

ENHANCING THE TEACHING OF ASTRONOMY IN SCHOOLS THROUGH WORKSHOPS FOR TEACHERS

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ABSTRACT

The Malaysian Space Agency (ANGKASA), with cooperation of the Ministry of Education of Malaysia, has organized the Astronomy Workshop for Primary and Secondary School Teachers since 2008 at the National Planetarium. The workshop was organized to provide science teachers with basic knowledge of astronomy in accordance with the school syllabus, with the hope that they can acquire sufficient knowledge in the field of astronomy to enhance their teaching activities in school. In this workshop, teachers will be introduced to night sky simulations in our space theater, a planetarium show, daytime and night time observation activities, hands on activities, and visits to the planetarium's observatory and exhibition gallery. Besides this, in the workshop they will share teaching experience with planetarium staff. Educational materials are also distributed to all the teachers as reference for their teaching. In this paper presentation, we would like to show how the National Planetarium plays an important role to help teachers in teaching astronomy in schools.

Key words: astronomy workshop, teaching experience, enhancement, hands on activities, planetarium

1. INTRODUCTION

In general, astronomy appears in a few lessons associated with another course. Very little astronomy is taught in primary schools and it normally appears as part of environmental or general science. In secondary schools, astronomy generally appears as a part of geography or physics. Teachers do not usually have a specialist education in astronomical topics. In general they use the same school books as their students in order to prepare their classes. When teachers do not have the opportunity to participate in training courses, they tend to prepare their classes about astronomy using courses book that are old-fashioned and fail to convey the excitement generated by modern topics that are subjects of active research. Besides that, astronomy is a subject that undergoes rapid change, so it is only appropriate to provide teachers with basic knowledge of astronomy and exposure to the latest changes before they teach in the classroom.

Hence, the Malaysian Space Agency (ANGKASA), with cooperation of the Curriculum Development Division of the Ministry of Education (MOE), has taken the initiative to organize Astronomy Workshops for primary and secondary school teachers annually since 2008 at the National Planetarium. The workshop was organized to provide science teachers with basic knowledge of astronomy in accordance with the school syllabus, with the hope that they will acquire sufficient knowledge to

prepare them for their teaching activities in school.

This paper will describe how National Planetarium plays an important role to help teachers in teaching and developing interest in astronomy in schools.

2. ACTIVITIES OF THE ASTRONOMY WORKSHOP

The Astronomy Workshop for Teachers is a one day workshop held at the National Planetarium and participated in by primary and secondary schools teachers from Peninsular Malaysia. The workshops include lectures, sharing and discussion sessions, informative and interactive presentations, hands on activities and visits to the astronomy related facilities at the National Planetarium. Contents are oriented towards the Malaysia Integrated Curriculum for Primary and Secondary Schools, and teachers in science subjects with astronomy and space science.

2.1. LECTURES AND SHARING SESSIONS

Explanations of astronomy and space science topics such as the the solar system, the Sun, the Earth, the Moon, constellations, the eclipses, the star and space explorations were given in this workshop. Teachers will be given the latest information through astronomy lectures accompanied by question and answer sessions. Notes will be provided to teachers. They will share teaching experience with planetarium staff.

2.2. Hands On Activities

A few hands on activities will be shown to teachers to use in dealing with their future classes. The teachers have the opportunity to try hands on activities that they can take back to the classroom. Materials for the hands on activities are easy to find and cost little. Therefore, the teachers can implement the activities easily with their students in the classroom. Figure 1 below shows a few hands on activities that have been conducted with primary and secondary school teachers from 2008 to 2014. Some activities have been modified due to the feedback from the teachers. After completing hands on activities, the teachers will present their hands on models among themselves and planetarium staffs.

2.2.1. 3D Sun Mobile

3D Sun Mobile is one of the hands on activities introduced by Space Science Education Division's staff to all teachers in this astronomy workshop, from 2011. The objectives of this activity are to give all the teachers the opportunity to build a 3-D mobile of the Sun, to learn the basic structure of the Sun and share the information about each layer of the Sun. This activity has been modified due to the feedback from the teachers in year 2011. After 2011, the 3D Sun Mobile has been modified and proposed to teachers during the astronomy workshop in 2012.

