Assessment Portfolio

SC1153: Introduction to Biotechnology

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Abstract

This module provided practical exposure to biotechnology concepts while developing essential academic and professional skills through a series of assignments and group activities.

Assignment 1 focused on gold biotechnology, explaining its scientific principles and applications in medical diagnostics, drug delivery, and nanotechnology. Assignment 2 examined biotechnology applications through Colossal Biosciences' de-extinction project, demonstrating how genetic engineering and advanced biotechnology tools may help restore extinct species and support biodiversity conservation. Assignment 3 involved my career' trajectory using a professional role model, which helped in me understanding career opportunities, required qualifications, and long-term professional development within biotechnology-related fields. Assignment 4 included a roundtable discussion on ethical issues, where I analyzed and debated biotechnology-related ethical concerns, strengthening critical thinking and decision-making skills.

In addition to academic knowledge, the module greatly enhanced a range of soft skills. I developed skills in video production and editing, preparing and delivering effective presentations, and designing professional presentation slides. Public speaking practice improved confidence and communication abilities. These activities and assignments also strengthened teamwork and collaboration, as many assignments required group coordination and shared responsibilities. Professional skills such as resume writing, I understood the importance of formal attire, and improving my academic and professional writing skills were also developed. Furthermore, the module improved time management, leadership, problem-solving, creativity, and interpersonal communication, which are essential for both academic success and future employment.

Overall, the module successfully integrated biotechnology knowledge with my professional skill development, helping me become more confident, skilled, and prepared for future academic and career challenges.

Acknowledgements

No achievement stands alone, and these endeavors would not have been possible without the unwavering support of many incredible individuals. I am deeply grateful to everyone who contributed their time, guidance, and encouragement along the way.

First and foremost, I thank my lecturers, especially Mr. Shanitha Mirihana, for their invaluable expertise and mentorship. Your insightful feedback, clear explanations, and belief in my potential shaped my direction in biotechnology and elevated the quality of my work. Lessons from your classes formed the foundation of my success of development in my first semester of the Bachelor's in Biotechnology. I also thank Prof. Colin N. Peiris for helping us deliver an effective presentation and create a great resume.

I extend my heartfelt thanks to my group mates for Assignments 1, 2, and 4. Their collaboration, late-night brainstorming sessions, group meetings, and willingness to divide tasks equally made the workload manageable and the process enjoyable. Together, we turned challenges into triumphs.

I also appreciate the fellowship and motivation from my batch mates. Their shared experiences and helpful discussions during breaks made this module far simpler.

A special note of gratitude goes to my parents, whose love and sacrifices provided the emotional and financial backbone for this journey. Their constant support, whether through motivational talks or practical help with assignments, reminded me why perseverance matters.

Finally, I thank others who played a role: friends for their pep talks, family members for their quiet backing, and peers from other batches for sharing resources. Their collective efforts made these endeavors—and its successful completion—a reality shared by all who helped me.

Contents

Description	Page No.
1. Abstract	1
2. Acknowledgements	2
3. Contents	3
4. Objectives of each assignment	4
5. Assignment 1	5
6. Assignment 2	10
7. Assignment 3	15
8. Assignment 4	19
9. Conclusion	23

Objectives of each assignment

- **The objective of Assignment 1** was to **make school children aware of the different applications of biotechnology**, specifically focusing on different fields of biotechnology, by presenting scientific information in a simple, interesting, and understandable way. The assignment aimed to help students **research major applications of chosen field of biotechnology**, organize information clearly, and communicate scientific ideas effectively through a creative PowerPoint presentation. It also encouraged teamwork, presentation skills, and the ability to explain complex biotechnology concepts to a general audience in an engaging manner.
- For assignment 2: Understand biotechnology applications by studying a real, modern biotech product, while explaining complex scientific ideas to the general public in a simple and clear way. We developed strong research skills by collecting accurate and relevant scientific information, and improved our presentation and communication abilities through creating a video presentation. Additionally, we enhanced teamwork skills by collaborating as a group to plan and produce the video, fostered creativity by presenting information in our own unique style rather than copying existing videos, and built confidence in answering questions from evaluators.
- The objective of assignment 3 was to help students explore possible career pathways in biotechnology by studying the career journey of a professional role model in the field. Through this activity, students aimed to understand the education, skills, experiences, and career decisions that contribute to professional success, helping them plan and shape their own future career paths with clearer goals and direction.
- The objective of assignment 4 was to help students understand the ethical, legal, and social issues related to modern biotechnology by participating in a role-based discussion and decision-making activity. Students were assigned different stakeholder roles, each representing unique interests, concerns, and goals related to a controversial biotechnology development. The purpose was not only to argue a position but to accurately represent different perspectives, negotiate with others, and work toward a group decision or policy outcome. Through this activity, students developed critical thinking, ethical reasoning, communication, and negotiation skills, while learning how biotechnology decisions impact society beyond the scientific laboratory.

