

International Schools for Young Astronomers

Teaching for Astronomy Development: two programmes of the International Astronomical Union

Michèle Gerbaldi¹, Jean-Pierre DeGreve² and Edward Guinan³

¹Institut d'Astrophysique de Paris, France
98 bis Boulevard Arago, 75014 Paris, France
email: gerbaldi@iap.fr

²Dept. of Physics, DNTK, Vrije Univiteit Brussel
Pleinlaan 2, 1050 Brussels, Belgium
email: jpdgreve@vub.ac.be

³Astronomy and Astrophysics Department, Villanova University,
Mendel Hall, 800 Lancaster Ave., Villanova, PA 19085, USA
email: edward.guinan@villanova.ed

Abstract. This text outlines the main features of two educational programmes of the International Astronomical Union (IAU): the International Schools for Young Astronomers (ISYA) and the Teaching for Astronomy Development programme (TAD), developed since 1967.

The main goal of the International Schools for Young Astronomers (ISYA) is to support astronomy (education and research) in developing countries in organizing a 3-week School for students with typically M.Sc. degrees.

The context in which the ISYA were developed changed drastically during the last decade. From a time when access to large telescopes was difficult and mainly organized on a nation-basis, nowadays the archives of astronomical data have accumulated at the same time that many major telescope become accessible, and they are accessible from everywhere, the concept of virtual observatory reinforcing this access.

A second programme of the IAU, Teaching for Astronomy Development (TAD), partially based on a School, but also of shorter duration (typically one week) has a complementary objective. It is dedicated to assist countries that have little or no astronomical activity, but that wish to enhance their astronomy education. The fast development of the TAD programme over the past years is emphasized.

Keywords. IAU Educational Programmes: International Schools for Young Astronomers (ISYA); Teaching for Astronomy Development (TAD).

1. Introduction

The International Astronomical Union (IAU) spends about 10% of its annual budget on programmes aimed to support the stimulation of astronomy in developing countries. As part of Commission 46 *Astronomy Education & Development* two programmes are presently engaged in organizing Schools for astronomy development. These are the *International Schools for Young Astronomers*, hereafter named ISYA, and *Teaching for Astronomy Development*, hereafter named TAD. These educational programmes were established in 1967, when the Commission 46 was created and are still on. A third programme aimed to the Science teachers had a short life-time, due to the lack of financial

support. The main features of the *International Schools for Young Astronomers* (ISYA) being already presented in Gerbaldi (2007) we will focuss on the latest developments in the present paper, whereas we will describe the organization of the second programme, *Teaching for Astronomy Development* (TAD), in some detail. The impact of this programme has increased over the years and will be underlined through its evolution.

2. In 1967, The Visiting Professors Project

In 1967, at Prague during the IAU General Assembly, in parallel with the creation of the *International School for Young Astronomer* (ISYA), the Commission 46 *Teaching of Astronomy* set up the *Visiting Professor Project* (Transactions of the IAU, vol. XIII B, p. 227, 1967).

The role of such visiting professorships is "... to provide contacts between places remote from main centers of astronomical research which could benefit by the visit of an astronomer teaching a course of particular interest to them and possibly helping them to develop a research and/or teaching programme ..."

Following this initiative, a "call of offer" for this programme was published in the issue of the IAU Information Bulletin (No. 25) in 1970: "... Several Institutions have already announced their interest in hosting a Visiting Professor for a limited period of time. The Visiting Professor's duties will be to give up-to-date courses on different chapters of astronomy and to guide advanced student in research ... Astronomers going on an observing mission to Africa, Australia, or to one of the large international observatories in Chile, are urged to stop on their way for a stay of a few weeks or months, if possible, in one of the institutions requesting visiting astronomers."

This programme was fulfilled twice. The first one in 1970, during a 4-month visit at the Bosscha Observatory (Indonesia) and the second one, in 1973, by an astronomer on sabbatical leave who stayed as a visiting professor for several months in different institutions in India (Bombay, Madras) and in Indonesia (Bosscha Observatory).

