IAU OAD TF3F (2013)
"Dark Skies Outreach to Sub-Saharan Africa" Final Report
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& Sanlyn Buxner (External Evaluator)

Section 1: Overview

The IAU's Office of Astronomy for Development (OAD) awarded the National Optical Astronomy Observatory (NOAO) with a grant to deliver a "Dark Skies Outreach to Sub-Saharan Africa" program to institutions in 12 African countries during 2013. The program's first goal was to help students identify wasteful and inefficient lighting and provide ways to reduce consumption and to keep energy costs in check. The second goal was to inspire students to be responsible stewards in helping their community safeguard one of Africa's natural resources - a dark night sky. The 12 countries chosen were based on three criteria: 1) coordinators were English-speaking and willing to train teachers, 2) coordinators, teachers, and students had to have some computer and internet access, and 3) the countries should for the most part be in sub-Saharan Africa. Based on these criteria, coordinators were suggested by the IAU OAD Director, Dr. Kevin Govender. From early 2013 until May 2013, 13 kits were designed and produced by the NOAO Education and Public Outreach group and sent to the 12 coordinators (who were located at universities, science centers, and a planetarium-type institution) and to the IAU OAD. The program's kit included complete instructional guides and supplies for six activities and a project on energy conservation and responsible lighting. From June through November, the six activities and project were taught to the coordinators and some of the teachers in a series of six Google+ Hangout sessions. One Google+ Hangout session included instruction on carrying out evaluations. All Google+ Hangout sessions were recorded for future viewing at any time. During the same period, the 12 coordinators trained local teachers in junior and senior high schools. From November until the following February, students from the different African countries undertook final class projects and shared them on the program's PBWorks website. Also shared on the program's website is every document connected to the program. These resources include information from the Google+ Hangout sessions, background resources, materials on the kit and activities, information on evaluation, progress reports, final projects, and photographs. Everyone in the program will continue to have access to the web site, contributing to and getting information from its pages.

The proposed objectives of the project that were met included:

a. Utilize the cross-cultural wonder of the night sky to increase science awareness.
b. Increase awareness of the effects light pollution has on our daily lives (on energy consumption, health, wildlife and viewing a starry night sky)
c. Bring understanding that a country's growth should be accompanied by good urban planning to minimize the effects of light pollution.
d. Bring awareness that light pollution is a global problem, but solvable on local levels.
e. Bring awareness that viewing a starry night sky is a natural heritage that is slowly disappearing and will have cultural consequences.
f. Inspire a change in behavior so students choose to do something to fix the problem of light pollution–that they can make a difference.

g. Provide students with the knowledge of how to light wisely to lower light pollution's effect on energy consumption, health, wildlife, and our ability to view a starry night sky.
h. Provide students with the STEM resources needed to understand the effects of light pollution, by providing them with fun, problem-based, inquiry-based, hands-on, experiential learning experiences.
i. Provide students with the web-based infrastructure to accomplish the project.
j. Provide a capstone activity for an incentivized goal plus an on-line community to sustain the momentum and interest into the future.

Section 2: Program Evaluation

The evaluation of the project was used to answer the following five questions:

1) To what extent were the supporting materials implemented successfully in partnering countries?
2) To what extent were the coordinators trained by NOAO, and the teachers they trained, equipped with the knowledge and skills needed to provide access to quality STEM learning experiences for students, regardless of their geographical location, academic ability and socioeconomic status?
3) What student outcomes were evident as a result of their participation in the project?
4) What was the level of participation of each partner country?
5) What were the challenges and lessons learned from the project?

Data to answer these questions was collected in the form of online and paper surveys, communication between NOAO staff and local coordinators through email and Google Hangout sessions, review of progress reports submitted by coordinators, and analysis of program artifacts including student presentations, work, and videos.

Findings to each question are reported below, along with evidence and in-depth descriptions of the program components.

1) Activities and supporting materials (e.g. kits and Google Hangout sessions) were implemented successfully in almost 60% of partnering countries.

Supporting evidence was gathered from local coordinators through Google Hangouts and other conversations held between NOAO staff of local coordinators. There were a number of ways in which supporting materials for the Dark Skies Africa program were implemented successfully in the partnering countries. NOAO supported the successful implementation by providing kit materials and information on how to use them, real-time Google+ Hangout sessions, archived videos of Google+ Hangout sessions, PBWorks pages to organize and provide information, and ongoing support through email and informal conversions, each described below.

Kit Materials

12 kits were delivered to each participating country prior to the initial Google+ Hangout sessions. Each kit contained organized materials for the six different main activities and

numerous subsequent activities, as well as helpful resources on further darks skies and energy conversation topics. Overall, each kit cost about $450. Baring a few issues with customs and delivery methods, these kits reached each coordinator with no further issues. NOAO facilitators are confident that the kit contained all materials needed for each activity, and thus was of high quality to the coordinators. Throughout the project, there were very few complaints about the kit material and suggestions on anything to add or remove. The most significant recommendation was to include a solar energy component on the next version of the kit and activities. Furthermore, all important kit materials were explained and demonstrated in the Google+ Hangout sessions, thus clearing up any questions on how kit materials should be used. Overall, the implementation of the kit materials occurred with great success.

Google+ Hangout Sessions

The implementation of the Google+ Hangout sessions, although internet connections made it difficult at times, turned out to be a success as well as a great learning experience. Cross-continent communication is always difficult, especially when also dealing with cultural differences, internet connectivity, and time-zone differences. In order to counteract these issues, the NOAO staff implemented a number of factors into each Google+ Hangout session. The dates and times for each session were selected based on the availability of the local coordinators, which normally led to early-morning, weekend sessions for the NOAO staff. NOAO typically offered two different session times for each of the six session topics to make sessions more available to coordinators. In total, 11 sessions were developed over six months of the project to cover all six topics. Furthermore, the Hangout sessions were downloaded as YouTube videos, so that parties who were not able to make a particular session would be able to watch it later at their convenience. As a result, the 11 YouTube videos were watched over 250 times in total by our team of coordinators, teachers, and students. The Google+ Hangout sessions were detailed and thorough. Anyone who attended the Hangouts, or watched the subsequent video archives made of the Hangouts, received an in-depth description of the kit materials, activities, and procedures. Being two to three hours, each session was long enough for any and all questions to be answered, and for each participant to have their voice heard and concerns dealt with.

