

THE NEED OF DISTANCE LEARNING FOR ASTRONOMY DEVELOPMENT IN INDONESIA

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ABSTRACT

Astronomy is a popular topic for the public in term of astronomical phenomenon such as occultations, solar and lunar eclipses or meteor showers. In term of education, astronomy also is popular as one of the world Science Olympiads. Social media, as the new trend in communicating and connecting people, plays a significant role in increasing the size of the astronomy community. Beyond IYA 2009, more and more astronomy activities have been done in many places in Indonesia. New astronomy communities have been formed in several cities and public engagement is also high in social media especially on Facebook and Twitter. In this paper, we will discuss the lesson learned from astronomy outreach achievements in Indonesia and the need for citizen science projects as a distance learning tool for the public as part of astronomy development in Indonesia. We argue and propose that this project will be also important up to a regional scope.

Key words: distance learning: education: citizen science

1. INTRODUCTION

Indonesia is an archipelago comprising 17,508 islands and in 2013 the country has 249.5 million people, making it the fourth most populous country in the world. As an archipelago with thousands of islands, the country reflects its diversity in ethnicity and language. Indonesia has 300 distinct native ethnic groups and 742 different languages & dialects, but the whole nation has one official language to communicate between with each other. As a developing country, the Indonesian education system faces many problems with less of the population enrolled in higher education because of economic problems. On the other hand, we also facing another phenomenon in that that science, especially astronomy, is not part of curriculum as an official subject. In this paper, we will look into Indonesia education problems and the alternative solution astronomy can provide through online media and collaboration with the community in each area.

2. EDUCATION IN INDONESIA

The Indonesia education system is the third largest in Asia region and the fourth largest in the world (behind only China, India and the United States). In Indonesia, two Ministries take the responsibility of managing the education system; the Ministry of Education and Culture with 84% of schools and the Ministry of Religious Affairs for the remaining 16% (World Bank,

2014). According to the latest Program for International Student Assessment (PISA) learning assessment in 2013 report for 2012 performance Indonesia scored poorly and ranked 64 out of 65 (Schleicher, 2014). Indonesia ranked second to bottom for Math, Science and Reading and lags behind other middle income economies and its East Asian neighbours. According to the UN human development index in 2013 report, Indonesia is ranked 121 (UNDP, 2013); (UNDP, 2014) and the education index for Indonesia is ranked at 64 (UNESCO, 2012). As for cognitive skills and Educational Attainment, according to The Learning Curve, Indonesia ranked last with a negative score (The Learning Curve, 2014). However, Indonesia is in the top 2 for the most innovative country in education according to OECD Measuring Innovation in Education report (Vincent-Lancrin et. al., 2014). Of 57 millions students in Indonesia, only a third complete their basic education.

Even though the international report shows education in Indonesia does have a problem, Indonesian students shows that they can compete globally as the students actively participated in science olympiads with good result from time to time. In 2014, Indonesia ranked 26th in International Mathematical Olympiad and the highest achievement received by students in IMO was the gold medal in 2013 (IMO, 2014). In the International Physics Olympiad, the highest achievement received by Indonesian students was the gold medal (IPhO, 2014). Indonesia has also participated in International Astronomy Olympiads (IAO) since 2003 and International Olympiads of Astronomy and Astro-

physics (IOAA) since its first competition in 2007 in Thailand (Tim Pembina Olimpiade Astronomi Indonesia, 2014). The students' highest achievement in both competitions are gold medals in 2004 and 2007 for IAO and 2007, 2008 and 2013 in IOAA. The goal of the science olympiads is to discover gifted and talented students and support them in pursuing their studies and careers in science and technology.

3. WHY ASTRONOMY?

Astronomy in Indonesia is not a main subject in curricula but is part of science or geography. In the new set of Indonesia curricula in 2013, students will start learning about astronomy in the Natural Science subject in 6th grade (Kemendikbud, 2013). Astronomy itself is an interesting subject for the public, especially for students. As a science subject and hobby, astronomy is an interesting point to introduce science in general and it can be part of the learning process at all levels at schools. For the majority, astronomy easily engages their attention for its beauty and grandeur. As for astronomy hobbyist and enthusiasts, amateur clubs will be the answer to start learning.

Astronomy can be used as an entry point for students to learn more about science, technology, art, and culture as one topic in astronomy can give insight in various subjects (Kemendikbud, 2013). The goal is to give another point of view that astronomy is integrated with many other subjects. As for students, the goal for introducing astronomy is to build awareness that science is fun and doable. Astronomy itself can be a good example to engage students to do their own research and become creative.

