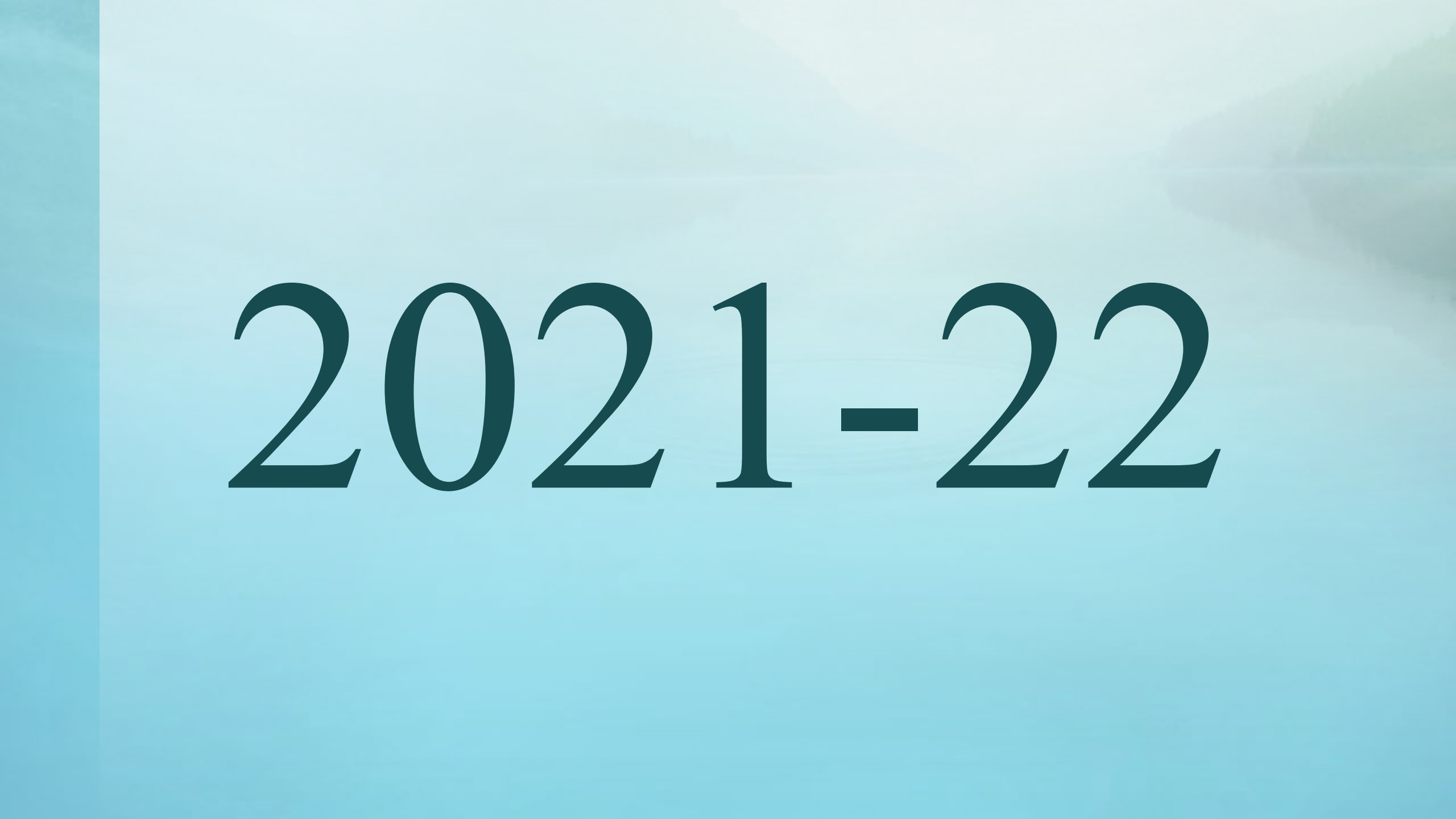




STEM Education at SKHBBSS



2021-22

24th Hong Kong Youth Science and Technology Innovation Competition 2021-2022

Our students achieved an outstanding result in the 24th Hong Kong Youth Science and Technology Innovation Competition 2021-2022, which was organized by Hong Kong New Generation Cultural Association. Our team members included 3A CHAU Hei-lam Zoe, 3D PANG Sze-yan and 3D CHU Chi-to. Dr. CHAN Kwok-keung was their mentor.



International Junior Science Olympiad 2022 - Hong Kong Screening

This was our fourth participation for the competition. 3A Chau Hei-lam Zoe won the first class honour (4.5% in HK), 3A Wong Shing-hei won the second class honour (9.7% in HK), 3B Chan Sum-leong and 3C Yeung Yu-ching both won the third class honour (18.0% in HK). Congratulations to the students, and many thanks to our teachers Mr. Chan Kin-man, Mr. Chan Tsz-man, Dr. Chan Kwok-keung and Mr. Chan Lok-hin.