Six main groups attended three or more Google+ Hangout sessions. Since the staff from Algeria diligently watched the recorded videos, we can say that seven out of twelve countries actively participated in the Google+ Hangout session and project as a whole (58%). This is consistent with our goal of the project (3 out of every 5).

PBWorks Page

As a further resource to the coordinators and teachers, a PBWorks resource page was created in order to display all information regarding the Dark Skies Africa project. This page, which can be found at http://darkskiesafrica.pbworks.com/w/page/67151813/Dark%20Skies%20Africa (password entry can be given upon request), has everything a project participant would want, including: program and participant information, Google Hangout links and information for video and session trouble shooting, dark skies and energy conservation links, activity resources and forum location, examples of previous projects, science standards from across the world, and progress made by each coordinator (including email updates from each coordinator). This has

been a tremendous resource to all who have used it. During the course of the project, the PBWorks pages evolved and were improved as the program unfolded.

Informal Conversions

Along with 11 Google+ Hangout sessions, email communication was pivotal to the success of the program. With new information arising at a constant rate, emails were sent out to coordinators about once every week or two depending on the program's current schedule. These emails contained pertinent information for the coordinators. Four coordinators were highly active communicators throughout the program, three others were highly active at most times during the program, and five were inactive or used little communication throughout the project.

2) Coordinators trained by NOAO, and the teachers they trained, were equipped with the knowledge and skills needed to provide access to quality STEM learning experiences for students, regardless of their geographical location, academic ability and socioeconomic status. Overall, members from seven countries were able to perform key activities of the project.

Supporting evidence was gathered from the analysis of final student projects as well as progress and final reports submitted by local coordinators. The content and delivery of the materials for the Dark Skies Africa program was done in a successful and professional manner. Coordinators and teachers who were active and fully participated in the program were fully prepared with all materials, education, and resources they needed to perform all aspects of the Dark Skies Africa Program.

In total, there were six main activities available in the Dark Skies Africa kit, which included the Light Shielding Demonstration, the Spectra of Lights Activity, the Outdoor Light Audit, the Constellation at Your Fingertips Activity, the Magnitude Reader Activity, and the Turtle Hatching Activity. The goal of the project was to get all coordinators and teachers to implement at least the first three activities with their students. Below is a list of all participating countries and the number of activities that they were able to use with their students, listed with the most active countries first. As can be seen, seven countries met and/or exceeded this goal of implementation.

Country and Coordinator(s)/Teacher(s)	**Number of activities implemented**	**List of activities implemented**
Algeria Jamal Mimouni, Gergouri Hickem	5	Light Shielding, Spectra of Lights, Outdoor Lighting Audit, Magnitude Reader, Constellation at Your Fingertips
Nigeria Bonaventure Okere, Daniel Okoh, Ezechi Nwachukwu, Misc. Teachers	5	Light Shielding, Spectra of Lights, Outdoor Lighting Audit, Magnitude Reader, Constellation at Your Fingertips
Rwanda Pheneas Nkundabakura, Antoine Mahoro)	5	Light Shielding, Spectra of Lights, Outdoor Lighting Audit, Magnitude Reader, Constellation at Your Fingertips

Tanzania Noorali Jiwaji, Shaban Juma Baya, Jonas Breiling, Mwinuka Pasvolo	5	Light Shielding, Spectra of Lights, Outdoor Lighting Audit, Magnitude Reader, Constellation at Your Fingertips
Ghana Jacob and Jane Ashong, Sarah Abotsi-Masters, Emmanuel Frimpong	3	Light Shielding, Spectra of Lights, Outdoor Lighting Audit
Zambia Prospery Simpemba	3	Light Shielding, Spectra of Lights, Outdoor Lighting Audit
South Africa Sivuyile Manxoyi	2	Light Shielding/Spectra of Lights
Ethiopia Solomon Tessema	0	No progress seen
Gabon Patrice Okouma	0	No progress seen
Kenya Paul Baki	0	No progress seen
Namibia Eli Kasai/Rob Johnstone	0	No progress seen
Senegal Maram Kaire	0	No progress seen

Overall, seven countries were able to perform the Light Shielding Demonstration and Spectra of Lights Activity, six were able to perform the Outdoor Lighting Audit, and four were able to perform the Magnitude Reader and Constellation at Your Fingertips Activities. The coordinators who were most active in the Dark Skies Africa program, whether through Google+ Hangouts or actively communicating with NOAO staff, were able to do at least the three main activities, if not more. The point is further shown through the quality of the students' final projects. As described further below, the final projects completed by students in four of the active countries unequivocally revealed that the students understood dark skies and energy conservation and felt comfortable enough with the material to put together excellent presentations.

As to be expected, there were some growing pains during the earliest parts of the program, as coordinators and teachers attempted to learn new materials from the Google+ Hangouts and utilize the kit materials. There were a few misconceptions seen in two of the progress and final reports. One of these misconceptions was related to the use of two devices, the SQM and Lux meter, in the Outdoor Lighting Audit. Students are seen incorrectly using the devices in photographs sent from two of the teachers. This has led to a revision of how to improve teaching this information in the future by the NOAO staff.

3) **There were substantial student outcomes, including increases in target knowledge, and engagement as a result of their participation in the project. Additionally, active students created excellent project outputs demonstrating their increased knowledge and engagements.**

Supporting evidence was gathered from surveys of students and analysis of final student projects. The main goal of the Dark Skies Africa project was to educate the students on the topics of dark skies and energy conversation, as well as get them interested in science. Below we describe how the final projects students submitted from the different countries demonstrate how well our goals were met.

