdict. It is my opinion that justification is necessary because in my eyes the pros outweigh the cons. The main pros for a verdict being justified are as follows: the possibility of closure for families and victims, the transparency it gives the case and pushes the defendant (if found guilty) to take accountability for their actions, the chance to gain knowledge behind reasoning towards verdicts and the potential to reduce likeliness of biases within a trial. While many could argue the fact that justification of the verdict leading to cases being overturned is a good enough reason to get rid of justifying the verdict altogether, I think overall there are many advantages to having the jury justify their verdicts as long as it is done in the right manner and follows all the necessary rules.

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Is politics too complex to be described in just the terms right or left?

Year 10, Key Stage 4

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The labels 'right' and 'left' are somewhat useful in describing politics as it gives us a starting point for understanding someone's initial ideas or perspective. However, problems arise when we start adding things like 'radical left', centre left, centrist, centre right, and radical right as the terms are not adequately broad enough to include these ideologies. This is a problem as there is a substantial difference between being a radical and a centrist. In this essay, I will explore whether these labels are sufficient enough to describe politics.

The origins of denominations can be traced back to the French Revolution in 1789. During a debate in the French National Assembly over whether Louis XVI should remain in power, those who supported him were seated on the right, while those who opposed him sat on the left. The presiding party sat between them to maintain order, much like a court judge today. The French newspapers dubbed the two groups as the traditional, conservative 'right' and the progressive 'left,' and these labels have remained in use for 234 years to identify people's political views.

The terms 'right-wing' and 'left-wing are used to identify a person's political beliefs. Being 'right-wing' is often associated with conservative views such as private ownership of property and wealth. For example, a person with right-wing views would argue that taxes should be low to keep as much money as possible. They are also in favour of traditional ideas, commonly agreeing with things like power being in upper-class hands, monarchy, and individualism. However, 'left-wing' views, being progressive, completely contest these ideas believing that rather than individual freedom that things should be equal, the state should have a more active role and access to power being open and free to everyone. For example, a left-wing person would argue that wealthier people should pay more taxes as it can help those less fortunate. Norberto Bobbio has an interesting theory, he believed that whether you are left or right depended on your view on equality. He claimed that if you thought everyone was equal and downplayed the differences of others, you were left-wing making you an Egalitarian. Contrastingly, if you acknowledged and up-played people's differences you were right-wing and an Inegalitarian (1). In this instance, the terms are useful as we are not looking deep into the political spectrum.

Further, we can use several different distinctions to identify a person's political standing such as radical and centre. These two distinctions are useful in describing where on the political spectrum someone stands. Being on either end of the spectrum defines you as 'radical' right or left, meaning that you are an extremist for what you believe in. Radical people have no interest in talking and coming to an agreement; their way is the only way. They often use militant and disruptive methods to be seen and heard. On the contrary, centre left, and right people are more open and inclined to sit and talk with each other and reach a conclusion. There are many examples of radical left and right groups, for example the English Defence League otherwise known as EDL. They are a far-right Xenophobic and Islamophobic organisation based in the UK. They claim to be 'protecting and promoting human rights' and 'defending British values', as they claim to be under attack from Muslim extremists. Their leader, Tommy Robinson, claims that the EDL is not racist, saying 'the truth cannot be racist' and that they oppose a fascist ideology despite some of their members being former fascist group members (2). Their main three types of protests were national demonstrations that called activists from all over the country, local demonstrations that featured members of the Local EDL division and flash demonstrations that were held without informing the authorities beforehand, causing disruption and inconvenience to others. An additional example of a radical group is Antifa. Antifa is a far-left group who are against Neo-Nazis, Neo-fascism, white supremacists and racism and these days the movement that encapsulates some of those ideas: the alt-right (3). They use a combination of nonviolent direct action and violence to achieve their goal of creating a society where Fascists do not have a platform to contribute to public discourse, using any means necessary. Individuals involved in this movement typically hold anti-authoritarian, anti-capitalist, and anti-state views. They also tend to support various left-wing ideologies, such as democracy and freedom of speech. Militant anti-fascists frequently use "direct action" techniques or use their strength to further their goals rather than relying on the government or the appropriate authorities. Their "violent extremism" has earned them a negative image among some Democrats and Republicans alike. Their "direct action" frequently takes the form of doxing or verbal abuse. But an example of a centre-right organisation would be the Conservative and Unionist Party in the United Kingdom. Their newly elected leader, Rishi Sunak, is often seen in parliament debating with other party leaders. Rather than direct, and sometimes violent, action, centre groups use things like propaganda to spread misinformation about their opponent to get the majority on their side. This can be seen through political figures doctoring videos to make their opponents seem impractical or uncommitted. Similar things can be seen for centre-left groups. This is what separates far and centre politics, their likeliness towards conversing and debating. As we can see in this case, right and left are not broad enough to describe politics as a whole.

Although the radical right and radical left have opposing views, it has been suggested that they share some similarities. A man by the name of Jean-Pierre Faye, mentions a theory called the Horseshoe Theory in his 2002 book 'Le Siècle des idéologies' ("The Century of Ideologies"). In the said book he discussed the use of Ideologies rooted in philosophy by totalitarian regimes with specific reference to Hitler,

Nietzsche, Stalin, and Marx (4). The horseshoe theory claims that radical right and radical left are more alike to each other than centre right and centre left and that the political spectrum mimics the shape of a horseshoe with the ends being close together. Many seem to agree with this theory, one being reformist Muslim Maajid Nawaz. He says ''As the political horseshoe theory attributed to Jean-Pierre Faye highlights, if we travel far-left enough, we find the very same sneering, nasty and reckless bully-boy tactics used by the far-right. The two extremes of the political spectrum end up meeting like a horseshoe, at the top, which to my mind symbolizes totalitarian control from above.'' (5) As we can see he emphasises that far rights and lefts are remarkably similar in terms of tactics and behaviours. Another man, Josef Joffe, a German publisher, once wrote in an essay that ''Left and right together illustrated once more the "horseshoe" theory of modern politics: As the iron is bent backward, the two extremes almost touch.'' (6) Once again it is being highlighted that the horseshoe theory is accurate. However, they are criticisms against it. Paul H. P. Hanel, a research associate, wrote ''Overall, van Hiel provided evidence demonstrating that Western European extremist groups are far from being homogenous, and left- and right-wing groups represent distinct ideologies.'' (7) He is saying that the two ideologies are far from being aligned and the horseshoe theory is inaccurate. As we can see in this case, right and left are not broad enough to describe politics as a whole.

In the 1960s, an American politician named David Nolan, proposed a different, more complex model as opposed to the simple line political scale as he too realised that it was not intricate enough to display all ideas. It is known as the Nolan Chart, and it features a rhombus divided into four and labelled Liberal, Authoritarian, Conservative, and Libertarian with Centrist in a square in the middle. It also has 2 axes, economic and personal. The economic part captures what people do in the economy as both vendors and consumers. Examples of opinions in this domain include tax rates, the role of the government in the economy, and company regulation, among others. Whereas the personal side overlooks individual opinions, such as which religion to follow, which field of work to go into or whom to marry. The four main groups of the political perspective that his diagram aimed to explain are: Right being those who favour greater private freedom but a greater level of government regulation of personal affairs, Left people are those who favour greater independence for individuals but more government regulation of economic activity, Libertarians include those who prefer greater freedom in both personal and economic matters, and those who prefer extensive government control over both economic and private spheres of life are known as Authoritarians. However, said chart has gotten some criticism over the years. Many have argued that the difference between economic and personal freedom is not clear enough to stick. For example, Libertarian Jacob Huebert states that the separation of personal and economic liberty is untenable when one considers the rights to prostitute oneself and to deal drugs, both of which are libertarian causes: adopting either profession is a personal (moral) as well as an economic decision (8). This proves that people's choices and opinions have too much variety to say they are just personal or economic. This can be seen through a survey conducted by YouGov, where people who consider themselves left-wing

and right-wing are asked about their agreement in views associated with the opposite wing. 63% of people who self-identified themselves as right-wing said that they thought 'the House of Lords should entirely be elected' which is seen as a left-wing view (9). 59% of people who self-identified themselves as left-wing agreed with the statement 'School discipline should be stricter' which is considered a right-wing view (10). Although the most distinct viewpoints held by people on the left and right align well with the stereotype of left and right, there are many policy areas in which people's viewpoints directly contradict that (11). Here we can see the flaw in Nolan's Chart despite believing in a certain view, people's views bend to fit their own opinion. Again, we can see here that 'right' and 'left' do not cover this aspect of politics.

To conclude this essay, one may think that the terms right and left are marginally useful in describing politics. They are useful in setting a starting point for one's beliefs but ultimately fail to cover every aspect of complexity in politics. It is clear that they have not lost their meaning yet perhaps their relevance as time has progressed. In politics today people refer to themselves by other labels such as Communists, Socialists, Capitalists, and many others as they fall somewhere in the middle of the 'wing' spectrum and do not see themselves fitting right or left.

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Knowledge and cultural capital are the most important ingredients of a primary school curriculum if you want to succeed in life. Discuss to what extent you think this is true or not.

Year 9, Key Stage 4

Pupil: Zoe Behling
School: Chace Community School
Supervised by: P. Moses
Tutor University: University of Cumbria
Course Title: What do we need to learn so that we can succeed in life?

Many people believe that knowledge and cultural capital are the most important ingredients of a primary school curriculum if we want children to succeed in life. However, there are many examples where the cultural capital of the dominant classes and groups in society can outweigh the knowledge and skills of those deemed to come from a lesser societal group and that the current primary school curriculum favours the cultural capital of the dominant classes. In order for primary schools to succeed there needs to be a shift in this philosophy.

Knowledge is the understanding of or information about a subject that you get by experience or study, either known by one person or by people generally (1). Knowledge can be achieved in many ways and there are certain things that children need to know and learn from school. Primary school education and its curriculum is the foundation for what children grow up to know and shapes their way of learning. Knowledge comes in different forms for different people and everyone deserves the right to knowledge and an education. Just because children learn in different ways or speeds does not mean they are not entitled to it, and this is where the national primary school curriculum fails.The real question is, what can the national primary school curriculum do to meet those expectations?

Cultural capital is the essential knowledge that children need to prepare them for their future success. It is about giving children the best possible start to their early education. Children do not all learn the same way so how can there be a set primary school curriculum that includes everyone? Schools generally are told to focus on the children that are quiet and just get on with their work. However, by doing this they are just ignoring other children who do not learn the way "they are supposed to".

One way schools can change their philosophy in order to include everyone is to expose children to different cultures and situations in which they may not have previous experiences of, whilst also embracing their own culture. Before people can learn about new things they need to learn to embrace what they already have. No one should have to change who they are for anyone.

There are different types of knowledge including Physical knowledge, Social knowledge and Logico-mathematical knowledge (2). Physical knowledge resides within the objects themselves and can be discovered by exploring objects and noticing their qualities. Social knowledge is more about experience and how people learn from others' mistakes. Whereas Logico-mathematical knowledge uses the brain to build neural connections which connect pieces of knowledge to one another to form new knowledge. Schools normally value logico-mathematical knowledge compared to the others. But how can this be seen as the best way to learn? It can not. Children should be taught to expand their mind and learn through different ways of knowledge otherwise they will not be learning the best they can. Different types of knowledge have their own viewpoints and children should be exposed to all of them. This way all children can be included and involved.

To some people dominant classes cultural capital can be seen as higher skill levels to someone of a different cultural capital. However, this is not always the case. People should not be judged because of their race, religion or background. There are three types of capitals: cultural, social and economic. Cultural capital focuses on skills and behaviours which is similar to social capital that focuses on relationships among people who live in a particular society. Economic capital focuses on money and wealth. Someone from a dominant class would be seen as privileged and who have more resources to help them so they would end up getting a job over someone from a different class as they have more resources at their disposal. This is unequal and everyone should be brought up to have equal opportunities.

Increasing cultural capital is an important part of the primary journey particularly in more deprived areas and with lots more parents working longer hours following the Covid pandemic and the current cost of living crisis. Children do not reach their full potential without a wide range of experiences, opportunities and exposure to new ideas, role models and places. The national primary school curriculum alone cannot fully develop the whole child, it has to be taught alongside a range of experiences and visitors that grow children's awareness of the world around them and their own opinions and responsibilities. In order to create equity in the classroom, schools have to fill the gaps that some children may have in their lives due to a lack of support, funds or opportunities. A child who has never visited a beach, or slept in a tent or been to an art gallery or spoken to a real athlete, will not have the vocabulary or ideas to write creatively, debate knowledgeably, or see the point of a science experiment. A child who has parents who provide them with experiences and invest in cultural and social opportunities will be in a stronger position than another child with a different background but both children can achieve equally if we raise the cultural capital for those who need it. The national primary school curriculum should sit equally with cultural capital in the priorities and structure of a primary education.

The current primary school curriculum is based on thinking about what is the best that has been thought or said, looking back at the past and reading and memorising from a textbook. The current primary school curriculum leads schools to believe that this will be the best knowledge that can be received. This is not the best as learning and

repeating the past will only get you what you got. I believe the primary school curriculum is wrong as yes textbooks can help children and young adults learn but there are other ways to learn i.e experience. You can know something but you can not fully understand it until you experience it. Albert Einstein explains this with "Any fool can know. The point is to understand "(3). To me this means that schools teach students to know things but they will not understand it until they experience it out of school. This shows that schools do not use the best techniques for teaching and because of this students will not learn and understand to the full extent. The past is full of mistakes and the best thing to do is to read about them and learn not to repeat them whilst trying to move forward from them and to ultimately do better. The world as a whole will not benefit if primary schools do not change the curriculum. Cultural capital is changing and if the primary school curriculum does not it will be a massive step for the world but in the wrong direction.

Schools should expand their teaching to widen children's viewpoints. Textbooks usually only show one point of view which is seen as the "right" view point. However, there should be more incorporation of trips, workshops, projects and group work. I think this because, children get to experience the world around them and it would be great for them to learn that not everyone lives the same, has the same beliefs or comes from the same background, whilst also learning there is nothing wrong with their beliefs or cultural background. Children should be taught and brought up to be themselves, but should also be taught respect, for themselves and for others along with kindness towards others. This is where group work and projects can come in to help teach this. Children who know more about different cultural capitals are more likely to be able to communicate, obtain jobs and have empathy for others. Exposure to and access to art, music, literature, history, science, etc through other means of learning rather than just textbooks ultimately gives children access to other forms of capital such as economic and social. The reason these skills are needed at such a young age is because primary schools set the foundation of education and learning for children. Secondary schools are a lot different to primary schools meaning that yes it is very important for children to have these skills in secondary school but if they have not been taught and encouraged to use these skills before as part of the primary schools curriculum they might struggle at secondary school.

Another part that the primary school curriculum should focus on is confidence. Building up a child's confidence and helping them to have skills to develop confidence in themselves ultimately helps children so much in life as it gives them the ability to be able to speak out for themselves and to strive for jobs or goals later in life that they would not have normally believed they could obtain. Children should not have to try and fit into society's standards. They should be taught to embrace themselves and their background. Children should not have to apologise for who they are but the national primary school curriculum makes that so hard to happen as children are not always taught or exposed to different cultures, religions and backgrounds. This is where confidence can help.

