LUNAR CITY DESIGN HACKATHON

JAPAN EVENT REPORT

OVERVIEW

On the 29th of August, Metaplaneta Japan organized its very first event in Tokyo, Japan. The event was called the "Lunar City Design Hackathon", and focused on the architectural aspect of the lunar city design. We invited three guest speakers: a geologist, an architect and a polar architect. We targeted high school and college students with any academic backgrounds or interests.

The purpose of the event was to help students find connections between space and their studies or interests. Participants had the opportunity to explore some of the non-traditional aspects of space missions by thinking about living on the moon, and exploring ways to construct a sustainable building on the moon.

Location: Viling Venture Partners Inc. Tokyo, Japan
Date: August 29th
Time: 10:00AM ~ 06:00PM
Ticket: Free
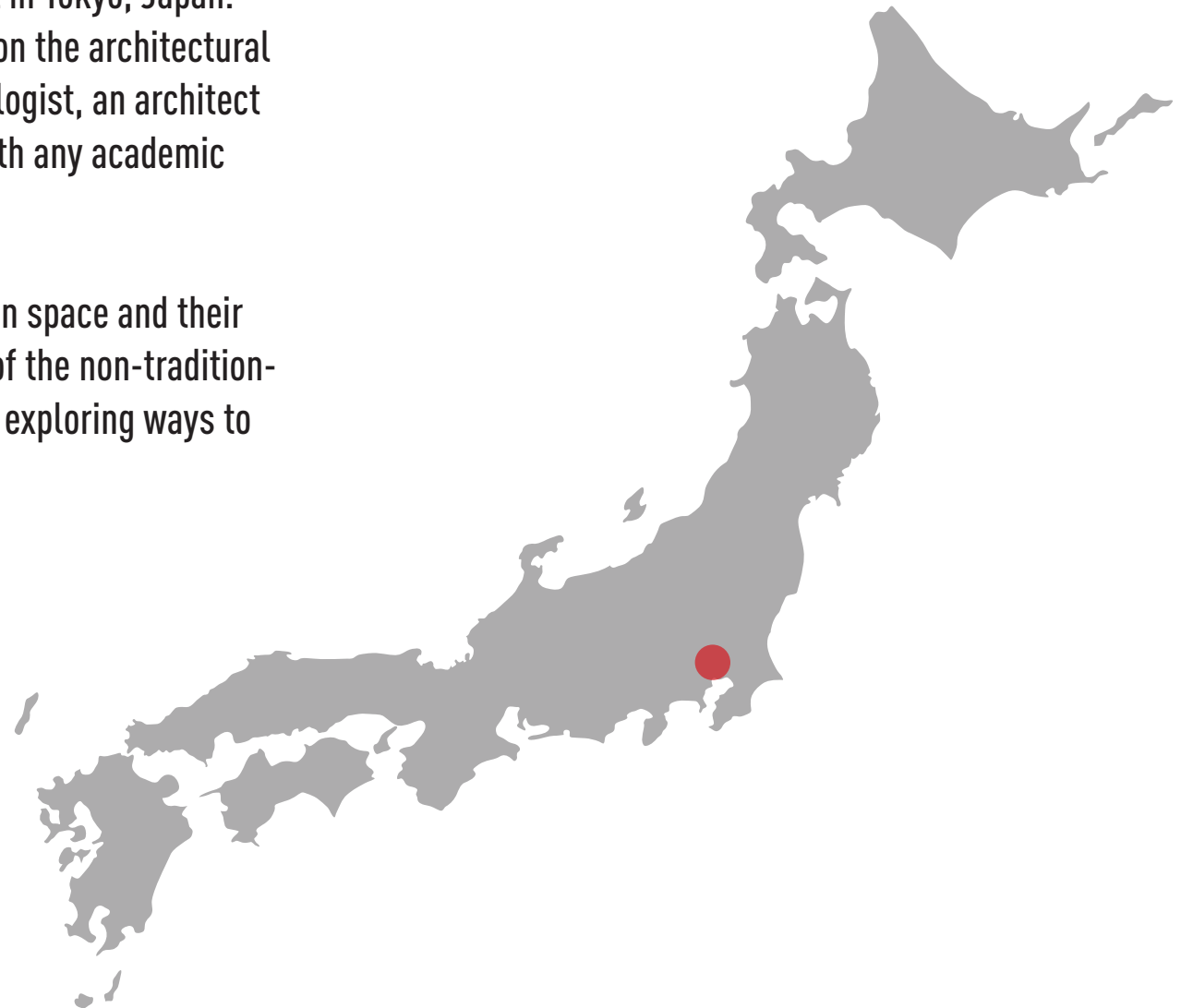
THE TEAM