Gifted Education Satellite Centre (GESC)

Our school and the Hong Kong Academy for Gifted Education co-organized a Biotechnology Course (Level III): Trends in Modern Biotechnology (I) (E3BTE001C) in December 2021. Target participants were S3 – S6 HKAGE student members and our students with priority. Our biology teacher, Dr. Chan Kwok-keung was the instructor of this courses

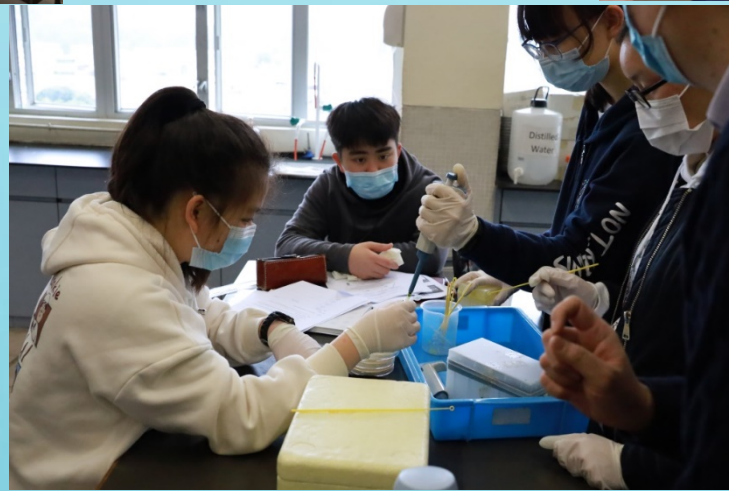
Session	Date	Time	Venue*
1	11 Dec	9:00 a.m. – 12:00 noon	Classroom 406
2	18 Dec		Classroom 406
3	23 Dec		Biology Laboratory
4	28 Dec		Biology Laboratory
5	29 Dec		Classroom 406
6	31 Dec		Biology Laboratory



香港資優教育學苑
The Hong Kong Academy for Gifted Education

Gifted Education Satellite Centre (GESC)

Trends in Modern Biotechnology I (E3BTE001C)



EMSD *School Outreach Exhibition*

To facilitate students in choosing energy-efficient appliances and raise their awareness on energy efficiency and conservation, Mr. Chan Tsz-man of physics had arranged School Outreach Exhibition provided by EMSD.

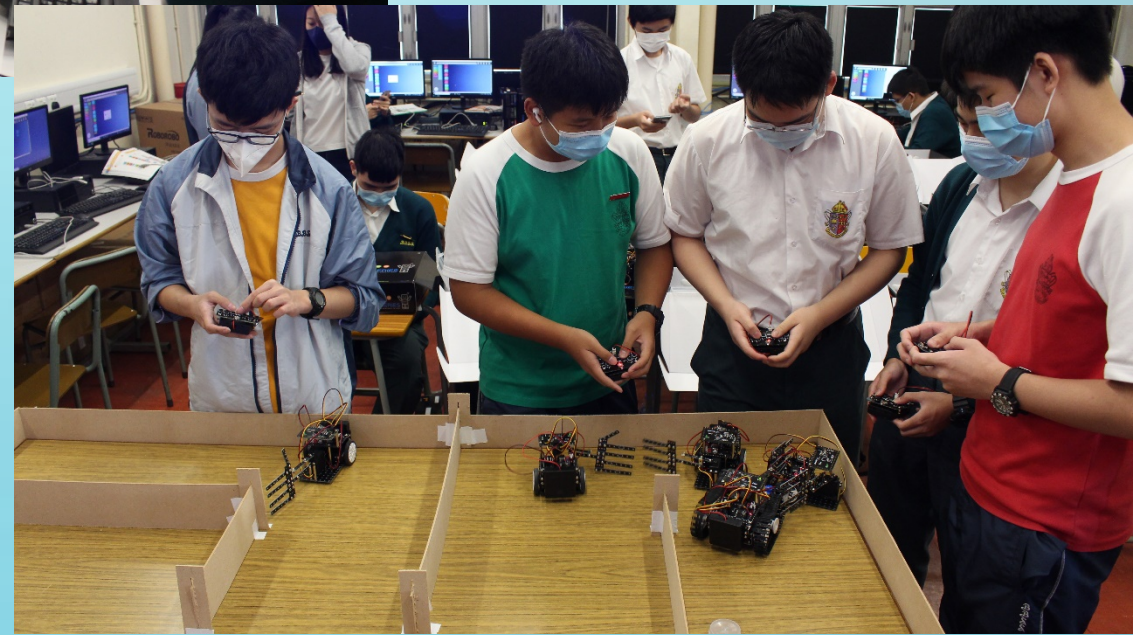
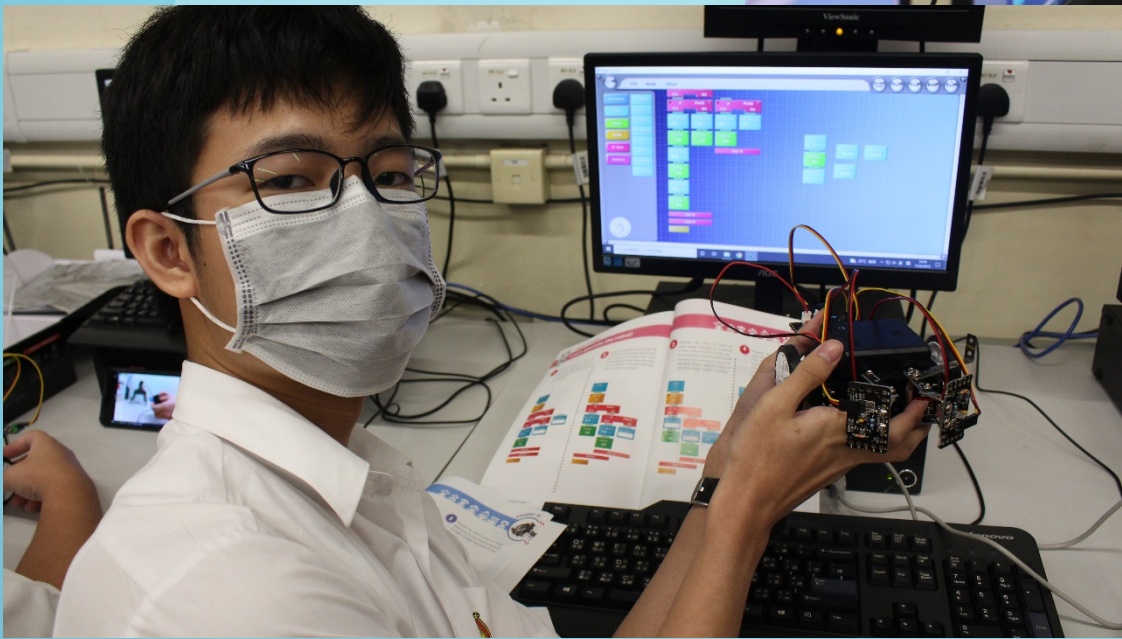