Cultural capital that benefits one class/group of people over another is alternately detrimental to society as a whole. The current primary school curriculum favours the so called

dominant cultural class and primary schools are having to do more outside the original curriculum to help all of the children so that they can progress through the academic system. Schools are trying to create equity in a classroom but at the end of the day they cannot do their best with the national primary school curriculum being outdated. I therefore believe that the current primary curriculum is in need of a major revamp so that all children are able to access an education that it takes into consideration everyone's background, experiences and skills.

In this assignment, I have outlined how primary schools should become more inclusive for different cultural capitals and how the national primary school curriculum should change. For the primary school curriculum to succeed it needs to evolve to focus on all cultural groups. The curriculum should encourage all children to embrace and express their existing culture whilst looking to extend their cultural capital by enhancing their experiences of other means of cultural capital through trips, workshops, group work, projects, etc. By enhancing a child's cultural capital at primary school level it will help them have a strong sense of identity, enhance creativity, encourage a love of learning whilst helping to build social and communication skills. If primary schools are able to achieve this then ultimately this will help all children to perform better academically as well as socially.

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Tutor comment:
"''Zoe was a quietly brilliant student and it was a real pleasure to work with her. She listens carefully and always thinks before she speaks which is an incredible skill for someone her age. Zoe's essay was an impressive display of her ability to grasp a wide range of complex, interconnected subjects within my PhD - many of which I am still struggling with. Congratulations Zoe and I am sure that whatever you choose to do in your future will be an achievement" - P. Moses

STEM

Saving the world from pathogenic antibiotic-resistant bacteria

Year 8, Key Stage 3

Pupil: Ann Busescu
School: Sir William Ramsay
Supervised by: Dr. R. Mundy
Tutor University: Imperial College London
Course Title: How Can Chemists Save the World?

Chemists can save the world in many ways, but one way they can save it is by developing new antibiotics that can treat infections caused by pathogenic antibiotic-resistant bacteria, also known as superbugs. They study the physical properties of atoms and molecules in substances and compounds. By using their knowledge of the structure of substances, chemists could think of alternative approaches and ways in which they could create the perfect medication, influenced by current antibiotics which could cure resistant infections in the human body.

Bacteria are prokaryotic cells, and part of five major types of microbes. They are the smallest and simplest unicellular microorganisms. We can view these diminutive living creatures with a range of magnification lenses and the use of a microscope. Bacteria can easily adapt to the environment they are in, which enables them to live virtually anywhere. The cells of bacteria differ to those of Virion, Archaea, Fungi and Protists, as the structure is much simpler. The control centre of a bacterium is within the gelatinous substance, also known as cytoplasm, this has all the genetic material needed for development and function. Some bacteria may have an extra circle of this material, it is called a 'Plasmid' (Jobling, 1996) instead of a nucleus. Most types of bacteria are harmless, these can help us when digesting food or regulating our immune system, but others can make us sick, these are known as pathogens, and <0.5% are pathogenic to humans.

Bacteria which cause disease can be treated by taking antibiotics. These are a type of medicine which can be used to kill bacteria, they are not effective on viruses or viral infections, like colds and the flu. Although they are helpful, antibiotics do have some disadvantages such as, not being able to target single types of bacteria. Any bacteria that can be destroyed will be destroyed by the antibiotic, like the helpful gut bacteria that mostly thrives in our colon and intestines. This shows that both the good and bad ones are targeted, which can lead to side effects after taking this sort of medication. The two main ways that the medicine works are by killing the bacteria which is called 'bactericidal' (Samek, 2013), and the process of stunting the growth or reproduction of a bacterium is known as 'bacteriostatic' (Loree, 2019).

Taking antibiotics often and when not needed, is the first step to antibiotic resistance. Antibiotic resistance is when bacteria changes in response to the medication used to treat a bacterial infection or an illness (WHO, 2020) [a]. Antimicrobial resistance is a global health threat, killing an estimated

1.27 million people worldwide, per year (CDC, 2022). Even though antibiotics help fight infection, not all work against all bacteria. Some bacteria are naturally resistant, whilst others can develop resistance to the medicine, this can be caused by the misuse of these medicinal drugs.

Antibiotic resistance is a worldwide health crisis as it can result in poor ability to treat infections and illnesses in people, plants, and animals. If this problem cannot be kept under control, there could be high illness, suffering and death rate, as well as excessive medical costs, and longer treatments.

Another issue is that there would be more side effects from the use of different and much more powerful medication (CG, 2014). We must all agree that 'to prevent and control the spread of antibiotic resistance', individuals should only take antibiotics when prescribed by a certified health professional. We should never demand this medication if a doctor says that we do not need them. By following the advice of a medical practitioner, and never sharing or consuming leftover antibiotics (WHO, 2020) [b] we may see a decrease of cases which were caused by 'our collective overuse of antibiotics' (Wellcome, 2020).

Most antibiotics are usually naturally sourced products made from microorganisms. They can also be semi-synthetical or chemically synthesized based on the structure of the pure product (Demain, 2009). A few other examples of antibiotic sources include Penicillium Mould and Streptomycin, this is produced by the bacteria named Streptomyces. Streptomycin is a different type of medication which is used to treat infections, and it can also control bacterial and fungal diseases in certain species of crops. It 'is the first discovered aminoglycoside antibiotic' and it is now primarily used as a part of multi-drug treatments for Pulmonary Tuberculosis (Tadi, 2021). The medicinal properties of this medicine could have an influence on superbugs, this may come as some help when discovering how to solve and end this issue.

The introduction of antibiotics into clinics was possibly the greatest medical success of the twentieth century. The use of this type of medication made many modern medical procedures achievable such as cancer treatments, organ transplants and even open-heart surgery (Matthew I Hutchings, 2019).

The journey of antibiotics from labs to patients has multiple steps, as well as numerous things that could go wrong. Before any sort of medication is released to the public, chemists are required to test how well the drug works and find any problems. The antibiotic must be tested on bacteria first, this is done in agar (nutritional jelly) filled petri dishes. Then the drug is tested on lab-grown human skin cells - many antibiotics fail at this stage as they may have damaged, or they do not have the desired effect on the cells. To ensure that the product is not toxic or has any unknown side effects, it is tested on lab animals (rats usually) for safety reasons. Chemists need to see how effective the antibiotic is against the bacteria first, and only then can they increase the dosage to find the right amount. If the medication has passed the lab testing stages, only then can it be tried on a healthy human. People tend to volunteer but there have been some less ethical and quite controversial instances when they have been tested on prisoners. Finally, the drug is given to patients who suffer from life-threating bacterial

diseases. This does not mean that the entire process has ended, because soon afterwards hundreds of patients are involved in a medical trial, this is one of the reasons why antibiotic production and development can take a long time.

When it comes to stopping pathogenic multi-drug resistant bacteria, chemists tend to face a lot of challenges. They are doing their best in finding new ways in which they can stop and fight antimicrobial resistance. However, they are 'struggling to identify new alternative drugs'. A group of researchers have planned the creation of DsbA inhibitors. These are enzymes that act on non- essential cell membrane proteins, which are unique to bacteria, they do not affect human cells. It could potentially be given alongside antibiotics as it may restore the drug's ability to fight the bacterial infection, this could hopefully offer a new way to treat resistant infections using available antibiotics (Duncan, 2022). Scientists are constantly trying to develop new antibiotics and medication that can replace the ones that bacteria have become resistant against. But this process can take anywhere between ten to twenty years and over $1 billion (£800 million), and the continuous misuse of these valuable compounds is not making it any easier for them.

The rise in pathogenic antibiotic resistant bacteria has had a negative impact around the world. If we help reduce cases, we are aiding in saving the world. Chemists do their part in trying to make new and effective treatments to cure bacterial infections and diseases. We can show our appreciation by taking measures when using antibiotics. By doing this not only are we saving time, but we are also saving a lot of money, which could instead be invested in improving health sectors in developing nations. People require medical attention to ensure that they are well, by improving hospitals and clinics it would mean that there is greater understanding of how to treat any health problems which may occur. Better health care could mean less sickness and spread of illness in medical institutions around the world.

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Parent comment:
"The Scholars Programme has helped Ann gain a more advanced understanding of critical thinking whilst simultaneously developing her confidence. I was super impressed with her research and it was clear she put maximum effort into her work. Congrats Ann!" - Dana Busescu

A strategy to halt the outbreak of Malaria in Mali, West Africa

Year 8, Key Stage 3

Pupil: Elizabeth George
School: Gordano School
Supervised by: M. Jackson
Tutor University: University of Bristol
Course Title: Disease Detectives

Report by Elizabeth George, Head of the Disease Detective branch of the World Health Organisation, January 2023

There has been a recent outbreak of malaria in Mali, a rural village, which is situated in West Africa, and it is imperative that we implement measures to prevent this outbreak from spreading further. This report will establish and explain the interventions that the World Health Organisation (WHO) intends to utilise in Mali.

Malaria is a malignant disease that is spread by the parasite plasmodium . This parasite infects the female Anopheles mosquitos (its host), who then transmit this disease to humans whilst feeding on the human's blood and simultaneously injecting the parasite into them. When living organisms spread diseases by this process, it is known as 'vector' (see diagram below).
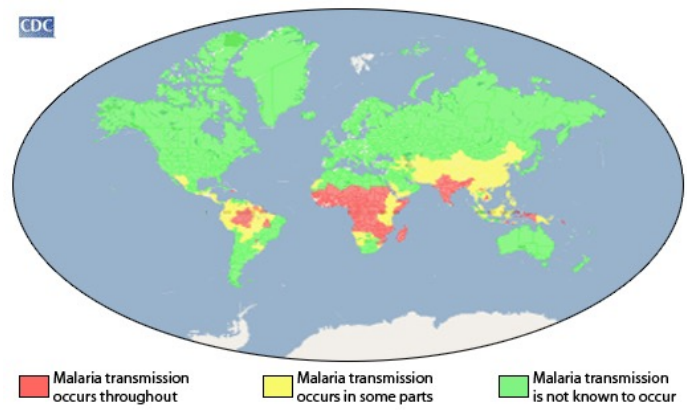
According to figures published by the WHO, malaria infected 24 million people in 2020 . Malaria is the 5th deadliest infectious disease worldwide and is the 2nd deadliest infectious disease in Africa . The deadliest disease in Africa is currently HIV/AIDS which claimed 650,000 fatalities worldwide in 2021 in comparison to the 619,000 deaths globally from malaria in the same year . As HIV/AIDS are viruses that cause immunodeficiency, those who are infected with it are more likely to suffer more severe symptoms and face a higher risk of death should they contract malaria.

Over the past two decades, deaths from malaria have reduced by half but, despite this, there are a number of factors which continue to make malaria a challenging disease to treat and eradicate, which are as follows:
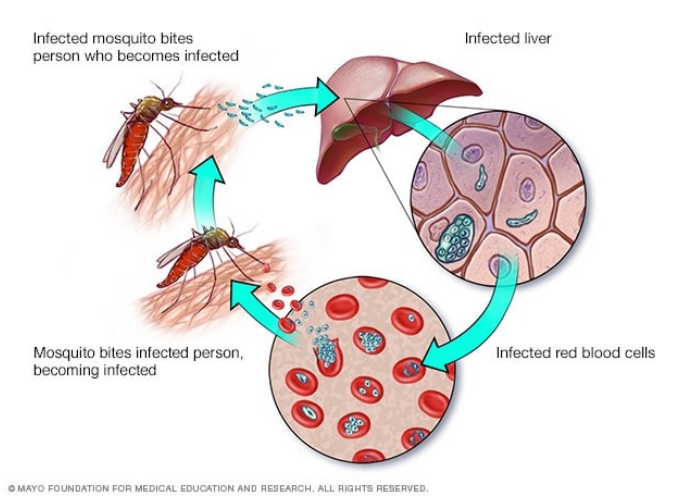
Firstly, the symptoms of malaria are similar to those of a common cold or flu. This means that cases of malaria are often not diagnosed until the symptoms become more severe; unless treated within 24 hours the symptoms can become life-threatening. This causes a higher risk of death.

Secondly, malaria is often prevalent in warmer countries (where mosquitos usually live and breed) that are close to the equator (see map below) . These countries are typically poorer LIDCs (Low Income Developing Countries) meaning that they will frequently have a lower standard of healthcare, reducing their capacity to treat this disease or implement strategies to prevent malaria in the long term, such as vaccination.

Malaria transmission occurs throughout | Malaria transmission occurs in some parts | Malaria transmission is not known to occur

Thirdly, it is challenging to create a treatment for malaria due to the complicated lifecycle of the parasite that causes it . This means that, by the time any symptoms are present, the parasite is already living in the red blood cells of its human host and any treatment would mean targeting these red blood cells which are vital for the human's survival. Furthermore, even if the patient had received an early diagnosis before the onset of symptoms, then the parasite would, by then, most likely be inhabiting the liver and targeting this for treatment could be fatal.

Infected mosquito bites person who becomes infected | Infected liver | Mosquito bites infected person, becoming infected | Infected red blood cells

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Fourthly, symptoms of malaria only occur ten to fifteen days after being bitten by an infected mosquito and many people would not recall being bitten over two weeks previously.

The strategy I would like to propose is sixfold and on a scale which will have an immediate impact on the inhabitants of Mali. I would also like to trial further measures which will have an impact on a wider geographical scale, and I will outline these later in this report.

Part One – Lockdown

The movement of people from the infected village by way of cordons and barriers will be restricted thereby imposing a temporary lockdown. This lockdown will last for a minimum of fifteen days after the elimination of the infected mosquito colony (which will be discussed below in part 6) in view of symptoms occurring up to two weeks after being bitten by an infected mosquito.

This strategy may appear unimportant, because this disease is not spread from person to person, however, if a mosquito from another village feeds on a moving person who has contracted malaria in Mali, then that mosquito and the colony that they inhabit will become infected and can continue to spread this disease to many more people in other villages. The colony will become infected because female mosquitos feed their young on human blood and, in doing so, can transfer the parasite to their young. I appreciate that this strategy could be deemed impractical as travel is vital to many cultures to be able to trade goods, visit distant relatives and seek more specialist healthcare for example. Hence, to remedy this, the WHO would send sufficient representatives to Mali to make sure that the village still functions during this quarantine period and to carry out several of the following parts of my strategy.

Part Two - Testing

The WHO representatives will carry out microscopic examination of blood smears and rapid diagnostic tests, which include parasite-based diagnostic testing on others in Mali who are currently not presenting any symptoms: this will make an early diagnosis easier. Should the inhabitants of Mali be reluctant to participate in testing, we will educate them on the benefits of this element of the strategy, the dangers of malaria and encourage them to comply for their own safety. We will do this using public health campaigns. For those who are unable to make it to testing facilities, a mobile testing unit will visit their homes or workplaces.