There are several difficulties to run such programmes:

(a) Most of the astronomers going on an observing mission have very tight schedules, and they wish to use the limited time they have available as much as possible for their observing and research programs.

(b) It takes sometimes months until plans are elaborated with an institution that expressed interest in hosting a visiting professor.

(c) Astronomy professors are usually overloaded with duties, and cannot find the time to devote several weeks or even months to teaching in some other observatory or institution.

This project, based on voluntary action with no specific funds allocated, remained inactive until 1979 because of these difficulties.

3. The Science Teachers' Courses in Astronomy

While Commission 46 set up the *International Schools for Young Astronomers*, many discussions took place on the importance of astronomy in the secondary schools during the XIIth IAU General Assembly (IAU Transactions vol. XIIB, p. 629, 1964). So it was proposed in the 70's "...to organize each year some courses in basic modern astronomy for science teachers and future science teachers in developing countries Courses of two weeks duration were envisaged, each for 20 to 30 students. Each 2-week course

would consists partly of basic lectures in astronomy and partly of discussions concerning teaching techniques including the use of various inexpensive laboratory materials. The intention is that the participants would not go back to introduce astronomy courses in the schools, but would integrate astronomy in general science or physics courses already in existence. Astronomy is particularly suitable for an integrated science teaching. It gives the student a feeling of the nature of scientific discoveries and reveals the way of thinking in physical sciences...It is expected that the host country would pay half of the expenditure if UNESCO provides for the other half."

The response from the Director of the UNESCO Division of Science Teaching to this request was positive. Financial support was thus given to the 1972 Science Teachers Courses in Astronomy which was held in Kenya, but such support was not given in the following years. However the Division continued to express its interest in the idea of incorporating topics in astronomy into integrated sciences courses.

3.1. *The Kenya Science Teachers Courses in Elementary Astronomy in 1972*

With the financial support of the IAU and UNESCO Division of Science Teaching, the Commission 46 organized two courses in Elementary Astronomy for Kenya Science Teachers in Nairobi (August 1972). A detailed report can be found in the IAU Transactions (vol. XVA, p. 720, 1973).

Such courses could be no more organized during the following years because of the lack of funds. However this concept remained viable and was fulfilled, from time to time during the later organization of a TAD project. Such an endeavor is now included in the new IAU decadal plan as described by Miley (2009, this conference)

4. From the Visiting Professors Project to the Visiting Lecturer Programme (VLP)

4.1. *The Visiting Lecturer Programme (VLP) in the 80's*

As the *Visiting Professor Project* could not fully achieve its goals, a new organization was set up through the creation of an Annual Visiting Lectureship.

"... The programme for a typical visit might involve public lectures, scientific seminars, during the course of 1-month duration in the country. When possible, the visiting lecturer should be based at a local university or institution of higher learning. The lectureship should be used to promote knowledge and understanding of astronomy, particularly in the countries having little or no formal astronomy which wish to initiate or to make substantial improvements in astronomical activities...."

This programme was formally set up in 1982 (IAU Transactions vol. XVIIIIB, p. 305, 1983) and was designated as *Visiting Lecturer Programme (VLP)*.

The effectiveness of the VLP requires the collaboration of a University or similar institution from the country in question, committing itself to participate in a substantial manner and to continue astronomical activities after the completion of this programme. It is not required that the country is a member of the IAU.

In 1988, D. Wentzel was nominated as the coordinator of this Commission 46 project.

4.1.1. *The first Visiting Lecturer Programme (VLP): Peru, in 1984*

A first contract has been signed in March 1984 between the IAU and San Marco University at Lima, Peru. (IAU Transactions vol. XIXA, p. 653, 1985). This first VLP

programme ended in 1987. The result is summarized as follows: three master degrees in astronomical subjects were being prepared and astrophysics has been included into the curriculum of the Faculty of Physics. A second VLP programme was initiated in Peru in 1989, the visiting professors came from Spain and Argentina. Two graduate students spent several months in Argentina doing work for their Licenciatura degree and three young astronomers went to Brazil for further studies.

