

## THE FEEL AND SOUND OF ASTRONOMY - FOR BLIND AND LOW-VISION (BLV) PERSONS IN TRINIDAD AND TOBAGO

S. Haque<sup>1,2</sup>

### RESUMEN

La Astronomía para la inclusión es una iniciativa muy reciente en Trinidad y Tobago y en el conjunto del Caribe de habla inglesa. Ha sido impulsada por la formación del grupo Caribbean Astronomy for Inclusion (CAI) en 2021. En este trabajo, examinamos el estado de esta iniciativa en Trinidad y Tobago para la comunidad de personas ciegas y con baja visión (CBV) y destacamos los desafíos y progresos logrados hasta la fecha. También se presenta y discute la retroalimentación de un grupo focal de personas comprometidas en actividades de divulgación para la comunidad CBV y otras personas ciegas.

### ABSTRACT

Astronomy for inclusion is a very recent venture in Trinidad and Tobago and within the English-speaking Caribbean as a whole. It has been motivated by the formation of Caribbean Astronomy for Inclusion group (CAI) in 2021. We examine the status of this enterprise in Trinidad and Tobago for the blind and low vision (BLV) community and highlight the challenges and progress made to date. The feedback from a focus group of persons engaged in outreach for BLV community, and other blind persons is also presented and discussed.

*Key Words:* Education — Inclusion — Astronomy

### 1. INTRODUCTION

Astronomy for blind and low vision (BLV) persons got its impetus with the formation of the Caribbean Astronomy for Inclusion (CAI) group in 2021 (Flaquer et al. 2022; Haque et al. 2022). It should be noted that the definition of Caribbean is quite variable and depends on the criteria in use for example geographical, historical or language. At present, CAI includes the countries represented by current members from Haiti, Honduras, Puerto Rico, Dominican Republic, United States and Trinidad and Tobago. For our purposes and intention, we are focussing on the English-speaking Caribbean which includes islands such as Barbados, Grenada, Jamaica, Antigua and Trinidad and Tobago as examples.

As our team began the uphill journey of Astronomy outreach to persons who are differently abled, we quickly learnt that we had much to learn. As such we embarked on engaging specialists in the community like Dr. Ben Braithwaite of the University of the West Indies in Trinidad and Tobago who had worked with the deaf community locally (Braithwaite 2015). Wanting to make astronomy accessible to differently abled communities has a lot of psycho-social barriers that we needed to understand from other specialists already working in the communities.

### 2. ORGANIZATIONS IN TRINIDAD AND TOBAGO FOR BLIND AND LOW VISION PERSONS

For the scenario in Trinidad and Tobago, it is estimated that 79,000 people have a visual impairment and 10,200 are blind in a population of 1.5 million people. The three leading preventable causes of blindness in this country are cataracts, glaucoma, and diabetic retinopathy (O50Q 2023). To provide assistance support to persons who are blind and low vision, the Trinidad and Tobago Blind Welfare Association (TTBWA) was established and has been in existence for over one hundred and eight (108) years, and its mission is to inspire persons who are blind, to exceed expectations through progressive networking with all stakeholders, to add value to the global community through advocacy and inclusion, creating a diverse and equitable society.

The organization's vision is a world that is inclusive, diverse, and equitable for all (O50Q 2023). The services offered by TTBWA include:

1. Accessible textbooks for students (Braille, large print, and soft copy)
2. Orientation and Mobility
3. Daily living skills
4. Braille classes

<sup>1</sup>University of the West Indies (shirin.haque@sta.uwi.edu).

<sup>2</sup>Astronomy for BLV persons in Trinidad

5. Computer literacy in text-to-speech classes
6. Music classes
7. Use of smart devices with text-to-speech classes
8. Consultation on blindness issues

Furthermore, other services they offer include The TTBWA accepts volunteers to assist people who are blind or visually impaired with various tasks. These tasks include tutoring, shopping, driving, independent living skills, traveling, converting printed documents into an accessible format, reading, vision screening, and testing blood glucose, blood pressure, and cholesterol levels.

There is only one other organization that is associated with blind and low vision persons in Trinidad and Tobago which is PAVI – Persons associated with Visual Impairment<sup>3</sup>. They indicate that their mission is “Seeing the possibilities and making them happen beyond visual impairment.”