Student Surveys

Student surveys were made available to all partnering countries. Surveys were collected from students in Ghana, Tanzania and Zambia. Although students have a variety of knowledge about light pollution and energy conservation before the program, they showed an increase in their knowledge and beliefs after engaging in the program activities. Students increased in their awareness of light pollution issues, consequences of light pollution, and ways they could address light pollution. Students did not report taking any actions at their homes to address light pollution. Despite this, they did indicate that this project was the first time they had been made aware of such issues and that they would consider changes in the future. Overall, students reported that they enjoyed engaging in the activities and making their projects. Although surveys were not returned from many of the sites, these preliminary student results show positive outcomes for the project and demonstrate that this type of project has value to these communities.

Progress and Final Reports

Algeria

Algeria submitted a substantial number of final project resources, including a Microsoft Excel graph, two poster projects, six Microsoft PowerPoint projects, and five video presentations. Each additional resource demonstrated that the Dark Skies Africa materials were taught to the students with efficiency and dedication. Analysis of the student projects supports the claim that all important information provided by NOAO staff during the Google Hangout sessions were delivered to the students, especially topics discussed during the three main activities. The student projects included information about light pollution in general and energy conservation, including light pollution hazards and solutions to light pollution, as derived from the Light Shielding Demonstration and Spectra of Lights Activity. Furthermore, an emphasis was put on the Outdoor Lighting Audit, as there were five different sets of audits preformed, all of which included full calculations. Some of these audits also included graphs which required the use of the Lux meter and SQM. This demonstrates that students were able to correctly use the tools given to them in the kit as well as understand how the tools worked in real world situations. Additionally, video presentations were submitted of students' final projects. The content of the videos showed that the students learned all major informative aspects of the three main activities. Their comfort level in presenting the material showed how well they had mastered the dark skies and energy conservation materials.

Nigeria

Nigeria provided four graphs prepared by their students. These graphs showed that the students were able to utilize the Lux meter and SQM, use them in real-world situations, and understand the significance of their readings. These graphs were part of the Outdoor Light Audit and thus support the claim, along with information from Nigeria's progress reports, that the students have a good understanding of the information provided in the activities and how light fixtures affect light pollution.

Tanzania

Tanzania provided two videos, each of which showed students performing a number of activities and results from their Dark Skies Africa education. The students shown were from the Filbert Bayi Secondary School, and were being assisted by one of coordinator Noorali Jiwaji's

main teachers: Jonas Breling. The two videos showed a number of students doing a full light pollution presentation for an audience. In both videos, a single student gave a poster presentation that included general information about light pollution and its harmful effects on all life factors, examples of proper and improper shielding techniques, as well as an overview of an Outdoor lighting Audit (with full calculations) they completed themselves. While it was unclear what the students were saying at some times during the videos, their presentations were full of useful information from all three main activities, especially from the Light Shieling Demonstration and the Outdoor Lighting Audit. The audience was then led to a dark room where other students led a full Light Shielding Demonstration. While the demonstration contained flaws in the delivery of the information, it is clear that the students understood the concept of light shielding and how it pertains to the prevention of light pollution.

Zambia

Zambia provided a video showing Gerlad Mwitwa, one of coordinator Prospery Simpemba's main teachers, and his students evaluating a light bulb and its fixture using educational and physical tools from this project. Most of the conversation in the video was prompted by questions from Mwitwa, and thus allowed the viewer to really see whether or not the students knew the information well. As seen in the video, students were able to identify a poor lighting fixture based on its relative level of light pollution, observe the number of bugs being attracted to the light (a topic covered in our Google+ Hangout sessions) and their flight pattern, and use a lux meter in order to evaluate the quality of the light fixture, even though the lux meter was not used properly. The short video demonstrated that the students in Zambia were taught materials from each of the three main activities and were able to utilize the materials in a real world situation.

Overall, the deliverable goals were attained. As seen from the students' comfort level during presentations and the in-depth content of their projects, they were not only been taught the information but also have retained the most important topics of dark skies education.

4) There was a spectrum of participation in the project by active partner countries. Some were incredibly active, despite barriers, and some did not engage in the project at all. Those who did participate were highly successful.

Supporting evidence was gathered from documentation of coordinator participation and progress reports. Within the Dark Skies Africa project, there were a range of different types of participation in which coordinators, teachers, and students were able to partake. Below are descriptions of the two main forms of participation: attendance/viewing the Google+ Hangout sessions and actively communicating via email.

Google+ Hangout Participation

Each Google+ Hangout sessions had a particular topic based on where we were with the project, with six different topics overall. Depending on the availability of the coordinators, multiple sessions were conducted by NOAO staff for the same topic. While the plan was only for coordinators and subsequent teachers to attend six topical sessions over the course of the project, eleven sessions were conducted overall to accommodate as many people as possible. The

following table lists the number of Google Hangout sessions attended by members of each participating country. The names included with each country represent the coordinator(s) for that country, as well as any of teachers who might have attended a particular session together (or attempted to).

Participating Coordinator and Teachers	Number of Google Hangout Sessions Attended
Algeria Jamal Mimouni, Gergouri Hickem)	0
Ethiopia Solomon Tessema	0
Gabon Patrice Okouma	4
Ghana Jacob and Jane Ashong, Sarah Abotsi-Masters, Emmanuel Frimpong	4
Kenya Paul Baki	1
Namibia Eli Kasai, Rob Johnstone	1
Nigeria Bonaventure Okere, Daniel Okoh, Ezechi Nwachukwu, Misc. Teachers	4
Rwanda Pheneas Nkundabakura, Antoine Mahoro	5
Senegal Maram Kaire	0
South Africa Sivuyile Manxoyi	1
Tanzania Noorali Jiwaji, Shaban Juma Baya, Jonas Breiling, Mwinuka Pasvolo	6
Zambia Prospery Simpemba	3

The Google+ Hangout sessions were also downloaded to YouTube for follow-up viewing. Overall, the videos had a viewership of 257 times. Although it is unknown who watched the videos, the large number of subsequent views suggests that information shared by NOAO staff during the online sessions was getting out to the intended audience, most likely the participating coordinators and teachers.