In 1993 this VLP in Peru was cancelled due to political instability. Nevertheless, astronomy at Universidad Nacional Mayor de San Marco (Lima, Peru) has become active during the VLP and remains so, since then.

4.1.2. *A second Visiting Lecturer Programme (VLP): Paraguay, in 1988*

Another VLP programme was initiated in Spring 1988 in Paraguay. Courses were given till 1994 by Visiting Professors from Mexico, Argentina and Italy. The Universidad Nacional de Asuncion hosted most of the lectures.

4.2. *Conclusion on the Visiting Lecturer Programme (VLP)*

One of the major problems of the *Visiting Lecturer Programme* was to find capable astronomers who can devote some of their time to go and teach, stimulate, and encourage astronomical research at one of the interested institutions. For example, for the VLP in Peru, the goal was one Spanish-speaking visitor per VLP per year, sufficiently frequently so that each visitor can build on the material of the previous lectures.

The organization of such a programme, based on a teaching organized over 3 years with lecturers staying over 3 months period, was too demanding to maintain.

5. **From the Visiting Lecturer Programme (VLP) to the Teaching for Astronomy Development Programme (TAD) in 1994**

Donat Wentzel, the coordinator of the VLP programme, presented in 1994 a new project named *Teaching for Astronomy Development (TAD)*.

“... The idea of of this new project is to aim for the formation of a small core of indigeneous astronomers interested in teaching and research. Such a goal could be obtained by having astronomical courses possibly integrated in the physics curriculum, as well as by training a few selected students abroad.” (IAU Transactions vol. XXIIIB, p. 214, 1994)

This programme is organized in a flexible way: it can be the visit of a foreign astronomer, for usually one or two weeks, but not as long the previous 3-month programmes. Alternatively, it can also be an approximately one-week intensive course of instruction given by one to up to five astronomers. It can also encompass training abroad of local astronomers as well as providing complementary equipment.

The TAD program is still on.

6. **Teaching for Astronomy Development TAD from 1996 till 2006**

As a start, in 1996, the IAU Executive Committee approved two TAD programmes, one in Vietnam and another one in Central America. Two more programmes were set up: in Morocco in 1998 and in the Philippines in 2002.

6.1. *Teaching for Astronomy Development Programme in Vietnam*

A 2-year programme focussing on a Summer school in Vietnam, to re-introduce astronomy to that country after a 30-year hiatus, started in 1997. A workshop took place in Vietnam, at Vinh University, in September 1997, for 15 university instructors and 15

physics students, to update them in astronomy and to instill a sense of inquiry and develop hands-on activities in astronomy. This programme was organized by Donat Wentzel.

Since then and very regularly till 2007, workshops and lectures took place in Vietnamese universities at Vinh and Hanoi.

The first modern text-book on Astrophysics, bilingual (Vietnamese and English), was published in 2000 with partial financial support by TAD. It is aimed at the astronomy course taught at ten pedagogical universities.

6.2. *Teaching for Astronomy Development Programme in Central America*

The TAD programme provides supports to the courses in different Central America countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama) which are regularly organized since 1997, corresponding to the creation of the *Central America Assembly of Astronomers*. These courses were initiated by an informal group of Central American astronomers and physicists to foster the development of astronomy in classrooms at primary, secondary, and university levels in Central America, and to help in the development of small observatories in teaching and research. These meetings include a number of workshops on teaching methods, observations with small observatories, and modern astrophysical research.

6.3. *Teaching for Astronomy Development Programme in Morocco*

The TAD program was first centered in the Faculty of Sciences of University Hassan II in Casablanca in 1998, then it was expanded in 2004 to the Alakhawayn University (town of Ifrane). Several TAD-supported visiting lecturers gave lectures both at Casablanca and Ifrane. A major initial initiative, at the University Hassan II in Casablanca was the acquisition of the IAU traveling telescope and the CCD.

Travels have been also supported for Moroccan students for training abroad. An ISYA took place in 2004 at Alakhawayn University.

This TAD programme is still very active at Alakhawayn University.