QEF *Project: Robotic arm*

This project aims to establish a robotic arm laboratory and related STEM courses, covering from theory to practical applications. This project was demonstrated at Learning & Teaching Expo 2021.



16-hours workshop for smart car organized by Mi Teen Academy



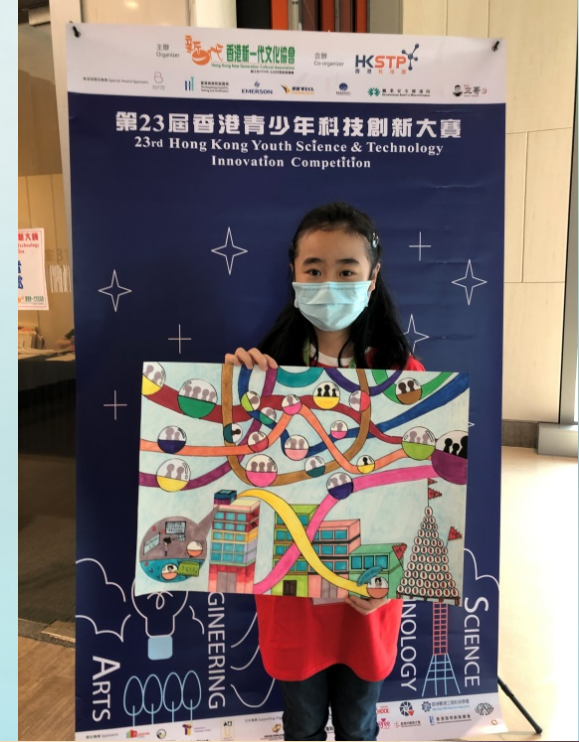


2020-21

23rd Hong Kong Youth Science and Technology Innovation Competition 2020-2021

Our student achieved an outstanding result in the 23rd Hong Kong Youth Science and Technology Innovation Competition 2020-2021 which was organized by Hong Kong New Generation Cultural Association.

2C Chiang Cheuk-ting successfully won the Science Friction Drawing (Secondary Division) 3rd Place Grand Award. The Drawing Title was “Shuttle Ball”, and Dr. Chan Kwok-keung was her mentor.





2021大灣區STEM卓越獎 (香港區)

The Greater Bay Area STEM Excellence Award 2021 (HK)

Our students achieved an outstanding result in the Greater Bay Area STEM Excellence Award 2021 (HK) which was organized by Hong Kong New Emerging Technology Education Association.

3A Yeung Peony, 3C Zeng Meng-qiu, 3B Li Nicole successfully won the Science Lab Stream Secondary (Junior) School Merit Award. Dr. Chan Kwok-keung was their mentor.





2021大灣區STEM卓越獎 (香港區)

The Greater Bay Area STEM Excellence Award 2021 (HK)

Our students achieved an outstanding result in the Greater Bay Area STEM Excellence Award 2021 (HK) which was organized by Hong Kong New Emerging Technology Education Association.

4C Wong Yat-ching, 4B Wu Sau-ying Zoe, 4D Yau Josh, 4D Hou Chin-pang successfully won the Science Lab Stream Secondary (Senior) School Merit Award. Dr. Chan Kwok-keung was their mentor.