Internet connectivity was a major issue throughout the length of this project. A number of coordinators and teachers (e.g. Mimouni and Hickem) were not able to connect even with technical support from NOAO special projects assistant, Daniel Tellez. Some of the coordinators who were not able to connect through Google Hangouts were still able to use the materials and educate their students. Sivuyile Manxoyi, who only attended the first session and did not communicate actively throughout the project, went through the activities with his students and teachers, and even used the light shielding demonstration to win “Third Best Exhibit” at Sasol Techno X, a science festival in Sasollburg.

Email Communication

Each Google+ Hangout session were approximately two 3--hour periods every month. To further support coordinators, a constant stream of emails was the main means of communication between the NOAO staff and the participating countries throughout the project. However, while an email by NOAO staff was sent to all participating personnel approximately once every two weeks for the span of the project, there was a range of emails returned by coordinators in partnering countries. Below is a list of coordinators and/or teachers and how well they communicated with NOAO throughout the project.

Highly Active with Communication Throughout – Noorali Jiwaji (Tanzania), Sarah Abotsi-Masters (Ghana), Bonaventure Okere (Nigeria), Pheneas Nkundabakura (Rwanda), Prospery Simpemba (Zambia)
Highly Active At Times – Jamal Mimouni (Algeria), Patrice Okouma (Gabon), Jacob and Jane Ashong (Ghana)
Little to No Communication Throughout – Paul Baki (Kenya), Rob Johnstone (Namibia), Sivuyile Manoxyi (South Africa), Solomon Tessema (Ethiopia), Maram Kaire (Senegal)

While the parameters of this list might seem vague, the communication from project participants followed a specific pattern. There were certain participants who actively communicated throughout the project, those who only communicated for a specific period of time, and those who we had little to no communication at all.

5) There were many challenges and lessons learned through the course of the project. These will be useful in future projects working with diverse populations.

As the project proceeded and developed, there were a number of challenges that became apparent. For most of these challenges, the staff at NOAO was able to adapt to solve them and improve the overall project. A number of different strategies for working and interacting with the coordinators and teachers were determined. The NOAO staff developed and used a number of different strategies and techniques that will be useful with future projects. Below is a list of challenges faced as well as ways they were addressed.

- Problematic Internet Connectivity
    - Due to different community capabilities, many of the coordinators in Africa did not have good internet connections. A number of the coordinators stated that this issue was one of the main reasons for their limited participation in the Google Hangout sessions (i.e. Mimouni's and Bonaventure's groups). While this is a difficult condition to deal with, there were a number of ways in which NOAO staff adapted the program to help the situation. NOAO staff recorded the Google Hangout sessions so that they could be watched anytime, anywhere. Mr. Mimouni's group took full advantage of these videos as they were never able to fully connect while the sessions were live. NOAO staff also researched ways to better help slow internet connections, and provided full technical support to ensure that the sessions could best serve the coordinators.

- Lack or slow communication
    - This was a complex project working with numerous different coordinators from different countries. Thus communication was key for its success. Due to the conflicting schedules, time-zone differences, and the amount of existing work of each participant, communication between coordinators and NOAO staff was lacking at times. This issue was discussed at length earlier. NOAO staff used two strategies to deal with communication issues. First, NOAO staff adapted a strategy of communication so that coordinators did not have to rely on Google Hangouts. Coordinators were continually emailed all the information and updates they needed on a more regular basis to keep everyone informed. This allowed coordinators to stay in the loop more frequently, and provide a stepping stone for participants to become active in the project at any point during the project. Secondly, NOAO contacted IAU and asked for their assistance in contacting the coordinators. IAU staff were much closer to the coordinators than the NOAO staff, and were more able to contact the coordinators to get more responses. This strategy increased responses from local coordinators also improving overall communication.

- Challenges keeping to assigned schedule
    - All of the coordinators were active in their communities and specific field of work, thus leading to busy schedules of responsibilities. While this project had a set schedule of information sessions and due dates, a number of coordinators found it hard to meet the predetermined dates. With this in mind, the NOAO staff was flexible with the coordinators, giving them the necessary time to complete their assignments while giving them the technical support and resources they needed to best serve their teachers and students.

- Getting materials to coordinators
    - Most support kits arrived on time and fully intact. However, international customs made it difficult for some of the coordinators them to receive their packages, and required additional payments for their retrieval. While there was little NOAO staff could do physically at these customs locations, they worked with the local customs and tried to give the coordinators as much information about the custom process as possible. This issue is an important one to be aware of for future projects working with different countries.

Other Lessons Learned

1. Keeping an organized list of every country's progress
    a. With so many different countries and participants involved in the Dark Skies Africa project, NOAO staff found it difficult to keep everyone's status organized. Utilizing the PBWorks page (discussed above), NOAO staff was able to have one digital location with every resource provided for the project and a place to keep all progress organized in regards to each participating country.

2. Tutorial videos would be good to have in advance with a Google+ Hangout session
    a. Conflicting schedules and poor internet connections indicated that having pre-recorded videos documenting all Dark Skies Africa activities would have been valuable. All participants would be able to watch the videos at their leisure and a secure location and then attend the Hangouts for discussion. This would result in shorting Hangout session as well. This will be used in the next project.

3. Utilizing a short application to ensure interest and commitment in program
    a. There were a certain number of coordinators that participated very little in this project, even after a vetting process by the IAU. For future project, NOAO staff is hoping to implement an application form for all participants to fill out. While the project would still honor all recommendations given by other organizations, this process would allow better understanding of potential coordinators, their unique situation whether or not they would have enough time and resources to commit to the project.