Assignment One

Group presentation on a selected area of biotechnology

1.The assignment description

- In Assignment 1, each student group was assigned a specific field of biotechnology, and as **Group 3 was assigned Gold Biotechnology**. The task required the group to prepare and deliver a **PowerPoint presentation highlighting the most important and commonly used applications** within this field. The presentation was designed for **school children**, so the information needed to be clear, simple, engaging, and easy to understand.

- The assignment aimed to help students **translate complex biotechnology concepts into understandable content** while maintaining scientific accuracy. Students were expected to conduct proper research, select the most relevant applications, and present information creatively to capture the attention of young learners. Each group member had to present part of the topic, encouraging equal participation and teamwork.

- The presentation structure included an **interesting introduction** to motivate the audience, a **main body** containing important and lesser-known applications of Gold Biotechnology, and a **conclusion** summarizing key ideas. Students were also required to include **three to four reliable references** used to prepare the presentation.

- In addition to subject knowledge, the assignment helped develop skills in **research, teamwork, slide preparation, public speaking, content organization, creativity, and audience engagement**, while also improving confidence in explaining scientific topics in a simplified and professional manner.

2. My self reflection

During Assignment 1, I learned the importance of **presenting with confidence** while explaining scientific concepts to an audience. I practiced speaking clearly and **keeping my voice loud enough** so everyone in the class could hear and understand the presentation. I also worked on maintaining **good eye contact with the audience**, looking at different members of the class instead of only at the slides, which helped keep the audience engaged and made the presentation more interactive.

One challenging moment during our presentation was when there was a **power cut for a few minutes**, which interrupted the slides. At first, it was unexpected, but I learned how important it is to **stay calm and continue presenting without panicking**. By stopping completely till light come I collected myself, i tried to continue explaining our points after the power returned. This experience taught me how to **regain confidence quickly during unexpected situations** and remain professional even when technical problems occur.

Overall, this assignment improved my **public speaking skills, confidence, teamwork, and ability to handle unexpected challenges**, helping me become more comfortable presenting in front of an audience.

3. Power point slide for the group presentation

Slide 1

GROUP 3

HS25510551 SANULI SAMARASINGHE

HS25510456 SAHANSA BANDARA

HS25510657 ANUSARA SALPADORU

HS25510489 SHRI SHARAN SPELMEN

Slide 2

GOLD BIOTECHNOLOGY

BIG DATA, TINY TOOLS

Slide 3

SCIENCE FICTION...OR FACT?

Slide 4

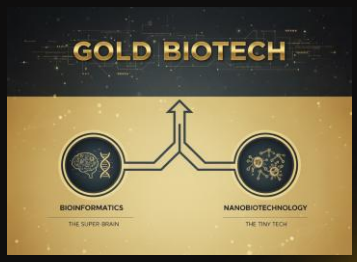
WHAT *IS* GOLD BIOTECHNOLOGY?

Using computational and nanoscale tools to solve biological problems.

"Golden Era"
of
Rapid Development and High Impact

Slide 5

WHAT *IS* GOLD BIOTECHNOLOGY?

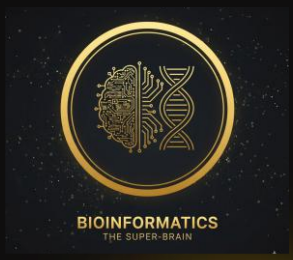


Slide 6

BIOINFORMATICS

Using supercomputers to read, analyze, and understand biological data

- Forensics
- Sequencing and analysing
- Personalised Medicine and Drug Discovery



Slide 7

FORENSICS

The use of scientific methods to resolve questions in criminal and civil law.