TOMOYA MORI

Astronomy / Media Communications
Brown University '16

MOMOKO NISHIMURA

-
K International School of Tokyo

TAKUTO MACHIZAWA

Electrical Engineering
Tokyo University of Science

KENTARO NAKAMURA

Algorithmic Design Architecture
Keio University

SOUTA NUMAHO

Law / Business Management
Keio University

KOUTO HARUYAMA

Law
Doushisha University

SHO TAKAHASHI

Space Architecture
Tokai University

MIZUKI ONOMA

Media Arts
Royal Holloway University of London

GUEST SPEAKERS

PROF. JUNICHI HARUYAMA
Japan Aerospace Exploration Agnecy

Professor Haruyama is a senior researcher at Japanese Aerospace Exploration Agency (JAXA) and Institute of Space and Astronautical Science (ISAS). His focus is on the lunar and planetary sciences and exploration, and he was the Principle Investigator for the Terrain Camera on board KAGUYA, a Japanese lunar orbiting satellite that made an incredible discovery of a lava tube on the moon.

TAKUTO SANDO
Tsubame Architects

Architect Sando Takuto has not directly been involved with space missions, but his projects are highly applicable. He received the Good Design Award for his graduate school project "Environment Energy Innovation Building" in which he explored a sustainable architecture using solar energy. He has also worked with ELEMENTAL, a Chilean architecture company that focuses on social impact of architecture projects.

YUSUKE MURAKAMI

Architect Yusuke Murakami is an architect and an adventurer. He touts himself as a "polar architect", has participated in a number of expeditions including the 50th Antarctic Research Expedition, Mars Desert Research Station and Mars Arctic 365 Mission. He travels to and lives in extreme environment to think about how to build a sustainable and habitable base in space.

OUR PARTNER

TN Lab

TN Lab is a student organization in Japan that promotes the field of Space Architecture among the youth. It provides a platform for interested students to interact, exchange ideas and skills to further cultivate the field.

Its activities include research presentations, exhibitions, information sessions and the management of the space architecture competitions called the "Space Architecture Prize".
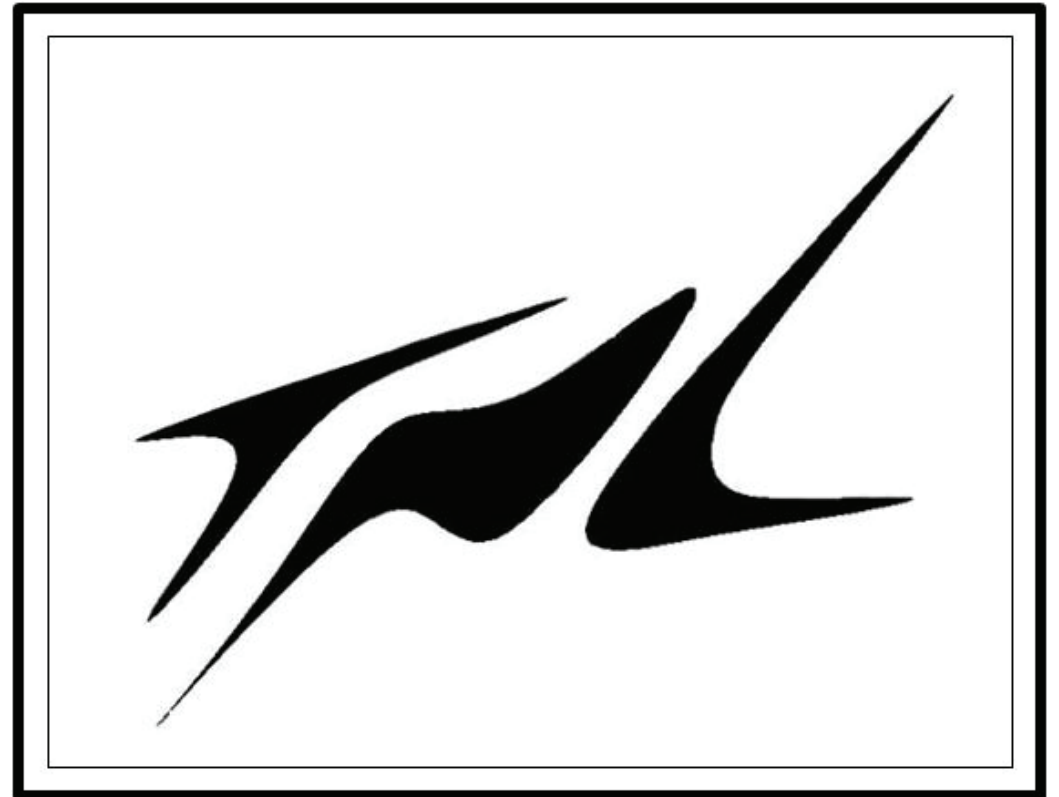
SPONSORS