Summary of Findings and Recommendations

1) Activities and supporting materials (e.g. kits and Google Hangout sessions) were implemented successfully in almost 60% of partnering countries.
2) Coordinators trained by NOAO, and the teachers they trained, were equipped with the knowledge and skills needed to provide access to quality STEM learning experiences for students, regardless of their geographical location, academic ability and socioeconomic status. Overall, members from seven countries were able to perform key activities of the project.
3) There were substantial student outcomes, including increases in target knowledge, and engagement as a result of their participation in the project. Additionally, active students created excellent project outputs demonstrating their increased knowledge and engagements.
4) There was a spectrum of participation in the project by active partner countries. Some were incredibly active, despite barriers, and some did not engage in the project at all. Those who did participate were highly successful.
5) There were many challenges and lessons learned through the course of the project. These will be useful in future projects working with diverse populations.

Recommendations for the Future

1) Use pre-recorded videos of activities and use Google hangout time to answer questions.
2) Provide multiple ways for coordinators to get information online.
3) Use short applications to ensure that coordinators are interested and committed to the project.
4) Use a variety of techniques to gather data to measure success of the project including online surveys, paper surveys, and analysis of artifacts submitted by coordinators from each country.
5) Be aware of issues with customs when mailing kits out to different countries so ensure efficient delivery of materials.

Section 3: Resources produced for Dark Skies Africa

(*All files and URL addresses shown below have also been sent in full to Dr. J.C. Mauduit at the IAU OAD.*

Program Wiki (with activities, photos, progress reports, final projects, evaluations, etc):

http://darkskiesafrica.pbworks.com/w/page/67151813/Dark%20Skies%20Africa

Google+ Hangout Sessions:

http://darkskiesafrica.pbworks.com/w/page/67562889/Google%20Plus%20Hangout%20and%20Event%20Page%20Links

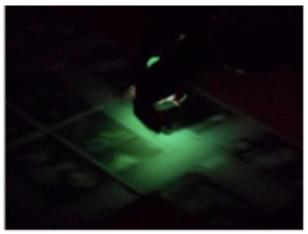
(SEE NEXT PAGES.)

Photos of the Participant Groups:

The Ghana Group

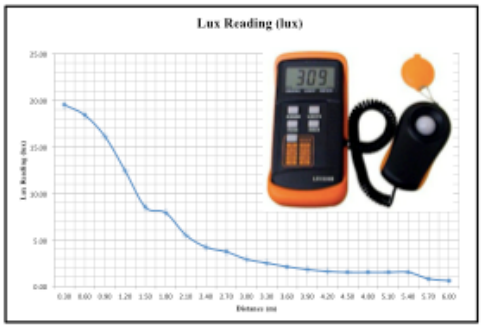
The Ashongs are the country coordinators.

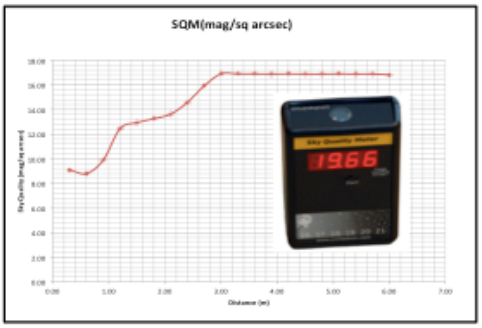


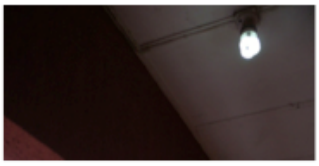


The Group from Nigeria

Bonaventure is the country coordinator.








The Group from Rwanda

Pheneas is the country coordinator…

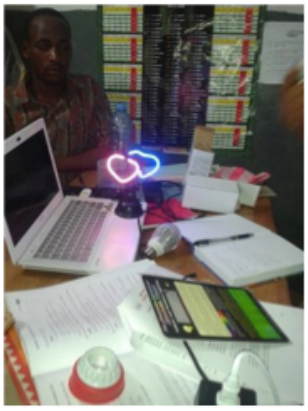
The Group from Algeria

Jamal is the country coordinator.