Their key objectives are listed as being able to provide support to adjust to blindness services including orientation and mobility, daily living skills and counselling to family members so that they would be better able to work along with the individual who has lost or losing sight.

They highlight their major achievements since its inception, has been to lobby for the rights of the visually impaired to vote independently. Their advocacy and awareness initiatives continue through the use of both traditional and social media. The organization also partners with other agencies for the empowerment of persons with disabilities.

Our attempts to meet with these organizations met with little success. Furthermore, as we tried to get more detailed demographic information, this was also not forthcoming. In both organizations, there is no mention of science related activities, including Astronomy which is already a somewhat exclusive area of science.

So, we note that there is a glaring omission. There are no science or STEM related endeavours far less for Astronomy for persons who are blind or with low vision. Informal discussions with blind persons have confirmed the situation that they are unable to access science outreach activities (private communication) where if they wanted to pursue the sciences, they are generally discouraged from this as it is seen as an avenue not suitable for them. This is regrettable that an entire community in this era is not

included in being to enjoy the wonders of our Universe just because of a disability. There is no awareness that technology is now available to overcome the challenges of being blind or having low vision.

With this background, our work has literally been cut out for us and we are starting at ground zero with much to be done in the English-speaking Caribbean.

### 3. OUTREACH EFFORTS

In Trinidad and Tobago there is the National Institute of Higher Education (NIHERST) under whose umbrella there has been the operations of the National Science Centre (NSC) which engages in the outreach in STEM disciplines to persons in the community. Astronomy has always been included in their portfolio for outreach and they have many telescopes they use for stargazing. Since COVID-19, the physical site has not been operational, however science outreach continues by going out to the communities. NIHERST has agreed to partner with us on Astronomy outreach to blind and low vision persons and we are currently coordinating with them to take astronomy to persons in the community who are blind or have low vision.

Alongside our attempts to increase outreach in Astronomy for inclusion we have engaged in academic opportunities at conferences which included a panel discussion at a Network and Outreach for Disability Education and Sensitization (NODES) disability conference held in Trinidad in April 2023 (Antoine-Dunn 2023). At this conference, Dr. Diaz-Merced presented devices that she was working on that allows blind and deaf persons to experience astronomy using vibrations. Blind persons in the audience also were very excited with the braille posters in Astronomy that were passed around and 3D printed moon the size of a football (Fig. 1). They did not have any prior access to such materials and the tactile feel of the craters on the surface of the moon left them mesmerized.

We have found it easier to grow our arsenal of outreach materials than to be able to engage with the community of blind and low vision persons. We have made tactile models of notable constellations that would be visible from Trinidad such as Orion and Ursa Major (Big Dipper). We have also begun a collaboration with Newcastle University in the United Kingdom with Prof. Christopher Harrison, the creator of the planetarium show “Audio Universe”. He has made available to us many tactile tiles with common images of astronomy imprinted on them such as the cosmic microwave background, galaxies and nebulae.

<sup>3</sup><https://cpdcngo.org/ngo-resource-directory/persons-associated-with-visual-impairment-pavi/>



Fig. 1. Panel at the NODES Disability conference in April 2023 with Braille Astronomy posters and 3D printed Moon.

We also built the Coordinated and Relative Dimensions in Space (CARDIS, Flaquer et al. 2022) which can help to align telescopes and aids with the teaching of mathematics in the conversion of polar and cartesian coordinate systems (Fig. 2).

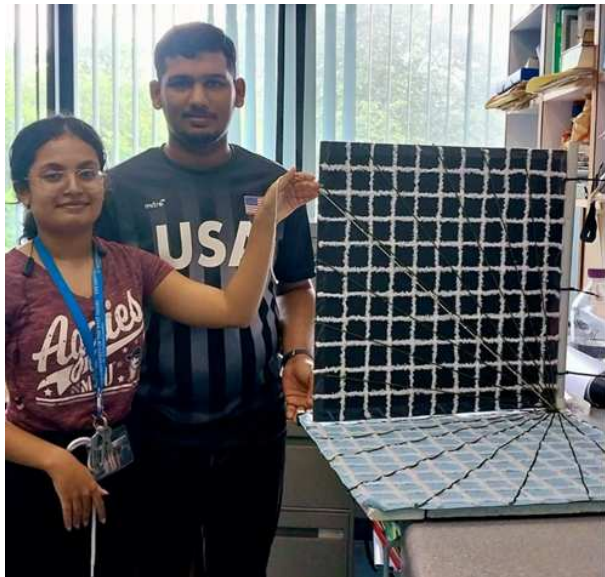


Fig. 2. Students at the University of the West Indies with the CARDIS built by them.