This activity was also introduced to the educators at the APRSAF-19 Water Rocket Competition in Malaysia in 2012. The Japanese Aerospace Exploration Agency (JAXA) started introducing this 3D Sun mobile to their JAXA educators and students from 2013. JAXA has introduced this material to Cambodia at the APRSAF Space Education Seminar last April. This activity has received good responses from Cambodia and they have translated the 3D Sun Mobile into their language and use it in their classrooms. Now, this activity has been introduced in Japan and Cambodia.

2.3. Viewing Sunspots, the Moon and Planets

All teachers had opportunity to observe sunspots using telescopes attached to the Thousand Oaks and solar scope. They also can view the prominences and flares through solar telescopes. At night, they also had the opportunity to observe planets such as Mars, Saturn, Jupiter and Venus and the Moon through telescopes.

2.4. Tour to the Exhibition Gallery and Observatory

The teachers were given the opportunity to visit facilities at the National Planetarium such as the exhibition gallery and observatory. They can gain more knowledge and experiences through interactive exhibits here with the theme of space exploration and astronomy. They also have opportunity to visit an observatory which is equipped with robotic telescope system and learn how it works.

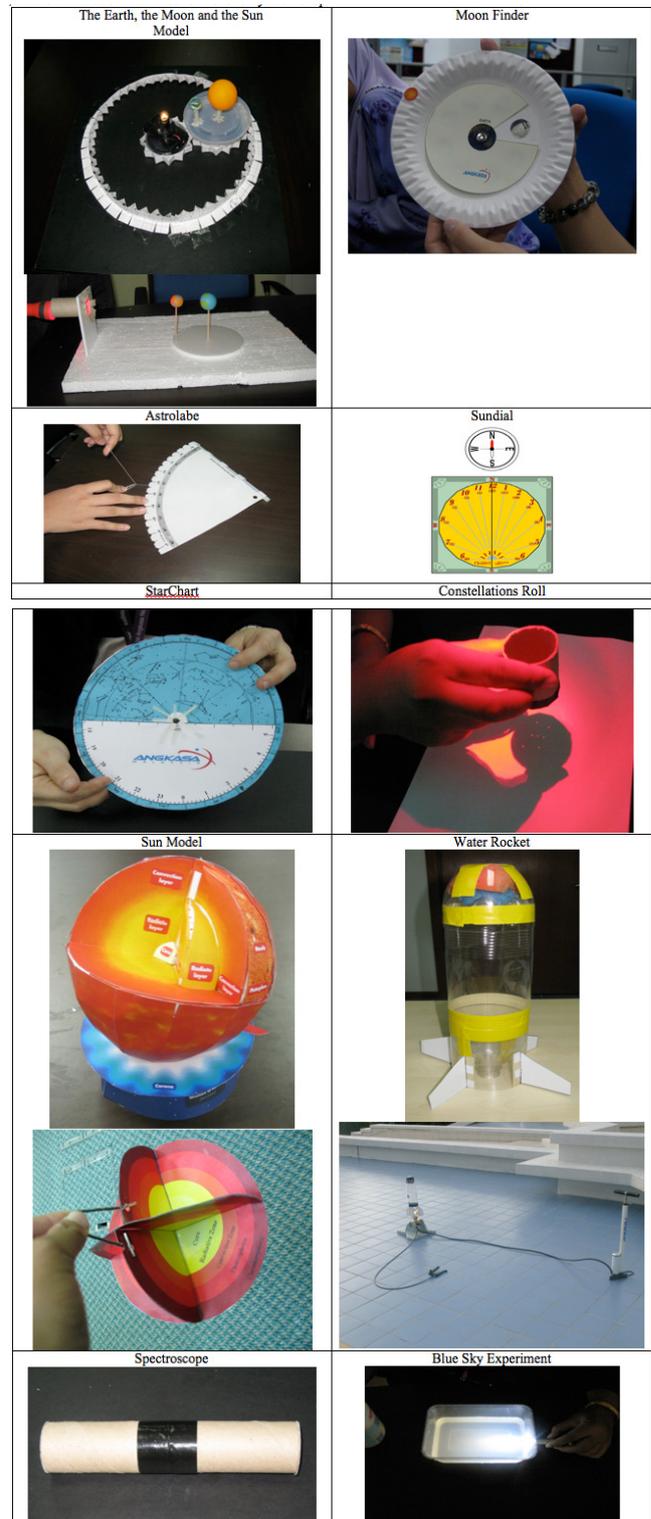


Figure 1. Hands on Activities for Astronomy Workshop

SYLLABUS	ACTIVITIES	2008	2009	2010	2011	2012	2013	2014
Standard 4: Solar System	Lectures	√						
	*Earth, Moon & Sun Model		√	√	√	√	√	√
	Planets & Moon Observation		√	√	√	√	√	√
	Astrolabe			√	√			
Standard 5: Constellations	Night Sky Simulations		√	√	√	√	√	√
	*Start Chart	√	√	√	√	√	√	√
	Constellations Rolls					√	√	
Standard 5: Earth, Moon and Sun	Lectures	√						
	*Earth, Moon & Sun Model		√	√	√	√	√	√
	Sun Observation	√	√	√	√	√	√	√
	Moon Finder				√	√	√	√
Standard 6: Eclipse	Lectures	√						
	*Earth, Moon & Sun Model		√	√	√	√	√	√
Others	Telescope			√	√	√	√	√

Figure 2. Relationship between Activities of Astronomy Workshop with the Malaysia Integrated Curriculum for Primary Schools in Science Subject

2.5. Simulations of the Night Sky

In addition, the teachers had chance to visit the space theatre which is equipped with a Fulldome Digital Theatre. They can enjoy the night sky simulations and learn about our universe here. They also have opportunity to watch a Planetarium show.

