

Inspiring Stars: Implementing a Workshop on Astronomy for Inclusion for Thai Outreach Practitioners and Science Teachers

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The 'NARIT-IAU100 Inspiring Stars Workshop 2019' was a workshop designed with the goal of exchanging knowledge and best practices on inclusive astronomy outreach resources and activities between the international community and Thailand. The workshop was developed and implemented by the National Astronomical Research Institute of Thailand (NARIT), in collaboration with the IAU Office for Astronomy Outreach (OAO) and the National Astronomical Observatory of Japan (NAOJ). This workshop was held in Chachoengsao in Thailand in late June 2019 with a group of thirty Thai science communicators, astronomical outreach practitioners, and science teachers from Thai schools for students with disabilities. This workshop helped participants discover various astronomical learning media and activities used internationally and inspire the development and dissemination of inclusive astronomical outreach materials in Thailand. As a legacy of the workshop, NARIT continues its national astronomical outreach for inclusion programmes and is preparing related projects, such as a catalogue of astronomical vocabulary in Thai Sign Language.

Introduction

The beauty of stars and the universe can be a powerful motivator to attract people into astronomy and inspire the new generation to pursue careers in science and technology. Therefore, it is paramount that opportunities to engage with astronomy are accessible to all.

The 'Report on the Situation of People with Disabilities in Thailand' (in Thai language) by Thai Ministry of Social Development and Human Security¹ states that the total number of people with disabilities in Thailand is 1 995 767, representing 3.01% of the Thai population, with the three largest groups being:

- People with mobility impairments: 986 583 people (49.43%)
- People with hearing impairments: 372 189 people (18.65%)
- People with visual impairments: 196 081 people (9.82%)

Astronomical outreach and teaching methodologies should be inclusive of people with hearing, visual, or mobility

impairments (and those who are neurodiverse) and not only be limited to certain 'mainstream represented' groups alone. Science educators and outreach professionals must diversify their astronomy teaching and outreach skills in order to reach and accommodate the broader spectrum of universal needs of their students and audiences.

The National Astronomical Research Institute of Thailand (NARIT) is the main national astronomical organization in Thailand, offering a wide range of outreach and educational activities and resources in astronomy to provide nationwide support to astronomy outreach practitioners and formal educators.

As the IAU National Member and close partner in many international programmes, our NARIT outreach team has identified the need to become more inclusive in our practices in order to reach and accommodate a more diverse group of audiences. In the past few years, NARIT has taken its first actions to create inclusive outreach facilities for visiting school

groups. Additionally, in Thailand many educators and outreach practitioners lack experience in teaching astronomy for these particular groups. For these reasons, NARIT has identified the need to establish a workshop in inclusive astronomy outreach in 2019. In collaboration with the International Astronomical Union (IAU) Office for Astronomy Outreach (OAO) and the National Astronomical Observatory of Japan (NAOJ), NARIT held the 'NARIT-IAU100 Inspiring Stars Workshop 2019'² in Thailand on 25-28 June 2019. The workshop aimed to introduce and inspire different groups of Thai people, especially those interested in inclusion, to apply astronomy to their work and, at the same time, support the outreach expansion of NARIT.

The Format of the Workshop

Inspiring Stars is an itinerant international exhibition of international inclusive resources in Astronomy, gathered by the IAU to promote inclusive astronomy³. The content of the Inspiring Stars exhibition

was used as a starting point to draft the content of the workshop and inform the sessions and topics presented.

The NARIT astronomy outreach centre considered the largest groups of people with disabilities¹ in Thailand and adapted premade international content from the Inspiring Stars exhibition for these groups in the Thai adaptation of the workshop.

The planning was also based on the target group of participants, 40 science communicators, astronomy outreach practitioners, and science teachers in specialized schools for students with disabilities across the country (in Thailand, the education school system currently assigns, in its vast majority, students with disabilities to attend specialized education schools).

The workshop was composed of five sessions:

Overview Session on Best Practices

The NARIT astronomy outreach centre selected the topic 'An Overview of Worldwide Best-practices in Astronomy for Inclusion for People with Visual and Hearing Impairments' as the first session of the workshop so the participants could have a general view of the best practices on astronomy for inclusion and how inclusive activities in astronomy are implemented and carried around the world.

The topics addressed included (1) characterising different types of impairments and the differences between them; (2) challenges and obstacles faced

by each group in learning astronomy and (3) the importance of astronomy dissemination and outreach for inclusion.

Astronomy for People with Visual Impairments

People with visual impairments are one of the largest groups of people with disabilities in Thai society; thus, astronomical media and activities for this group are of great importance. This session introduced astronomical learning media, related software and hardware, and tactile learning media for people with visual impairments.

