

# Dark Skies Rangers Program

## Student Symposium: Educating Others on Effects of Outdoor Artificial Night Light

**Grades:** 6 – 12

**Purpose:** Students will plan, conduct and film a Symposium the goal of which is to educate and inform others about artificial night time light pollution (LP), its existence, the dangers it can pose to the professional and semi- professional workforce, the local economy, wildlife and on the larger community in general. They will also research possible solutions and ways to mitigate the consequences of LP. Each student will be responsible for conducting their own research and then be involved in the production of a video that will be distributed to the larger community.

**U.S. National Science Education Standards: (selected standards not limited to the following)**

**NS.5-8.1 SCIENCE AS INQUIRY**-all students should develop—

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

**NS5-8.5 SCIENCE AND TECHNOLOGY**...students should develop—

- Abilities of technological design
- Understandings about science and technology

**NS.5-8.6 PERSONAL AND SOCIAL PERSPECTIVES**...students should develop understanding of...

- Personal health
- Populations, resources, and environments
- Risks and benefits
- Science and technology in society

**NS.5-8.7 HISTORY AND NATURE OF SCIENCE**...students should develop understanding of

- Science as a human endeavor
- Nature of science
- History of science
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**Arizona Science Standards: (not limited to those listed below...)**

**Grades 6 - 8:**

S1,C1,PO3. (Gr.6) Locate research information, not limited to a single source, for use in the design of a controlled investigation.

S1,C1,PO2. (Gr. 7-8) Select appropriate resources for background information related to a question, for use in the design of a controlled investigation.

S1,C2,PO5. Keep a record of observations, notes, sketches, questions, and ideas using tools such as written and/or computer logs.(See W06-S3C2-01 and W06-S3C3-01)

S1,C3,PO2. Form a logical argument about a correlation between variables or sequence of events (e.g., construct a cause-and-effect chain that explains a sequence of events).

S1,C3,PO3. (Gr. 8) Interpret data that show a variety of possible relationships between two variables.

S1,C4,PO1. Choose an appropriate graphic representation for collected data.

S1,C4,PO5. Communicate the results and conclusion of the investigation.

**Grades 9 - 12:**

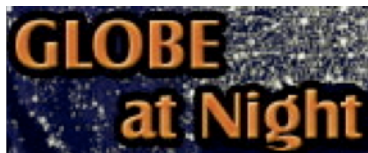
S1,C1,PO1. Evaluate scientific information for relevance to a given problem. (See R09-S3C1, R10-S3C1, R11-S3C1)

S1,C2,PO5. Keep a record of observations, notes, sketches, questions, and ideas using tools such as written and/or computer logs.

S1,C3,PO3. Critique reports of scientific studies (e.g., published papers, student reports).

S1,C4,PO1. For a specific investigation, choose an appropriate method for communicating the results.

S1,C4,PO2. Produce graphs that communicate data.



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**Content Objective:** Students will...

- Use appropriate resources to research the topic of artificial light pollution.
- Present information in a logical, scientific and understandable way.
- Design graphics that will truthfully represent their information.
- Use credible evidence to support their findings.
- Communicate information using polished presentation skills.
- Employ the use of technology to inform others.

**Time to Do Activity:** This is an activity that can take up to two weeks where students take responsibility for producing a product (an informational video) that will demonstrate their conceptual understanding of numerous scientific principles along with learning and using 21<sup>st</sup> Century Skills. An approximate schedule might look like the following; 1 day –introduction, 3 to 5 days research, 1 day- practice, 1 class session for taping symposium.

**Materials needed:** Computer access, flip camera or video camera. (Many students have these.)

**Preparation/Prerequisites:** YOU AS TEACHER DO NOT HAVE TO KNOW HOW TO DO ALL THESE THINGS...THE STUDENTS WILL KNOW OR FIND OUT AS THEY GO! DO NOT STOP YOURSELF- THIS IS A LEARNING EXPERIENCE FOR EVERYBODY.

This activity is not a debate. It is designed as an information session designed to gather information and inform an audience who has little to no knowledge on the incidence and effects of light pollution. Students are responsible for being local “experts” and delivering information that will change behavior. They will be assessed using a rubric(s) given to them before they begin the activity. They will also be given role cards designating their group responsibilities.

You might look into getting parent permission forms for taping students. Check with you school and its policy regarding this.

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### Lesson Sequence:

#### Hook:

Teacher will show 2 to 3 segments from You Tube or Teacher-Tube to class. (These videos should be produced by classes, highlighting their work in a subject area meant to inform the public on work they have been involved with.) The teacher will engage their class in a discussion asking students –“Do you think we can do the same thing? You have been studying .....why not inform others what you have found out about...?”

