様式 A-1
(FY2024)

2024 年 11 月 18 日

サイエンス・ダイアログ　実施報告書

1. 学校名・実施責任者氏名：兵庫県立神戸高等学校　向江　達也

2. 講師氏名：Dr. Sinjan DAS

3. 講義補助者氏名：高橋　俊太郎　准教授

4. 実施日時：2024 年 11 月 12 日（火）　12 ： 40　～　14 ： 40

5. 参加生徒：　1 年生　36 人
   備考：総合理学・探究部の生徒 40 名を対象とし、当日 4 名欠席

6. 講義題目：A Deep Dive into DNA World: Formation, Function, and Future

7. 講義概要：細胞周期を統制する核酸の四重らせん構造形成の定量的解析と機能制御

8. 講義形式：
   ☒対面 ・ □オンライン （どちらか選択ください。）
   1) 講義時間　90　分　　質疑応答時間　10　分

   2) 講義方法（例：プロジェクター使用による講義、実験・実習の有無など）
      パワーポイント使用による講義、教材データ共有、カードを使用した活動、発光実験の実物を提示

   3) 事前学習
      有 ・ ㊙ （どちらかに〇をしてください。）
      使用教材

9. その他特筆すべき事項：
   生徒の英語力に配慮した講義の進め方で、安心して受講できましたた。普段の学習内容をはるかに超えた科学的内容を学ぶにあたり、カードゲームなどの活動を取り入れることで、生徒の興味・関心が自然に、スムーズに、発展していくきっかけになったと思います。
   今回は講義補助者の方もきていただき、本校の生徒像や普段の活動などについてもお話しすることができたので、高大連携の強化にも繋がる実り多き講義の時間となりました。どうもありがとうございました。

SD4512

Form B-2
(FY2024)
Must be typed

Date（日付）19/11/2024
（Date/Month/Year：日/月/年）

Activity Report -Science Dialogue Program-
（サイエンス・ダイアログ 実施報告書）

- Fellow's name（講師氏名）: Sinjan DAS （ID No. P24037 ）

- Name and title of the lecture assistant（講義補助者の職・氏名）
Shuntaro TAKAHASHI, Associate Professor

- Participating school（学校名）: Hyogo Prefectural Kobe High School

- Date （実施日時）: 12/11/2024 （Date/Month/Year:日/月/年）

- Lecture title（講義題目）:
A Deep Dive into DNA World: Formation, Function, and Future

- Lecture format（講義形式）:
◆☒Onsite ・ □Online (Please choose one.)（対面 ・ オンライン）（（どちらか選択ください。））
◆Lecture time（講義時間） 1 hour 50 min（分）, Q&A time（質疑応答時間） 10 min（分）
◆Lecture style（ex.: used projector, conducted experiments）
（講義方法（例：プロジェクター使用による講義、実験・実習の有無など））
We utilized projector for presentation of lecture, demonstarted a simple experiment, and played scientific a card game to make stable DNA duplexes.

- Lecture summary（講義概要）: Please summarize your lecture within 200-500 words.

I delivered my lecture comprising the following sections: Presenation and discussion (50 min), demonstration (30 min), and scientific card game (30 min).

In my lecture, I started by introducing my country, India, to the students. I presented an overview of India's geographical location, population, time zone, and cuisine. I displayed diverse landscapes found in India. To make the information more relatable, I compared each topic to similar aspects of Japan. I breifly discussed about how Indian and Japanese cultures influenced each other from ancient times. I also some world famous and notable contributions from famous Indian Scientists.
Next, I talked about my university, where I completed my education. Then, I gave a brrief introduction to my current research institution and research group before transitioning into the scientific portion of my presentation.
In the scientific segment, I provided an overview of the importance of DNA in life processes,

beginning with genetics and heredity. I explained the central dogma of gene expression, explaining how proteins are expressed from RNA, which receives information from DNA. Following this, I discussed the structure and function of DNA double helix and demonstrated how the cellular environment around DNA can impact its structure and function. I also emphasized that not only double helix DNA but also other higher order structures like triplexes, tetraplexes exist and they are functionally significant as well. By the end of this segment, I highlighted the importance of both DNA sequence and the molecular environment for controlling gene expression.

For the experimental demonstration, we showed the students how to monitor DNA duplex formation using a simple fluorescence quenching technique. We designed single stranded DNAs labeled with either a fluorophore or a quencher at one end in such a way that the upon hybridization with a complementary strand, the fluorophore and quencher remain in close proximity, resulting in disappearance of bright fluoroscence of the fluorophore by the quencher under UV light. We arranged different solutions through varying combinations of four single straned DNAs (two labeled with fluorophore and two labeled with quencher). We asked the students to predict the color of the solutions and demonstrated the solution colors under a UV lamp and the students verified the same wearing UV-protective goggles.

After scientific demonstration, we discussed the significance of DNA duplex stability in modern technologies like detecting the coronavirus through reverse transcription polymerase chain reaction (RT-PCR). We explained the method of determining duplex stability from the base sequences using the nearest-neighbor model. To help the students understand this model physically, we played a DNA card game based on it, developed by our research group. We divided the students into small groups and asked them to construct DNA duplexes using the cards (representing individual DNA bases) to form most stable DNA duplex. The goup who prepared the most stable duplex by adding up the stability values of nearest-neighbor pairs was declared the winner.

◆Other noteworthy information（その他特筆すべき事項）:

After interacting with students, I realized that they have very clear idea about the fundamental aspects of DNA and its functions. They enjoyed the science demonstration very much and also quickly understood the rule of the DNA card game. Some of the students also showed their interest in studying and working on nucleic acid chemistry and as well as its technological applications in near future.

- Impressions and comments from the lecture assistant（講義補助者の方から、本プログラムに対する意見・感想等がありましたら、お願いいたします。）:ボランティアベースなので難しいとは思いますが、講演者と高校同士でお互いのミスマッチが少なくなる事前の工夫・準備がもう少しあれば良いと思います。