In modern life, people will not observe the Sun or Moon to determine the calendar anymore but for Indonesian people, the majority of who are Moslem, waxing crescent observation still holds an important role in determining important Islamic dates (Yamani & Malasan, 2012). Astronomy is also important for daily life, especially in Indonesia which is an agricultural and maritime country. This is an important subject as an introduction for students and the public in general.

4. ASTRONOMY IN INDONESIA

Astronomy in Indonesia has been widely known since ancient times when people use celestial objects for daily life, especially for maritime and agricultural life. Modern astronomy in Indonesia officially started when Bosscha Observatory was built in 1923. It was also marked the transfer of astronomy by the Dutch to Indonesia during the first quarter of the twentieth century. The main reason for the powerful observatory in the southern hemisphere was the need to open up the southern sky for astronomical research (Hidayat, 2000). Since its completion, Bosscha Observatory is the only observatory which has conducted astronomy research in this country. In October 1951 Bosscha Observatory was officially transferred to the Faculty of Mathematics and Natural Sciences of the Bandung Institute of Technol-

ogy, and G.B. van Albada was nominated the first Professor of the Department of Astronomy. This marked the beginning of astronomy in tertiary levels of education (Hidayat, 2004).

The biggest challenge is how to engage the whole nation with astronomy and build science awareness among the public. From time to time, amateur astronomy activities have a big influence for the public to build astronomy awareness. Up until now, Indonesia has 1 Astronomy Study Program, 1 University Observatory, 2 Solar Observing Stations, 3 Small Observatories, 4 Planetaria, 31 Astronomy Communities, 11 Astronomy Online Media, 1 Astronomy Magazine, 32 Twitter Accounts, 20 Astronomy Facebook Groups and 9 Astronomy Facebook Pages. The number increased from 11 Astronomy Communities and 1 Online media in 2009 when the astronomy community celebrated the International years of Astronomy (Yamani & Malasan, 2012).

People in Indonesia have a high interest in astronomy for several reasons, and one of them is current issues and celestial events as seen in Figure 2. Another reason people look to astronomy is to clarify astronomy hoaxes and misconceptions (langitselatan, 2014); one of these is that Moon and Mars will appear as twin moons in the sky. New findings and astrophotography are another way to engage the public and astronomy community in Indonesia and holds an important role in building awareness for the public. Astronomy communities in Indonesia usually hold regular events or occasional events such as regular astronomy meetings, star parties, teacher training, Sun observations, astro camps, telescope training, hands-on activities at school, World Space Week, sidewalk astronomy, meteor shower monitoring, seminars and public talks.

Astronomy institutions in Indonesia also have an obligation to educate the public and regularly conduct astronomical meetings, an annual waxing crescent observation, astronomy olympiads and other competitions, observatory open houses, and science festivals, which have become regular events of astronomy institutions in Indonesia. They gather people to come and join the event as well as to have an interactive and direct discussion with public. Aside from offline activities, online astronomy activities are also important, and are run by by amateur clubs or astronomy media. News blogs, virtual observations, online astronomy classes, short tweet series, astronomy link shares, real time discussion with fans and followers have become regular activities and some of these are daily activities between astronomers or hobbyists and astronomy enthusiasts.

5. EVALUATION

Astronomy activities in Indonesia split into online and offline conducted by different institutions and communities. Offline activities are always the best way to engage the public because direct interaction provides a deeper sense of community. By looking through telescopes, it will leave a feeling of fascination and awesomeness of the sky. Although limited to a group of people in an area, this kind of activity will always give an opportu-



Figure 1. Astronomy Institutions and Community distribution in Indonesia. The dark grey area represent provinces which have astronomy institutions or community.

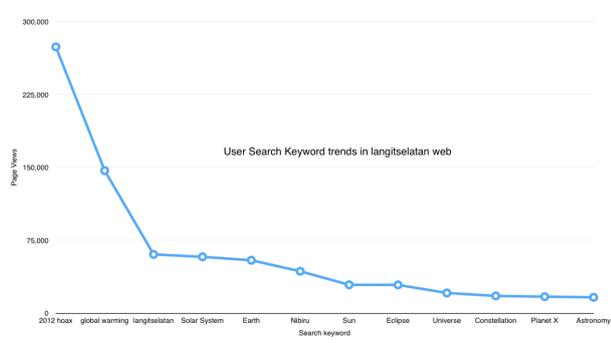


Figure 2. User keywords trend when people search for astronomy term in the langitselatan website.

nity to meet the astronomer and have a direct discussion which will lead to less misunderstanding. Attending of-line activities in astronomy not only gives a chance to look through advanced instruments but the public will be easily inspired by the expert or speaker. As for science communication marketing, offline activities usually boost science performance by having reporter or news worker at the site. The activity itself can be used as a promotion or awareness building for the whole nation through the newspaper, magazines or even television, which have higher penetration in Indonesia. By holding offline events, it can reach groups of people that don't have the ability or desire to interact online. An offline event requires higher costs and thorough preparation. Another problem is feedback and follow up after astronomy events.

