UD天文シンポジウム

Astronomy for Inclusion

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概要　「ア・タッチ・オブ・ユニバース（宇宙にふれる）」プロジェクトなどを通じて、全ての人が天文学にふれることができるためにこれまで開発してきた教材について簡単にご紹介します。また、国際天文学連合のワーキンググループの活動についてもご説明いたします。

Abstract

I will introduce briefly the materials that our group has been using to make Astronomy accessible to all, in particular with the “A Touch of the Universe” project, a kit of accessible materials. I will also present the activities of the IAU Working Group on Astronomy for Equity and Inclusion. The group has the goal of becoming a forum where astronomers and educators share their activities, materials and good practices to make Astronomy accessible to all. It also promotes the development of new tools in the frame of the Universal Design of Learning.

1. Introduction

Since 2003 the Astronomical Observatory of the University of Valencia (OAUV) has been conducting regular activities for school groups in the frame of the "Aula del Cel" (The Sky Classroom) program. Then, in 2005, motivated by a request came from a special education centre we developed, working closely with teachers of that school, a new kind of visit tailored to their needs. All of their student showed some kind of cognitive disability, in some cases together with physical disabilities. Therefore, the activities had to accommodate a wide spectra of different needs.

The visit consisted in two power point presentations and several hands-on activities. One of the presentations was based on making links between astronomical objects and sensorial stimuli. For example, they were touching balloons filled with warm water while looking at the

surface of Venus, cold water when watching Saturn's moon Europa. Incense sticks were lightened while Jupiter's moon Io was on the screen. This sensorial feedback gave them better chances to understand and remember what they were listening and/or watching. After that, they attended to another presentation, a sequence of astronomical images accompanied by a soothing music.

The hands-on activities were the ones we usually carried out with the regular schools, like creating constellations with luminescent stars or shooting water rockets (Fig. 1).

Fig. 1 Special school students making paper sundials and constellations with luminiscent stars. Credit: OAUV

Later, we also used other kinds of interactive talks were the public had to contribute to the narration, like the one in which they had to find out how to travel to the Moon (by a hot-air balloon? by different kinds of airplanes? by spaceship?). Afterwards they would build a hanging mobile with the Earth on the centre and satellites, spaceships and the Moon around it.

2. The International Year of Astronomy 2009: Storytelling, feeling, drawing, observing

The International Year of Astronomy was an important turning point in this project. We coordinated the activities for publics with special needs in the Spanish node of the international organization, and new and exciting projects were developed with funding from the FECYT, an office of the Spanish Ministry of Education.

For people with cognitive disabilities we created an interactive talk, "La Vida de las Estrellas" (The Life of the Stars). It showed them the life cycle of three different stars of large, medium and small size. The participants were invited to draw what they had learnt and afterwards a book was published with their drawings. They also could see the sunspots with a solar telescope.

To address the public with motor problems we devised a new version of the computer software that they use in their wheelchairs to communicate with their carers. In our free version, call "Astroadapt", they could find astronomical images with a brief description of them (Fig. 2). The software is multilingual (Spanish and English so far), multiplatform (it was written in Python) and can make use of the computer's voice-over function.

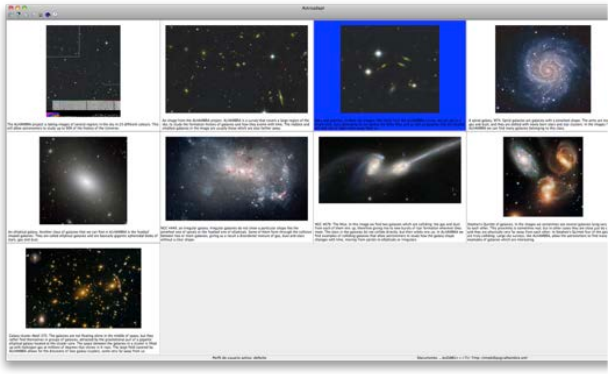

Fig. 2 A snapshot of one of the screens of "Astroadapt". By pressing any key the user selects the box that is being highlighted at that moment, getting a large version of the image along with a brief explanation. Credit: OAUV

For blind publics, we translated into Spanish and printed the contents of an astronomy book which had been produced by the Astronomical Observatory of Padova (Italy) (Benacchio et al. 2000). The book was entirely written in Braille, with contents ranging from the electromagnetic spectrum up to dark energy and the Big Bang, and very nice tactile illustrations.

Finally, a planetarium show for the blind and visually impaired was designed (Fig. 3), based upon a previous experience by Sebastian Musso at the Planetarium of Buenos Aires (Argentina). We developed an original script about a journey through the stars, to visit different regions of the sky with famous constellations and objects. Each of them had a particular sound associated to it in the program's soundtrack. The originally composed the soundtrack was recorded in five different channels to be fed into the multiple speaker system of the planetarium.