We also have obtained LightSound (Bieryla et al. 2020) and used the opportunity of the partial eclipse on October 14, 2023, where there was about 50% occultation with some dimming. Students at the University of the West Indies participated in testing the equipment (Fig. 3). We recorded the audio and subsequently shared with some blind per-

sons and just knowing they were able to experience the eclipse in another modality using multisensorial technology was of great excitement to them.

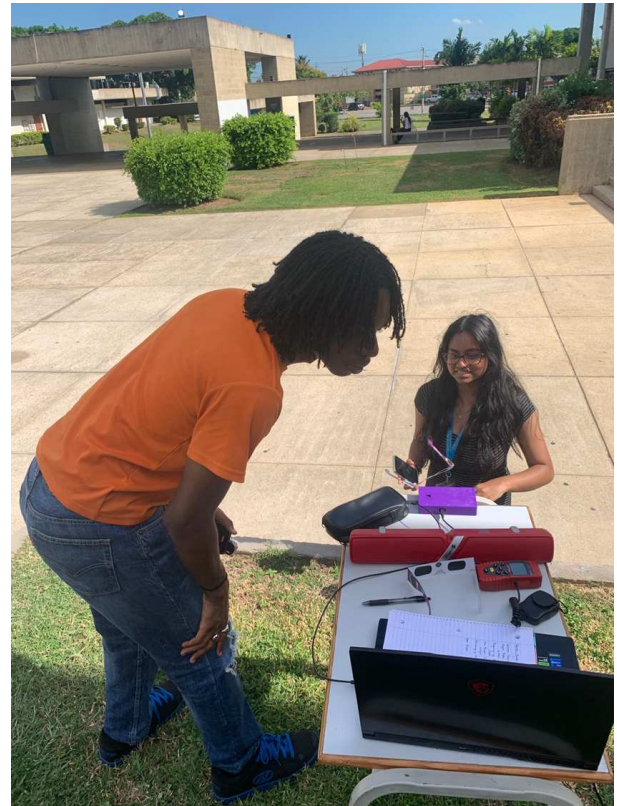


Fig. 3. Students at the University of the West Indies testing the LightSound equipment during the partial solar eclipse of October 2023.

Multisensorial avenues have been able to offer options for experiencing the Universe by blind persons and we have been working on accessing a range of such. We are also working on implementing the planetarium show “Audio Universe” (Harrison et al. 2021) for outreach to blind and low vision persons.

#### 4. FOCUS GROUP STUDY

We have noted that there are a lot of resources in astronomy that are readily available or that can be duplicated. Some are low cost and of course some like specialised printers for tactile printing can be expensive. Since we embarked on this project, we have made definite progress in having materials for outreach in Astronomy to the blind and low vision community. It is no good having resources and expertise if we are not able to communicate and bring it to the community. As such a focus group study was done to get feedback on what was of importance to the individuals who engaged in this type of outreach in developing materials (this group included

two undergraduate students of the University of the West Indies) and three other persons who were blind.

The three persons who were blind worked at the National Library of Trinidad and Tobago, the disability unit at the Ministry of Social Development and Family Services in the Government and the third was a musician.

They were administered the following questions:

1. Are you interested in Astronomy?
2. Have you had any opportunity to learn about astronomy?
3. Would you like to learn more about it or experience it with other senses such as sound and touch?
4. What topic if any interests you most in astronomy?
5. What do you think is the greatest challenge for you to pursue a passion in Astronomy?
6. Would you like to attend workshops in Astronomy?
7. Would you like to experience an interactive museum display in Astronomy?
8. Anything else you would like to add?