MORI DESIGN INC.

AWAITING DATA

MORI DESIGN INC.

MORI DESIGN INC. is a graphic design studio specializing in brand development, corporate communication, editorial, and web design. Principal and design director Haruki Mori offers a unique and informed perspective drawn from an international background and twenty years of experience.

MORI DESIGN INC. has designed Metaplaneta's logo as well as the official T-shirt for the event.

VILING VENTURE PARTNERS INC.

"Viling Venture Partners" is an early-stage venture capital seed fund specializing in the education field, unprecedented type of VC in Japan. To create a company that cause innovation in education, we offer incubation office space, Seed Accelerator Program, and investment for a variety of independent companies ranging from seed level to early level.

Viling Venture Partners kindly offered Metaplaneta a meeting space and an event space.

MIRA CREATIVE INC.

Mira Creative is a digital design company specializing in a variety of creative productions including graphic design, UI design, videography and projection mapping. It also conducts a research on interactive expression methods through the synchronization of videos, music and light.

Mira Creative has helped Metaplaneta with the use and the application of Minecraft in the event.
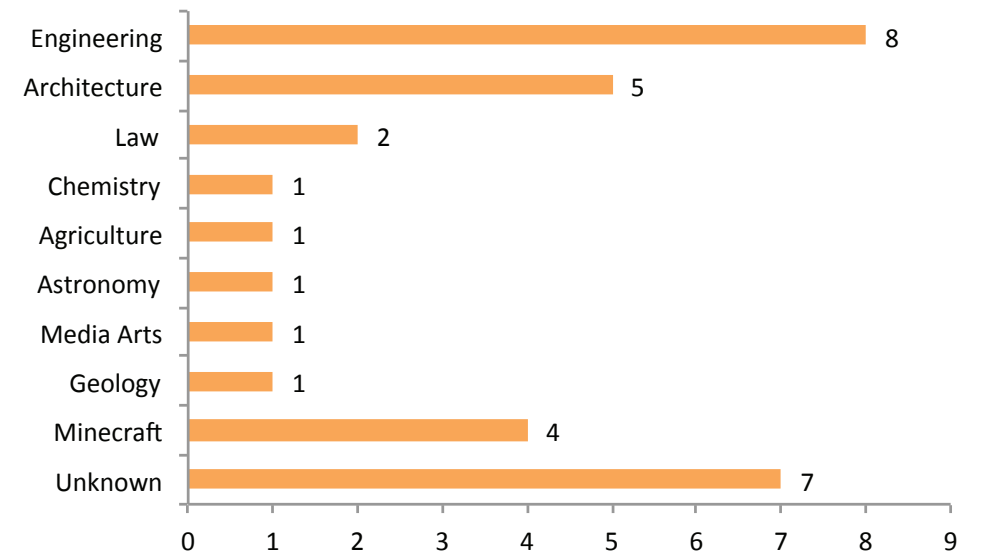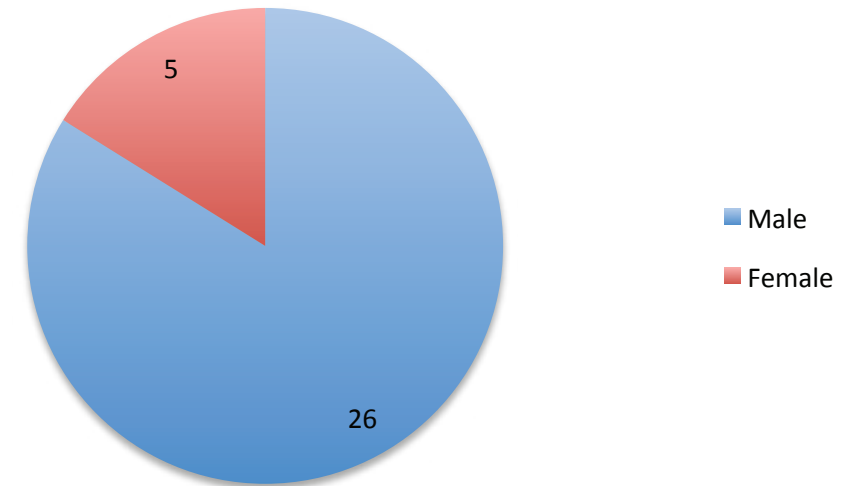
PARTICIPANTS