The 14th Hong Kong Budding Scientists Award

Our students achieved an outstanding result in the 14th Hong Kong Budding Scientists Award (HKBSA) competition which was co-organized by the Gifted Education Section of the Education Bureau and the Hong Kong Association for Mathematics and Science Education. Team members included 4C Wong Yat-ching, 4B Wu Sau-ying Zoe, 4D Yau Josh, 4D Hou Chin-pang. Dr. Chan Kwok-keung was their mentor.

The research theme of their investigation was 'Inhibitory potential of natural flower teas for management of diabetes'. They explored, investigated and experimented the hypothesis, and finally won the Champion Award in HKBSA competition. In addition, our report on an interview with a scientist (Prof. Joseph JY Sung) also won the Reporter Award.



Solar Harvest – Energy Support Scheme

We have joined the “Solar Energy Support Scheme” coordinated by Solar Harvest and Electrical and Mechanical Services Department. The system has been successfully installed and is generating electricity. This scheme promotes renewable energy while the electricity generated reduces the fee of our school. It is also part of our Integrated Science curriculum which is a good experience of STEM knowledge application.





2019-20

22nd Hong Kong Youth Science and Technology Innovation Competition 2019-2020

Our students achieved an outstanding result in the 22nd Hong Kong Youth Science and Technology Innovation Competition 2019-2020 which was organized by Hong Kong New Generation Cultural Association. Our team members included 2A Yeung Peony, Zeng Meng-qiu, Li Nicole and Dr. Chan Kwok-keung as their mentor.

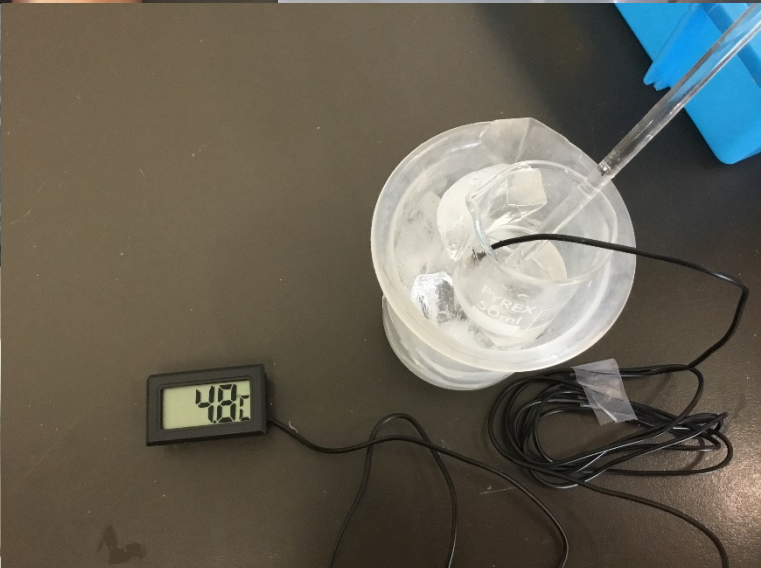
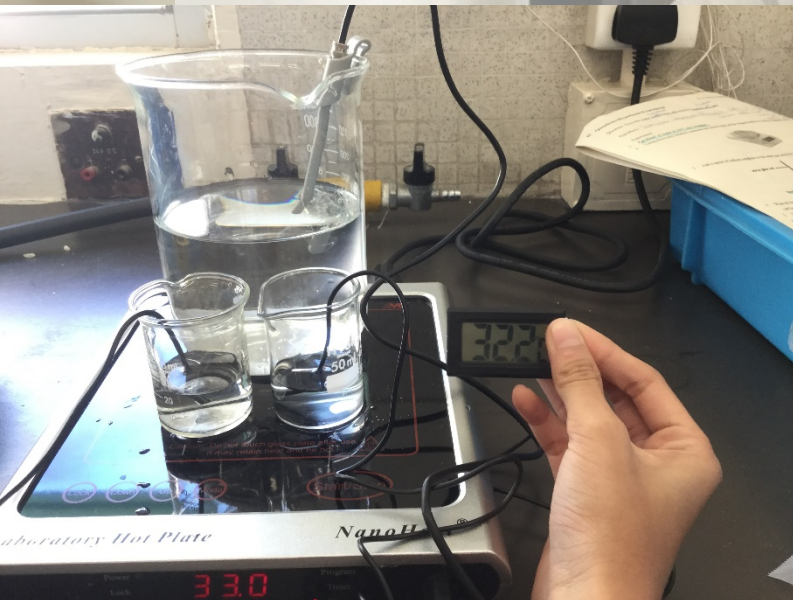
The research theme of their investigation was 'Synthesis and characterization of degradable bioplastic from chitosan and starch'. Having explored, investigated and experimented the hypothesis, they were lucky to be selected as one of the 7 teams entering the final competition. Finally, our school successfully won the Energy and Environmental Science (Junior Secondary Division) 3rd Place Grand Award.





2018-19

Scientific Investigations in I.S. lessons – Solubility



Good Mentor Scheme



*Diversity Learning Day – Visit to STEM and VR
Education Centre*



Diversity Learning Day – Visit to STEM and VR Education Centre



What is DNA?

DNA (deoxyribonucleic acid) is the hereditary material in humans and almost all other organisms. It carries genetic information which instructs a cell what to do. Nearly every cell in a person's body has the same DNA. Most DNA is located in the cell nucleus.