The Astronomy workshop was concluded with the education kits and certificate giving ceremony.

3. CORRELATION OF ASTRONOMY WORKSHOP TO THE INTEGRATED CURRICULUM FOR PRIMARY SCHOOL AND SECONDARY SCHOOL TEACHERS

All the activities of the Astronomy Workshop that have been developed for the Malaysia Integrated Curriculum for Primary and Schools have been improved through the teachers' feedback after the Astronomy Workshop. Figure 2 and 3 below showed the activities held that can be used to help teachers meet the Malaysia Integrated Curriculum for primary schools and secondary schools in science subjects with astronomy and space science components. The teachers in this workshop are encouraged to conduct proposed hands on activities in their class and distribute them to other teachers in the area or zone. They were also encouraged to bring students to visit the National Planetarium. Feedback forms regarding all the activities conducted in this workshop had also been distributed to teachers for survey purpose about the effectiveness of obtaining the desired information from the workshop.

4. CONCLUSIONS

The overall impression of this workshop from all the educators shows that this program will benefit teachers in increasing their astronomy teaching capabilities in science classes in their respective schools. This program can also be done on a regular basis to provide more teachers to attend astronomy workshops. Besides that, it can provide a communication channel for the National

SYLLABUS	ACTIVITIES	2008	2009	2010	2011	2012	2013	2014
Form 4: Stars & Galaxies	Lectures	√						
	Night Sky Simulations		√	√	√	√	√	√
	Sun, Planets & Moon Observation		√	√	√	√	√	√
	Pinhole Projector		√					
	*Sun Model			√	√	√	√	√
Form 4: Space Explorations	Visit to Exhibition Gallery	√	√	√	√	√	√	√
Form 4: Forces, Pressure & Motion	Water Rocket		√	√	√			
Form 4: Light	Blue Sky Experiment						√	√
	Spectroscope				√	√	√	√
	Telescope			√	√	√	√	√
Form 4: Waves	Spectroscope				√	√	√	√
	Telescope			√	√	√	√	√

Figure 3. Relationship between Activities of Astronomy Workshop with the Malaysia Integrated Curriculum for Secondary Schools in Science Subject

Space Agency to deliver any new astronomy news and developments to the teachers.

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