4 high school students

15 college students

5 adults

2 elementary school students

2 middle school students

3 guest speakers

Male — 26
Female — 5

Field	Count
Engineering	8
Architecture	5
Law	2
Chemistry	1
Agriculture	1
Astronomy	1
Media Arts	1
Geology	1
Minecraft	4
Unknown	7

MISSIONS

Particpants were split up into 4 teams: Alpha, Beta, Gamma and Delta. Each team had been pre-assigned by the organizing team to ensure the academic diversity. For example, we made sure that each team had at least one architecture student.
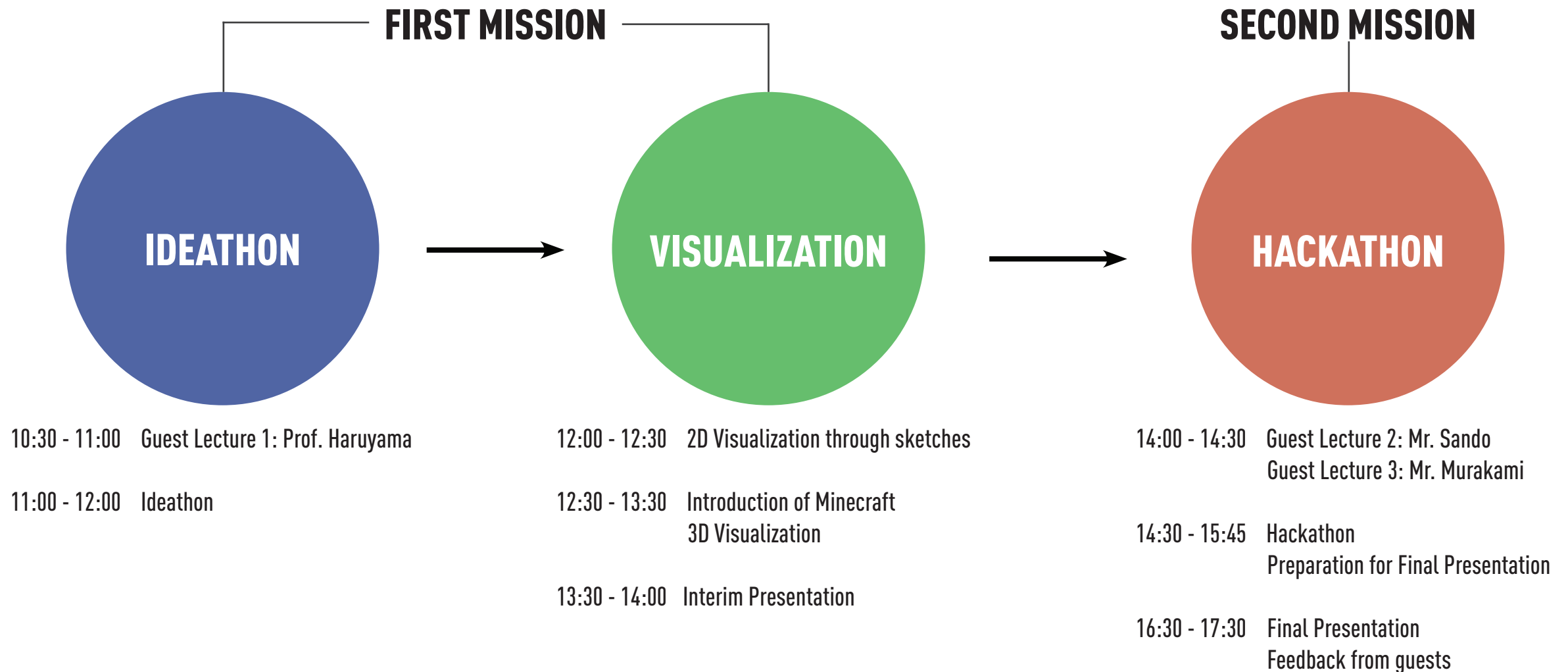
All teams were give two missions throughout the event:

FIRST MISSION: Design a commercially appealing lunar accomodation

SECOND MISSION: Improve the design to make it sustainable in a form of:

- A village that can accomodate 30 people
OR
- A facility that can accomodate a group for a year

EVENT STRUCTURE

FIRST MISSION

SECOND MISSION

IDEATHON → **VISUALIZATION** → **HACKATHON**

10:30 - 11:00   Guest Lecture 1: Prof. Haruyama

11:00 - 12:00   Ideathon

12:00 - 12:30   2D Visualization through sketches

12:30 - 13:30   Introduction of Minecraft
3D Visualization

13:30 - 14:00   Interim Presentation

14:00 - 14:30   Guest Lecture 2: Mr. Sando
Guest Lecture 3: Mr. Murakami

14:30 - 15:45   Hackathon
Preparation for Final Presentation

16:30 - 17:30   Final Presentation
Feedback from guests

TOOLS

MINECRAFT

Minecraft is a 3D crafting game that allows the users to dig (mine) and build (craft) tools and buildings to explore a wolrd of 3D blocks. Minecraft was selected as a rapid 3D prototyping tools for the design hackathon to allow participants to virtually experience their lunar habitats. We invited 4 Minecraft experts (elementary and middle school students) to help each team develop 3D models of their designed lunar buildings.

LUNAR CATALOGUE CARDS

Lunar catalogue cards were designed by Metaplaneta Japan in order to provide necessary background knowledge to participants. Each card contains information that is categorized into "lunar geology", "life support systems", "architecture" or "safety support". It is possible that a card is categorized into multiple categories. Images were taken from NASA digital archives and information is based on publicly availble research papers (all of which are credited on each card).

PHASE 1: IDEATHON

**What would you like to do on the moon? What could you do on the moon?**

The event started with Professor Haruyama's 30-min lecture about the lunar geology. His interactive lecture-style was highly engaging and provided us with some of the basic information about the moon. He also talked about the latest discoveries on the moon including lunar lava tubes that could potentially be used to construct habitable bases, as they provide natural protection from harsh surface environment.

With these information in mind, the participants began to brainstorm about possible uses of their lunar accomodations. Lunar Catalogue Cards were made available to each team to help them come up with relatively realistic ideas.

