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Astronomy education in Morocco–a new project for implementing astronomy in high schools

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Abstract. Astronomy education in Morocco, as in many developing countries, is not well developed and lacks the very basics in terms of resources, facilities and research. In 2004, the International Astronomical Union (IAU) signed an agreement of collaboration with Al Akhawayn University in Ifrane (AUI) to support the continued, long-term development of astronomy and astrophysics in Morocco. This is within the IAU programme Teaching for Astronomy Development (TAD). The initial focus of the programme concentrated exclusively on the University's Bachelor of Science degree programme. Within this programme, and during two years, we were successful in providing adequate astronomy training to our physics faculty and few of our engineering students. We also offered our students and community general astronomy background through courses, invited talks and extra-curricular activities. The project is now evolving towards a wider scope and seeks to promote astronomy education at the high school level. It is based on modules from the Hands on Universe (HOU) interactive astronomy programme. Moroccan students will engage in doing observational astronomy using their personal computers. They will have access to a worldwide network of telescopes and will interact with their peers abroad. Through implementing astronomy education at this lower age, we foresee an increasing interest among our youth not only in astronomy but also in physics, mathematics, and technology. The limited astronomy resources, the lack of teacher experience in the field and the language barrier are amongst the difficulties that we will be facing in achieving the objectives of this new programme.

Keywords. Astronomy education, interactive astronomy

1. Introduction

Morocco is a developing country where a little less than half of its population is illiterate and a little over 50% are more than 15 years old. The unemployment rates are particularly high for young adults between the ages of 15 and 34 years. The recent national transition to a more open economy incites considerable improvement of the Moroccan educational system. There is an increasing need for a skilled work force to support the country's economic growth. In order to achieve that, a stronger scientific education for the youth is essential. During the past decade, it was a national challenge to make education accessible to all, but the lack of resources made it very difficult for the Ministry of National Education (MNE) to equip most middle and high schools with science laboratories. The MNE was also unable to supply science teachers with all the necessary demonstration kits and pedagogical tools. This reflected negatively on the overall number of engineers, scientists, medical doctors and skilled technicians graduating each year. These numbers are below the international average. It is found that the science level and background of a large proportion of Moroccan youth either in middle or high schools is not up to the expectations set by the MNE. In 2003, the US National Center for Education Statistics published a worldwide comparative study which ranks countries in terms

of education in the field of sciences and mathematics (Gonzales *et al.* 2004). This showed that Moroccan eighth-graders perform far below the international average. Moroccans ranked 41st among 46 other participating countries. A closer look at this international study shows that Moroccan students are mainly lacking observational and basic data analysis skills. Astronomy education, so far ignored in the Moroccan science curricula, is proposed here as a key learning activity, that would enhance the scientific skills of the students. It could also play a major role in increasing youth interest in physics, mathematics and technology, hence producing the desired skilled work force needed by the emerging market. The project will also contribute to the popularization and development of astronomy in Morocco.

2. Astronomy education in Morocco

Astronomy education in Morocco is currently limited to masters and doctoral programmes. There are four universities that offer graduate programmes in the space sciences (Casablanca, Marrakech, Rabat and Oujda). Research interests focus mainly on helioseismology, astroclimatology, astroparticles, cosmic radiation, near Earth objects and search for supernovae, and site testing for the ELT. There are two small observatories in the country. The Oukaimeden Observatory, near Marrakech, was founded in 1988 in the High Atlas Mountains and has 60-cm and 35-cm telescopes. The Rabat Observatory was founded in 1999 and has a 51-cm telescope. In the science curricula of middle and high schools, astronomy is almost absent. It appears only in the middle school physical sciences course (8th grade), where students have their first acquaintance with astronomy through a single short chapter titled "Elementary notions about astronomy" (Radi *et al.* 2004). In this chapter, students get a few glimpses of the scope of astronomy and its fundamentals, such as the difference between a star and a planet, the characteristics of the different planets in the solar system (diameter, distance from the sun, moons, period and temperature), and one paragraph about famous Muslim astronomers.