The activities presented included measuring solar energy by one's face and learning through tactile models of constellations. This session was presented by Beatriz Garcia (IAU National Outreach Coordinator (NOC) for Argentina) and the NARIT outreach staff:

1. Photometers and photometry in astronomy: determination of the sun's power for inclusion⁴
2. 'SonoUno': The sonification software for scientific data⁵
3. 'LightSound': the sonification device for eclipses⁶
4. Moon and Mars tactile models, from Spanish project 'A Touch of the Universe'⁷
5. The Subaru Telescope and ALMA radio telescope tactile models, from NAOJ⁸
6. DIY constellation tactile models using clay (by Suwanit Wutsang (NARIT)).

Astronomy for People with Hearing Impairments

The session consisted of educational activities for people with hearing impairments, introducing concepts of stellar magnitude and temperature by using LEDs of different colours (analogous to the colour of the stars and their surface temperatures) and sizes (larger LEDs representing brighter stars).

This session also included an introduction to astronomy vocabulary in various sign languages and designing astronomical words in Thai Sign Language (TSL), using the 'Hands in the Stars: The First International Comparative List of Astronomical Words in Sign Languages'⁹. Inspired by a lack of astronomical words in TSL and using a close collaboration between teachers of hearing-impaired students knowledgeable of Thai Sign Language, science communicators, and astronomy outreach practitioners who could verify the accuracy of the words created.

Astronomy Activity for Neurodiverse People

The activity in this session was focused on making planet keychains as an example of an astronomy activity for neurodiverse individuals. With the purpose of increasing the concentration span, during one to two hours participants coloured spherical wood models representing the planets using an image of the planet as a reference. This



Figure 1. a) A participant of the workshops makes a tactile constellation model using clay as a medium. b) A participant of the workshop paints a planet to be used on a keychain. c) A participant of the workshop during a session about designing astronomy-related words in Thai Sign Language (TSL). Credit: NARIT

activity was designed by NARIT outreach staff member Suwanit Wutsang.

The Planetarium Show and Stargazing

This session was planned with the intent of supporting and improving NARIT's efforts to expand our planetarium programming to people with disabilities. The content of the session focused on identifying the necessary steps to adapt existing NARIT outreach programmes for students with disabilities to experience an accessible visit to the public NARIT facilities.

The NARIT outreach team first presented our regular outreach programmes (planetarium shows and stargazing activities) and NARIT's facilities for visitors to the workshop participants.

The participants, who included specialized education professionals, were encouraged to directly engage with planetarium and observatory staff and discuss how to adapt the outreach programmes to be more accessible and inclusive. As a result of this dialogue, for the planetarium show, although NARIT will not provide a sign language interpreter, NARIT will facilitate the incorporation of sign language interpretation for visiting groups of schools for hearing impairments and their interpreters and use tactile models for people with visual impairments. Stargazing activities may also include sign language interpretation, but inclusive stargazing sessions have proved to be technically impossible with the current technical capabilities.

Feedback and Lessons Learned

Hosting the 'NARIT-IAU100 Inspiring Stars Workshop 2019' brought helpful insights to the NARIT outreach staff on the path forward into becoming more inclusive in our outreach practices and resource production.

Challenges in Identifying Participants

Many members of the science communicators and astronomy outreach practitioners group were part of the NARIT staff or the staff from Thai science museums who were already part of the NARIT collaborative networks.

It was a difficult task for us, the organizers, to find specialized education professionals



Figure 2. A demonstration of the LightSound device, an instrument that transforms light into sound for people with visual impairments can experience an eclipse. Credit: NARIT

as NARIT did not have many contacts with specialized education schools or groups. Developing long-term relationships with specialized education schools (e.g., through visits by professional astronomers or astronomy outreach practitioners to the specialized education schools or school trips to NARIT public facilities) is essential in building relations with the community and from which to find more participants and encourage more educators to join these initiatives.

Establishing such networks is also paramount to receive direct feedback on the content production of inclusive resources and activities and have specialized education professionals to take part in the process of content creation.

The Challenges in Adopting Complex International Resources to a Thai Audience

A large percentage of Thai specialized education teachers, science communicators, and astronomy outreach practitioners were of the opinion that there are difficulties in implementing Lightsound device and SonoUno software for (1) the lack of availability of the materials, and (2) its operational complexity of the sonification media by both visually impaired individuals and educators.

As a first experience in delving into astronomy inclusive resources, participants preferred learning media and activities that could be created by themselves (e.g. tactile models, tactile planispheres, and astronomy vocabulary in TSL).