As most offline events were held in Java, it means there is a higher need to engage people in other areas. Another effective way to engage the public is through online activities, and the most popular one is a group discussions in social media as Indonesia is one of the largest and the most active social media users in the world. Its flexibility is an advantage for scientists to engage with the public 24/7, and the information is also easy to access. All you need is internet access and mobile device. Online media and events also provide a wider audience, without borders. Time is not an issue as dis-

cussion can happen anytime, anywhere and can spread to all subjects. It also provides live interaction with the expert and it will build trust between the public and scientists, in this case astronomers. Most importantly, online activities are easy to build and cheap, but have the snowball effect of information distribution reaching everywhere. However, it doesn't mean there is no negative side to online activities. There is a higher chance for the public to misunderstand the issue. Even though resources distribution become unlimited via online media, there is no proper feedback from users.

6. DISCUSSION

he biggest challenge to reach people in Indonesia is location and internet access. Even though social media and online engagement are high the internet is still in an issue, especially outside Java island. The combination of online and offline activities are still the best choice so far. As a study case, our example is the Transit of Venus in 2012. At that time, all astronomy institutions and communities held a public event, and a few of them held a trip to another area to get a better view of the transit. One of them is LANGITSELATAN, an astronomy communication and education media group in Indonesia. The group had a trip to Ambon, in the East part of Indonesia. In collaboration with the local education foundation and community, an astronomy club has been set as a follow up after the event. Offline events became the trigger to gather astronomy enthusiasts and online activities became the choice for communication and resource distribution. Internet access is generally slow in Ambon, so members with access will have the advantage in using our resources and have direct communication. For those with limited internet access, LANGITSELATAN provide the curriculum and material for astronomy education in Ambon and its implementation will be done by the local community who conduct the astronomy club.

By evaluating the educational facts and problems and the fact that astronomy clubs and enthusiasts are increasing with time, the need for more distance learning project should arise in the country. It can be used not

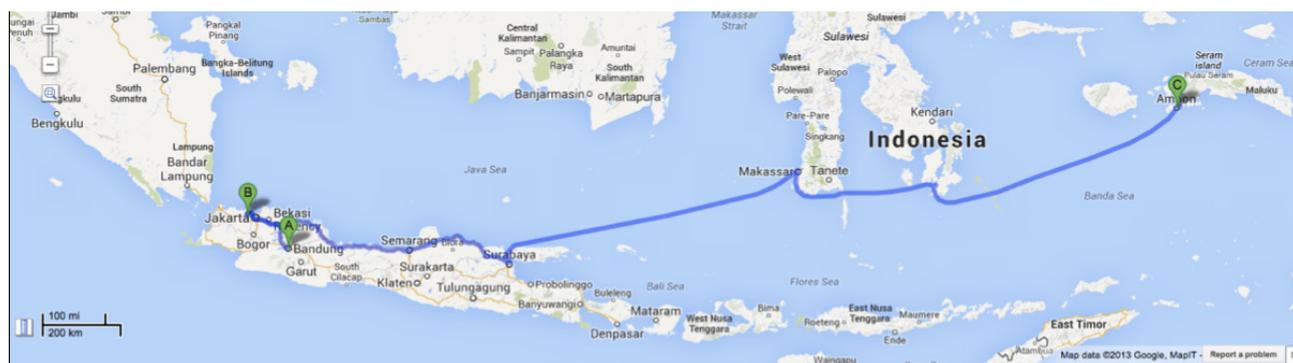


Figure 3. Jakarta - Ambon Map for Transit of Venus 2012 trip. Credit: Ferry M. Simatupang.

only to engage and build awareness but also to give students an opportunity to do research. A project has been planned to build citizen science engagement by using astronomy data. Students will use the data to analyse and hopefully will have a paper as the output. This project will be easy to access since it will be online and anyone can access it from anywhere in the country. A distance learning project is needed for the nation and it can be applied not only in Indonesia but also as a regional project in South East Asia. The goal is not only to build awareness though public involvement in research but also to provide education in basic science for students and the general public.

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