

様式 A-1
(FY2025)

令和 7 年 9 月 2 日

サイエンス・ダイアログ 実施報告書

1. 学校名:長野県飯山高等学校
2. 講師氏名:Dr. Felix Sebastian KOESTER
3. 講義補助者氏名:加瀬 圭佑
4. 実施日時: 2025 年 8 月 29 日 (金) 10:00 ~ 12:00
5. 参加生徒: 年生 人、 2 年生 30 人、 年生 人 (合計 30人)
備考: 探究科 30 人
6. 講義題目: Germany, and why do we do Science? What is Machine Learning? Why do we use it?
7. 講義概要: 自己紹介・ドイツと日本の関わり・科学者とは?・科学者になるには?
機械学習について・どんなことが行われているか
質疑応答(機械学習に関して 文化について)
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 50 分 質疑応答時間 40 分 高校生プレゼン 30 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: 講師からの事前資料(Q&A) 本校独自のワークシート、Youtube の動画(機械学習について)
9. その他特筆すべき事項:
本校の生徒のレベルに合わせた英語力に調整いただき、さらに専門的な内容も非常にわかりやすく噛み砕いてお話しいただき、生徒にとって非常に有意義な時間となりました。テーマはやや難解で生徒はやや理解しきれない部分もあったようです。ただし、生徒は昨今話題のテーマでもあり、楽しみにしていたようで、今話題の AI や機械学習について鋭い質問もありました。講師の先生の温かく親身な雰囲気生徒たちも助けられました。
後半には、本校生徒による英語での課題研究発表も実施させていただき、ご専門外の内容も親身にアドバイスいただきました。今後も、高校生の探究活動へのアドバイスなどいただくようなディスカッションができればありがたいと考えています。

Form B-2
(FY2025)
Must be typed

Date (日付)
04.09.2025 (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): Felix sebastian KOESTER (ID No.24363)
- Name and title of the lecture assistant (講義補助者の職・氏名)
Keisuke Kase 加瀬 圭佑
- Participating school (学校名): Nagano Prefectural Iiyama High School
- Date (実施日時): 29/8/2025 (Date/Month/Year: 日/月/年)
- Lecture title (講義題目): Why do we do science? What is machine learning?
- 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) 60 min (分), Q&A time (質疑応答時間) 60 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))
Powerpoint slides with projector
- Lecture summary (講義概要): Please summarize your lecture within 200-500 words.
- ◆ Other noteworthy information (その他特筆すべき事項):
- 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。):

Lecture Summary

Why do we do science? What is machine learning?

The lecture, “*Why do we do science? What is machine learning?*”, began with the question of why humans do science at all. Science is not only about solving practical problems but also about curiosity and the joy of understanding the world. We ask questions because we want to know more — and because discovering answers is exciting.

I emphasized that science is never done alone. We work in teams, we share results, and we make sure that experiments are reproducible so that others can confirm and build on them. Cooperation and reproducibility are at the heart of science.

To show that science can be about anything, I gave several examples. Scientists study music theory to understand harmony and rhythm. They study strange natural phenomena such as why hot water sometimes freezes faster than cold water, or why a spinning ball curves in sports. The message is: you can be a scientist about anything that interests you.

And with science, we can achieve great things as teams of humans working together. Science allows us to program realistic video games, to send astronauts to the Moon, or to build giant machines like the Large Hadron Collider to study the smallest particles of nature.

From there, I introduced the history of problem solving in mathematics, from ancient Babylonian tablets and Archimedes in Greece, to the Chinese *Nine Chapters* and Japanese sangaku tablets. Later, some problems became so hard that whole rooms of “human computers” were needed to calculate rocket trajectories, until machines like ENIAC replaced them.

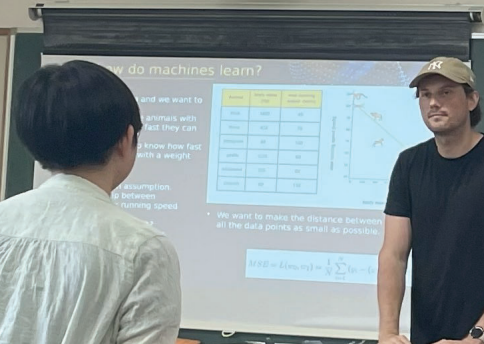
With rapidly growing computer power, we could solve many problems with rule-based programming. But some challenges, such as face recognition or language translation, remained unsolved. Here machine learning became essential: instead of writing rules, we let the computer learn patterns from data.

I explained training and gradient descent in simple terms and guided the students through interactive experiments such as fitting a line to data and testing how well a model predicts new points. We also looked at familiar applications in social media, sports, music, and games.

The lecture closed with a reflection: science is both a human joy and a shared effort. It lets us explore the world, create new technology, and solve great problems — but always as a team, cooperating across generations and cultures.

Other noteworthy information

The students participated and also gave a talk about their own research to which I asked them questions. They did impressive work and were curious. I think the most important part was them to open up to speak in English for which I gave them the recommendation of watching a lot of english science videos online to strengthen their listening comprehension.



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1	1	1	1	1
2	1	1	1	1
3	1	1	1	1
4	1	1	1	1



• We want to make the distance between all the data points as small as possible.

$$RSS = \sum_{i=1}^n (y_i - \hat{y}_i)^2 = \sum_{i=1}^n (y_i - (w_0 + w_1 x_i))^2$$