Base pairs: Adenine Thymine, Guanine Cytosine

Sugar phosphate backbone

let me find the answer.

All that genetic information is stored in DNA within a simple code. It's made up of molecules known as bases: cytosine (C), guanine (G), adenine (A), and thymine (T). These four bases are like words in a special language, which can be arranged like sentences into thousands of sequences.

Original DNA

Original DNA strands pieced apart

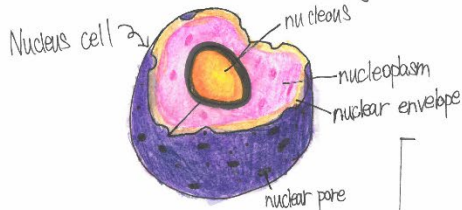
Thank you!

STEM Poster Competition

The functions and structure of DNA

What is DNA?

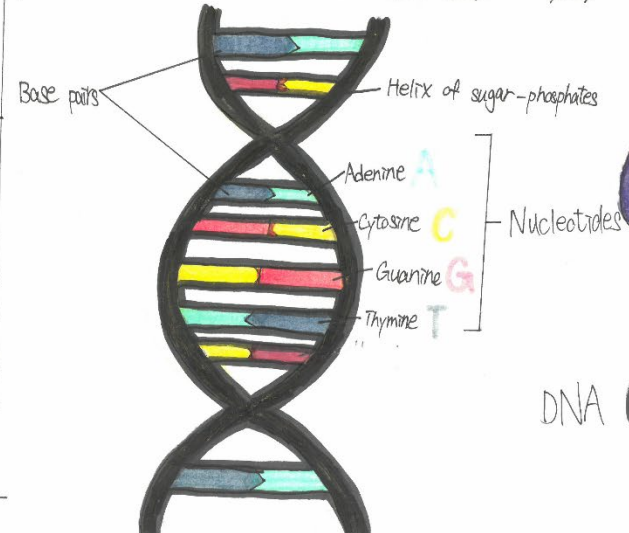
- Deoxyribonucleic acid
- It is found inside the nucleus of a cell
- It is a double stranded molecule that is twisted into a **Helix** (螺旋) (Spiraling Staircase)



Structure of DNA

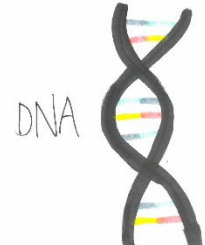
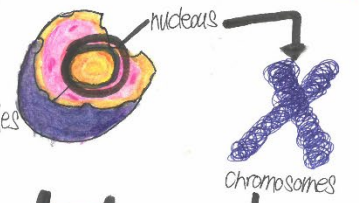
- The structure of the double helix is somewhat like a ladder
- With the base pairs forming the ladder's rungs and the sugar and phosphate molecules forming the vertical sidepieces of the ladder
- DNA can replicate accurately so that the same genetic information can be passed to new cells

DNA



functions of DNA:

- DNA has two functions:
 - Hold information on how to make proteins
 - Make more DNA
 - Main function of DNA
 - Store genetic information
- The information that DNA stores is how, when and where to make proteins.
- Genes are sections of DNA that have the information for how to build one protein
- DNA is the molecule of heredity
- The second function of DNA is to make more DNA, this is called **replication**



STEM Workshop for P6 – Forensic science



STEM Workshop for primary 5 – Food tests



STEM Visit to Shenzhen, HKUST and BYD



STEM *Visit to Shenzhen, HKUST and BYD*



STEM *Tour to Korea*



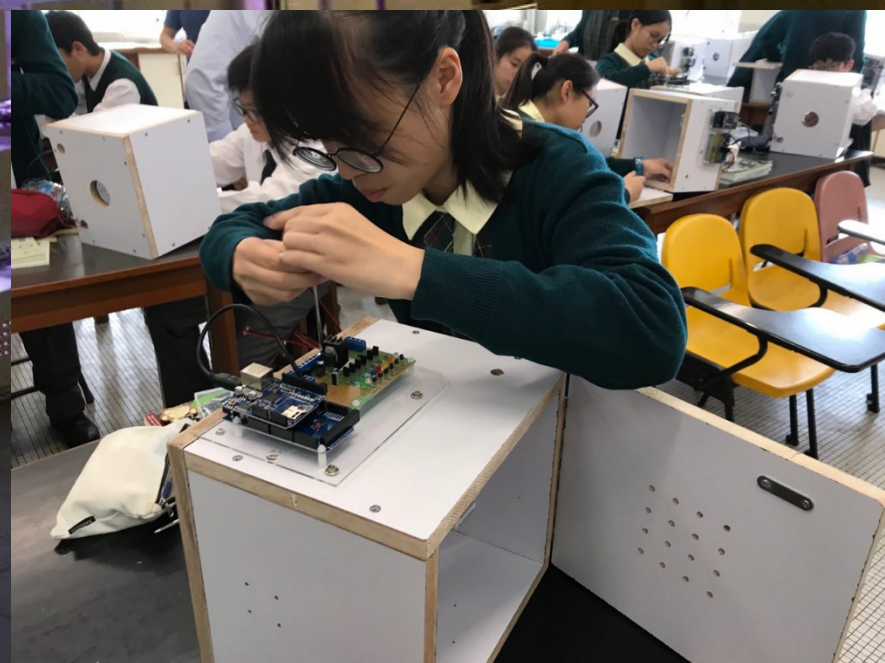
Exhibition at Ling Oi Primary School



QEF Project : Controlled Environment Agricultural System



QEF Project : Controlled Environment Agricultural System



STEM Competition – Solar cooker



International Junior Science Olympiad 2019 - Hong Kong Screening

3A Wong Yat-long and 3D Chiu Sum-yi won 3rd honor rewards in International Junior Science Olympiad 2019 – Hong Kong Screening.