The Challenge in Presenting Information to the Diverse Participants in the Workshop

There were two main participating groups: teachers from specialized education schools, who are versed in the media and learning of individuals with disabilities, and science communicators and astronomy outreach practitioners, who are skilled with the accuracy of astronomy information. Some activities were straightforward and easy for both groups to understand (e.g., using and exploring tactile models or making planet keychains).

Notably, each group could 'fill the gap' with each other's skills when designing astronomical words in TSL. The specialized education teachers helped with the grammar and facilitated the understanding of people with hearing impairments. Science communicators and astronomy outreach practitioners checked the accuracy of the sign and the written definition. Each group was also able to correct misconceptions related to their respective specialities as well.



Figure 3. School visits at the Princess Sirindhorn AstroPark in February 2020. a) NARIT planetarium show for hearing-impaired students with the collaboration of Thai Sign Language (TSL) interpreters from the school for hearing-impaired. b) Students with visual impairments visit the astronomical exhibition. Credit: NARIT

Including Feedback from Specialized Education Professionals

By carrying out the workshop, research institutions with a strong component on outreach and education such as NARIT can learn directly from experts, such as specialized education teachers, on how to meet the necessary requirements to create inclusive programmes for differently abled students.

The exchange of ideas originated by the workshop can improve the future direction of the inclusive astronomy-related work of the NARIT outreach team, planetariums, observatories, educational tours, collaboration between astronomical institutes/organizations with schools/organizations for people with disabilities, etc.

The Legacy of the Workshop

Suggestions from teachers of visually impaired and hearing-impaired students have led to NARIT's next steps in inclusive outreach actions: the development of a planetarium show for visually impaired individuals and a standardized astronomical vocabulary in TSL.

Astronomy learning media in TSL has been created by many specialized education schools, but there are differences in astronomical words between schools due to a lack of a 'standardized scientific vocabulary'. Specialized education professionals suggested that as the leading national authority in astronomy,

NARIT should determine the standard astronomy vocabulary in TSL.

The participating teachers brought their students to the Princess Sirindhorn AstroPark exhibition and planetarium a few months after the workshop. Because of these visits, NARIT plans to continue developing inclusive astronomical outreach activities, particularly for people who are vision and hearing impaired in 2021.

Notes

¹ 'The report on the situation of people with disabilities in Thailand, 1st April 2020' (in Thai language) by Thai Ministry of Social Development and Human Security (Page 1-2)

² First Inclusive Astronomy Workshop Held in Thailand News articles on the IAU100 website <https://www.iau-100.org/inclusive-astronomy-workshop>

³ Inspiring Star Website <https://sites.google.com/oao.iau.org/inspiringstars>

⁴ Photometers and photometry in astronomy: determination of the sun 's power for inclusion http://sac.csic.es/astrosecundaria/en/proyectos_con_unesco/la_potencia_del_sol_y_como_medirla/la_potencia_del_sol_y_como_medirla_en.pdf

⁵ SonoUno <http://sion.frm.utn.edu.ar/sonoUno/>

⁶ LightSound <http://astrolab.fas.harvard.edu/LightSound-IAU100.html>

⁷ Touch of the universe (Moon and Mars tactile models) <https://www.uv.es/astrokit/>

⁸ NAOJ Subaru Telescope Tactile Model https://prc.nao.ac.jp/3d/index_e.html

⁹ The first international comparative list of astronomical words in sign languages <https://www.iau.org/news/pressreleases/detail/iau1706/>

Biographies

Pisit Nitiyanant is an experienced astronomical outreach officer in the centre of the astronomy outreach of NARIT in Chiang Mai, Northern Thailand since 2013. His main fields of interest are planetary geology, Far East cultural astronomy, and astronomy for inclusion.

Suparek Karuehanon is the head of the astronomical public outreach, the centre of astronomy outreach of NARIT in Chiang Mai, Northern Thailand and working in NARIT since 2007. His main fields of interest are the interactive astronomical exhibitions and planetarium control system development for NARIT facilities for the public.

Suwanit Wutsang is an experienced astronomical outreach officer in the Regional Observatory for the Public, Chachoengsao of NARIT in central Thailand, raising awareness and research on astronomy in NARIT since 2007. His main fields of interest are astronomy, astrophysics, cosmology, telescope development, and astronomy for inclusion.

Wichan Insiri is working at NARIT as a Director of Foreign Affairs. He specializes in international collaborations under different frameworks. His main duties include OAD and OAO coordination, where he serves as a national representative. He is also involved with NARIT's International Training Centre in Astronomy under the auspices of UNESCO (ITCA) as an oversight committee member.