6.4. *Teaching for Astronomy Development Programme in the Philippines*

A new TAD programme to support astronomical training of the staff of the Astronomy Research and Development Section of PAGASA (Philippine Atmospheric, Geophysical, and Astronomical Administration) including a programme for the use of the 45-cm telescope donated by the Government of Japan was launched in 2002. This programme supported several courses given on fundamental astronomy and astrophysics in 2003 and 2004. Dedicated training for observing techniques were organized on all aspects of modern CCD photometry and imaging. Travels of astronomers between Gunma Astronomical Observatory (GAO) in Japan and PAGASA took place. This TAD programme is still on in 2008.

7. Objectives and Organization of the Teaching for Astronomy Development Programme

7.1. *Objectives of the Teaching for Astronomy Development Programme*

The purpose of the TAD programme is to assist countries with currently little astronomy that wish to enhance significantly their astronomy education and to improve the overall environment for science education and research.

To fulfil its mission, TAD programme employs several mechanisms, often in combination, sometime single. It can be:

- (a) to assist with the creation of university level astronomy courses,
- (b) to provide equipment and expertise for educationally based research programmes,
- (c) to provide travel funds for selected graduate students and/or scientists for advanced education or training abroad,
- (d) to provide travel funds for foreign experts to deliver advanced training via courses (of short in duration) to students and scientists in the country,
- (e) to provide general support for science (astronomy) education to high school teachers as well as to undergraduate students.

TAD programmes may provide support in these forms or in others if a particular country needs them.

7.2. *Organization of the Teaching for Astronomy Development Programme*

This programme is organized in a flexible way. TAD programme expects that the requesting countries provide funds and resources for the activities, the IAU covering the travel funds.

A memorandum between IAU-TAD programme and a particular university or other institution includes an explicit statement of each party's obligations to the planned activities. This memorandum is discussed and proposed to the IAU Executive Committee by the Chairs of the TAD : Edward Guinan (Villanova - USA; edward.guinan@villanova.edu) and Larry Marschall (Gettysburg - USA; marschal@gettysburg.edu).

8. **New development of the Teaching for Astronomy Development (TAD) Programme since 2006**

In August 2006, Dr. Edward Guinan and Dr. Larry Marschall replace the previous TAD programme chairperson : Dr. James White. The TAD programme continues to vigorously support the development of astronomy education, teaching and research in several countries following the objectives developed in the previous section. Moreover, there are now two types of TAD programmes. TAD traditional, as presented before, in which an expert astronomer visits the host country for several days to give lectures, meet with students and provide advices. The other TAD form is the support of a 1-week Astronomy School in which 25-40 undergraduate students from the host country participate.

Table 1 gives a list of these new TAD programmes developed since 2006 as well as a summary of the support given, either as travel grants or as a participation in the organization of a course (lectures given by foreign astronomers, travel grants to participate to a school, etc.).

9. **The International School for Young Astronomer (ISYA)**

A detailed text outlining the main features of the International Schools for Young Astronomers (ISYA), a programme developed by the International Astronomical Union (IAU) since 1967, has been published by Gerbaldi (2007) and will not be repeated here. Since August 2006, Dr. Jean-Pierre DeGreve and Dr. Kam-Ching Leung replaced the previous chairperson and vice-chairperson of this programme, respectively Dr. Michèle Gerbaldi and Dr. Edward Guinan.

9.1. *Strategies for future ISYAs*

A planning for future ISYAs starts from previous explorations by Commission 46 Programme Groups, and more precisely through the *Teaching for Astronomy Development*

Table 1. Teaching for Astronomy Development programmes (TAD) set up since 2006.