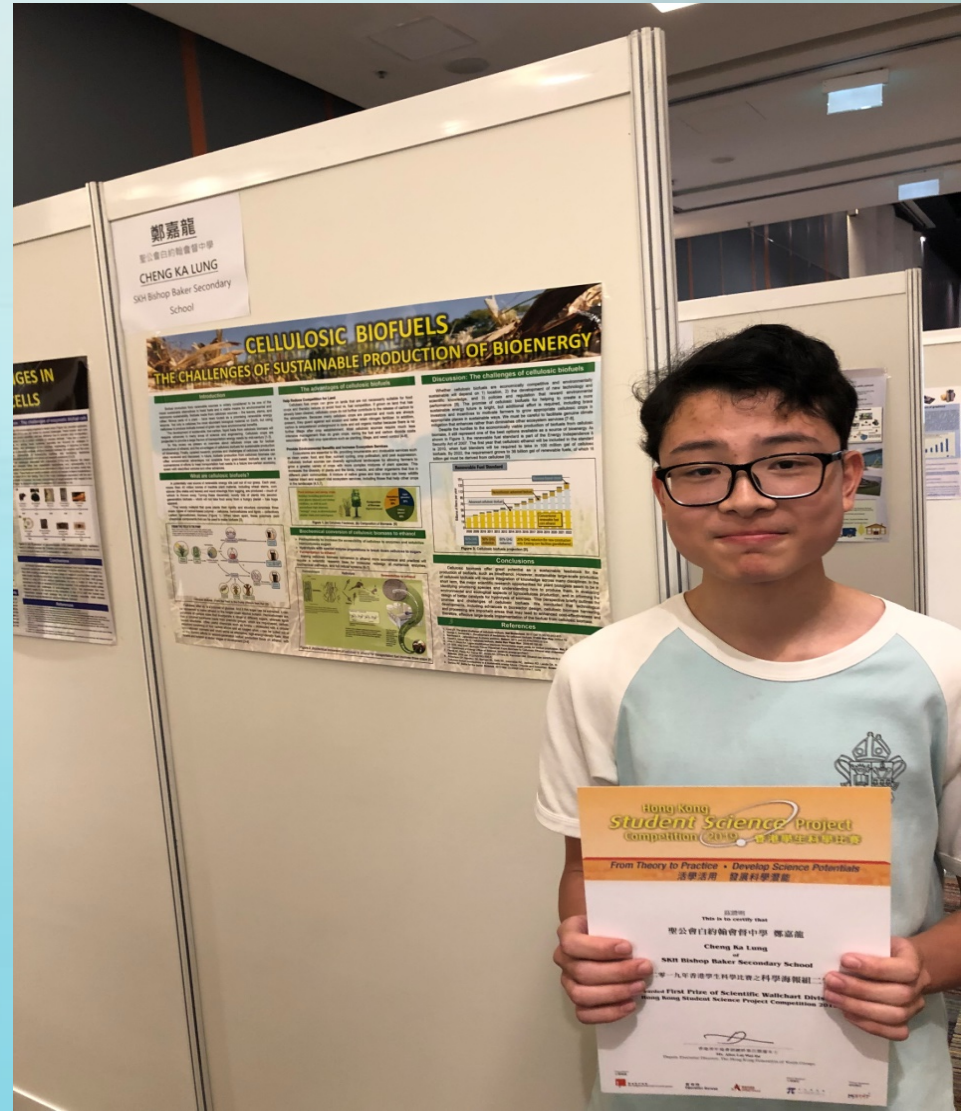
Hong Kong Youth Science and Technology Innovation Competition 2018-2019

3A Wong Yat-long, 3B Wong Cheuk-man and 3D Chiu Sum-yi won the Biology and Health (Junior Secondary Division) Merit award in Hong Kong Youth Science and Technology Innovation Competition 2018-2019.



Hong Kong Student Science Project Competition 2019

4C Cheng Ka-lung won the Scientific Wallchart Division Second Prize in Hong Kong Student Science Project Competition 2019.