Applications:

- DNA Fingerprinting
- Forensics Archaeology

Slide 8

SEQUENCING AND ANALYSING

The use of computers to read the secret instruction code of living things to see what they look like, what they do, and how they have changed over history.

Application:

- DNA Recombinant Technology

Slide 9

PERSONALISED MEDICINE AND DRUG DISCOVERY

Study of tailoring a drug to an individual, depending on their unique data.

Applications:

- Treating cancer patients
- Personlized Proteoformics

Slide 10

NANO BIOTECHNOLOGY

Using tiny tools (like nanoparticles) from nanotechnology to help in biology and medicine

- Drug Delivery
- Advanced Diagnostics

Slide 11

DRUG DELIVERY

Use of nanoparticles to transport drugs to targeted areas in the body with high precision

Advantages

- Targeted Delivery
- Controlled Release

Ex : Liposomes used for chemotherapy

Slide 12

ADVANCED DIAGNOSTICS

Use of nano materials and nanoscale tools to detect diseases faster, earlier and more accurately than traditional methods.

Benefits

- Early Detection
- High sensitivity and specificity

Ex : Gold nanoparticles used in pregnancy and COVID-19 test kits

Slide 13

NOVEL INNOVATIONS

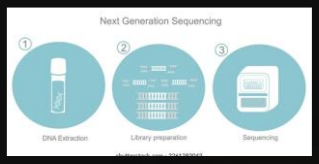
Sprayable Nanofibers for Wound Treatment (spincare wound care system)

Artificial Intelligence (AI) and Machine Learning (ML) in Bioinformatics

Slide 14

NOVEL INNOVATIONS

Gold Nanoparticles (AuNPs) in Drug Delivery for Cancer Treatment



Next generation sequencing (NGS)

Slide 15

TO SUMMARISE...

Using the "Super-Brain" to find the problem... and the "Tiny Tech" to deliver the solution.

Slide 16

THANK YOU

Slide 17

REFERENCE

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Assignment Two

Create a Video to on a Biotechnology Product

1. The assignment description

Assignment Title: Introducing an Exciting New Biotechnology Product

- This group assignment was given to students to do research and present a newly developed product created using biotechnology. The group must create a **10-minute video** that explains the product and its importance to the **general public** in a clear and engaging way.
- The video presentation should include three main parts: **Introduction, Content, and Conclusion**. Each group member must present a portion of the topic individually, and all presentations should be combined into one final video. During the video, each presenter's **face, name, and registration number** must be visible.
- Students must gather information from reliable sources and present the content in their **own words**, avoiding copying from existing online videos. The final video will be presented to academic staff, and group members should be prepared to answer questions from evaluators.

2. Written summary

- **The Product we choose as group 3 is** De-extinction Technology by Colossal Biosciences.
- De-extinction is a modern biotechnology approach that aims to bring back extinct animals using genetic engineering, cloning, and advanced breeding methods. Scientist's study ancient DNA from extinct species and use new technologies to recreate or restore lost species traits. One company leading this effort is **Colossal Biosciences**, which aims to revive animals such as the woolly mammoth using gene-editing techniques.

- **How It Works**

  De-extinction uses biotechnology to revive extinct species by:

1. Recovering ancient DNA.
2. Comparing it with living relatives.
3. Editing genes using tools like CRISPR.
4. Creating an embryo placed in a surrogate mother.
5. Producing offspring with traits of the extinct species.

- This process combines genetics, cloning, and modern biotechnology.
- **Why It Is Important**

  De-extinction technology helps to:
  - Restore lost ecological roles.
  - Improve ecosystem balance.
  - Support endangered species conservation.
  - Advance medical and genetic research.
  - Repair environmental damage caused by humans.
- It shows how biotechnology can help protect nature and biodiversity.

3. Reflection

- I learned that biotechnology is used not only in medicine but also in conservation, disease treatment, agriculture, and environmental restoration. I also understood how technologies like cloning and CRISPR gene editing help solve real-world problems and create new possibilities for the future while raising ethical and environmental discussions.
- The most challenging part was understanding complex biotechnology concepts and explaining them in simple language for the public. Coordinating with group for recording was also difficult and small mistake while editing the video would lead to great problem while presenting the video but I did learn from my mistakes for future videos.