Part Three – Surveillance

The same representatives will also attempt to track and analyse where the infection rates of this disease are the highest so that they can attempt to find out where the infected mosquitos are. This surveillance will also give us vital information to be able to predict where this outbreak could spread in the near future.

Part Four – Technology

While this is being actioned, we will order and supply the newest technology to prevent the spread of malaria. This technology includes a lightbulb that has been designed to attract and trap mosquitos as well as mosquito nets which have been dipped in insecticides.

These lightbulbs are often sold for a few dollars each making them an inexpensive and effective way to help to stop the spread of malaria.. I would suggest that each household in Mali be supplied with at least one of these lightbulbs and that this lightbulb be placed in the most used room of the house in order to protect the most people. If it is possible then each room in the house would be supplied with one of these lightbulbs but reaching the amount of money needed for this may require financial support from charities. The lightbulbs do not require any electricity as they are battery powered and recharge whenever they are being used.

The mosquito nets dipped in insecticides should be

distributed one per person and I would suggest that these should be hung around the space where each person sleeps. Though it is non-essential for the mosquito nets to be dipped in insecticides, their being dipped means that any mosquitos that touch the nets die; this means that many mosquitos that could be carrying malaria could be killed. However, we should also be aware that many mosquitos are becoming resistant to insecticides .

Part Five – Medication & Vaccination

The representatives will then supervise the roll out of both a vaccine and medication. We will employ the use of a vaccination which has been trialled successfully in Ghana, Kenya and Malawi and has been researched for 100 years. This vaccination has proved to be 40% effective in preventing cases of malaria. However, the cost of this vaccine is currently unclear so we will only vaccinate the groups of people who are most at risk of malaria, which include pregnant women, the elderly and those who are clinically vulnerable, as well as travellers (including WHO representatives) and young children. We will also supply those in Mali who did not receive the vaccine with anti-malarial drugs (these are anti-parasitic drugs which can prevent malaria though no drug is 100% effective and should be used alongside other preventative measures). For those people who are beyond treatment and for whom science has yet to find a cure, we would do everything we can to ensure that their passing is as comfortable and dignified as possible.

Part Six – Elimination

Finally, we will use the data that we collected from part three to find out where the mosquito colony which is spreading this outbreak is located; we will then eliminate this colony using insecticides. As it is most likely that this colony and breeding area will be in a watery or swampy area, it may be necessary to find another water source if this is also used for drinking, irrigation and sanitation. I do not feel that the relocation of villagers inhabiting the space near the mosquito colony will be necessary, as it is my understanding that the proposed insecticides pose no danger to humans. However, should any of the inhabitants wish to be temporarily relocated then we will respect this and do all we can to make it happen. With regard to the elimination of the mosquitos, I appreciate that this may be considered environmentally damaging, as mosquitos are pollinators. I therefore propose the introduction of several beehives in the village to balance this loss.

Though the short-term strategy outlined above will help to halt this current outbreak, the WHO would also like to explore some new initiatives in the areas of housing, education and mosquito infertility, which could help to prevent any future outbreaks before they appear. Please see my additional notes below for more information.

In conclusion, the WHO would like to propose a strategy which is sixfold and will affect Mali immediately and in the long term. In summary, this strategy includes introducing a lockdown, testing, surveillance, use of the newest technology, the provision of medication and vaccinations, and the elimination of mosquitos in the affected areas. Malaria is a disease that the WHO will continue to work keenly to eradicate and hopefully ending this outbreak

will be another step towards achieving our 2030 target within the global malaria strategy.

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Global malaria deaths by world region

Source: WHO Global Health Observatory (2016) OurWorldInData.org/malaria • CC BY
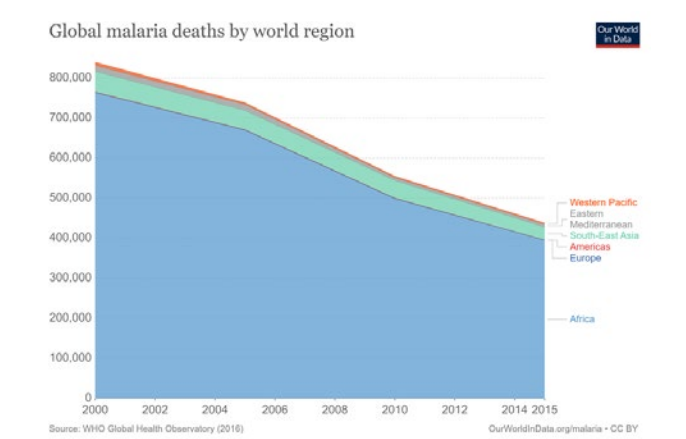
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Housing
- 3-year study of comparison between new houses and traditional houses
- Well-ventilated, 2 stories high (mosquitos are reluctant to fly upwards)
- Non-solid walls – made of mesh (to allow co2 to escape in a lower concentration: mosquitos are attracted to the co2 we breathe out)
- Upstairs bedrooms
- The carbon dioxide can diffuse out of the house in a lower concentration due to the mesh (the mosquitos can't detect the mixture)
- The ventilation allows the room to be colder – people are happier to use nets
- Costly (other governments or charities could get involved)
- Viewed with superstition (people need to get used to the idea and how the houses look)
- These houses could encourage better hygiene and could also protect against pneumonia and diseases in children

Education
- We will educate people about the symptoms of malaria to raise awareness
- Symptoms = fever, vomiting, headaches, chills etc. (similar to common cold which is why education is needed)
- Also educate about how they can protect themselves against malaria
- Use public health campaigns

Making mosquitos infertile
- Project in London
- Tries to make female mosquitos that carry malaria infertile
- The number of mosquitos that can spread malaria decreases due to the above
- Uses genetic modification
- Modifies genomes to affect their reproduction
- Takes mosquito embryo and injects with enzymes
- 2 different tactics (see below)
- One to target how much they breed
- One to use their offspring male
- It is working (their genes are changing)
- 99 per cent of offspring inherit these traits (using a gene drive)

- Reduce the number of female mosquitos that spread malaria in the wild (the aim)
- Need permission from government
- Results have been published
- These mosquitos can survive in the wild

How does the peripheral nervous system differ from the spinal cord after injury? How does this impact regeneration and what are the current treatment options?

Year 12, Key Stage 5

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Course Title: Can we regrow the brain?

Introduction

A UN report in 2007 reflected that, nearly 1 in 6 of the world's population suffer from neurological disorders (UN News, 2007). Neurological disorders are widespread yet many mechanisms throughout the nervous system remain unknown. The complex interactions between the glial cell types and post injury response differ greatly between the peripheral nervous system and the spinal cord. It is evident that the different cellular makeups result in different responses to injury which alters the regenerative potential and treatment options.

Cellular Makeup of the Central and Peripheral nervous systems

Firstly, neurons (neural cells) have the same physiology in both nervous systems. Neurons create complex pathways with hundreds or thousands of other neurons, resulting in neuronal networks which transmit and process information throughout the nervous system (Hammond, 2015). Neurons can transmit their information via two mechanisms – electrical signals and secretion of neurotransmitters (ibid). Electrical signals propagate along a neuron's axon via an action potential. When the action potential reaches the axon terminals, neurotransmitters are released at the synapse and received by a neighbouring neuron which stimulates an electrical signal firing a new action potential. This mechanism allows electrical signals to travel through the nervous systems (Chen and Lui, 2019).

The other category of cells within the nervous system is glial cells (Jessen, 2004). In the central nervous system (CNS) oligodendrocytes are the myelinating cells meaning their primary function is to generate myelin which extends from their plasma membrane and wraps around nerve axons to form the myelin sheath (Kuhn et al., 2019). This enables

an action potential to be transmitted faster compared to non-myelinated axons (ibid). Astrocytes (star-shaped glial cells) are another cell type located in the CNS which regulate neuron activity and transmit signals via calcium waves (Gaudet and Fonken, 2018; Hanani and Verkhratsky, 2021). Microglia are the main immune cell type present in the CNS and have complex interactions with synapses (ibid).

In the peripheral nervous system (PNS) glial cell types differ from those found in the CNS despite some of the cell types carrying out the same functions. One example of this is Schwann cells, which are the myelinating cells for the PNS instead of oligodendrocytes (Fallin and Tadi, 2022). Although both cell types are involved in myelination, Schwann cells are only able to myelinate a single axon unlike oligodendrocytes (Ludwig and M Das, 2020). Non-myelinating Schwann cells (ensheathing or Remak cells) contrast myelinating Schwann cells as they loosely ensheath multiple unmyelinated axons (Gaudet, Popovich and Ramer, 2011). Furthermore, satellite glial cells in the PNS can be compared to astrocytes within the CNS as they both utilise calcium waves and chemical messengers for cell signalling. Information on satellite glial cells is lacking, however there is evidence that these cells are critical in pain tolerance (Hanani and Verkhratsky, 2021). Overall, it is evident that although neurons function in the same way in CNS and PNS, glial cells are much more varied which creates different responses to injury in each environment.

Spinal Cord Injury Responses

Spinal cord injury (SCI) is defined as damage to the spinal cord that temporarily or permanently causes changes in its function (Ahuja et al., 2017). According to a report by Andrew D. Gaudet and Laura Fonken who both have a Ph.D. in neuroscience reflecting the report as credible scientific literature; after SCI a complex glial cell response occurs resulting in astrocytes, oligodendrocytes, and microglia all experiencing changes to their functions – the responses of each cell type are both reparative and unproductive (Gaudet and Fonken, 2018).

Astrocytes play an important role in the response to SCI as surviving reactive astrocytes migrate to the lesion where they form a dense mesh framework known as a glial scar (ibid). This scar tissue has been understood to have detrimental impacts on axon regeneration for a long period of time (Clement and Wilde, 1954; Reier et al., 1983). Nevertheless, more recent studies have investigated the beneficial impacts of glial scarring. A 2004 study investigating the impact of glial scarring after SCI injury in mice, reflected positive roles of astrocytes including repairing the blood-brain barrier, protecting neural elements, and preserving motor function (Faulkner et al., 2004). Moreover, as the glial scar encases the epicentre of the lesion it prevents the spread of necrotic (body tissue) and apoptotic (programmed) cell death (Gaudet and Fonken, 2018). Finally, an investigation looking at astrocyte scar formation and axon regeneration found that when scar forming astrocytes were removed from SCI lesions, after eight weeks no regeneration of the axons across the lesion occurred (Anderson et al., 2016). This would suggest that glial scarring is not the primary

cause for inhibition of axonal regeneration despite evidence displayed by Gaudet and Fonken (2018) that astrocytes 'generate a long-lasting molecular barrier to regenerating axons'. Overall, it is evident that astrocytes are critical in the response to spinal cord injury and have multiple beneficial impacts including prevention of lesions spreading, but their impact on axon regeneration, even with mixed evidence, is negative.
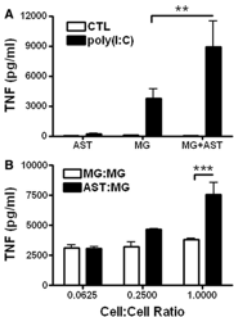
Astrocytes response to SCI is not limited to glial scar formation, there is evidence of an astrocyte-microglia feedback loop in which astrocytes increase the pro-inflammatory response of microglia. This is exemplified by galectin-9 from astrocytes causing the microglial secretion of pro-inflammatory cytokine TNF (tumour necrosis factor, a widespread cytokine). In Figure 1 (Steelman and Li, 2014), it is clear from (A) that when stimulated by poly (I:C) the glial cells which were cultured together, produced a much greater secretion of cytokine TNF (ibid). However, this relationship is potentially detrimental to the survival of neurons and oligodendrocytes, which limits remyelination and neural regeneration. This is because TNF-a inhibits the survival and differentiation of oligodendrocyte precursor cells (Ren et al., 2018). Therefore, the interrelationship between glial cells is perhaps further contributing to the limited capacity of regeneration in the CNS.

The connection between astrocytes and microglia is further explored in a relatively modern report by O'Shea et al. (2017), in which it describes the shared ability of these glial cells to attract blood-borne inflammatory cells to assist with debris clearance. Timothy O'Shea emphasises that 'this mechanism must be balanced as too little inflammation can lead to accumulation of cytotoxins, whereas too much inflammation can destroy tissues'. Similarly, Gaudet and Fonken's report describes microglia and macrophages by 28 days post-SCI to predominantly express pro-inflammatory markers. It appears that the environment of the injured CNS, signals to continue in a prolonged pro-inflammatory state, which is ultimately damaging for repair (Gaudet and Fonken, 2018). Although this presents the negative effects of microglia and macrophages in the CNS, there is some contrasting evidence from a study showing macrophages promoting axonal regrowth, despite the overall results presenting positive and negative impacts of macrophages to SCI repair (Gensel et al., 2009). In conclusion, the current understanding of microglial and macrophage response reflects limited benefits and largely suggests promotion of secondary damage.

The final major glial cell type to consider is oligodendrocytes and their precursor cells (OPCs). Oligodendrocytes and neurons suffer rapid cell death within 15 minutes of injury which continues for 24-48 hours post injury at the epicentre. This contrasts to astrocyte death which is first detected 4 hours post injury (Pukos et. al, 2019). Many post-inflammatory cytokines released by macrophages and other CNS cells upregulates oligodendrocyte death (Donnelly and Popovich, 2008), for example, TNF-a. This

particular example has been explored above through the interrelationship of microglia and astrocyte likely causing increased TNF-a levels. Despite this rapid cell death, OPCs differentiate into oligodendrocytes within 3 days post injury, suggesting the typical mitotic cycle is accelerated in response to injury (Pukos et. al, 2019). This abundance of new cells not only combats ongoing oligodendrocyte apoptosis, but it also allows for some remyelination of axons which surviving mature oligodendrocytes are unable to achieve (Crawford et al., 2013). Furthermore, macrophages and microglia have the potential to aid remyelination from their phenotypes. Over the second week post injury these cells switch from a mixture of M1 and M2 phenotypes to predominantly M1. Both phenotypes aid OPC proliferation however, M2 promotes remyelination and oligodendrocyte differentiation (Wang et al., 2015; Miron et al., 2013). This would suggest that harnessing a strategy to push macrophages and microglia into M2 phenotype would promote remyelination and regenerative potentials. The response of oligodendrocytes is highly impacted by the other glial cell types, and it is clear these cells are able to regenerate post injury and return to their function of remyelination but remyelination on regenerated axons remains problematic (Pukos et al., 2019).
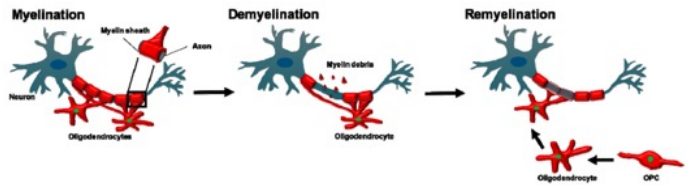

Figure 2 – (Kuhn et al., 2019) Images representing the stages of oligodendrocytes from there naturally myelinating state preinjury through to demyelination and remyelination.