Hong Kong Student Science Project Competition 2019

鄧凱嵐
聖公會白約翰會督中學
CHOW HOI LAAM
SKH Bishop Baker Secondary
School

ARTIFICIAL PHOTOSYNTHESIS: DIRECTLY CREATING FUEL FROM SUNLIGHT

Introduction

Over 40 years ago, photosynthesis was discovered to be the most efficient way to produce energy from sunlight. It is a natural process that converts solar energy into chemical energy through the use of photosynthetic organisms. This process is the basis of life on Earth and is a key component of the global carbon cycle. However, the efficiency of natural photosynthesis is relatively low, and it is difficult to control and scale up for industrial purposes. Artificial photosynthesis aims to overcome these limitations by using synthetic materials and processes to convert sunlight directly into fuel.

Artificial Photosynthesis Processes

1. Light absorption
2. Charge separation
3. Electron transport
4. Proton pumping
5. Water splitting
6. Carbon fixation

Challenges and Future Prospects

Artificial photosynthesis faces several challenges, including low efficiency, high cost, and the need for complex materials and processes. However, recent advances in nanotechnology and materials science have opened up new possibilities for improving the efficiency and scalability of artificial photosynthesis. Future research should focus on developing more efficient light absorbers, charge separators, and catalysts, as well as integrating artificial photosynthesis with renewable energy sources and industrial processes.

Conclusions

Artificial photosynthesis is a promising technology for producing clean, renewable energy and chemical fuels. While there are still many challenges to overcome, the potential benefits are significant. Continued research and development in this field are essential for realizing the full potential of artificial photosynthesis as a sustainable energy source.

References

1. Nature, 2010, 463, 632-637
2. Science, 2011, 333, 1510-1515
3. Energy Environ. Sci., 2012, 5, 7173-7179
4. ChemSusChem, 2013, 6, 1021-1024
5. Nat. Mater., 2014, 13, 1017-1023
6. Energy Environ. Sci., 2015, 8, 1021-1024
7. Nat. Commun., 2016, 7, 1021-1024
8. Energy Environ. Sci., 2017, 10, 1021-1024
9. Nat. Rev. Mater., 2018, 3, 1021-1024
10. Energy Environ. Sci., 2019, 12, 1021-1024

鄭嘉龍
聖公會白約翰會督中學
CHENG KA LUNG
SKH Bishop Baker Secondary
School

CELLULOSIC BIOFUELS THE CHALLENGES OF SUSTAINABLE PRODUCTION OF BIOENERGY

Introduction

Biofuel production from renewable sources is widely considered to be one of the most sustainable alternatives to fossil fuels. Cellulosic biofuels, derived from agricultural and industrial waste, offer a promising pathway to sustainable energy. However, the production of cellulosic biofuels is currently limited by several challenges, including high costs, low yields, and the need for advanced technologies. This project explores the challenges of sustainable production of bioenergy and proposes solutions to overcome these obstacles.

The Advantages of Cellulosic Biofuels

Cellulosic biofuels offer several advantages over fossil fuels. They are renewable, sustainable, and have a lower carbon footprint. Additionally, they can be produced from waste materials, reducing the need for virgin resources. Cellulosic biofuels also offer a higher energy density and are compatible with existing infrastructure.

Discussion: The Challenges of Cellulosic Biofuels

The production of cellulosic biofuels is currently limited by several challenges. These include high costs, low yields, and the need for advanced technologies. The main challenges are:

- 1. Feedstock availability: Cellulosic biofuels require a large amount of feedstock, which is currently limited by land availability and competition with food crops.
- 2. High costs: The production of cellulosic biofuels is currently very expensive due to high energy requirements and low yields.
- 3. Low yields: The conversion of cellulose to biofuels is currently very inefficient, resulting in low yields.
- 4. Need for advanced technologies: The production of cellulosic biofuels requires advanced technologies, such as genetic engineering and biorefinery, which are still in the early stages of development.

What are Cellulosic Biofuels?

Cellulosic biofuels are a type of biofuel that is produced from cellulose, a complex carbohydrate found in plant cell walls. Cellulose is the most abundant organic polymer on Earth and is a major component of the cell walls of plants. Cellulosic biofuels are produced through a process called cellulosic ethanol production, which involves the conversion of cellulose into glucose and then into ethanol.

Biological Conversion of Cellulosic Biomass to Ethanol

The biological conversion of cellulosic biomass to ethanol involves several steps:

1. Feedstock collection: Cellulosic biomass is collected from agricultural and industrial waste.
2. Pretreatment: The biomass is pretreated to break down the cell wall structure and make it more accessible to enzymes.
3. Hydrolysis: The pretreated biomass is hydrolyzed into glucose using enzymes.
4. Fermentation: The glucose is fermented into ethanol by yeast.
5. Distillation: The ethanol is distilled to separate it from the water and other components.
6. Dehydration: The ethanol is dehydrated to produce anhydrous ethanol, which can be used as a biofuel.

Conclusions

The production of cellulosic biofuels is a promising technology for sustainable energy. However, there are still many challenges to overcome, including high costs, low yields, and the need for advanced technologies. Continued research and development in this field are essential for realizing the full potential of cellulosic biofuels as a sustainable energy source.