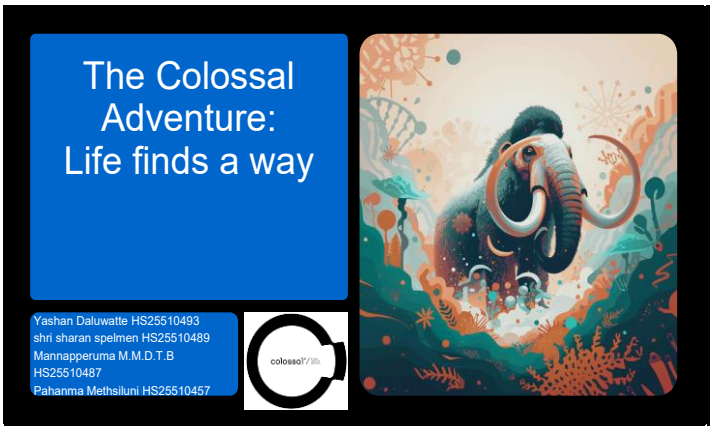
My Contribution to the Video

In our group video, I contributed by:

- Researching information about de-extinction technology.
- Helping prepare presentation slides.
- Presenting my part of the explanation in the video.
- I helped with video editing and organizing content.

4.Group ppt of the video

Slide 1



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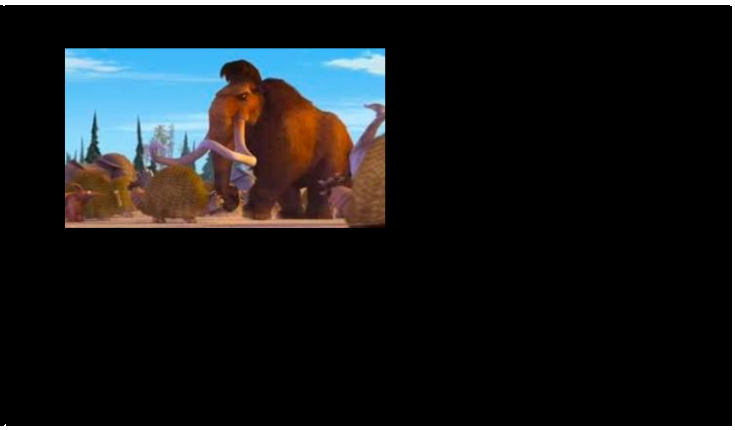

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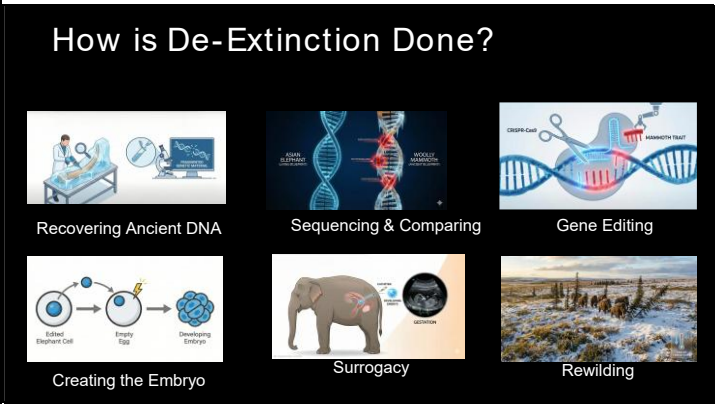
Slide 4



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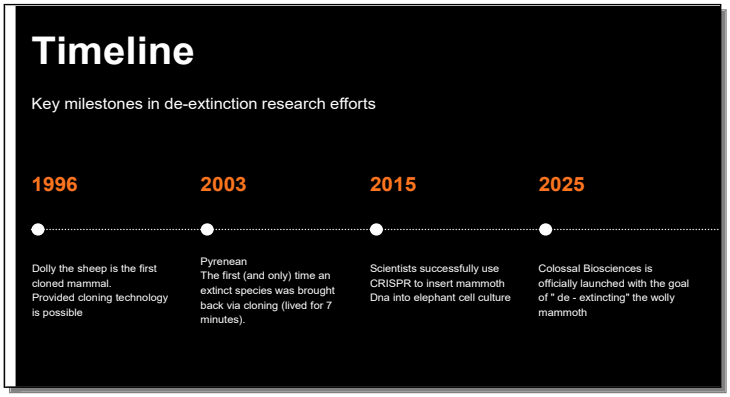
Slide 6