Altogether the response to spinal cord injury is complex and compromised of the interrelationships of the glial cell types. Often these naturally occurring relationships negatively impact regenerative potential, for example increased TNF-a and the continuance of pro-inflammatory phenotype in macrophages and microglia. However, there are hopeful prospects of increasing remyelination post SCI by harnessing the relationship between macrophages and oligodendrocytes (Wang et al., 2015). Aditionally, as the main limiting factors post SCI have been identified to be myelin associated inhibitors and chrondoitin sulfate proteoglycans (Heubner and Strittmatter, 2010), therapies targetting these limiting factors may result in some axonal regneration post SCI.

Peripheral nerve injury response

Peripheral nerve injury (PNI) is damage to the body's extremeties and the number one cause for peripheral neuropathy disorders in the UK is diabetes (NHS, 2022).

Schwann cells are vital in the response to PNI through their unique ability to alter phenotypes post injury (Jessen, Mirsky and Lloyd, 2015). The first step of response is Wallerian degeneration in which axons and myelin break down within hours of injury. In the later stages of Wallerian degeneration Schwann cells secrete basal lamina composed of growth promoting lamina which forms tubes containing proliferating Schwann cells (Brosius Lutz and Barres, 2014) . These are known as Bugner bands

which are critical in the regneration of axons as they act as a guide for sprouting axons (ibid; see Figure 5). The impact of these growth promoting channels containing lamina is evident through an experiment by Chen and Strickland 2003 in which they disrupted the lamina gene in Schwann cells. These mice suffered hind leg paralysis and the Schwann cells were unable to myelinate axons thus reflecting the importance of lamina in promoting repair. The action of Schwann cells throughout this stage is as a result of radical phenotypic change which causes the reversal of myelin differentiation and up-regulation of many neutrophic factors which promote neuron survival and axon elongation (Brishart et al., 2013). These combined features form the novel Schwann cell type known as a Bungner repair cell. The ability of the Schwann cells to adapt efficiently and promote repair through the differentiation into Bungner repair cells is vital to the regeneration potential in the PNS and something that is not evident in SCI injury response.
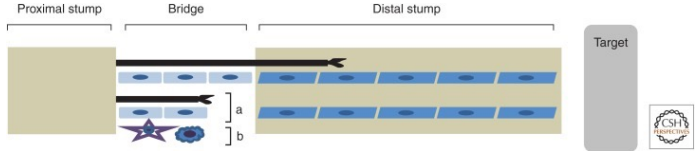

Figure 3 – (Jessen, Mirsky and Lloyd, 2015)

The figure illustrates the Schwann cells forming a bridge between the regnerating axons in the proximal stump into the distal stump where they can reach their target.

Within SCI injury response, mechanisms such as glial scarring and the prolonged pro-inflammatory state of macrophages and microglia have adverse effects on axon regeneration (Gaudet and Fonken, 2018) which directly contrasts the beneficial impacts of Schwann cells in aiding axon regrowth via Bugner bands. Key differences in the response mechanisms are also evident in the clearance of myelin debris. Schwann cells work with macrophages to remove axonal debris and clear the injury site within 2 to 3 weeks of the injury (Burnett and Zager, 2004); whereas in SCI injury, debris remains months after injury. The breakdown and clearance of myelin promotes regeneration as myelin components are nerve outgrowth inhibitors therefore further reflecting how PNI response is more effective in promoting regeneration (Brosius Lutz and Barres, 2014).
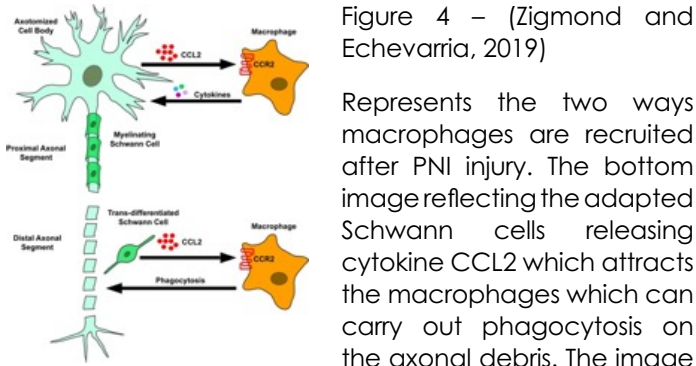

Figure 4 – (Zigmond and Echevarria, 2019)

Represents the two ways macrophages are recruited after PNI injury. The bottom image reflecting the adapted Schwann cells releasing cytokine CCL2 which attracts the macrophages which can carry out phagocytosis on the axonal debris. The image above reflects how the neurons themselves also release this chemokine.

Furthermore, Schwann cells establish autocrine survival circuits during maturation which ensures very little cell death post injury. In comparison oligodendrocytes are

highly susceptible to cell death with loss as high as 30%-40% and even surviving oligodendrocytes have little utility in the response to SCI injury (Brosius Lutz and Barres, 2014). It is clear that the collective response to PNI is highly effective in debris clearance and regrowth of cells compared to limited efficacy in the CNS due to limiting factors such as inefficient myelin clearnce. This overall results in higher rates of regeneration post PNI injury.

Treatments for SCI

There is still a serious lack of effective tratment for SCI although, there is increasing research into stem cell therapies (Gao et al., 2020). One of the most promising stem cell therapies is using embryonic stem cells (ESCs) which can differentiate into neurons and glia. Manley et al. injected OPCs originally differentiated for ESCs into rats which reflected improved motor function compared to rats given the Hanks' Balanced Salt Solution (HBSS, see Figure 5). Myelinated axons were also observed in the injury site of rats treated with OPCs whereas limited myelinated axons were exhibited in the injury site after HBSS treatment (Manley et al., 2017). Furthermore, Hwang et al. also utilised ESCs to produce neural precursor cells after SCI in rats which resulted in alleviation of neuropathic pain (Hwang et al., 2016). Both of these studies reflect positive impacts of ESC therapy, therefore strengthening the potential of stem cell therapy having extensive benefits for humans post SCI.
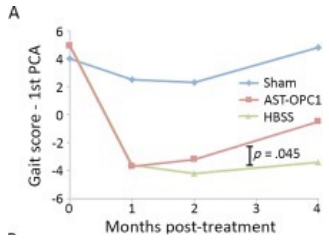

Figure 5 – (Manley et al., 2017)

The graph represents the intial decline of motor function in rats which suffered SCI (red and green lines). It is evident that ESC treatment (AST-OPC1) saw a greater incline in gait score (measure of motor function) compared to the HBSS treatment. Additionally, ESC treatment saw a similar rate of gait score increase to sham (un-injured rats) between 2-4 months post injury.

Treatments for PNI

The most common treatment for laceration injury in the peripheral nervous system is surgical intervention, although these treatments fail to address the cellular and molecular responses to PNI. As a result therapies are being produced to improve the positive response of Schwann cells in promoting regeneration. One example of this is electrical stimulation, which has been proven to accelerate motor axonal regeneration in both humans and animals (Haastert-Talini et al., 2011). Another example is steroid hormones, e.g. progesterone and oestrogen, which promote myelination of axons post PNI by up regulating myelin growth factors (Modrak et al., 2019). These treatments all focus on recovery from the initial injury; the therapies aim to enhance regeneration. This contrasts the focus of SCI treatment such as rehabilitation, which aims to prevent secondary injury rather than

promoting regeneration in the spinal cord (Fehlings et al., 2017). Due to our growing understanding of the processes in SCI response, it could be inferred that treatment aims to prevent secondary injury as regeneration and repair of intial injury is limited in that environment.

Conclusion

In conclusion, the differing glial cell types found in the PNS and CNS have profound effects on the injury responses. Schwann cells are not located in the spinal cord and therefore their ability to promote axonal regeneration via Bugner bands, phenotype change and control of debris clearance is not seen in SCI response. Although astrocytes are able to prevent some of the spread of cell death by forming a glial scar and oligodendrocyte precursor cells proliferate into myelinating oligodendrocytes post injury, ultimately the environment in the spinal cord contains limiting factors for axonal regeneration. It is clear that regeneration does occur in the spinal cord however it is minimal compared to PNS axons which readily regenerate. The continued research into the response to injury and treatments of injury in both the spinal cord and PNS will result in better rates of regeneration in both systems as innovative treatments and interventions for neurological disorders are discovered.

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Parent comment:
"The Scholars Programme has really helped Ella to develop her independent learning skills. We are very proud of what she has achieved." - Rob and Beth

What is the Universe made of?

Year 9, Key Stage 3

Pupil: Finley Shaw
School: Ysgol Gymraeg Bro Morgannwg
Supervised by: M. Evans
Tutor University: University of Sussex
Course Title: What is the universe made of?

The universe is made of space, time, matter, and energy. The focus of this essay is dark matter (DM). Matter has mass and volume, it is made up of atoms and can be presented in different states such as liquids, gasses, and solids [1]. Matter makes up 5% of our universe and it is believed the other 95% consists of DM (25%) and dark energy (68%) [2,3]. DM does not absorb, reflect, or emit light, It appears invisible to us - hence the word 'dark' used to describe it [3,4]. It is a well-supported hypothesis that DM exists because as Zwicky noted in the 1930s, there must be matter that we can't see, that contributes most of the gravitational force that holds everything in place [5,6]. Studying DM is important for us to understand the size, shape, and future of our universe. The amount of DM in the universe will determine if the universe is open (continues to expand), or closed (expands to a point, and

then collapses) or flat (expands and then stops when it reaches equilibrium) [7].

In particle physics, different types of processes detected or detectable in energetic collisions study the possible particles that could make up DM. ATLAS is one of seven particle detector experiments built 2004-2008 in a cavern 100m below ground near CERN in Switzerland. In the Large Hadron Collider (LHC), ATLAS collides beams of particles making collision debris in the form of new particles that travel out in all directions to mimic what might have occurred at The Big Bang when all these particles formed. ATLAS uses subsystems arranged around the collision point to record data on paths, momenta, and energies of the particles which are then analysed to individually identify them. A magnet system is used to curve the routes of charged particles so their momenta can be calculated [8]. In some of these collisions, scientists hope to find DM.

The presence of a DM component in the universe is inferred from the observation of its gravitational interaction. If DM interacts weakly with the Standard Model, it could be produced at the LHC. The ATLAS experiment has developed a broad search programme for DM candidates, including resonance searches for the mediator which would couple DM to the Standard Model [9].

Table 2 [17 p19].

Table 2 represents a stacked histogram of lead_lep_pt, measured in the units of GeV 9 (initialism of giga-electron volt), which is a unit used for measuring the energy of subatomic particles. The height of the bar represents the weighted number of events. The different coloured bars represent different processes, one example is DM_300. The equation for significance is the total signal weights divided by the square root of total background weights [18]. The total signal weights are to find how many DM_300 events are in each histogram bin then adding the result from each histogram together. And the total background weights are finding the total height of each histogram bin, adding them together, then subtracting the total signal weights at the end. The equation for significance is the total signal weights divided by the square root of total background weights. When we do this, it should give us similar results to the significance graph below.

Table 1. [10 p14].

The columns in Table 1 represent different measurements in a series of tests. The rows represent test procedures to see if dark matter is produced by protons colliding.

ATLAS produces 64TB of data per second [11]. Archiving vast quantities of data is stored on magnetic tapes before being migrated to higher density tapes [12]. Searches continue with the existing dataset, but a new discovery might eventually require even more energy and more data [13].

In their data, scientists are looking for evidence of DM. Statistical techniques help to deepen the understanding of the data. In particle physics this is proven by achieving a significance over 3; any measure lower than this is not considered to possess sufficient validity and reliability (level of confidence) to be inferred as evidence that could form the basis for a conclusion[14,15]. 'When we have an excess of 3σ we talk about evidence, and when we have an excess of 5σ, we are facing a discovery '[16 p1].
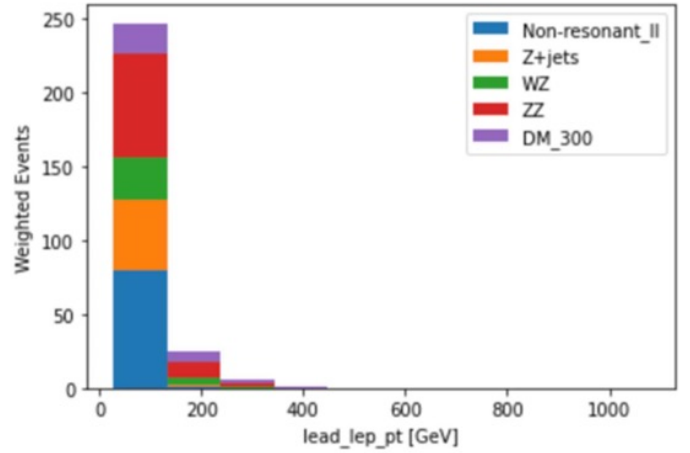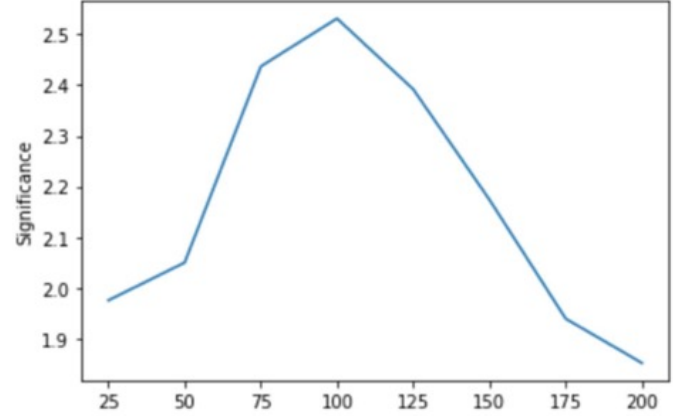

Table 3 [19 p19]

This is a significance graph for lead_lep_pt in the units of GeV. The line peaks at around 2.5 showing no evidence of dark matter because the highest number on the graph in Table 3 is under the significance of 3.

To conclude, experiments at high-energy physics colliders are expected to further inform us on the nature of DM and determine its properties. In a 2022 result, physicists from ATLAS investigated the validity of several models at once across a large energy range [20]. They compared their data to the expected signals of five different theoretical models. This new result set valuable constraints on several theoretical models, pointing future researchers towards new areas for exploration.

Additionally, the Future Circular Collider (FCC) will host the next generation of higher performance particle colliders which will extend research currently conducted at the LHC. The FCC will examine scenarios for three different types of particle collision: hadron collisions, like in the LHC, and electron–positron collisions, as in the former LEP. Other options include proton–electron collisions or proton–heavy ion collisions [21]. ATLAS hopes that the FCC will bring exciting new insights into DM and help with our understanding of the universe and what it is made of.

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An Evaluation on the Causes and Diagnosis of Pelvic Girdle Pain

The role of instability as a cause of persistent pelvic girdle pain is much debated. However, the majority of treatment options are focused on increasing the stability of the area. Why might this be the case? Is there a need for a new understanding?