Some teams listed their ideas in bullet points and other teams began to sketch out their ideas.
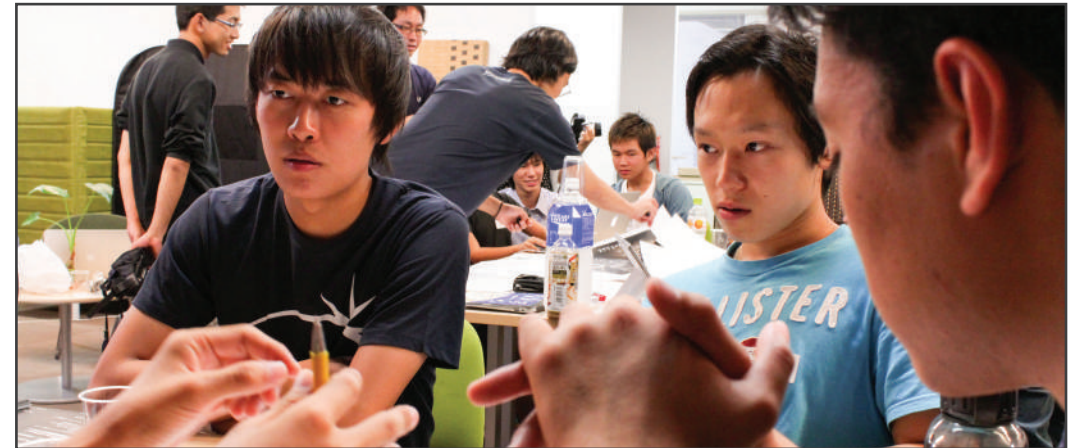
PHASE 2: VISUALIZATION
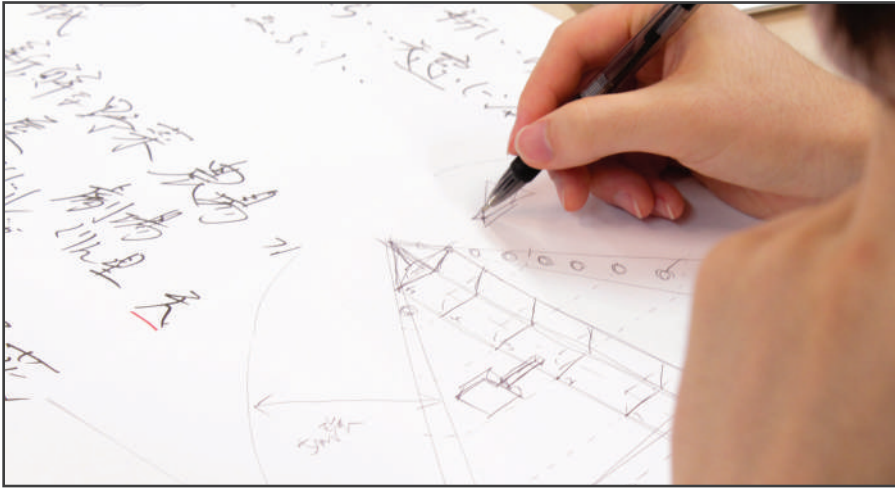
WHAT STRUCTURES OR FACILITIES COULD YOU USE TO REALIZE YOUR IDEAS?

Ideas generated in phase 1 was then visualized in this phase. Each team had explore ways to give shapes to their ideas. Since each team had an architecture major student, they took the lead to sketch out a detailed structures and architectural design drawings.

Next, Minecraft was introduced to the participants. Two middile school students and two elementary school students were invited to the event as Minecraft experts. Each team was assingned one expert and they worked together to visulize their 2D sketches into 3D models in Minecraft.

The participants were simply amazed by what Minecraft can do. Although it may seem like a children's game, it is capable of producing a very realistic and functional buildings. In short, this was a great way to produce a rapid prototype model of their design.

PHASE 3: HACKATHON

HOW CAN YOU IMPROVE YOUR DESIGN TO ACCOMODATE PEOPLE FOR A LONGER PERIOD OF TIME?

To better introduce the second mission, we had the remaining guests to give an inspirational talks to the participants.

Mr. Sando (top right) gave a talk about the design of a space that could adapt to changing environment, cultural norms and living styles even after its construction.

Mr. Murakami (bottom right) talked about what life is like in extreme environments. Using videos he produced in both Antarctica and the Mars Design Research Facility in Utah, he explained some of the important factors to consider about living in such extreme environment.

After the talks, the teams began to tweak their design to fulfil the mission. At the same time, the Minecraft experts updated the 3D models accordingly.

FINAL PRESENTATION

For the final presentation, each team explained their approach to complete the two missions using posters, scale models and power point slides. The Minecraft 3D models were shown at the same time on the screen behind the presentors.

After each presentation, the three guest speakers provided some constructive feedback. Not only did they praise their final work but also suggested improvements to the designs in order to better fulfil the mission.

For exmaple, to the team that presented a lunar elderly home, Professor Haruyama suggested they talk to elderly people in order to better understand how they would want to spend the final years of their lives. Similarly, Mr. Murakami suggested they reflect upon "death" and further discuss about how they could provide a more comfortable environment for elderly people on the moon.

Mr. Sando repeatedly pointed out that the teams were merely providing limited solutions to challenges that they encountered. Just like he said during his lecture, he suggested that the designs should be flexible and allow the inhabitants to bring their own life style into the buildings.

The participants understood that this was not a one-time event. Even though their designs accomplished the give missions, there were many improvements that could be made to better the lives of potential inhabitants.

CHALLENGES

Although the event seemed successful, there are some challenges to be tackled and improvements to be made for the future event organization.

