

様式 A-1

2026 年 7 月 7 日

サイエンス・ダイアログ 実施報告書

1. 学校名: 福井県立藤島高等学校
2. 講師氏名: Janani GNANAPRAKASAM 博士
3. 講義補助者氏名: 無
4. 実施日時: 2026年 7月 2日 (木) 13:30 ~ 14:30
5. 参加生徒: 1年生 15人、 2年生 1人 (合計 16人)
備考: 普通科生徒
6. 講義題目: Science for a Sustainable Future
7. 講義概要: 現代社会が直面する最も重要な課題の1つである持続可能なエネルギーへの移行について
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 55分 質疑応答時間 5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)
プロジェクター使用による講義
 - 3) 事前学習
☐有 ・ ☒ 無 (どちらか選択ください。)
使用教材:
9. その他特筆すべき事項:

Form B-2

Date (日付)

10/07/2026 (Date/Month/Year: 日 /月 /年)

Must be typed

Activity Report -Science Dialogue Program-

(サイエンス・ダイアログ 実施報告書)

1. Fellow's name (講師氏名): Gnanaprakasam Janani (ID No. P25389)

2. Name and title of the lecture assistant (講義補助者の職・氏名): None

3. Participating school (学校名): Fukui Prefectural Fujishima Senior High School

4. Date (実施日時): 02/07/2026

(Date/Month/Year: 日 /月 /年)

5. 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) 65 min (分), Q&A time (質疑応答時間) 20 min (分)

◆ Lecture style (e.g., 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))

A lecture delivered as a slide presentation using a projector, a student-centered discussion followed by an interactive Q&A session.

6. Lecture title (講義題目): Science for a Sustainable Future

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

The lecture commenced with a brief overview of my academic and research journey from India to the Republic of Korea and Japan, providing context for my work in materials science and electrochemistry. It then transitioned to the central theme, how these fields contribute to building a sustainable energy future. I introduced the distinction between renewable and non-renewable energy sources and highlighted the major challenges associated with fossil fuels, including climate change, air pollution, adverse health effects, resource depletion, and price instability. This discussion highlighted a key issue in renewable energy systems, the mismatch between energy supply and demand due to intermittency, emphasizing the need for efficient energy storage and conversion technologies, such as batteries and hydrogen production.

The lecture focused on the electrochemical principles underlying clean-energy devices. I explained the differences between galvanic (voltaic) cells, which convert spontaneous chemical reactions into electrical energy, and electrolytic cells, which use electrical energy to drive non-spontaneous reactions. I also addressed key limitations of these systems, including energy losses, sluggish reaction kinetics, material degradation, and reliance on expensive components. Catalysts were introduced as a critical solution, with emphasis on their role in lowering activation

energy and improving reaction efficiency.

Building on this foundation, I presented my research on bifunctional and multifunctional electrocatalysts for water splitting and metal-air batteries. For hydrogen production, I described the hydrogen evolution reaction (HER) and oxygen evolution reaction (OER), focusing on the challenge of high overpotential and its impact on efficiency. Using volcano plots, I illustrated how optimized catalysts reduce energy barriers and showcased examples from my published work. I extended these concepts to rechargeable zinc-air batteries, in which both the OER and the oxygen reduction reaction (ORR) must be efficiently catalyzed. Despite their high theoretical energy density, these systems face challenges such as large charge-discharge overpotentials and dependence on costly noble metals. I discussed my strategy of integrating multiple active sites into a single material to achieve multifunctionality, a promising yet complex approach.

The lecture concluded with an overview of a researcher's daily activities, including experimentation, data analysis, scientific writing, and collaboration, as well as diverse career opportunities in science. An interactive question-and-answer session followed, during which students actively engaged and shared creative ideas about future technologies. The lecture was delivered in an interactive format, with key terms presented in both English and Japanese to enhance comprehension.

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

The lecture was delivered in an interactive format, supported by slides that presented key scientific terms in both English and Japanese to enhance comprehension. Students were encouraged to engage actively and ask questions throughout the session. In the closing segment, I invited them to imagine what they would invent without limitations, which sparked a lively discussion about future technologies, including pollution-eating machines and infinite battery.

9. 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。):

Not applicable