3. A new project for implementing astronomy in high schools

We propose a new project to introduce interactive astronomy in the Moroccan high school curriculum in order to improve students' observational and data analysis skills, and to increase their interest in science and technology. We believe that introducing astronomy at this level will boost the development of the space sciences in the country. The project centres on the use of internet astronomy. Students will have access to an automated telescope from their personal computers and will be able to investigate the universe without being at any observatory. They will be able to request observations, download images and analyze them. They will engage in doing science by using their own data, which is quite an exciting learning activity for most students. This educational programme will be based on *Hands-On Universe* (HOU), a programme developed at the University of California (Ferlet & Pennypacker, 2006). HOU enables students to investigate the universe while applying tools and concepts from science, mathematics, and technology.

The introduction of this programme into the Moroccan high school curriculum will not be easy. Astronomy is viewed by most science teachers as a difficult subject that needs advanced technology and resources. A lot of effort must be put into changing this negative perception to help teachers appreciate the richness of this subject in educational examples, activities and tools that would enhance Moroccan pupils' observational and data analysis skills. Currently, the AUI is proposing to be a site for the University of

California Lawrence Hall of Science Real Astronomy Experience telescope and also for a one-meter Las Cumbres Observatory Telescope. We expect that once either of these telescopes is installed, growing interest in introducing astronomy in the Moroccan science curriculum for middle and high schools will emerge. This will coincide with the Ministry of National Education project GENIE that aims at introducing computer laboratories and internet access in 3000 middle and high schools by the year 2009. Internet access to the automated telescopes at AUI, or any HOU telescope, would then not be a problem for these schools. The newly established Soft Center for Citizen Empowerment at AUI will contribute to the development of the necessary Arabic IT support material in astronomy education and will train teachers on the use of the HOU telescopes.

4. Conclusion

Interactive astronomy is an inexpensive science activity that suits Moroccan youth. High school students will engage in doing observational astronomy and developing scientific reasoning and methodology from their personal computers. They will be part of a worldwide network of students using the same technology and working on similar scientific activities. These common activities will engage them discussions with peers in other countries, thus building international ties while sharing the excitement of scientific pursuits. They will also develop their communication skills in foreign languages. We foresee that the project will substantially contribute to the popularization and development of the space sciences in Morocco.

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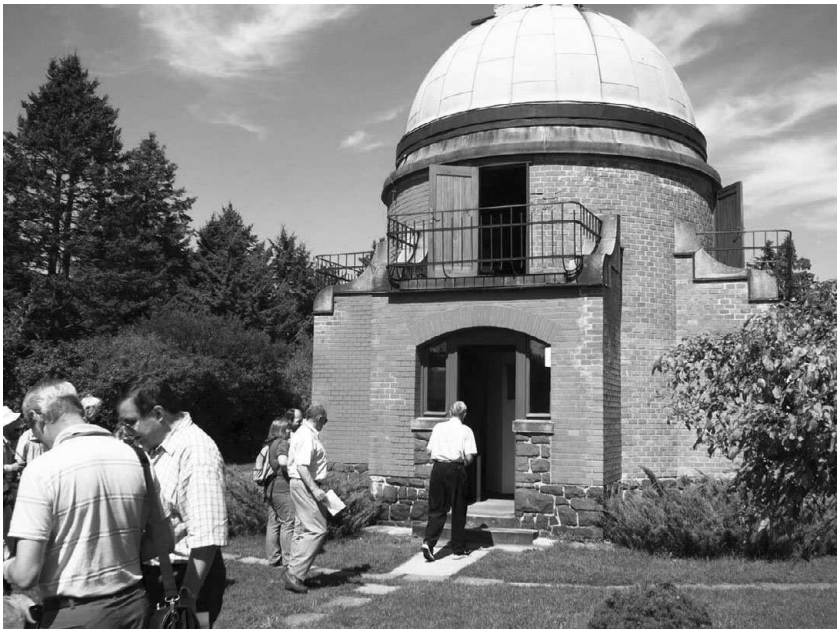
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Visit to Ondrejov Observatory near Prague during the IAU General Assembly