1. Male to Female Ratio

Only 3 out of 23 participants were females. This shows that female students generally feel reluctant to join space-related events. For future events, we will need to think about how we could attract more female students in future events in order to encourage them to actively participate in the human space exploration. We could collaborate with "Women in Science" groups in Japan, or invite female guest speakers.

2. Time keeping

Although we had informed the guest speakers to prepare a 15 - 20 min lecture, almost all three speakers went overtime. This pushed back the subsequent parts of the event and forced us to cut back time for the ideathon and hackathon parts. For future events, we could be more strict in keeping the time during the guest lectures, or we could allocate more time for each guest. In fact, many participants enjoyed the guest lectures the most, so the latter solution would be ideal for future events.

3. Use of the Luna Cards

Feedback from the organizing team about the luna cards were mixed. Some teams used the cards effectively to produce ideas, but other teams hardly used them during the event. Since we were only testing the effectiveness of the cards, we did not prepare any specific instructions for the use of them. Although the concept of the luna cards is interesting, there needs to be further improvements to be made in order to make the best use of them.

4. Keeping the motivation of the participants

Since the participants had a large amount of tasks to complete throughout the event, some of them seemed overwhelmed throughout the day. Mr. Sando suggested that we change the layout of the event space for each phase. For example, for the ideathon part, we could remove all tables and just allow the participants to interact freely and exchange ideas. Similarly, for the discussion part, we could have them sit in circles for a more intense and intimate atmosphere. By doing so, not only would they understand the purpose of each task better, but also change their mindset accordingly to approach the tasks more effectively.
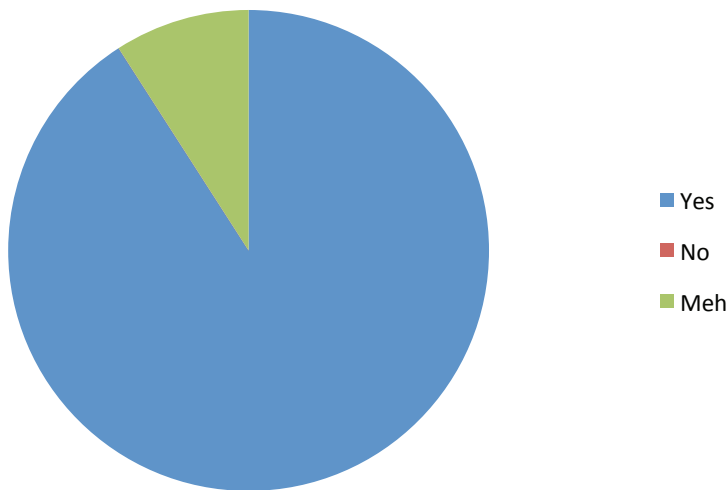
FEEDBACK

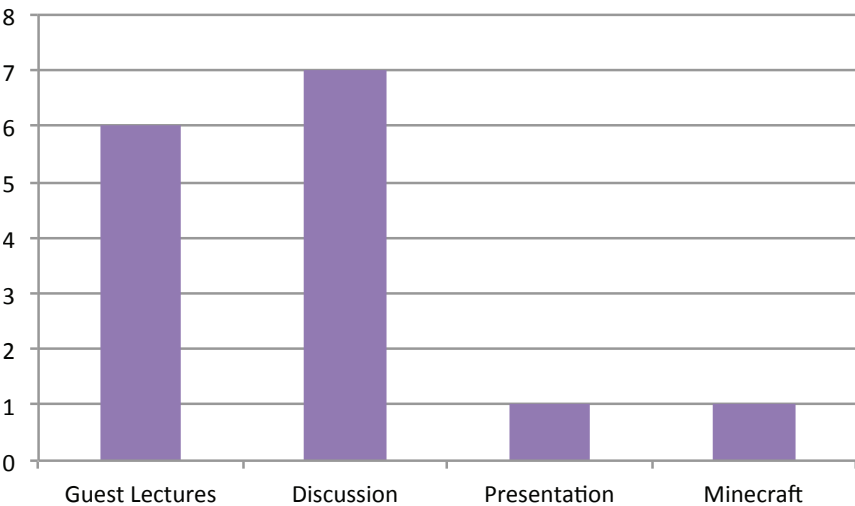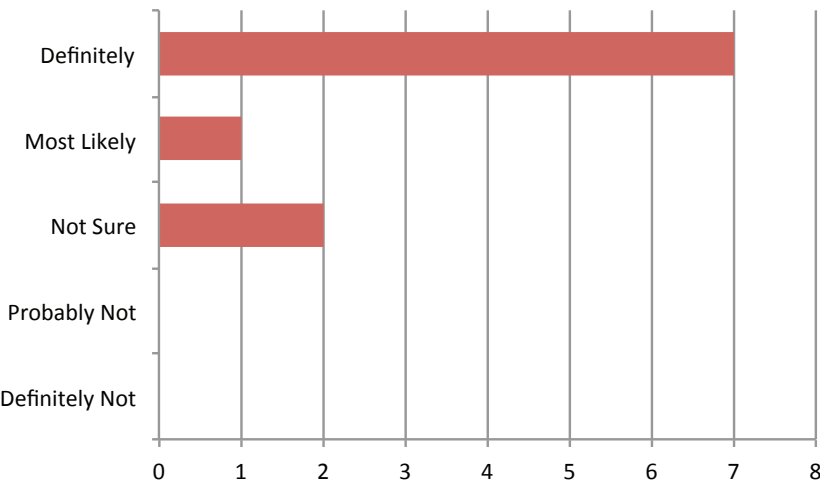## Do you feel closer to human space exploration after the event?