一等獎

馬偉健
聖公會白約翰會督中學
MA WAI KIN
SKH Bishop Baker Secondary
School

RECENT ADVANCES AND CHALLENGES IN BODY-INTEGRATED BIOFUEL CELLS

Introduction

Body-integrated biofuel cells (BIFCs) are a type of biofuel cell that is designed to be implanted in the body to provide a continuous and sustainable source of energy. BIFCs have the potential to revolutionize the way we think about energy storage and delivery, particularly in the context of medical implants and wearable devices. This project explores the recent advances and challenges in the development of BIFCs.

Recent Advances in Body-Integrated Biofuel Cells

Recent advances in BIFCs have focused on improving the efficiency, stability, and biocompatibility of these devices. Key developments include:

- 1. Improved catalysts: The use of nanostructured catalysts has significantly improved the efficiency of BIFCs.
- 2. Biocompatible materials: The development of biocompatible materials has enabled BIFCs to be implanted in the body for long periods of time.
- 3. Self-healing capabilities: The incorporation of self-healing materials has improved the stability and longevity of BIFCs.
- 4. Wireless power transfer: The development of wireless power transfer technologies has enabled BIFCs to be recharged without the need for external wires.

Challenges of Enzymatic Biofuel Cells

Enzymatic biofuel cells (EBFCs) are a type of BIFC that uses enzymes as catalysts. While EBFCs offer several advantages, such as high efficiency and biocompatibility, they also face several challenges:

- 1. Enzyme stability: Enzymes are sensitive to environmental conditions, such as pH and temperature, which can affect their activity and stability.
- 2. High cost: Enzymes are currently very expensive, which makes EBFCs difficult to scale up for commercial applications.
- 3. Limited substrate range: Enzymes typically only catalyze a narrow range of reactions, which limits the range of substrates that can be used in EBFCs.

Conclusions

Body-integrated biofuel cells are a promising technology for providing a continuous and sustainable source of energy. While there are still many challenges to overcome, the potential benefits are significant. Continued research and development in this field are essential for realizing the full potential of BIFCs as a sustainable energy source.

References

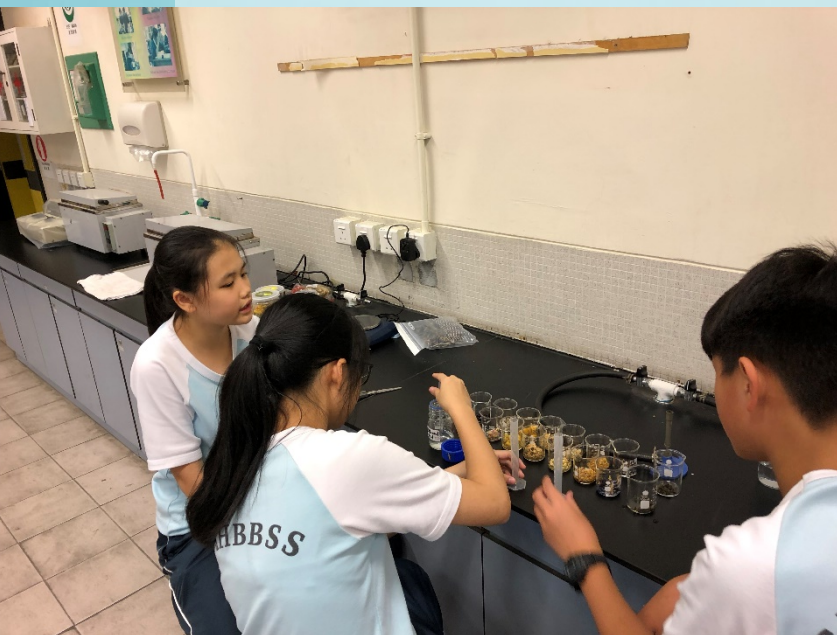
1. Nature, 2010, 463, 632-637
2. Science, 2011, 333, 1510-1515
3. Energy Environ. Sci., 2012, 5, 7173-7179
4. ChemSusChem, 2013, 6, 1021-1024
5. Nat. Mater., 2014, 13, 1017-1023
6. Energy Environ. Sci., 2015, 8, 1021-1024
7. Nat. Commun., 2016, 7, 1021-1024
8. Energy Environ. Sci., 2017, 10, 1021-1024
9. Nat. Rev. Mater., 2018, 3, 1021-1024
10. Energy Environ. Sci., 2019, 12, 1021-1024

Hong Kong Student Science Project Competition 2019

2A Wong Yat-ching, 2A Wu Sau-ying ZOE, 2A Hou Chin-pang and 2A Yau Josh won Junior Division Investigation Best Newcomer Award in Hong Kong Student Science Project Competition 2019.



Hong Kong Student Science Project Competition 2019



Hong Kong Budding Scientists Award 2018/19

Secondary Section

3A Wong Yat-long, 3B Wong Cheuk-man, 3B Cheung Chit-hei, 3C Li Yan-ho and 3D Chiu Sum-yi won the 2nd Runner-up in Hong Kong Budding Scientists Award 2018/19 Secondary Section.



Hong Kong Budding Scientists Award 2018/19

Secondary Section



Future Engineer Project 2019

12 students, from S2 to S4, participated in the Future Engineer Project 2019 hosted by EDB, and promoted to the final stage.



Reading to learn

科學

We subscribe the journal “Science” from HKUST for all S1 and S2 students.