Year 10, Key Stage 4

Pupil: George Law
School: Callington Community College
Supervised by: B. Halliday
Tutor University: University of Plymouth
Course Title: A Persistent Pain Conundrum

Introduction

Pelvic girdle pain (PGP) commonly occurs in pregnancy with research suggesting that it affects approximately 50% of all pregnant women [1]. It is described as a pain between the posterior iliac crest and the inferior gluteal fold, particularly in the vicinity of the sacroiliac joint, which radiates outwards [2]. PGP can be problematic since it restricts movement of the back and the impact of postpartum lumbopelvic pain can affect quality of life for new mothers who would already experience the heightened stress of a new child. This can form depressive symptoms and create kinesiophobia [3]. This is the excessive and debilitating fear of movement or physical activity [4]. This can be a large discouragement for women to return to a healthy and active life after pregnancy. Specifically, it may increase the leave they take from work, postpartum, which causes economic strain on the parents (if they go over paid maternity leave). PGP is often diagnosed inefficiently which, added to a lack of awareness and research of the condition, can cause confusion amongst sufferers. This is a topic that shall be discussed in this essay. Additionally, the causes of it shall be outlined, for - it can be argued - it is not entirely physical. There is an element of biopsychosocial factors that can heighten the effects of this condition. However, it is suggested that the primary source of pain is due to pelvic instability which can be corrected by a support belt [5]. These ideas will be expanded upon later.

The "physical versus psychosocial" argument

Pelvic girdle pain is somewhat of an enigma when we consider the durability of the pelvis. The strength of the pelvis is derived from its form closure (from the joints and ligament structures) and force closure (stability from the local myofascial tissues) [6]. This reinforces the structure, requiring tremendous force to move the pelvis. The pelvis and sacroiliac joint are well designed for load transfer, and are inherently stable [7]. However, biomechanical changes happen in pregnancy to the spine and pelvis which shifts the centre of gravity due to the growth of the foetus [8]. This can reduce the ability for the pelvis to 'self-lock' in force and form closures and applies a deviant force upon the region [9]. Movement of a strong region can cause pain - especially since the pelvis is the basis for the whole upper body (so it is required to be reliable). Activities that can heighten pelvic girdle pain are walking, bending down, carrying heavy items or any strenuous activity.

However, some may argue that instability of the pelvis is not the primary reason for PGP. As previously stated, there are a number of biological, psychological and social factors that can heighten pain experienced. For example, disturbances in body-perception sleep and elevated kinesiophobia can be correlated to moderate disability from the lumbopelvic region [10]. Sleep deprivation is exacerbated by the caring routine of mothers. This will be incredibly frustrating for new parents. Additionally, mental health problems can heighten any quantity of pain. Very much like tiredness (due to a lack of sleep), pain feels far worse when one feels anxiety. This is not necessarily anxiety towards the pain itself (like kinesiophobia) but just general day to day trials and tribulations. When people are nervous, more attention is spent on their pain stimulus for it is an extraneous variable that can cause worry. Attention to pain can significantly heighten the experience [11]. This experience is massively heightened when it is endured by people who suffer from persistent pain and, related or otherwise, anxiety.

The case for instability in the pelvis appears to be at first glance a considerably stronger cause for PGP than the mental counterpart. A study by SM Kalus showed that there is a moderate correlation between poor muscle function in women with severe PGP [12] and so, there must be some link to a physical cause as one would presume. Notwithstanding, there is significant evidence for more psychosocial factors that lead to the condition. The idea of PGP being partly a mental condition is further enforced by the demographic of people who suffer from it - it is primarily experienced by women postpartum. Pregnancy can be very traumatic and a lot of the ideas explored puts a lot of pressure on women, specifically new mothers. The concept of having a baby to care for, which will disrupt day-to-day life, combined with physical agony, is a stressful time for any mother. This can cause anxiety for new mothers which can heighten sensitivity to any potential tissue damage. The negative pathophysiology of PGP will most likely not be the cause, however. The fact that the condition targets postpartum women exclusively, who will have altered lumbopelvic kinematics from pregnancy which can cause pain and instability [9], is suggestive of biomechanical changes during pregnancy being the cause. This does not mean that there is no role of psychological factors. It is likely that a poorer mental state will catalyse and exaggerate the pain, like in most chronic health conditions. And so, we must conclude that it is some combination of both that leads to severe PGP. The ratio of physical to mental factors will vary depending on the prior state of the patient. For example, joint conditions such as arthritis or hypermobility could exacerbate the pain experienced.

Evaluation of diagnosis

Whether the cause for pelvic girdle pain is primarily composed of more mental or physical factors that lead to the condition, is vastly debated. One proof for the psychological cause was an intriguing study in 1998, conducted by Tulberg et al on whether direct manipulation of the pelvis can influence the position of the ilium and sacrum [12]. 10 patients with symptoms of sacroiliac joint dysfunction were given various tests. For a positive test, the patient's pelvis should be able to move when directly moved. The movement is monitored by roentgen stereophotogrammetric analysis: essentially injecting patients with ball bearings in the required region to be traced to monitor the movement of the area [13]. The study concluded that, even if it is directly moved with abnormal force, the structure will not move. This is due to the previously mentioned self-locking mechanism of the pelvis [9] . However, the manipulation neutralised the positive results of clinical tests. This affects the validity of the results of said results, vividly. This highlights a major problem in the treatment of pelvic girdle pain: how we can diagnose it.

The most efficient test for pelvic girdle pain is the 'active straight leg raise' (ASLR). It is used to assess load transference through the pelvis by studying motor control - for a change in mobility of the area has been reported in patients with PGP [14]. ASLR is extending the predominantly affected leg approximately 20 cm above their otherwise flat body, maintaining the knee in complete extension. Patients are asked to rate their fatigue (not including pain) from a scale of 0-5. This is repeated on the other leg. A result of fatigue >3 can be classified as a positive result [15]. However, there are numerous problems that affect the validity of this test. For example, patients will have vastly differing opinions upon quantifying tiredness. This will mean that, due to previous experiences in relation to pain / fatigue, patients will diagnose themselves differently from each other - so some may not seek treatment when it would be required. Alternatively, patients may rate themselves to have socially desirable results. Moreover, this test can identify motor control problems, which is in itself useful, but can give arbitrary results of pelvic girdle pain. This causes the results of ASLR to be not truly ecologically valid, which is problematic as it is the primary way of diagnosis. In the case of a positive result, physiotherapists can prescribe a pelvic belt to compress the lumbopelvic region. Alternatively, doctors could manually compress the iliac bones [15]. Both of these treatments aim to reposition the altered state of the pelvis - a physical treatment. This could be potentially problematic if PGP is ailed additionally by the cognitive state of those who suffer from it.

Pelvic girdle pain is a serious problem yet is still unrecognised by many GPs. Although originally discovered in Hippocrates' time [16], only more recently have detailed studies taken place on the physical and psychological effects of the condition.This means that the condition is not as researched as it could have been resulting in many women not receiving the correct help. This is worsened by the current process of diagnosing PGP. Especially considering, as previously stated, 50% of all pregnant women experience this condition [1], we must wonder why the treatment is so poor. It could be said that this is because it is a condition primarily experienced

by females and historically as the majority of medical research was carried out by men, the importance of such a condition was not recognised. Alternatively, the fact there are psychological and physical elements to the condition can produce a lack of clarity on how to treat it. This emphasises the vitality of keeping funding treatment and research. We can see this, quite plainly, in the numerous enigmas and questions we have discussed, such as the pathophysiological versus biomechanical debate or the abnormal force that must be exerted to create instability in the pelvis. Ideally, we must have more information to draw conclusions with.

Ultimately, women who suffer from PGP struggle with daily life and endure consistent pain. This can be a major deterrent for going back to work which applies further pressure on new mothers who should be focussing on their children. If effects, as previously concluded, are some combination of psychosocial and biological, they will be heightened by a lack of diagnosis; for example, kinesiophobia will be more persistent when the pain is unexplained. PGP has direct psychological and physical effects on sufferers of the condition which has profound social (eg. frustration, lack of energy, domestic troubles, family breakdown, depression) and economic effects (eg. loss of productivity, increased sick leave). Professionals need to be aware of the anger, frustration and negative emotions which all stem from PGP [17] so they can impart advice to patients, families and the public.

Conclusion

Pelvic girdle pain is a pain or instability in the lumbopelvic region. There is controversy on whether the condition is primarily caused by a shift in the kinematics of the pelvis due to pregnancy or from pathophysiological effects. This essay has outlined the cases for both and drew the conclusion the cause is a mix of the two: the physical effects are catalysed by the psychological effects. However, it is important to note that we have only begun to scratch the surface of in depth research about the condition. Ideally, we should gather more data to make a more educated judgement about this cause. Therefore, it is vital that it should be kept funded for research, diagnosis and treatment of patients. If diagnosis can be more efficient, treatment can be quicker. This can be achieved by further research. Physiotherapists aim to relieve or eliminate the pain altogether, increase muscle mobility and improve the position of the pelvis by manual therapy and exercises [19]. This will help them recover faster so their lives can return to normal after pregnancy giving the research practical applications.

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Parent comment:
"The Scholars Programme has been a fantastic opportunity for George to work closely with a PHD mentor, providing opportunity to learn, analyse and create a university level paper, this experience has given a superb insight into an academic future. We were extremely impressed and proud of George's dedication, perseverance and excellent standard of work."

A local primary school has received a grant to fund after school club activities. To figure out which activities to run and buy items for, the school conducted a survey of parents and carers of pupils who attend the school. Each parent was asked to fill out a survey, and once the results were collected the school made a decision on which activities to fund based on the data.

Do you think the school made the correct decision, why or why not?

Year 6, Key Stage 2

Pupil: Kai O
School: St Ursula's Catholic Infant School
Supervised by: W.Awais
Tutor University: University of Kent
Course Title: Lying with Statistics versus Capturing the Truth

In this assignment I will be looking at whether the school made the correct decision about the four new activities that were added to the after-school programme. These activities will be funded by a new grant and were decided upon by consulting parents and carers through a survey.

I will do this by analysing what information the survey has provided. I will evaluate the quality of the questions, and check if it answers the school's problem. I will also scrutinize the survey to make sure it is valid, structured and reliable. I will also examine how they collected their information and whether their methods are reliable or not. I will also see if there is any more data that they have omitted. I will review all of this to determine whether they have made the correct decision or not.

Firstly, I will define what a survey is. "Survey research is defined as the process of conducting research using surveys that researchers send to survey respondents. The data collected from surveys is then statistically analyzed to draw meaningful research conclusions." [1] A good survey will provide you with good data and is a popular way to conduct research [2].

For some of the clubs introduced it looks like less voted for their genre. For example, with dance club it said only 35% of responses were in favor of it, however we don't know how many voted against and how many stayed neutral. If the rest was against then it should not have been introduced. However, for example, if it was where 45% was neutral and 20% stood against then it should be introduced. However, we can't conclude an answer as we have not been given the rest of the numbers. Also, the sample response rate for the survey was less than 50% so

when clubs get 35% it shows only a small amount voted for them and this could be even smaller if a certain amount stayed neutral. It can make you look at the validity of the survey. "The goal of sampling strategies in survey research is to obtain a sufficient sample that is representative of the population of interest." [3]

Another issue is the school's questions are not of good quality. Question 2 is a close-ended quantitative question; however, it does not help as it is not specific to after-school activities sponsored by the school [4]. For example, a child may be in clubs that are outside of the school and may just tick 'yes'. This does not help them as it does not show which new clubs to add. Following this, on question 3 it asks the caregiver or parent to list activities the child is in, but once again it does not specify it to school-related ones. Question 3 is a good open ended qualitative question, but for this survey is too vague [5].

As an example, a parent may not list activities outside of school. This does not help as it does not help you know which new ones to introduce, and they may think clubs which aren't being run are already ongoing in the school; this means that clubs which should be started won't be. Once again, it makes you question the reliability of the survey since it isn't collecting information regarding the aim. "It is significant to ensure that the design of the questionnaire is arranged to minimize errors." [6]

It is my opinion that the school has not produced a good survey which thus means they can't make the right choices. They haven't asked the right questions to find out what they want to know. On question 1 for example it doesn't matter which class you are in as clubs occur after-school, not during. This type of close ended question does not give the school good information. Question 5 is an open-ended question which is too vague. A better question you could ask would be 'Which clubs would you like to see introduced?'

The response to the survey was low. Their sample was too small and did not represent the greater amount, so you could not get accurate results. When the survey was to find out clubs for children, they asked the parents. A better way to do this would be to get parents and children doing it together so there is more child involvement.

Furthermore, we don't know if there were other genres or options people voted for. These options may have received more votes than the ones that the school introduced; however, we don't know this since they have not been disclosed.

"The goal is not always to secure the highest RR possible, but to obtain the high- est quality responses possible that result in a sample that is appropriate for a study's goals. "[7] For instance, 40% of people may have voted for a football club (which is more than the amount voting for a dance club) but this has not been shown. It doesn't represent the pupil's choices and could be biased. It seems that the school has possibly shown bias so that specific clubs get introduced instead of others. It also isn't reliable as if somebody else did it they would most likely get representative results which could show the other options. It appears to have accidental bias as it seems clubs which should not be in got in. You can question the

validity as information collected strays from what they want to know.

"Data may be analysed and presented in different ways to support contradictory arguments or to reach different conclusions, whether deliberately or by mistake." [8]

In conclusion, based on the evidence we have been given it is my opinion that the school has made the wrong decision regarding the clubs who have been introduced as new after school activities. To begin with, the response rate to the survey was less than 50%, so already it was not representative of the population. This makes you question the reliability, as for it to be accurate it needs to have a higher response rate.

It also appears to have bias in it, where for some clubs introduced less voted for it than against. As the correct information is not available, we do not know how the school reached their decision. It doesn't appear to represent the pupils' choices. There may have been more popular votes, but that information is not available.

Another thing is that the survey questions did not answer what the school wanted to know and were not structured well. They were too vague and did not answer the point of the survey. It also doesn't appear to be representative of the students or their opinions regarding the clubs since it is the parents answering instead of them.

To combat this, I would recommend having more pupil involvement. I would suggest redoing the survey to get better results. This time I would ask the students instead and would give better, more structured questions that would give the school the correct data.

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Parent comment:

"I am very proud of the work that Kai produced through The Scholar's Programme. He really enjoyed the whole experience, and the structured programme and tutor feedback was very positive. I am particularly proud of how Kai was able to use the skills he learned on the programme, and combine those with the excellent teaching he consistently received at St Ursula's to produce the work he did. Kai did several drafts and used them to refine his writing and structure and then produce an assignment that he should be so proud of. I personally think that being introduced to academic writing at a young age is very beneficial. It has helped fire his academic enthusiasm. He found the sessions very beneficial, and I saw at home how willing he was to work hard and improve. He has now brought this positive attitude into year 7 in a new school, and I believe the programme was great for his confidence as well as teaching invaluable skills. Most importantly though he enjoyed the experience, and I am very grateful for the staff at St Ursula's who saw his potential and believed in him as I do."