Slide 7

Colossal's Biotech Innovations in De - extinction

HOW IT IS DONE

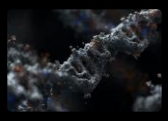
The Process of reviving extinct species through Biotechnology

DIRE WOLF

The most well known example of De-extinction,

TASMANIAN TIGERS

Fixing a historical mistake and revitalizing the ecosystem



WOOLLY MAMMOTH

Bringing back the walking giant

Slide 8

The Dire Wolf

Reviving an Iconic Species Through Innovative Genetic Technology

The Dire Wolf, once considered extinct, has been brought back. It is living proof that De-Extinction is possible.

Slide 9

The Tasmanian Tiger

Fixing what we ended

The Tasmanian Tiger, once considered extinct due to human intervention, is on a path to revival through **cutting-edge de-extinction techniques**, bringing hope for biodiversity restoration.

Slide 10

The Woolly Mammoth

The Woolly Mammoth Project seeks to utilize advanced technology to bring this remarkable species back to life, highlighting the possibilities of biotechnology in reversing extinction.

Slide 11

Why is De-Extinction Important

De-Extinction is important for many reasons.

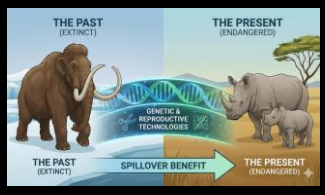
-It restores lost functions
-Stabilizes the climate
-It helps fix human mistakes

Slide 12

Why is De-Extinction Important

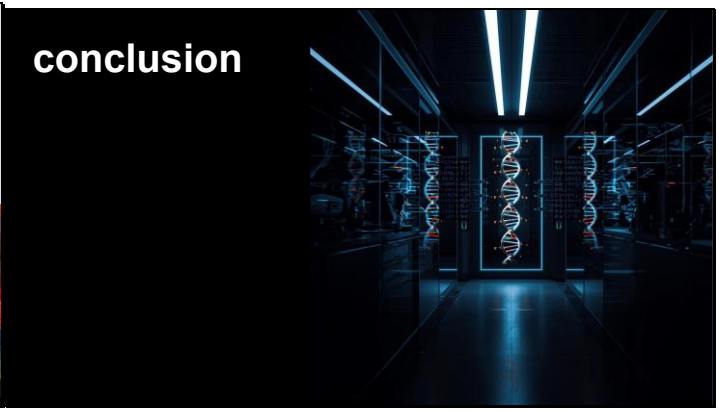
De-Extinction is important for many reasons.

-Spill over technology
-Saving endangered animals
-Curing genetic diseases



Slide 13

Slide 14



Here is the link for the video presentation

https://www.canva.com/design/DAG7qLCXZXg/cPgU1Fwnm8S7Wl3_VK0hNA/view?utm_content=DAG7qLCXZXg&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utlId=he7f7d7c85f

Assignment Three

Career Trajectory

1.Assignment description

- The assignment helps you explore potential biotechnology career paths by studying the career journey of a professional role model in the field. The goal is to understand the knowledge, skills, and experiences required to shape your own career trajectory.

- **Select a Role Model:** Choose a well-known biotech professional (scientist, academic, entrepreneur) who inspires you.
- **Research:** Gather info on their education, career milestones, contributions, skills, and strategies for success.
- **Career Trajectory:** Reflect on your goals. Outline **short-term, medium-term, and long-term** steps, including skills and experiences you need.
- **Deliverable:** 4-minute presentation covering:
    - Introduction of your role model
    - Summary of their career and achievements
    - Your career plan inspired by them
    - Reflection on what you learned about career planning