The Group from Tanzania

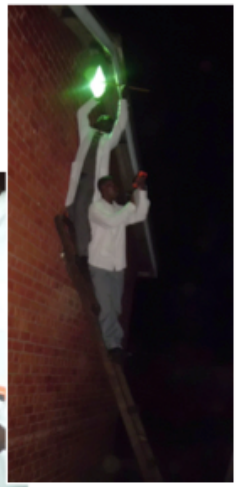
Noorali is the country coordinator

Jonas group - Filbert Bayi Sec School
LIGHT AT NIGHT ATTRACTS INSECTS

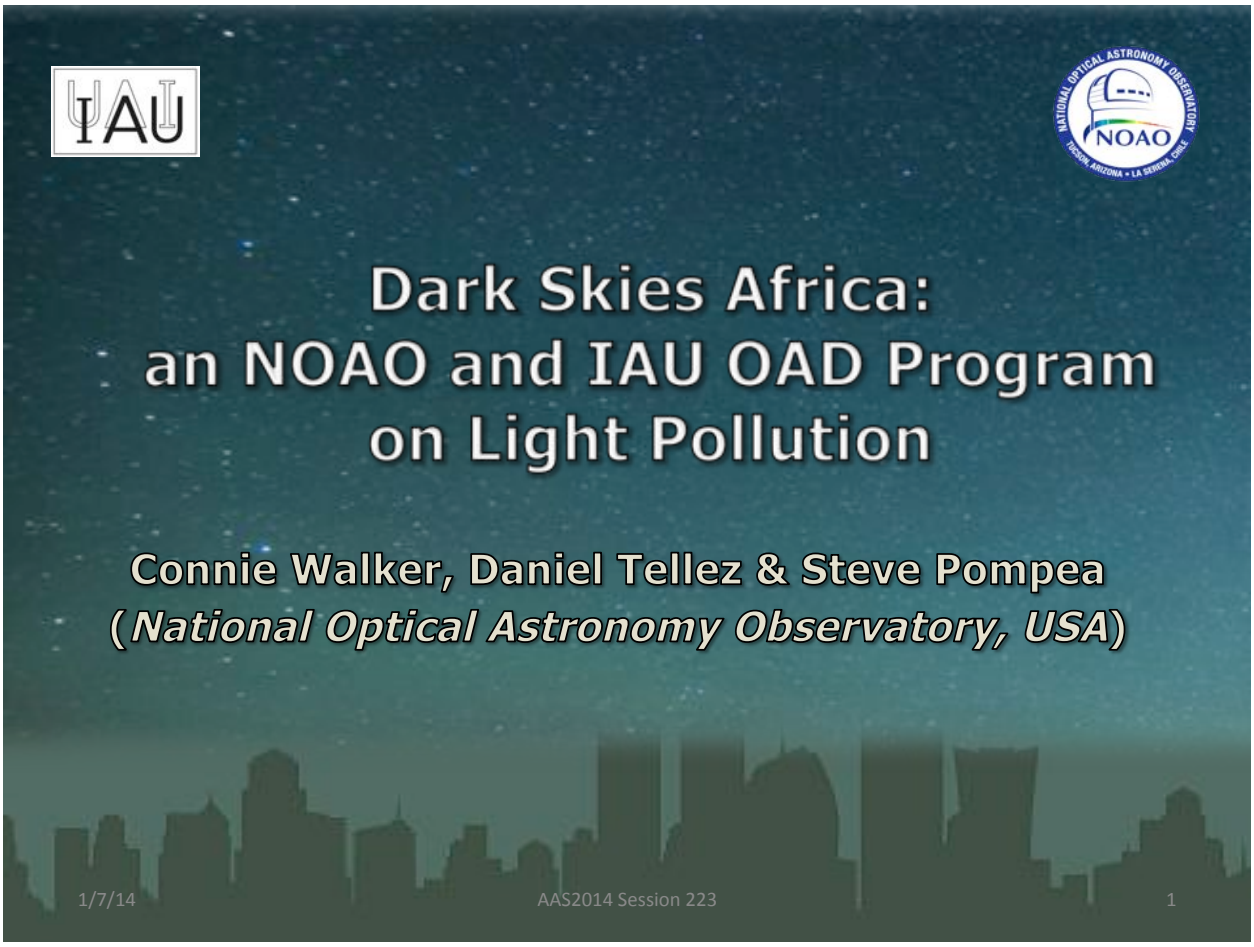


The Group from Zambia

Prospery is the country coordinator.



Talk (reduced file size) given at the Communicating Astronomy with the Public conference in October 2013 and at the American Astronomical Society conference in January 2014:



(The full powerpoint file has been sent to Dr. J.C. Mauduit at the IAU OAD.)

Handout (reduced file size) to accompany poster for Astronomical Society of the Pacific conference in July 2013 and the International Dark-Sky meeting in November 2013:

Dark Skies Africa: an NOAO and IAU OAD Program on Light Pollution

Constance E. Walker, Daniel C. Tellez and Stephen M. Pompea
(***National Optical Astronomy Observatory; cwalker@noao.edu***)

Overview

The International Astronomical Union's Office of Astronomy for Development (IAU's OAD) has provided the National Optical Astronomy Observatory (NOAO) with a grant to deliver a "Dark Skies Outreach for Sub-Saharan Africa" program to institutions in 12 different African countries (See the country names outlined in red in Figure 1.) This program helps students identify wasteful and inefficient lighting and provides ways to reduce consumption and to keep energy costs in check. The goal of the project is to inspire students to be responsible stewards in helping their community safeguard one of Africa's natural resources - a dark night sky. The program's kit includes complete instructional guides and supplies for six activities, including a project on energy conservation and responsible lighting. Six sets of Google+ Hangout sessions were scheduled from June to November. From the December through January final class projects (such as posters or movies) will be shared on the program's website. The entire program is designed to help educators work with students, parents, and the communities to identify dark sky resources, lighting, and energy issues while assessing their own status, efficiency and effectiveness.

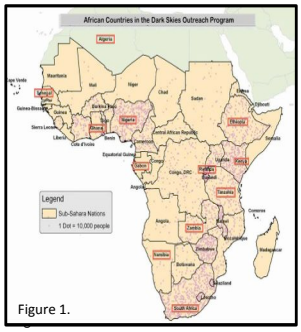


Figure 1.


Figure 2.


Figure 3.

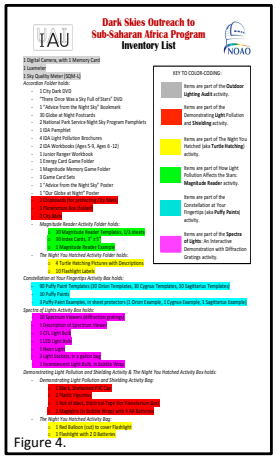


Figure 4.

In Spring 2013, the activities were created based on the NOAO Dark Skies Rangers (DSR) program. (See http://www.noao.edu/education/ads.php.) The original intent of the DSR program was to provide foundational content for the Globe at Night campaign, an international citizen-science program involving the public in awareness, measurement and research of light pollution. The activities have children building star-brightness "readers," creating glow-in-the-dark tracings to visualize constellations, and role-playing hatching sea turtles confused by on-shore lights. In particular, secondary school students create a model city with shielded lights to stop upward light, examine different kinds of bulbs for energy efficiency, and perform an outdoor lighting audit of their school or neighborhood. These last three activities are in a scaffolded sequence that lay the foundation for a student-led, project-based learning experience.

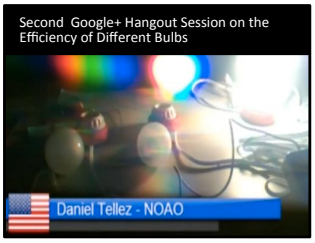
The kits were designed to accommodate all six activities. (See Figures 3 & 4.) The kits were built and shipped to 12 coordinators recommended by the IAU OAD, each coordinator in a different African country. (See Figure 2 of Sivuyile Manxoyi, a coordinator in South Africa.) The 12 coordinators committed to Google+ Hangout sessions on the activities and to recruiting and teaching teachers the activities using the kits.