Country	Year	Location	Actions / Support
Kenya	2007	Nairobi	travel grant
Trinidad and Tobago and Caribbean region	2007	Trinidad	workshop on the development of an Astronomy Science Education and Public outreach programme
People Republic of Mongolia	2007	Ulaanbaatar	2-week courses in May-June for 40-50 undergraduate travel grants
People Republic of Mongolia	2008	Ulaanbaatar	1-week School in July; 50 participants; travel grants
Kazakhstan	2008	Almaty	1-week workshop
Colombia	2008	Medellin	travel grants
Nepal	2008	Katmandu	1-week school in April; travel grants
Democratic People Republic of Korea	2008	Pyongyang	travel grants
Bolivia	2009	Cochabamba	travel grants

Programme (TAD) with a conclusion towards the organization of an ISYA, including possible necessary local improvements and regional impact. The ISYA was, is and must be a complementary action. It should take into account what exists already, with emphasis on local or regional research interests, but also recent initiatives such as COSPAR meetings etc. Before organizing it, the ISYA Programming Group will consider whether strengthening of existing operations through cooperation could be an option as complement to the ISYA programme.

An overlap with an astronomical conference nearby may also be looked for. It may give the students the opportunity to attend this conference and integrate with the professionals coming from all over the world. Another objective is to arrange some contributions from ISYA participants to the conference.

The content of the ISYA will be a balanced mixture between observations and theory with attention for data-mining, new developments in data handling and the Virtual Observatory concept. The program content is built around local research interest and capacity but broadened to other areas as added value for the heterogeneous international student group.

A pool of lecturers will be built of international specialists expressing a willingness of future participation in an ISYA. This pool should contain a sufficient amount of female lecturers, as well as female participants.

An ISYA is organized through an agreement signed between the IAU and an university often associated to a project of development (new astronomy department, implementation of a telescope, ...). All the preliminary discussions are done by the Chairperson of

Table 2. List of the ISYA from 2000

No	Date	Location	Duration (weeks)	Participants (number)
25	2001 Jan	ChiangMai, Thailand	3	36 (17f, 9n, 6w)
26	2002 Aug	Casleo, Argentina	3	28 (14f, 9n, 10w)
27	2004 July	Al Akhawayn, Morocco	3	29 (18f, 13n, 9w)
28	2005 July-Aug	INAOE, Mexico	3	46 (20f, 10n, 18w)
29	2007 March	Selangor, Malaysia Langkawi island	3	38 (28f, 12n, 9w)
30	2008 July	Yis, Istanbul, Turkey	3	35 (12f, 12n, 14w)
31	2009 Dec	Trinidad & Tobago	3	
32	2010 Sep	Byurakan, Armenia	3	
33	2011 Apr	Lijiang, China	3	

the ISYA Jean-Pierre De Greve (Brussel - Belgium) (jpdgreve@vub.ac.be), (Vice-Chair: Kam-Ching Leung (Lincoln - USA) (kleung@unlserve.unl.edu), in close collaboration with the local scientific committee.

Table 2 gives the list of the recent ISYAs. This table provides information on the number of foreigners (f), the number of different nationalities (n) and of the number of women (w).

10. Conclusion

The TAD programme and the ISYAs continue to support strongly the development of Astronomy education, teaching and research in several countries.

The development of a decadal plan by the IAU and the opportunity of extra funding justify but also require a medium term planning for the ISYAs, in collaboration with the other activities within Commission 46. In doing this, we want to achieve a larger impact by the TAD programme and ISYAs in the various regions, i.e. bringing progress to the regional development of astronomical research in particular, and to science in general. However, though we want the set up of TAD programmes and ISYAs to evolve into a strategic and planned approach, the ad-hoc nature will never disappear as the organization still depends largely on opportunities and the willingness of individuals in the host countries to engage themselves in fundraising and organization.

It should finally be emphasized that no ISYA, no TAD programme could have taken place without all the astronomers who participated to it, giving so freely their time and energy to make a success of these programmes.

Acknowledgements

It is our great pleasure to acknowledge the IAU Executive Committee members and more specially the General Secretaries who have supported continuously these programmes.

Reference

- Gerbaldi M. 2007, in *IAU Special Session 5, Astronomy for the Developing World. 26th meeting of the IAU Prague, Czech Republic, 2006*, p. 221, J. B. Hearnshaw and P. Martinez (eds) (Cambridge: Cambridge University Press)