The projection of the night sky on the dome is arranged in such a way that when the narrator is talking about a particular constellation, the sound associated to it is heard coming mainly from the speaker closest to the place where it is being projected, thus giving information to the public about the relative positions of the objects in the "sky" above them.

Obviously, in this way we were only telling about the position but, what do the constellations look like? To help with this, we developed a hemisphere made of fiberglass, with different kinds of engravings (Fig. 4). Bumps represent stars, and they come in two different sizes, according to the star brightness. The continuous lines draw the shapes of the constellations, and the dashed lines guide the way from one constellation or object to the next, according to the show's script.

Fig. 3 Planetarium show at Porto (Portugal) Credit: Lina Canas

Fig. 4 The tactile constellations. Credit: OAUV.

In order to combine the two main elements, the sounds and the sphere, the soundtrack had two different narrators, one for the astronomical contents, the other to guide the public through the tactile hemisphere while following the astronomical story.

3. Reaching to the Moon with a tactile 3D model

After the tactile celestial hemisphere we embarked in the design of a tactile model of our Moon which would allow people to explore our satellite regardless of their vision abilities (Ortiz-Gil et al. 2012).

The final model is a sphere with a diameter of 20 cm, representing a simplified version of the lunar surface, with the main maria and craters (Fig. 5). The goal is to convey in a tactile way the visual impression that we gather when looking at the Moon. Therefore, it is not a mere topographic representation. For example, crater rays have some relief in the model, although in the real Moon they are flat.

The different features can be labeled with a Braille letter. One can print a separate Braille document with the name of the feature corresponding to each Braille letter. Also, the names of the features can be written on the surface, for the benefit of those who are not totally blind.

The North pole has been marked by a 'T', and the vertical line of this 'T' is pointing to the near side of the Moon. A meridian marks the separation between the near and far sides. The South pole is marked by a smooth cap.

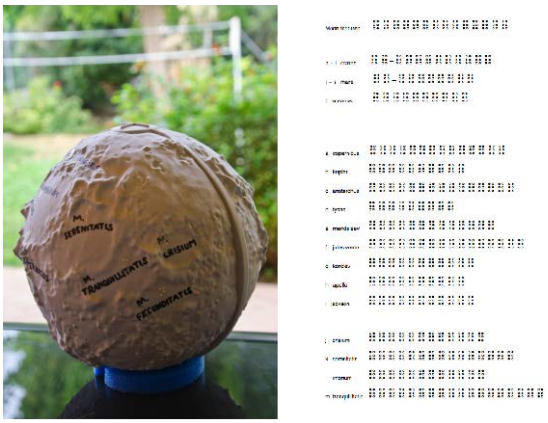

Fig. 5 The 3D tactile model of the Moon for the visually impaired. Credit: OAUV.

4. "A Touch of the Universe"

After all these experiences, we decided to build a kit of selected resources to teach astronomy to kids and adults either blind or not, based on the Universal Learning Design principles (Ortiz-Gil, A. et al 2014). With funds from the International Astronomical Union Office of Astronomy for Development and other sources we developed a box that contained different materials, developed by us or others. This

project, which we called "A Touch of the Universe" was able to distribute 30 of these boxes to several underdeveloped regions around the world, in America, Africa and Asia (Fig. 6).

Fig. 6 "A Touch of the Universe" box in 'deconstructed' mode. Credit: OAUV.

The kit contains a wealth of astronomical tools: 1) an introductory letter, 2) a half-sphere with engraved constellations, 3) a document explaining the planetarium program "The Sky in Your Hands", 4) a tactile moon model, 5) a guide to using the tactile moon, 6) three constellation models, 7) an activity book in Braille and normal printing with some suggestions on how to use those materials, 8) prints from the "From Earth to the Universe" (FETTU) project by NASA's Chandra X-ray Observatory, 9) a document with FETTU activities and 10) a book "The little Book of the Moon Phases" by Noreen Grice. It also includes a DVD with the soundtrack of the planetarium program in Spanish, Portuguese and English versions; FETTU audible: audible version of the FETTU prints; different PDF versions of the kit guides in various languages.

5. IAU Working Group on Astronomy for Equity and Inclusion

Many other groups and individuals are developing similar activities and materials around the world. In order to put them in contact, foster international collaborations and fasten up the creation of new and better materials, the International Astronomical Union created the Working Group on Astronomy for Equity and Inclusion. The group has the goal of becoming a forum where astronomers and educators share their activities, materials and good practices to make Astronomy accessible to all. It also promotes the development of new tools in the frame of the Universal Design for Learning. Please visit the group's website for more details: http://sion.frm.utn.edu.ar/iau-inclusion.

Recently, the working group organized a workshop in Cartagena de Indias (Colombia) on Astronomy beyond the common senses, that gathered experts from all around the world to share and reflect upon how to make astronomy accessible for professionals, students and general public

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