How bacterial diseases are diagnosed now and how advancements in science could change this

Year 9, Key Stage 4

Pupil: Maeve Carnes
School: North Chadderton School
Supervised by: E. Trinh
Tutor University: University of Manchester
Course Title: The Unseen Enemy - Diagnosing Bacterial Infections

Introduction

Responsible for over 7 and half million deaths each year, bacteria is a single celled micro-organism called a prokaryotic cell (1,3). It is a simple structure which consists of a cell wall and cytoplasm similar to that of plant cells, but it doesn't have a nucleus. They can come in a variety of shapes/structural features including spheres, rods and spirals to adapt to their surroundings (2). When the body encounters harmful bacteria it can result in an infection, causing the host's immune system to react in a way that consequently creates symptoms (1). Dependent on how harmful the bacterial infection is, or how long it goes untreated, it can affect the severity of symptoms. For example, a small case of food poisoning can easily be treated with antibiotics and not leave the host with too many symptoms. But if left untreated, it could result in dehydration, hospitalization or even death. Bacterial infections, mild to severe play a major role in the world of health and disease in our modern-day society.

Urinary Tract Infection caused by Escherichia coli

Escherichia coli (E. coli) is a Gram-negative rod that is found in the intestines and guts of most mammals (4). Generally, this bacterium is harmless and essential for a healthy intestinal tract, yet there are multiple pathogenic strains, that can be deadly- such as the Uropathogenic E. coli (UPEC). This is due to their complex and clever structure. UPEC strains have adhesins- which work like Velcro- allowing it to climb the walls of the urinary tract and cause an infection. Like most bacteria they have a flagellum that enables the bacterium to move and are acid resistant, meaning in order to cause an infection, only a few of the bacterium would need to arrive at the intestines (1). E. coli is responsible for about 90% of all UTI infections. These common but sometimes life-threatening cases occur when E. coli enters the urinary tract - usually through the urethra (5). Even though UTIs can't spread from person to person, there are factors that increase the rates of bacteria entering the bladder. Some of these include; using a catheter, being on certain types of birth control or having a weakened immune system originally (1). Because of this it's more typical for women to get a UTI, however anyone can get them, including men, children and elderly people. In recent studies, it's estimated that up to 40% of women will have a UTI at some point in their lives (5). And from person to person, signs and symptoms differ greatly. However, the most common symptoms to occur are a burning sensation with urination, cloudy and possibly bloody urine and a pelvic pain (5). If a patient

feels nausea, high fever, pain and vomiting, then this could signal that the kidneys have been infected, leading to serious kidney damage (1).

Diagnosis of E. coli

In order to diagnose what the species of bacteria is that has caused the infection, there are several steps taken. As most bacteria fall into one of two classes, Gram staining is the first and most important labatory technique used to differentiate the Gram-positive or Gram-negative bacteria based on the characteristics of their structure. E. coli is a Gram-negative bacterium and when the acetone is added, it decolorizes the purple stain, so it will appear pink. This is because it has two cell membranes around the very thin peptidoglycan wall so it can wash the purple stain out (1). To identify the bacterium on a species-level, it is cultured on agar plates. For example, MacConkey agar is a selective type which isolates the growth of gram-negative bacteria. E. coli will appear in moist, pink colonies because it is 'lactose fermenting' (1). Additionally, CLED agar works by differentiating between types of urinary pathogens, like E. coli which appears in yellow colonies. Specifically, the use of these two agars is recommended for detecting UTIs. Additional biochemical tests may be required to confirm the diagnosis, such as the Indole test. As E. coli is a member of the Enterobacteriaceae family, the Indole test is an appropriate identification method for most strains. This test differentiates the bacterium based on their ability to produce Indole from the breakdown of the amino acid, tryptophane (14). Least commonly used because of its low specificity, a spot indole test is useful for the detection of rapid indole producing organisms. It is performed using filter paper, moistened with Indole reagent and using a wooden applicator stick, an isolated colony is smeared onto it. Appearing as a reddish color suggests Indole is present, whereas a blue color is converse (15). The other of the two methods is the more conventional but time-consuming tube test. Ensuring sensitive results, this test requires inoculating the tryptophane broth with the bacterium and Kovac's reagent. Examined for the presence of a red ring if it is Indole positive like E. coli or absence of a ring if it is Indole negative (14). Only recently, drug resistance in E. coli has caused a major difficulty in the treatment of UTI.

Advantages and disadvantages of using culture methods

Since the early 2000s, E. coli is one of the six leading pathogens causing death due to antibiotic resistance. However, only recently has it truly become an global dilemma, the average resistance rate is as much as 40% in places and continuing to grow at an alarming rate (12). Specifically, it's resistant to a multitude of drugs, such as ampicillin, nitrofuranton and cotrimoxazole (13). Microbiologists test for it, eliminating these organisms to reduce the chances of treatment failure (13). Known to be the gold standard for susceptibility testing, the disk diffusion method was developed in 1956 by W. Kirby and continues to demonstrate its reliability in hospitals around the globe. Especially in developing countries, where the emergence of antibiotic resistance is worrying, this method is cheap and ensures simplicity of performance. The standardized disk diffusion is relatively accurate, not necessarily requiring a trained professional as it allows

clear visibility of growth. However, it's usually performed by a microbiologist with minimal equipment. They work by placing an antibiotic disk on an agar plate cultured with bacteria (9). During an overnight incubation, the disk diffuses over the plate, revealing clear inhabitation zones where bacterial growth has been stunted (1). Dependent on the concentration gradient around the disk, it determines the antibiotic susceptibility. If there is no zone of inhabitation and the bacteria grows up to the edge of the disk, then it's resistant. Although, one limitation of this method is that the agar used doesn't support the growth of all fastidious and slow growing bacteria. The prolonged incubation time to culture the slow growers, results in inactivation of the drugs. Consequently, limited to what it can test, disk diffusion is unreliable for patients urgently requiring antibiotics.

PCR for detecting antibacterial infections

For centuries, detecting antibacterial resistance has been reliant on using slow and sometimes inaccurate methods like culture. But when it comes to doing this efficiently in the busy and chaotic hospital environments, our go-to methods need updating. Invented in the 1980s, PCR is an in vitro method, that's an accurate and fast way for detecting antimicrobial resistance, through finding the gene in the DNA that is behind the infection, even before symptoms have occurred (10). It involves a repetitive cycle of amplifying the gene, so it's easier to detect (1). The two possible ways to get a PCR test include nasal swabs which are accessible for patients to perform themselves and blood tests, performed by health care specialists, then both samples are sent to a microbiology to be tested. Currently, the procedure works as a rapid identification method taking less than one hour, which promotes the appropriate assignment of medication promptly (16). Unlike the 'gold standard' culture, PCR tests are known to have a high sensitivity of around 95%, delivering more accurate results to patients (11). However, a more comparable and slightly lower specificity, a higher risk for false positives. Additionally, the whole procedure requires trained specialists and specific equipment, costing from £15 to £30 per test, affecting the availability in hospital laboratories.

Conclusion

When the body encounters harmful bacteria, it can result in an infection like UTI. These common yet life-threatening cases occur when E. coli enters the urinary tract - usually through the urethra. In order to supply the patient with the appropriate treatment, it's important to diagnose the bacteria causing the infection. In my opinion, culture-based methods need to be developed further. These standardized methods remain some of the most widely used for antimicrobial susceptibility testing. It's essential that antibacterial resistance is identified at the earliest convenience so the patient will receive the most appropriate and effective drugs for their condition. Currently, the incubation time is prolonged by the laboratory working hours rather than the habits of the bacteria. Earlier results could ensure patients receive appropriate treatment quicker and reduce cost and length of the patient's stay. Consequently, countries with the least-developed health care would be able to

deliver higher-quality and availability of care to a larger percentage of the population. As the emergence of antibiotic resistance is increasing, demand for a reliable and rapid method like PCR is also increasing. In my opinion, PCR is the most promising method because of its quick turnaround time for accurate and sensitive results.

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Tutor comment:
"Maeve is a hardworking student who had excellent engagement throughout the course. I was really impressed with her essay, which showed incredible understanding and application of the tutorials. When writing her essay, she went above and beyond the tutorials, showing outstanding research skills." - E. Trinh

Could bacteria and their enzymes be a viable option to tackle the plastic waste crisis?

Year 9, Key Stage 4

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In this essay, I will discuss and evaluate plastic-degrading bacteria as a solution to the plastic waste crisis. The plastic waste crisis is a global problem that damages ecosystems, pollutes the earth's oceans, and impacts local residents' social well-being. On a yearly basis, a minimum of 14 million tonnes of plastic waste are released into the ocean (1), causing irreversible damage to the lives of many marine creatures. Plastic pollution is often seen in the form of microplastics, however it comes in many different forms e.g. mesoplastics (2). Microplastics specifically are plastic particles smaller than 5mm and come from polymers that have been broken down over time. They have been found in every stage of the food chain, including humans, as many marine organisms ingest the microplastic, directly affecting the top of the food chain (3). Microplastics are a threat to humans as they can result in health issues such as problems with the respiratory system and changes in chromosomes (4). Due to these and many other issues, the plastic pollution crisis needs to be tackled as fast as possible, requiring new and innovative ideas such as plastic-degrading bacteria. Bacteria are unicellular organisms that are usually a few micrometres in length and exist in most environments. These organisms possess many useful qualities (such as the ability to degrade plastic), which can be used to improve quality of life and tackle environmental issues. In my opinion, bacteria could be a good way of dealing with plastic pollution if combined with other degradation methods as using bacteria alone has many disadvantages, which will be discussed further in this essay. At the beginning of the essay, I will focus on the process of bioremediation, which is the realisation of biodegradation, used mainly for removing environmental pollutants. I will explain fully how bacteria use enzymes to degrade plastic and outline the main advantages and disadvantages of using bacteria as a solution to plastic pollution.

Some types of bacteria are able to degrade plastic, which could potentially be incredibly useful in tackling the plastic waste crisis. This process is called biodegradation and it is outlined in Figure 1 below.
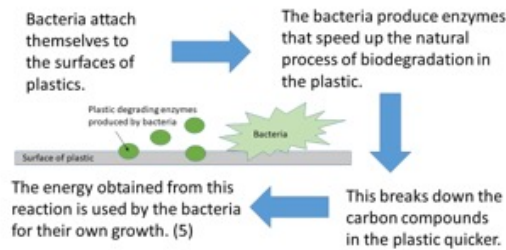

Fig 1 - own figure, the process of biodegradation explained, using information from ref (5).

This process can be used to degrade plastic in large quantities in a bioreactor, where bacterial consortia (communities of bacteria) are mixed with plastic, at optimum conditions for the enzymes to degrade it (3). However, each species of bacteria is adapted to produce specific enzymes, which can often prove to be very inconvenient. This is because for a large-scale process of biodegradation to have maximum efficiency and for the bacteria to multiply well, they require a set of optimum conditions (e.g. right temperature and pH) (6). Therefore, if the bacteria that produce enzymes to degrade a specific polymer is extremophilic, this can cause a less efficient/slower process of biodegradation at room temperature. Sometimes, the bacteria producing the required enzyme is also pathogenic (causes disease), which means that it is dangerous to work with. In these cases, genetic engineering, such as horizontal gene transfer is required so the bacteria are easier/safer to work with. The genetic material (DNA) of the original (donor) bacteria is transferred into an easy-to-work with, new (recipient) bacteria and inserted into its genome (7).

An example of bacteria that is often used as the recipient is E. coli. There are many benefits to using E. coli, for example, it is a lot cheaper as no extreme or hard-to-maintain conditions are required, unlike with extremophilic bacteria. The specific type of E. coli used is not pathogenic and therefore, cannot cause disease and can be used with no health threats. In addition, E. coli has an extremely fast growth rate, taking only 20 minutes to double, therefore the production rate of the required enzyme is very high/efficient. Engineered bacteria like E. coli are often used in industry, for example, insulin genes, which regulate the level of glucose in the blood, are taken from humans and engineered into an easy-to-work-with bacteria to produce medicine for diabetes (7). This is a big improvement in comparison to insulin being harvested from pigs, as producing insulin in a bioreactor doesn't have any ethical issues associated with it.

With this process of bacteria engineering, bioremediation - 'a biological process that removes pollutants from soil, waste, water, or industrial sludge' (6) - gains potential as a solution, because engineering makes it a lot more efficient. There are many other advantages to using plastic-degrading bacteria as a solution to the waste crisis, for example, new plastic can be made from the products of bioremediation, without using petroleum. After the plastic has been degraded in a bioreactor, the products can be collected and used to make new plastic (8). This is extremely useful as it stops the production of plastic altogether, which would be the optimum solution, but otherwise would be very impractical and perhaps impossible to carry out. This is because nowadays plastic can be found in almost every household, meaning that stopping the production of new plastic is impossible unless bioremediation is used.

In addition, bioremediation is the most beneficial method for the environment, compared to the methods being currently used. Incineration, landfill sites, and recycling do not remove plastic from an ecosystem completely, unlike bioremediation. Instead, they are simply methods to take care of the excess amounts of plastic. Both

incineration and landfill have a very negative impact on the environment. For every 1 kg of plastic incinerated, approximately 2.9 kg of carbon dioxide is released into the atmosphere, contributing greatly to global warming (9). Poorly managed landfill sites are often in open access to wildlife, which can cause animals to choke or get tangled in plastic. Landfill runoff also pollutes the surrounding environment causing contamination of water and soil (9). Recycling is also not the ideal solution (though is significantly better than both incineration and landfill) as plastic can only be recycled several times before it has to be disposed of in one of the methods mentioned above. Bioremediation, however, does not have these issues as it does not affect the environment negatively, release greenhouse gases, or have a limitation on the number of times that it can be carried out.

On the other hand, bioremediation has many disadvantages. While it can degrade plastic that is collected, it does not solve the problem of marine pollution and plastic in the ocean. This is due to the fact that bioremediation technologies cannot be applied directly into the ocean as the bacteria can create serious imbalances in ecosystems, meaning that all the plastic for degradation would have to be collected by hand (3). This makes biodegradation less useful as a solution because collecting the plastic by hand would be impossible. Therefore, the problem of plastic in the ocean remains unsolved. Moreover, not all plastic is biodegradable as some types of polymer can only be partially degraded or cannot be degraded at all. So what do we do with the remaining plastic that cannot be degraded? This question brings us to the main disadvantage of bioremediation; to degrade plastic, the enzyme that breaks down that specific type of plastic needs to be found. The process of searching for a new enzyme is called genome mining. By searching bacterial genomes for a set (conserved) gene sequence that is often found in plastic-degrading bacteria, there is a chance that a plastic-degrading enzyme may be found (7). However, the gene sequence and the function it carries out do not always match, meaning that the enzyme always needs to be tested before it is used. There are many options to test for degradation, for instance, measuring the weight of plastic before and after incubation with the bacteria being tested. This is often a useful method to compare the bacteria found through genome mining. Genome mining itself does, however, have many disadvantages as it is mostly based on trial and error, meaning that if we do not know what to look for specifically it becomes useless.