2. Reflection

- Studying **Frederick Sanger** as a role model has shown me the power of curiosity, perseverance, and precision in scientific research. Sanger's groundbreaking work in sequencing proteins and DNA revolutionized biotechnology and earned him **two Nobel Prizes**, demonstrating how careful, methodical research can create lasting impact.
- I was particularly fascinated by his work on **determining the amino acid sequence of insulin**, which was the first protein to be fully sequenced. Understanding how he decoded the building blocks of life inspired me, as it combines logic, attention to detail, and creativity—skills I hope to develop in my own biotech journey.
- What I found inspiring is his dedication to solving complex problems step by step and not alla t once , his focus on accuracy, and his humility despite enormous achievements. This assignment helped me realize that a successful career in biotechnology requires not only technical knowledge but also critical thinking, patience, and a commitment to ethical research practices.
- Reflecting on Sanger's career has motivated me to **plan my own path** in biotechnol carefully: building a strong foundation in molecular biology, pursuing research opportunities, and developing problem-solving skills. It taught me that innovation comes from dedication, curiosity, and the willingness to push the boundaries of knowledge.

3.My presentations- Career Trajectory

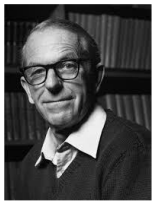
Slide 1

My Career Pathway

In biotechnology

Shri sharan
HS25510489

Slide 2



Frederick Sanger

Frederick Sanger

- Frederick Sanger was a groundbreaking british biochemist and molecular biologist renowned for determining the amino acid sequence of insulin and developing methods for DNA sequencing.
- Pioneer of DNA sequencing technology
- One of the founders of modern genomics
- I picked him because his work laid the foundation for biotechnology research

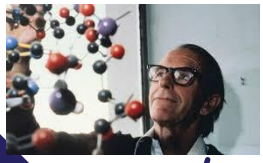
Slide 3

• Educational Background & Career Journey

- Early Schooling: Attended Bryanston School (1932-1936).
- Undergraduate (Cambridge): St. John's College, Cambridge, B.A. in Natural Sciences (1939).
- Postgraduate (Cambridge): Pursued a Ph.D. in Biochemistry, focusing on lysine metabolism under supervision from Albert Neuberger.
- Doctorate: Awarded Ph.D. in 1943.
- After his doctorate, he worked at Cambridge, initially on the structure of insulin, a pivotal protein.

Slide 4

Career Milestones



- Developed methods to determine amino acid sequences of proteins
- first for determining the amino acid sequence of insulin (proving proteins have definite sequences) using chemical labeling and chromatography

Slide 5

1958

1980

- later developed Sanger DNA sequencing method Invented Sanger sequencing, a method to read DNA sequences
- His technique enabled:
  - Human Genome Project
  - Genetic disease diagnosis
  - Genetic engineering
  - Bioinformatics development
- Awarded two Nobel Prizes in Chemistry (1958 & 1980)

Slide 6

My Career Interests in Biotechnology

- I have a strong interest in research-based biotechnology like senior researcher scientists.
- Fascinated by genetics, molecular biology, and genomics
- Motivated to understand biological systems at the molecular level to make unique discovery.
- I was inspired by how basic research leads to major scientific breakthroughs

Slide 7

Slide 8

4. Photos

Assignment Four

The acceptance and Ethical issues on selected topics

1.The assignment description

In this assignment, students take on the role of a **stakeholder** involved in a controversial biotechnology issue and debate policy decisions from that character's perspective. The goal is not just to argue, but to **accurately represent stakeholder interests** and help shape a policy outcome.

There were few responsibilities given as

1. Pre-Roundtable Research

Each student submits a **one-page Position Paper** including:

- Stakeholder's **primary goal**
- **Scientific justification** with references
- **Ethical framework** (e.g., utilitarianism, rights, precautionary principle)

2. Live Roundtable Session

Three parts:

- **Act I: Opening Statement** – Introduce role and main position.
- **Act II: Crosstalk Discussion** – Debate, respond to others, and try to find compromise.
- **Act III: Policy Proposal** – Group writes a consensus statement or records dissenting opinions.

Students select roles from the Discussion Roles document.

2.Reflection

Participating in the discussion on **Genetic Privacy and Law Enforcement round table discussion** helped me understand how biotechnology affects not only science but also personal rights and public safety. The topic made me think carefully about the balance between solving crimes and protecting individual privacy.