- Yes
- No
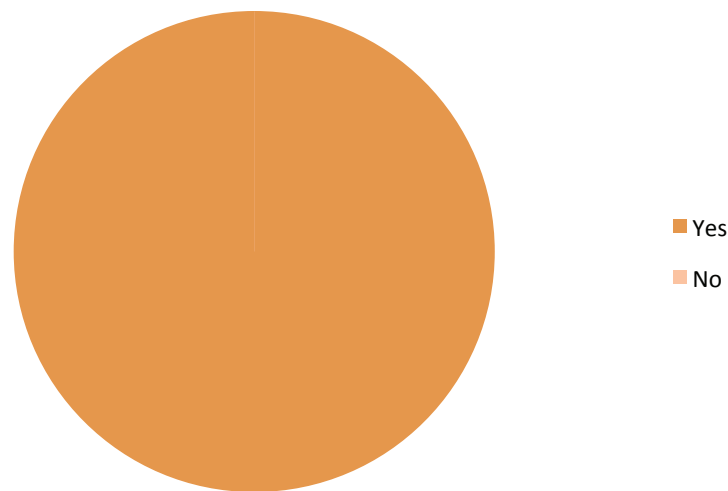
Were you able to interact with people from other disciplines?

- Yes
- No
- Meh

RESPONSE RATE
78%

What did you enjoy the most?

Guest Lectures · Discussion · Presentation · Minecraft

Would you like to participate in similar events in the future?

Definitely · Most Likely · Not Sure · Probably Not · Definitely Not

CONCLUSION

The Feedback from the participants clearly shows that the event helped them feel closer to human space exploration. By reflecting on our daily lives and applying some of the fundamental elements to a hypothetical life on the moon, the participants were able to find connections between the two seemingly unrelated living conditions.

Before the event, some people pointed out that "hackathon" would not be the appropriate title. "Hackathon" usually describes an event where partipants produce a new hardware or a software using unprecedented combinations of existing technologies.

It is true that our event was not technological. But what we were hacking was not a tech device; we were hacking our everyday life.

For us, "hacking" defines the act to rethink the established norms and develop a new perspective. This event definitely allowed us to "hack" the human culture. For example, team gamma's "Lunar Elderly Home" idea made us rethink about death. Similarly, team delta's habitation module triggered an interesting discussion about the important factors in developing long-lasting relationships. All

these discussions will become crucial in the future of space exploration where humans advance into the universe.

In general, space is considered exclusive to rocket scientists. But this event made us realize that space missions need more than science and engineering, but we also need to involve people from other disciplines. Final presentations showed that an interdisciplinary approach to space missions like this could lead to unexpected outcomes.

This design hackathon event focused on architecture and the potential values it could provide. In the next couple of years we will organize more events that focus on other disciplines. Metaplaneta Japan aims to organize an event focused on Space Law early next year.

Our journey has just begun.

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