Furthermore, the process of bioremediation is not yet fully developed. This means that the efficiency is low, which nullifies the potential that bioremediation has. Currently, there are over 90 bacteria and fungi that have the ability to degrade plastic made from petroleum (10). They have developed this quality - adapted - over time through changes in their DNA, either caused by mutations or genetic engineering/DNA inserted into their genome. The most common types of plastic-degrading enzymes are Cutinase, Lipase and PETase (11). Figure 2 below shows the results of HPLC (High-performance liquid chromatography) in a bar graph.
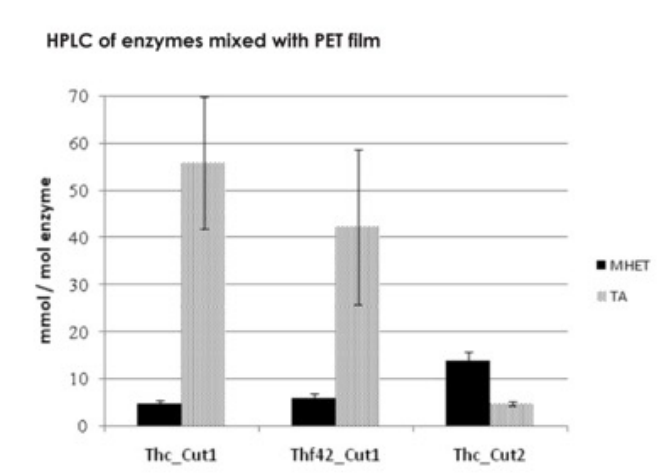

Fig 2 - Comparison of hydrolysis (breakdown due to reaction with water) of PET (plastic) films in three different types of cutinase enzymes. The technique used is HPLC (high performance liquid chromatography), which identifies the components/chemicals at the end of a reaction (ref. 12).

The experiment tested three types of Cutinase enzymes, which are all able to degrade plastic. This can be seen as the breakdown products (MHET and TA) are present in all 3 of the reactions, meaning that in all the experiments the PET film was broken down. Despite this, the data of the experiment is incomplete as there is no indication that the experiments were carried out for the same amount of time, which is an essential control variable. Assuming that this control variable was followed, the reactions all had different efficiencies as there were different amounts of products for each reaction. Enzyme Thc_Cut1 is the best and most efficient enzyme in the conditions in which the experiment was carried out, as it produced the largest amount of products, therefore degrading the most PET in the least amount of time. Nevertheless, the other enzymes' efficiency - the rate at which they degrade PET - can be improved by modifying the conditions in which the experiment takes place (e.g. changing pH and temperature) (7). This is a problem for many enzymes as they have different optimum conditions that they work best at.

In the future, this could be improved through genetic engineering and modifying the protein for the production of this enzyme (Cutinase) into a bacteria like E-coli. Alternatively, we may wish to find the optimum temperature for each of the other two types of Cutinase, if it is not too extreme. Both of these options would increase the rate of degradation of PET as they would find the optimum temperature of the reaction, which would make it a lot more efficient. Efficiency can also be increased by modification of the enzyme's active site so that it is a tighter fit to the substrate, in this case - plastic, that it is breaking down. This would increase the rate of the reaction as this would ensure that the substrate would fit better, increasing the rate of degradation. The alteration of the enzyme's active site to make it more thermally stable would also help with efficiency as that would mean that it would be possible to work with the enzyme at higher temperatures, without it denaturing from the extreme heat.

In conclusion, plastic-degrading bacteria has the potential to become a part of the solution to the plastic waste crisis, however, it is impossible to tackle this issue using bacteria alone due to its many disadvantages. Although bioremediation is the best option for the environment and mainly cuts out the production of new plastic, it cannot solve the pollution already created by humanity. In addition, it is not fully developed (7), meaning that it requires investment and time , which humanity does not have: the plastic crisis is a pressing issue, which has to be tackled as soon as possible to stop the negative impacts on humans and the environment before it is too late. With some development, e.g. modification of enzymes that break down plastic, biodegradation will probably become more efficient, most likely replacing other, less eco-friendly methods, such as landfill and incineration, but humanity's current goal should be to make this happen as fast as possible. I believe that the optimum solution would be to stop the production of plastic entirely and use the products of bioremediation to create new plastic, instead of using more petroleum, however, this is highly unlikely to happen as humans are heavily dependent on plastic. The problem of the plastic waste crisis mainly lies in the careless production of 300 million tonnes of plastic yearly (13), not in the way this is managed. Nonetheless, bioremediation may play a key part in the solution to the plastic waste crisis, if it is further developed.

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Will genetic engineering reshape humanity and the world?

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Genetic technologies are changing the way food is produced, increasing crop yield, and enabling key medical advances. They therefore have the potential to create huge revolutions in the future of humanity. Genetic engineering is a process that manipulates DNA to alter an organism's characteristics in a particular way; it may also involve extracting DNA from an organism's genome and combining it with the DNA of another. Applications of genetic engineering, which play a huge role in humanity, include industries such as medicine, agriculture, and forensic science. These are everchanging and progressing allowing for economic growth to support the rapid increase in the population along with the changes in demand of the population.

There have been many key advances in genetic engineering that have contributed to today's knowledge. Boyer and Cohen were some of the first successful genetic engineering researchers, by showing genetically engineered DNA may be cloned in foreign cells. In 1974, the first genetically engineered mouse was created causing all its cells to have an altered DNA structure, later followed by the first transgenic tobacco plant created in 1983 which combined a foreign plasmid with a gene of a specific strand of tobacco.

There are many benefits to genetic engineering in humanity. However, there are also several limitations that must be considered when discussing its potential to reshape humanity and the world that will be evaluated in more detail throughout this essay. The main limitations involve ethical concerns, unknown risks, and side effects. So, the question that must be asked is, "Do the strengths outweigh the weaknesses?".

There are many methods of genetic engineering. One key technique is CRISPR, also known as Clustered Regularly Interspaced Short Palindromic Repeat, which refers to the unique organisation of short, partially palindromic, repeated DNA sequences found in the genomes of bacteria and other microorganisms. CRISPR acts as an immune system within a bacterial cell, where the spaces between the gene are made up of viral DNA. CRISPR expresses a specific RNA and protein called Cas9 that cuts off the viral DNA, therefore, by manipulating the CRISPR system, we can modify and edit genes within eukaryotic cells as well.

The three main genetic edits that can be formed with CRISPR/Cas9 are disruption, deletion, and insertion. In disruption, if a single cut is made, a process called non-homologous end joining can result in the addition or deletion of base pairs, hence the disruption of the original DNA sequence and causing gene inactivation. During

deletion, a larger fragment of DNA can be deleted by using two guide RNAs that target separate sites, causing a non-homologous end to join the separate ends and deleting the intervening sequence. Finally, insertion is the adding of a DNA template alongside the CRISPR/Cas9 machinery which allows the cell to correct or even insert a new gene using a process called homology directed repair. One-way CRISPR/Cas9 is benefiting and changing humanity is in the methodology of many cancer biology studies due to the convenience of the technique. CRISPR has been a huge game changer in the development of a cancer treatment as scientists now know that cancer is caused by changes in DNA, and CRISPR provides an easier way to correct those changes by manipulating the DNA. There are about 167,000 deaths due to cancer per year in the United Kingdom, therefore a treatment needs to be found. However, it could be argued that this has limitations as using CRISPR/Cas9 as a method for treating cancer may cause unknown and undesired side effects.

One major application of genetic engineering which plays a huge role in humanity and providing for the population is agriculture and farming. Agricultural genetic modification has been practiced for a long time and can be used in the production of plants, crops, and animals to alter characteristics such as the colour or size of plants and the amount, and quality of meat an animal provides. People have sought to improve agriculturally important organisms by selection and breeding. An example of genetic engineering in agriculture is the development of disease-resistant wheat varieties by crossbreeding different types of wheat until the desired disease resistance was present in a resulting new variety. There are several ways DNA can be modified to create specific characteristics such as, in a genetically modified plant, new DNA is transferred into plant cells, where then the cells are usually grown in a tissue culture where they develop into plants. The seeds produced by this plant will also carry this new DNA. A further method used to transfer DNA is to coat the surface of small metal particles with the relevant DNA, and then bombard the particles into the plant.

Another technique used in genetic engineering in agriculture is the use of eukaryotic cells; an example of this is the case study of the biopharming of antithrombin where the aim was to produce a sheep that made milk containing antithrombin. This was done by removing the antithrombin gene from a human and a fertilised zygote from a sheep. The antithrombin gene was then combined with the fertilised zygote which created a transgenic zygote, this was then reinserted into the sheep. When the new lamb was born it produced milk containing antithrombin, which is much more efficient than collecting this from humans. This could lead to a future change in humanity because it allows for a more efficient way of producing crops and materials that could be used in medicine to decrease the probability of people developing life-threatening diseases and to create essential treatments for common, but serious, illnesses. This would then lead to a reduced mortality rate.

There are several benefits to genetic engineering in agriculture. One key strength is increased crop productivity, which has been achieved by creating qualities such as

disease resistance and increased drought tolerance. For example, researchers from the University of Hawaii and Cornell University developed two varieties of papaya that were resistant to papaya ringspot virus, by transferring one of the virus' genes to the papaya to create resistance.

Secondly, a strength of genetic engineering in agriculture is improved nutritional value. Genetic engineering has allowed new options for improving nutritional value, flavour, and texture of foods. An example of this is the development of soybeans with higher protein content and rice with the ability to produce beta-carotene, which is known to help prevent blindness in people who have nutritionally inadequate diets.

However, there are possible risks associated with the use of transgenic crops in agriculture, such as health related issues like allergens and toxins. People with food allergies have an unusual immune reaction when they are exposed to specific proteins, called allergens, in food. Therefore, a major safety concern raised relating to genetic engineering technology is the risk of introducing allergens and toxins to otherwise safe foods.

The medical industry is also massively affected, and a key application of genetic engineering. This may be the industry that reshapes humanity and the world the most, in the upcoming years. A leading example of genetic engineering in medicine is its role in the production of human insulin which is mainly used for people who suffer from diabetes. Over 3 million people have been diagnosed with diabetes in the UK alone. This is a chronic, metabolic disease that elevates blood glucose levels and over time causes serious damage to the heart and blood vessels. Therefore, it is essential people with diabetes inject their own insulin to maintain levels of blood glucose. Insulin, which was originally extracted from an animal pancreas, is now mainly produced by yeast and bacteria. The process includes isolating the human gene which is then inserted into a plasmid using DNA ligase (which carries out ligation, the joining of two nucleic acid fragments) followed by sticky end creation via restriction enzymes. The plasmid is then inserted into the bacteria or yeast, which are then grown in large fermenters allowing insulin to be extracted from it.

Genetic engineering in medicine could be used for the treatment, or even the elimination of some diseases, and in embryo modification which could be used to prevent genetic conditions that affect quality of life. This has the potential to reshape humanity as the number of people with these serious diseases will rapidly decrease, which in turn will benefit medical facilities, such as the National Health Service (NHS), due to less pressure and money being spent to treat and support the people with the disease. An example of a medical condition affecting many people is cystic fibrosis, which is an autosomal recessive disorder that requires mutations in the cystic fibrosis gene in both genetic alleles, causing the build-up of sticky mucus in the lungs and digestive system, leading to lung infections and problems digesting food along with higher risks of developing other conditions like diabetes and liver problems. It is estimated that only half of the people with cystic fibrosis live past the age 40 and they

often have a lower quality of life. However, this could be changed due to advances in gene therapy techniques, which could be used to potentially cure the disease for future generations. This is done by replacing the genetic mutation with the correct version of the cystic fibrosis transmembrane conductance regulator, a protein that helps maintain the balance of salt and water on many surfaces in the body.

Therefore, there are multiple strengths to the involvement of genetic engineering in the medical industry. One that particularly stands out is the fact that research into life-limiting and life-threatening diseases could lead to increases to quality of life, or even total cures due to being able to change the genetic mutations that cause them. Genetic diseases could even be fully eliminated for future generations, which then has a knock-on effect for organisations such as the National Health Service (NHS) who spend hours treating and supporting people with these diseases, as they will be able to focus on people with other conditions.

However, there are also limitations to the use of genetic engineering in medicine such as unknown side effects to treatments. For instance, it is unknown what altering DNA to prevent genetic diseases will do, like potentially causing the person to have a higher chance of developing other diseases or losing eyesight or hearing at an early age. A more futuristic development of genetic engineering is the ability to create a designer baby or animal by altering DNA in human and animal embryos by germline gene editing, to give offspring particular characteristics such as eye colour, hair colour, personality, and intelligence. germline gene editing, also called Genome editing, is a technology that scientists have invented for modifying an organism's DNA. In human germline modification, the DNA of the organism is altered in the desired way by altering its genes, this method has been prohibited in more than 40 countries for safety and social reasons but has still brought revolutionary changes in the world of science.

Through germline editing, a designer baby can also be free from hereditary diseases such as, some cancers, human immunodeficiency virus (HIV), haemophilia and many more. This serves as a benefit to parents who are worried about passing potentially life-threatening diseases to future children and could be used to totally abolish certain genetic diseases. Similarly, germline editing could be used to create a child with the specific antibodies or stem cells needed to treat an already living person who has a serious disease, as it can be incredibly difficult to find someone with a perfect blood match to donate the required cells or organs. A leading example is the case of Adam Nash, from Colorado, USA, who was the first designer baby born as he was designed to be a bone marrow match to his older sibling who suffered from Fanconi's anaemia. He was chosen from 15 genetically modified embryos following in vitro fertilisation (IVF).

Many people disagree with the idea of designer babies as there are many ethical issues, such as the production of a designer baby is exploiting the existence of a human individual, as it is treating them like an object with the purpose of potentially treating an ill sibling. However, it could be argued that this is a positive idea as not only is a

new life created but an existing life is saved, allowing both the designer baby and sick sibling to live a happier life. Another limitation of designer babies is that it is very expensive and therefore, only people with enough money have the chance to potentially save an existing ill child or create a child with the exact characteristics wanted. Consequently, people with less money do not have the same opportunities.

To conclude, genetic engineering proposes huge changes to life and humanity in the future, mainly through agricultural and medical applications. Many major advances have been made in genetic engineering such as, the ability to alter DNA in crops to make them resistant to certain diseases and have specific characteristics like, size and colour. A second key advance is the ability to create new treatments that could potentially cure some diseases and the capability to alter genes in embryos to ensure they don't carry genetic diseases, which could allow for the elimination of genetic diseases. I believe breakthroughs in genetic engineering have many strengths as they provide a reachable end to diseases that kill many people every year and help accommodate for the demands of the rapid increase in population. However, I also agree that there are serious limitations that must be considered like the unknown, long-term side effects and potential damage of gene pools. In my opinion the advantages of genetic engineering outweigh the negatives, as there are many other applications that I haven't discussed in this essay that could also lead to a positive reshaping of humanity, such as the use of genetic engineering in world energy production of biofuel and petroleum, and its uses in forensic science and reduction of pollution.