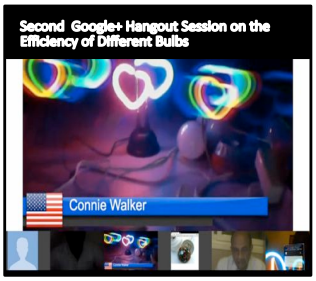
Sets of Google+ Hangout sessions started in June to accommodate schedules and have gone every 3 weeks, for a total of 6. There have been two sets of sessions on the first two activities in the scaffolded sequence (one on shielding lights and one on the efficiency of different bulbs). (See the photos on the right.) The third set of sessions on the third activity ("The Outdoor Lighting Audit") was the first weekend of August.

To better serve the African coordinators and teachers, a PBworks forum web site was created, as well as a formal webpage on the project (http://www.astro4dev.org/category/tf3/dark-skies-africa/). On the PBworks site is placed useful information the coordinators have requested, as well as answers to their questions and Google+ Hangout updates.

Challenges

Although precautions were taken to minimize difficulties with Customs, challenges arose with half of the kits. Official invoices, letters specifying the kits were for educational purposes only and not for resale, and detailed content lists and prices were included in each package. However, two kits still took 6 weeks to arrive. Discussions between the carrier, Customs, the recipient and NOAO were unavoidable.





Getting all the coordinators to attend the Google+ Hangout sessions has also been a challenge. To accommodate their schedules, 3 different dates were offered for the 1st Google+ Hangout session and 2 different dates for the 2nd Google+ Hangout session. For those truly unable to attend, the sessions were all recorded and placed on-line.

Acknowledgement: This project is supported by the IAU's Office of Astronomy for Development as a TF3 grant to the National Optical Astronomy Observatory. NOAO is operated by the Association of Universities for Research in Astronomy under a cooperative agreement with the National Science Foundation.

Poster (reduced file size) given at the Astronomical Society of the Pacific conference in July 2013 and the International Dark-Sky meeting in November 2013:

Dark Skies Outreach to Sub-Saharan Africa

Daniel C. Tellez, Constance E. Walker (PI) and Stephen M. Pompea (Co-PI)
(*National Optical Astronomy Observatory; cwalker@noao.edu*)

Overview

The International Astronomical Union's Office of Astronomy for Development (IAU's OAD) has provided the National Optical Astronomy Observatory (NOAO) with a grant to deliver a "Dark Skies Outreach for Sub-Saharan Africa" program to institutions in 12 different African countries (See the country names outlined in red in Figure 1.) This program helps students identify wasteful and inefficient lighting and provides ways to reduce consumption and to keep energy costs in check. The goal of the project is to inspire students to be responsible stewards in helping their community safeguard one of Africa's natural resources - a dark night sky. The program's kit includes complete instructional guides and supplies for six activities, including a project on energy conservation and responsible lighting. Six Google Plus Hangout sessions are scheduled from June to November. From the end of November until mid-December final class projects (such as posters or movies) will be shared on the program's website. The entire program is designed to help educators work with students, parents, and the communities to identify dark sky resources, lighting, and energy issues while assessing their own status, efficiency and effectiveness.

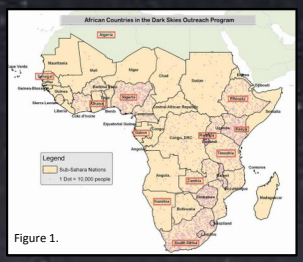


Figure 1.


Figure 2.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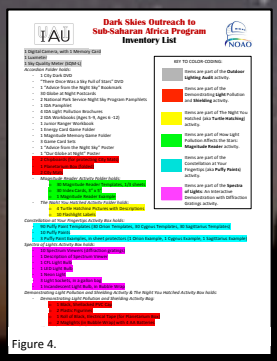

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The kits were redesigned to accommodate all six activities. (See Figures 3 & 4.) The kits were built and shipped to 12 coordinators recommended by the IAU OAD, each coordinator in a different African country. (See Figure 2 of Sivuyile Manxoyi, a coordinator in South Africa.) The 12 coordinators committed to Google+ Hangout sessions on the activities and to recruiting and teaching teachers the activities using the kits.

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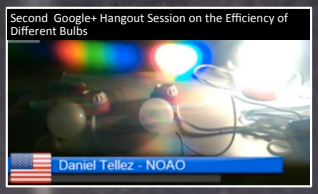

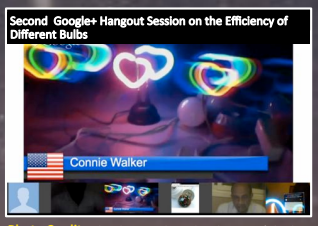

Photo Credit: The photograph used as the poster's background is by Jia Hao from China. Submitted to the April 2012 international "Earth and Sky" photo contest on Dark Skies Importance, the photo is of Comet Lovejoy over Australia. For more info, see www.twanight.org/contest.

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Section 4: Information for OAD

Suggestions and Recommendations to the OAD for expanding the project both locally and to other parts of the world

