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Mars as big as the supermoon?

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Abstract

Funny title? Well, actually it is not, it is a mix of misconceptions that we find very often in the press and social networks. These are telling us two very important things: People don't have enough knowledge of astronomy and very often forget completely to look to the sky.

Public outreach and education are fundamental in our society. How do we reach those that don't know they need urgently to be reached? How to engage educators in the use of modern tools end resources for science education? How to build a whole new attitude towards science and its meaning to us?

1. Introduction

The European Commission is investing a lot of resources for research in the implementation of modern methodologies for science education, with particular interest in IBSE models (Inquiry-based science education).

Using e-Science and e-Infrastructure resources might be a very effective way to achieve the EC vision. These resources have also the power to attract the curiosity of students, to engage educators in the use of modern repositories of materials and, in the end, to involve local communities.

This is the goal of two European Commission funded projects: Discover the Cosmos (DC) and Open Discovery Space (ODS). Both projects aim to bring cutting edge science and teaching models to the hands of teachers and students alike. Both envisioning a new approach for the delivery of science content using modern tools and innovate technologies.

1.1 Discover the Cosmos

Discover the Cosmos is a coordination action that aims to demonstrate innovative ways to involve teachers and students in e-Science through the use of existing e-infrastructures in order to spark young people's interest in science and in following scientific careers. It tries to demonstrate how the use of such e-Science tools and infrastructures can be pedagogically valid instruments. By using image processing software, robotic telescopes and other such tools [1] students can, for instance, measure the size of the full moon in different dates and understand that the different in size from an average full Moon and the so called Supermoon (Full moon during perigee) is only 14%. This exercise can engage the young minds in profitable discussion as to why this is so and what is the importance of this phenomena to humans, if any.

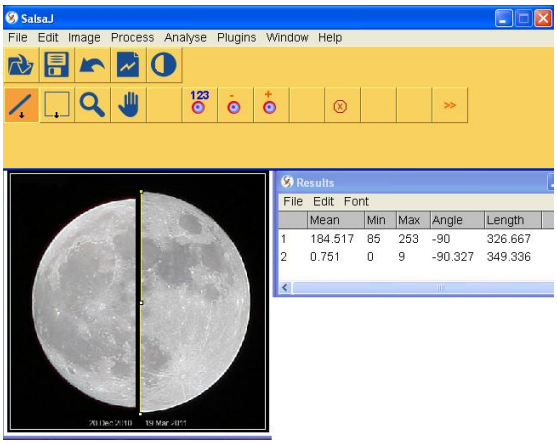

Figure 1: Measuring the apparent size of the Moon using SalsaJ.

Another interesting exercise is to invite students to understand the cycles of the Sun and its relation to our climate [2]. Students can measure prominences, count spots and discover amazing features in our Sun's surface analyzing data from the astronomical observatory of Coimbra. The archives have images since 1926.

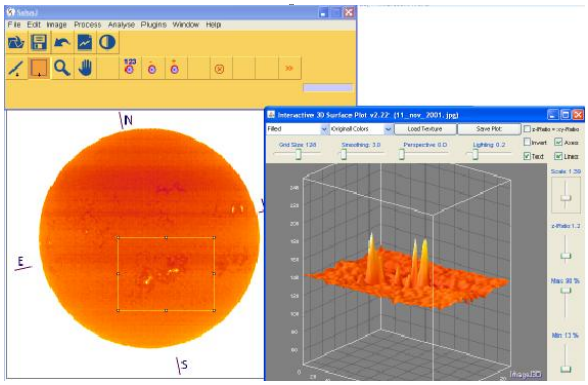

Figure 2: Counting sunspots in the surface of the Sun.

1.2 Open Discovery Space

Open Discovery Space (ODS) is a socially-powered and multilingual open learning infrastructure to boost the adoption of eLearning resources. It aims to serve as an accelerator of the sharing, adoption, usage, and re-purposing of the already rich existing educational content base. By engaging in the ODS proposal educators will have the opportunity to design innovative lesson plans using cutting edge resources for science education.

Let's use as an example a lesson plan that envisions the introduction of a discussion about the differences and similarities between Mars and Earth. The lesson could start with a discussion about the frequently announced appearance of Mars in August as big as the Moon. Students would analyze the orbit of the planets using planetaria software suggested in the repository. Students would be invited to explain the meaning of a close approach between planets. By simulating the orbit of the planets they could predict the retrograde motion of the planet and would quickly understand that Mars could never have the same size as the Moon.

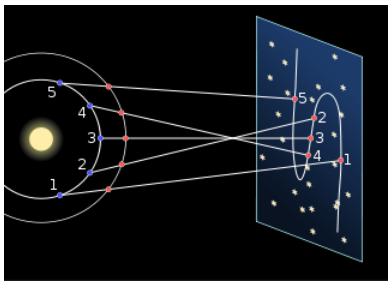

Figure 3: The apparent retrograde motion of Mars

The next step could be for instance the exploration of Mars main features by participating in a citizen science project such as the one promoted by NASA: Be a Martian [3]. Besides handling real images they can engage in fruitful discussions about the differences and resemblances between our planet and Mars. The lesson can be completed by a discussion on why should we continue to explore the planet and if we should visit the red planet someday.

2. The importance of teacher training and the existence of a support network

All the above ideas are impressive but in real life teachers are struggling to handle the school curricula and in most of the times preparing students for exams and other mandatory school activities. Even those that are eager to engage in such novelties have a hard time to get started in the use of new solutions. So the mission at hand is not easy. There are several aspects that have to be taken into account:

- How to introduce cutting edge eScience tools and resources within the school curricula?

- How to prepare teachers to use them?

- How to help teachers make smart choices on which tool or model to use?

All of these aspects need to be addressed during the teacher training sessions. But the effort doesn't end after this phase, actually the training session is just the beginning of a long journey. An effective support network must be in place in order to ensure the continuation of the process and the actual implementation of the suggested models in classrooms.

This is what the Galileo Teacher Training Programme (GTTP), a legacy of IYA2009 [4], has been building since 2009. The secret of the success of GTTP is precisely the support network being built with the help of the 15000 teachers reached by our efforts worldwide.

3. Conclusions

The road ahead is designed and the tools are all at hand. What is needed now is the support from the research community to continue bringing real research opportunities into classrooms. We need educators to engage in new trends for science education. But most of all we need the support of education authorities from all over the world to recognize the importance of this process and acknowledge the effort of the teachers. The end of this road promises a science literate community, alert to the beauty of the Moon, even when it is not "Super".

References

[1] Rosa Doran, Anne-Laure Melchior, Thomas Boudier, Pacôme Delva, Roger Ferlet, Maria L. T. Almeida, Domingos Barbosa, Edward Gomez, Carl Pennypacker, Paul Roche, Sarah Roberts: Astrophysics datamining in the classroom: Exploring real data with new software, arXiv:1202.2764 (Accepted for publication in the American Journal of Physics).

[2] Discover the Cosmos Demonstrators www.discoverthecosmos.eu and the observatory of Coimbra's images archives http://www.mat.uc.pt/sun4all

[3] Be a Martian is a citizen science project promoted by NASA http://beamartian.jpl.nasa.gov

[4] The Galileo Teacher Training Programme was a cornerstone of the International Year of Astronomy 2009 and remains as a living legacy of the ephemeris (www.galileoteachers.org)