One challenge was understanding both sides of the debate as I was genetic counselor. While DNA databases can help identify criminals and bring justice to victims, they also raise concerns about privacy and consent, especially when people's genetic information is used without their knowledge through relatives' data. As genetic counselor in was nor for or against the topic.

Through this activity, I learned that biotechnology policies are complex and require careful consideration of ethical, legal, and social impacts. Working with my group improved my ability to listen to different opinions and discuss sensitive issues respectfully while trying to reach common ground.

Overall, this assignment helped me see how important it is to create laws that protect both public safety and personal privacy as biotechnology continues to advance.

3.Position Paper for Round Table Discussion

as Summary of my part spoken

HS25510489_ Shri Sharan

Title

Should Law Enforcement Be Allowed to Use Consumer DNA Data to Track Down Suspects via Their Relatives?

Introduction

The use of DNA information from consumer genetic testing services by law enforcement seeks access to these databases to solve crimes has sparked intense debate at the crossroads of science, ethics, privacy, and the justice system. As commercial DNA testing companies have expanded, millions of individuals have willingly shared their genetic data for reasons such as exploring ancestry, finding their ethnicity and tracing family history. **genetic counselors have become increasingly involved in advising on the interpretation and ethical use of such genetic information.** While DNA technology has proven highly effective in identifying suspects in long-standing cold cases, its use raises serious concerns about consent, privacy, and the rights of innocent family members.

Thesis Statement

Law enforcement use of consumer DNA databases is ethically defensible only in rare, tightly regulated cases involving the most serious crimes. In routine regulated use would risks to privacy, consent, and public trust outweigh the benefits.

Background

Consumer DNA databases from ancestry tests raise forensic concerns due to missing consent for law enforcement use. Genetic counselors explain investigative genetic genealogy (IGG), using partial matches to map family trees and aid investigations, while highlighting risks like data misinterpretation and family impacts. They stress informed consent, privacy, and **psychosocial effects.**

Argument: Genetic Counselor's Perspective

Scientific Justification

Law enforcement uses **Investigative Genetic Genealogy (IGG)** to identify partial DNA matches and construct family trees that may lead to suspects. While this method has successfully solved cases like the Golden State Killer, it does not directly identify individuals and can involve many innocent relatives. Consumer DNA databases were not designed for forensic use and may lack the standards and safeguards of official forensic databases. Genetic counselors emphasize that DNA evidence is probabilistic and must be interpreted cautiously alongside other evidence.

Ethical and Privacy Concerns

This position is guided primarily by **individual rights** and the **precautionary principle**. Individuals have a right to control how their genetic information is used, and it is ethically problematic to implicate family members who never consented to law enforcement involvement. Because genetic data is permanent and shared among relatives, misuse can result in long-term **psychological,** social, and legal harm. While utilitarian arguments highlight public safety benefits, genetic counselors stress that these benefits must not come at the expense of fundamental privacy rights.

Legal and Policy Considerations

Governments are implementing robust regulations and specific procedure to govern law enforcement access to consumer DNA databases for forensics misuses. Genetic counselors advocate introduce policies to prioritizing informed consent, judicial oversight, and transparency. These ensure privacy protection and public trust while balancing crime-solving benefits.

Conclusion

DNA **absolutely can solve crimes**, but the ethical question is about how far society should go in allowing the harvesting, storage, and use of genetic data—especially when it affects people who have **never been suspected of a crime**. DNA technology should be used with caution and strict oversight. Law enforcement access to consumer DNA databases should remain limited to involving serious crimes

4.Photos of me speaking in the Debate

Conclusions

In Conclusion What I Learned from this Module

This module has taught me a lot about biotechnology, both scientifically and professionally. Through the assignments, I learned **how biotechnology impacts society**, from ethical debates about human germline editing and genetic privacy to understanding how innovations like CRISPR can transform medicine. Researching and presenting my **role model, Frederick Sanger**, helped me appreciate the dedication, curiosity, and problem-solving skills required for a successful biotech career.

Creating this **portfolio** was especially valuable, as it encouraged me to organize my work even though not much pictures to show, reflect on my learning, and connect different topics across the module. Overall, this module has not only deepened my understanding of biotechnolgy concepts but also improved my **research style, communication in confident , and career planning skills**, which will guide me in my future studies and professional path.