Their feedback is summarized below:

Regarding interest in Astronomy, all participants answered in the affirmative with one noting "I wanted to delve deeper, expand my understanding, and learn more about this captivating field." On being asked if they had any opportunity to learn about astronomy, two thirds of the blind participants responded in the affirmative but that it was rather limited. One person indicated that it was when they had some sight in their childhood and another through online content. Sighted persons by default as students of the University and working on projects for outreach materials for blind and low vision persons had experience with Astronomy.

On discussing if there was interest in learning about astronomy via multisensorial modes, such as sound and touch (tactile) there was 100% interest and enthusiasm for such by all participants. Delving further into areas of Astronomy of interest to the participants, there was great interest in the expanding universe, that is, the Big Bang and including the solar system and layers of the atmosphere on Earth itself. One participant also noted that there were

probably other areas of interest that they were unaware of due to limited access.

What did they see as their greatest challenge to pursue a passion in Astronomy? Blind persons noted that accessibility solutions were lacking. Another noted the cognitive challenge of comprehending the phenomena they could not touch or see. Two persons in the focus group noted that financial constraints was an issue especially more so for persons with disabilities than the general population.

There was 100% consensus regarding desire for participation in workshops especially designed for blind and low vision persons. One blind person noted "That would be awesome. Even being in the space where the conversations are happening would be a way to grow and a step in the right direction." Regarding any other comments they would like to share, two blind persons shared the following comments respectively.

"Many individuals with visual impairments are denied the opportunity to understand Science. This will be an excellent initiative, to help persons with visual impairment, understand their surroundings."

"Persons with disabilities are interested and fascinated by what lies beyond our solar system as much as anyone else. If we can interact and experience these grand phenomena through various accessible media that would really allow us to participate in a meaningful way in an area that is vast and exciting."

One of the sighted students who worked on the project to develop materials noted "I hope to see Astronomy continues to diversify and be more inclusive so that everyone has the opportunity to experience it. Especially locally I hope for more exploration of the field."

## 5. DISCUSSION AND CONCLUSIONS

Our experience in Astronomy for inclusion with a focus on blind and low vision persons has shown us that there is a lot of content available which are affordable and accessible, can be made in house which we have been collecting. This ranges from braille posters and books in astronomy, to 3-D printed models of Astronomical objects, tactile tiles printed with astronomy images, including tactile constellations. We are yet to implement the Audio Universe planetarium show but intend to. So, this aspect of access to resources is certainly an area where reasonable progress has been made. As academics, participating in conferences, writing papers and partaking in seminars are all activities we have been able to engage in without a problem.

Where the greatest challenge has sadly been seen, has been in connecting with the blind persons and the community and organizations. Only through personal contacts after quite some time that we were able to make some meaningful contacts. From here on, we are hoping for implementation of lessons learnt from the focus group which can now get underway.

Our experience has thus shown us that resources and skills for outreach in Astronomy to blind and low vision persons in the English-speaking Caribbean is the least of the problems. We have much to understand of their world and challenges of the persons in the community – we have much to learn from them even as we have much to share with them.

We therefore conclude that historically there have been walls dividing the sighted and blind and low vision persons in the community. These must be broken down and it is now time to build bridges that we hope our efforts will help create in the near future.

## REFERENCES

- Antoine-Dunne, J. (2023). Enhancing Accessibility in Astronomy Education: Perspectives from the NODES Conference. *Astronomy Education Review*, **22**(1), 78-92.
- Bieryla, A., et al. (2020). LightSound: An Innovative Approach to Solar Eclipse Engagement. *Publications of the Astronomical Society of the Caribbean*, **8**(4), 112-125.
- Braithwaite, B. (2015). Astronomy Outreach with the Deaf Community. *Journal of Science Communication*, **14**(3), A03.
- Flaquer, B., et al. (2022). Caribbean Astronomy for Inclusion group (CAI) in 2021. *Journal of Inclusive Astronomy*, **1**(1), 23-34.
- Haque, S. (2022). Challenges in Astronomy for Blind and Low-Vision Persons. *Accessible Universe*, **10**(2), 45-56.
- Harrison, C. (2021). Audio Universe: Making Astronomy Accessible Through Sound. *Journal of Multisensory Astronomy*, **7**(2), 56-67.
- O50Q. (2023). Publication of the Trinidad and Tobago Association of Responsible Persons, **Issue 1**, 27.