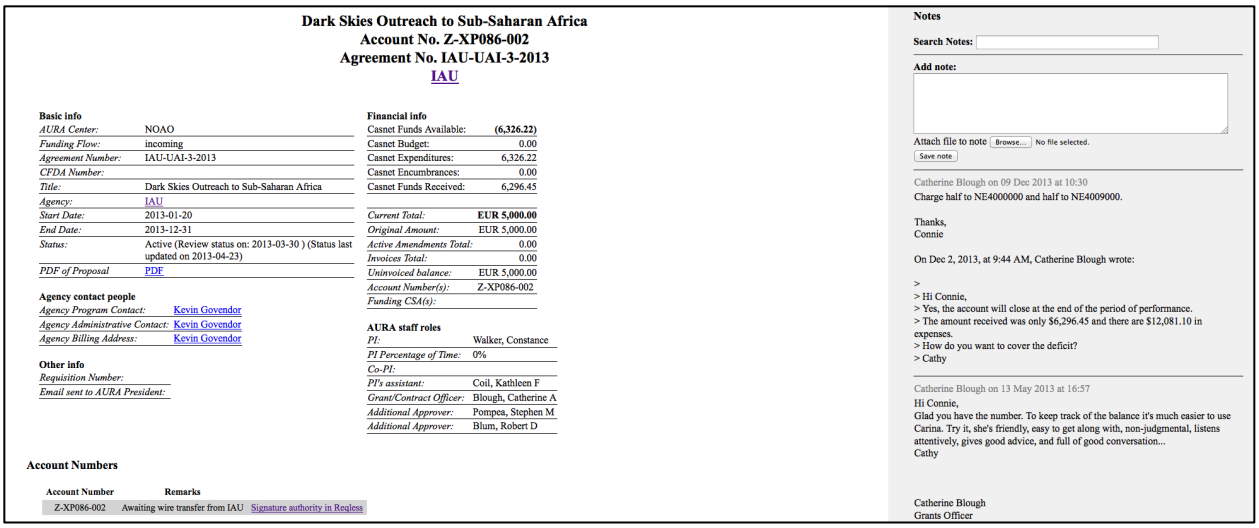
The International Year of Light 2015 (IYL2015) is looking for a project similar to this where the focus is on responsible and energy efficient lighting. The IYL is also interested in focusing on countries that are not so developed. NOAO EPO has ideas on how to expand even further on the first three activities and would be amenable to working with the IAU OAD to develop, produce, send, and train other coordinators in sub-Saharan Africa and/or to expand on the network of coordinators presently in the program. If the teachers of the present coordinators feel comfortable with the materials and are using them correctly, the coordinators could either take on additional teachers or train other coordinators to partner with teachers on this program, thereby expanding the program. NOAO EPO is qualified to do the professional development involved and to undertake the program expansion. There is also the possibility of identifying organizations willing to fund IYL projects like this.

There is always the possibility of collaborating with EPO-type organizations around the world to adopt this program and reproduce it either locally or for an underdeveloped country in closer proximity.

Finally we can explore options to use cheaper materials, but often you get what you buy. Typically in our development of kits, we compromise but always in the best interest of the teachers and students. Materials that the teacher can easily get and is inexpensive is preferable as long as the material lasts for more than a few uses.

Financial report

The IAU OAD TF3 grant was for 5,000 EUR. At the time of the proposal, 5,000 EUR was equivalent to $6428 USD. Initially the plan was to build 15 kits at $300. $1500 was set aside for sending the kits to Africa. The balance ($428 USD) was for production and printing costs. At the time of transfer, this amount was equivalent to $6,296.45 USD. The kits were subsequently improved in the first couple of months of the funded program and the price per kit increased to $450 USD. Fourteen were built. The cost of the kits came to a little more than the grant allotment at the time of transfer. Twelve were sent to the African countries and one to the OAD. One kit was kept in-house for professional development at the Google+ Hangout sessions. The IAU OAD TF3 proposal did not cover the NOAO EPO staff salaries. The expenses to send the kits to the African countries were covered by NOAO. The cost of sending the kits to the 12 African countries was on average $482 USD per kit or a total of $5,781 USD. (The kit to the OAD was hand-delivered to J.C. Mauduit and Kevin Govender at the CAP2013 meeting in Warsaw.) Altogether $12,081 USD was spent on the project. (See Figure 1.)



Dark Skies Outreach to Sub-Saharan Africa
Account No. Z-XP086-002
Agreement No. IAU-UAI-3-2013
IAU

Basic info

AURA Center:	NOAO
Funding Flow:	incoming
Agreement Number:	IAU-UAI-3-2013
CFDA Number:	
Title:	Dark Skies Outreach to Sub-Saharan Africa
Agency:	IAU
Start Date:	2013-01-20
End Date:	2013-12-31
Status:	Active (Review status on: 2013-03-30) (Status last updated on 2013-04-23)
PDF of Proposal	PDF

Agency contact people

Agency Program Contact:	Kevin Govendor
Agency Administrative Contact:	Kevin Govendor
Agency Billing Address:	Kevin Govendor

Other info

Requisition Number:	
Email sent to AURA President:	

Financial info

Casnet Funds Available:	**(6,326.22)**
Casnet Budget:	0.00
Casnet Expenditures:	6,326.22
Casnet Encumbrances:	0.00
Casnet Funds Received:	6,296.45
Current Total:	**EUR 5,000.00**
Original Amount:	EUR 5,000.00
Active Amendments Total:	0.00
Invoices Total:	0.00
Uninvoiced balance:	EUR 5,000.00
Account Number(s):	Z-XP086-002
Funding CSA(s):	

AURA staff roles

PI:	Walker, Constance
PI Percentage of Time:	0%
Co-PI:	
PI's assistant:	Coil, Kathleen F
Grant/Contract Officer:	Blough, Catherine A
Additional Approver:	Pompea, Stephen M
Additional Approver:	Blum, Robert D

Account Numbers

Account Number	Remarks
Z-XP086-002	Awaiting wire transfer from IAU Signature authority in Reqless

Notes

Search Notes:

Add note:

Attach file to note Browse... No file selected.
Save note

Catherine Blough on 09 Dec 2013 at 10:30
Charge half to NE4000000 and half to NE4009000.

Thanks,
Connie

On Dec 2, 2013, at 9:44 AM, Catherine Blough wrote:

>
> Hi Connie,
> Yes, the account will close at the end of the period of performance.
> The amount received was only $6,296.45 and there are $12,081.10 in expenses.
> How do you want to cover the deficit?
> Cathy

Catherine Blough on 13 May 2013 at 16:57
Hi Connie,
Glad you have the number. To keep track of the balance it's much easier to use Carina. Try it, she's friendly, easy to get along with, non-judgmental, listens attentively, gives good advice, and full of good conversation...
Cathy

Catherine Blough
Grants Officer

Figure 1. NOAO Statement for the Account for the IAU OAD TF3 "Dark Skies Africa" program.

Contact Information:

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