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How bacterial diseases are diagnosed now and how advancements in science could change this

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Introduction
A study conducted in 2019 found that globally an estimated 7.7 million deaths were associated with bacterial pathogens [1]. Not all bacteria are life-threatening, with some proving vital for human life, improving our immune systems and aiding digestion.

Common diseases affiliated with bacterial infections include acne, gastroenteritis, chlamydia, and pneumonia, all of which occur once bacteria enter the body [2]. Diagnostic methods vary depending on the type of bacterial infection being identified, from agar culturing to more specific biochemical testing. Diagnosing bacterial disease must be fast and accurate, and for this reason, we must understand the structure of the pathogens being investigated. Escherichia coli (E. coli) is of increasing concern due to its emerging resistance to antibiotics over the past years, causing issues regarding treatment.

Bacterial Structure
Bacteria are prokaryotic cells (do not contain a nucleus) with rings of double-stranded DNA called plasmids. It is these plasmids which afford the bacteria its antibiotic resistance. The plasmids can be transferred to one another through a process of conjugation, spreading the ability of the bacteria to resist antibiotics [3]. The bacterial cell wall provides structure and protection whilst in the host, and a cytoplasm where chemical reactions take place. Some bacteria (common amongst bacilli [4]) also have a flagellum which allows for free movement.

Escherichia coli
Escherichia coli (E. coli) is a Gram-negative pathogen which is found in the digestive tract as part of the normal flora. Although beneficial in this form, certain strains of E. coli can cause infection, for example, E. coli O157:H7 [2]. Per annum, E. coli O157:H7 causes 2.8 million cases of infection, with 63,000 cases of acute disease, and haemorrhagic colitis [5]. E. coli O157:H7 infections are most likely to infect immunocompromised individuals (specifically, children under the age of 5 and the elderly), as well as those visiting developing countries. E. coli O157:H7 can infect the intestines of animals leaving over 90,000 in agriculture at risk of infection [6].

This rod-shaped Gram-negative serotype of E. coli consists of 3 layers: the outer membrane, the cytoplasmic (inner) membrane and a thin layer of peptidoglycan, a polymer that encapsulates the cytoplasmic membrane and protects the bacteria from environmental stress [7]. The bacterium contains the O157 antigen on its surface which can trigger an immune response through the activation of the complement system (a large number of plasma proteins that react with each other to induce an inflammatory response [8]). E. coli O157:H7 is efficient in cell division and growth, allowing for the infection of multiple areas of the host [9].

E. coli can be found in raw meat and once consumed allows the bacteria entry into their host's gastric and intestinal areas. The O157:H7 strain has high acid resistance [10], which allows for the bacteria to withstand the acidic conditions of the stomach (PH 1.5-3) and lead to subsequent infection [10].

Symptoms of an E. coli O157:H7 infection and pathogenesis
E. coli O157:H7 causes the acute disease haemorrhagic colitis with symptoms characterised by common gastrointestinal infections. Vomiting is common among patients, as well as nausea and fatigue. Abdominal cramps are also common due to stomach irritations caused by E. coli O157:H7. Bloody diarrhoea may occur due to Shiga toxins present in the serotype of E. coli directly killing cells in the body. If these toxins reach the intestinal tracts, they can damage the inner lining which can lead to bloody diarrhoea and decreased efficacy of digestion. It can also cause Haemolytic Uremic Syndrome (HUS), a rare condition where damage to the endothelial cells lining the blood vessels in the kidneys leads to potential kidney failure [2]. HUS is more commonly found in the younger population [8]. A patient with HUS would experience symptoms such as vomiting, fatigue, and cramps. If the condition were to progress further, the patient may present with skin bruises, paleness, and an increased risk of fainting [24]. In the UK, the mortality rate for HUS is 25% [13], however, if diagnosed and treated accurately most patients can recover following hospital treatment.

Sepsis
Septicaemia (also known as blood poisoning) is where bacteria enter the bloodstream, causing an immune response triggered by endothelial cells, which release special proteins (antibodies) along with other chemicals into the bloodstream to fight the infection. If this response were to become uncontrollable, immense inflammation is triggered resulting in sepsis [14].

Symptoms of sepsis vary depending on the age of the patient, adults would present with elevated heart rate, fever, shortened breath and constant shivering. Children, aged 5 and below, may present with difficulty in breathing, lethargy, unresponsive, black/green vomit, high temperature (over 38ºC below 6 months), and reduced fluid intake [13].

Severe sepsis, (30-40% mortality rate compared to 20.3% in normal sepsis [15]) is developed from the inflammatory damage of one or more organs caused by sepsis [16]. Shiga toxins within E. coli O157:H7 attack the endothelial cells of the kidneys which increases the chance of developing severe sepsis from an O157:H7 infection, compared to other toxin-producing bacterial infections. Septic shock may also occur if the patient's blood pressure drops significantly while trying to contain the disease [17], This is a serious disease with high mortality rates (700,000 per annum in Europe) and is most common amongst the elderly; immunocompromised; and patients with chronic diseases such as diabetes and cancer [18].

Treatment for E. coli O157:H7 and sepsis
E. coli O157:H7 does not have a definitive treatment strategy with antibiotics increasing the risk of HUS [2]. Sepsis treatment would use antibiotics administered intravenously, targeting the site of infection directly [18]. If the bacteria causing the sepsis has not yet been identified, a broad-spectrum antibiotic would need to be used to target both Gram-positive and Gram-negative bacteria [19]. After 2-4 days of successful intravenous (IV) treatment, antibiotics would then be administered orally [19]. Many O157:H7 infections, like gastroenteritis, may last around 10 days and the patient may suffer dehydration caused by diarrhoea. Patients are advised to rest and drink plenty of fluids. Anti-diarrhoea drugs are not recommended as they can prolong the amount of time the Shiga toxins remain present in the intestines [2].

Hospitalisation may be required for patients whose symptoms exceed 10 days as they are at increased risk of HUS and sepsis. In this scenario the patients would be administered IV fluids to manage the dehydration, some patients may be given kidney dialysis, a process of cleaning the blood mimicking the job of the kidneys, which are currently compromised by the infection and heavily weakened by the HUS [20]. Blood transfusions may also be needed depending on the spread of the infection.

Diagnosis of E. coli O157:H7
E. coli O157:H7 diagnosis requires a stool sample which is subsequently assessed utilizing a Gram staining method. The sample is placed on a microscopic slide where a series of stains are added. This test would provide a basic description of the sample by colour (blue/purple indicating Gram-positive and red/pink indicating Gram-negative); and shape (either round cocci or rod-shaped bacilli) [21]. In the presence of E. coli O157:H7, a Gram stain would be expected to show as red/pink in colour and bacilli in shape [2].

The sample would then be subject to agar culturing where the sample is placed on an agar plate. An agar plate is a solid substance that is a reliable source of carbon, nitrogen, and inorganic salts [22] (nutrients that bacteria require to grow [23]), the agar plate is placed into an incubator which will allow the bacteria to grow, allowing colonies to appear on its surface. This process can take up to 24 hours to produce results. A point to be considered in case a fast diagnosis is required.

E. coli O157:H7 is unable to ferment sorbitol, therefore MacConkey agar, which is usually lactose based, is replaced with sorbitol [24]. On this type of agar, E. coli O157:H7 would develop colourless colonies 2-3mm in diameter. The sensitivity of sorbitol MacConkey agar is 100%, which is higher than PCR testing (80% sensitivity) with a specificity of 85% [25], however, issues may arise if an agar sample is left in the incubator for longer than needed as the lack of colour from an E. coli positive colony is more likely to disappear, making it harder to distinguish from any negative colonies. Additionally, there are non-toxin-producing strains of E. coli O157:H7 and agar culturing cannot differentiate between the toxin and non-toxin-producing bacteria. This would mean that a patient infected with a non-toxin-producing E. coli infection could incorrectly receive treatment for a toxin-producing infection potentially worsening their prognosis.

Biochemical testing of E. coli O157:H7
A catalase test looks for a catalase enzyme within the bacterium by reacting hydrogen peroxide to release oxygen and water, thus proving a bacterium is a catalase-positive [26]. E. coli O157:H7 is catalase positive as it contains the catalase gene katP [27].

The oxidase test aims to identify the oxidase enzyme using a non-metallic sterile instrument/tool (most commonly a sterile wooden splint) to remove colonies from agar culturing. The colonies are rubbed onto an oxidase reagent strip which replaces oxygen as a recipient for electrons for the oxidase enzyme. If present, the electrons would change from colourless to purple, indicating a positive oxidase test. No colour change indicates no oxidase enzyme presence so no electrons would have been collected [28]. If E. coli O157:H7 was to be subject to an oxidase test, the oxidase reagent would not change colour due to the bacterium not containing the enzyme, making E. coli O157:H7 oxidase negative.

Oxidase tests require between 60-90 seconds to obtain results, therefore are a rapid form of isolation, however, the tests are expensive to produce, and the stability of the oxidase reagent is not secure. Advancements in science have allowed this method to involve the use of paper strips with less reagent, this method takes around 15 seconds to obtain results and is a more secure method [28].

Antibiotic Resistance
Antibiotic resistance remains the biggest challenge facing clinicians in the current practice of medicine, accounting for 1.27 million deaths globally [29]. Antibiotic resistance is where the frequent use of an antibiotic leads to bacteria developing resistance to it, negating the effects of the drug, and is usually caused by overuse and inappropriate use of antibiotics [2]. As a result, infections become difficult to treat, an example would be Methicillin Resistant Staphylococcus aureus (MRSA) which resists penicillin-like antibiotics, for this bacteria effective methods for treatment include the drug vancomycin which is expensive and can lead to hearing loss and

kidney damage [2].

To detect antimicrobial resistance, clinical microbiologists can use the disk diffusion method, which is a laboratory-based test of the bacteria to confirm antibiotic effectiveness. This test requires paper disks impregnated with antibiotics to be placed on agar cultured with bacteria and incubated overnight [30]. If the antibiotics have worked against the bacteria, clear zones would appear around the disks, showing that the antibiotic has prevented further microbial growth, no clear zones mean the antibiotic has not worked against the bacteria. With E. coli O157:H7, antibiotics are not recommended as treatment due to the increased risk of HUS. A study conducted in 1998 isolated E. coli O157:H7 from animals that had tested positive for antibiotic resistance to common antibiotics, such as ampicillin and kanamycin [31], this study showed that though antibiotics are not routinely used for treatment for E. coli O157:H7 if used they can develop resistance to such antibiotics.

PCR testing can be used to confirm antibiotic resistance, this test looks for genes within the sample bacterium's DNA that allow for antibiotic resistance and visually identifies whether a bacterium is resistant or not, unlike disk diffusion which is not specific. Disk diffusion can be time-consuming on average an 18-hour waiting period for maximum effectiveness from the antibiotics [32] compared to PCR testing which can take between 15 minutes to an hour.

MALDI-TOF MS
Matrix Assisted Laser Desorption Ionisation-Time of Flight Mass Spectrometry (MALDI-TOF-MS) is a method of diagnosis showing promising value as a tool for bacterial isolation through its use of ribosomal protein analysis and is already being used in laboratories and hospitals across the US [33]. MALDI-TOF-MS provides a mass spectrum (a measure of the mass-to-charge ratios of a molecule [34]) of the sampled bacteria in a brief time, a feature that allows for quicker diagnosis than traditional methods which can afford the patient to be treated sooner. To carry out a MALDI-TOF-MS test, a sample is taken from agar to the MALDI plate where it is coated with a matrix solution, an energy-absorbent compound crucial to the technique, and crystalises over the sample as it dries [35]. MALDI-TOF-MS works by ionising the matrix-crystalised sample with a laser. With this, single ions are generated and accelerated at a fixed potential through a flight tube which separates them by their mass-to-charge ratio (m/z), which is analysed using a time-of-flight mass analyser by measuring the time taken to cross the length of the flight tube [33]. The data is then collected to form a Peptide Mass Fingerprint (PMF), a characteristic spectrum, and is compared to PMFs of bacteria contained within a database [35].

MALDI-TOF-MS can recognise the pathogenic strain E. coli O157:H7, however, it is a subspecies of non-pathogenic E. coli, and due to their similarities, MALDI-TOF-MS risks mistaking E. coli O157:H7 for another subspecies of E. coli. This could result in misdiagnosis and incorrect treatment administration, for example, Uropathogenic E. coli (UPEC) can be treated with the antibiotic imipenem [36], but for Shiga-producing E. coli O157:H7 antibiotics can

prolong the amount of time the Shiga toxins remain in the intestines and increases the risk of HUS [2]. Further research into subspecies recognition is needed to maximise the potential of this technique.
To allow MALDI-TOF-MS to work agar culturing is required, a process which takes at least 24 hours, delaying diagnosis and treatment for the patient. If a certain bacterium is not in the database for the machine, then the test would not recognise the sample. Therefore, time and effort are required to build up volume within the database for MALDI-TOF-MS, to allow for a more accurate diagnosis [37].

The hardware for this process is expensive, with average costs of $270,000 and additional costs for software maintenance and database updates [38]. However, it is cheaper to run compared to traditional methods of diagnosis. In 2015, a study at the University of North Carolina found the costs of running MALDI-TOF-MS diagnosis compared to traditional methods, like agglutination tests, over 12 months factoring in the reagent expenses, maintenance, and the technologist. The study showed on average the cost for a test using traditional methods was $6.50, compared to $3.14 for MALDI-TOF-MS. The set-up costs are the highest but long-term can be more cost-efficient [38]. MALDI-TOF-MS has a high sensitivity (97%), and a low specificity (69.5%), reducing the number of incorrect diagnoses. Excluding the time for agar culturing, it takes less time to do this test compared to other techniques, with one test only taking 30 minutes [35] [37].

DDPCR
Droplet digital Polymerase Chain Reaction (DDPCR) is a novel technique for diagnosing bacterial infection. The sample (usually stool) is inserted into a droplet generator, where the sample is partitioned into individual droplets using water-in-oil emulsion. These droplets contain genetic material used for analysis and quantification by the droplet reader [39] [40].

DDPCR takes between 9-24 hours [46] to work, similar to agar culturing which requires a minimum of 24 hours; DDPCR can be done at Points of Care however this remains costly, and as such this test is often performed in the laboratory [42].

Conclusion
There are a variety of methods that can be utilised for the diagnosis of E. coli O157:H7. Agar culturing is the more universally accepted method due to its high sensitivity and specificity, compared to other methods such as PCR testing. However, agar culturing can be more time-consuming, and considering the impact, bacterial diseases have on our health, a delay in diagnosis can have fatal consequences. Sepsis, when correctly diagnosed, is often initially treated with broad-spectrum antibiotics. Due to the potential for end-organ failure, the need for rapid identification of the causative pathogen remains vital. Advances have been made in the detection of bacterial diseases, including MALDI-TOF-MS, with further research required to bring these practices to mainstream usage.

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Parent comment:
"The Scholars Programme was a great opportunity allowing Yusuf to really understand the depth of understanding and work required for higher education. I think such exposure is really beneficial at this age as it really promotes the right work ethic and a great sense of achievement."

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