**Integration:** Technology- use of video camera and sound recorders.

Language Arts- written presentations. Science- local environmental issues. Social Studies- history of local community, maps. Communication- presentation skills, graphics. Math- graphs, demographics, change over time.

#### Activity:

This is an activity involving the entire class. There will be numerous ways to involve each student on an individual as well as a team basis. **The activity is divided into two parts:** Part 1-conducting research and Part 2-production of a video. The highlighted colors will help you when reference is made to TEAMS. Every student will be a part of the **Information Team** in Part 1. In Part 2 each student will choose to be a part of the **Production Team** OR the **Presentation Team**.

- **Part1**  
**Information Team**- every student will be involved with researching LP and will be assessed individually.
- **Part 2**

**Production Team** **Presentation Team**- Students will choose the one team they want to join and be assessed both individually and as a team member. Each student will be switching roles and be a part of different groups through out this activity. It is imperative that each student keeps notes and records all information that the class generates. Stress this from the start. The information they research will be used by someone else and they will be dependent on the information collected by someone else. This will be a group effort.

#### Introduction of activity:

1. Show Teacher Tube (You-Tube) selections to entire class and involve students in a discussion on how they could create an informational video about light pollution (LP)?

2. In table groups, (4 students -with a “recorder” and “reporter”) have students brainstorm ideas about producing a video. You might want to use the following prompts to keep the discussion focused...

- Who would be the intended audience of a video on light pollution (LP)?
- What information do you consider important for other to know/understand about LP?
- What would you like to see happen (if anything) as a result of others gaining this information?
- How long (time wise) do you think a person be willing to watch a video on LP?
- What are some techniques/strategies you could use to deliver information on LP that could hold a person’s interest?
- What did you find most interesting/ surprising about LP?

Have “reporters” present to the entire class their group’s ideas. As a class categorize commonalities/outstanding ideas that all groups share.

3. The group discussions could be done in 1 class period. Do not get bogged down here, keep the activities going at a fairly quick pace (set time limits). The students will be expanding these ideas in their Research teams. (At the end of this the students have created a brief outline. This also functions as a review of light pollution.) The other important focus of this time is for them to get excited about producing an informational video.

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### Part 1

#### Overview- Information gathering

The class will be producing videos educating the public on the existence and prevalence of LP in their community. To do this in a realistic way different members of the community will be consulted to see if they perceive artificial nighttime light as a problem and if so how big of a problem it is. Each student will receive a **role card**. Decide how to assign roles or distribute the **role cards**\* and \*\* randomly. (HINT: You might want to color code and laminate these cards. There will be duplicates of the roles so the colors will make it easier for students to find each other.)

Instruct the students that the class will be collecting information from numerous people in their community. They are to find and interview the person on their card and will be reporting back to the class through this person's eyes- their thoughts on artificial nighttime light.

This "interview" can be done very informally, on the phone, at home or at school etc. You might have to discuss and model ways to approach people, techniques to record thoughts etc. Hand out rubric<sup>1</sup> and review it with students so they understand how they will be assessed and their responsibilities. Ideally the interview would be a weekend HW activity.

<sup>1</sup>Go to < <http://www.rubistar.com/>> to make your own rubric to assess your goals for students.

#### 4. Information Team

Teacher distributes all 12 role cards\* and \*\* (leave out Community Activist) –one to each student. These cards designate a specific "role" that represents a community member. Students meet with others having the same role card (using like colors keeps noise down in classroom when students hunt for each other). This group is referred to as the student's **Information Team** and will not change. On the card are prompts to focus their discussion. They are given a time limit to discuss what they felt might be concerns voiced by their interviewees surrounding nighttime artificial lighting. It is hoped that they will exchange ideas on how to approach their interviewee and generate other questions they might want to ask them. After the interview they will meet back with their team and exchange information they collected.

(HINT: You might want to put time limits on this discussion...and give ideas like it is

each groups' responsibility to come up with five(?) questions they will ask their community member concerning how they depend on artificial light, how their job is affected by such light and if they are concerned with the amount of light (too much/too little/sufficient) that is available to them at night. Circulate and question the depth and breathe of the questions they are coming up with.)

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Possible ROLES: (Can be added to/deleted as needed) (Roll cards are at the end of this document.)

\*Homeowner in a residential neighborhood in a high crime area

\*Homeowner in a residential neighborhood in a low crime rent area

\*Rural area homeowner

\*Retail storeowner

\*Fire fighter

\*Parks and Rec. coordinator

\*Policeperson

\* \*\*Community activist

\*(This person will be on the panel and represent the Communities concerns- all the above un-highlighted will be combined into a single person)

\*\*Astronomer

\*\*Wildlife biologist

\*\*City council member

\*\*Inventor/lighting technician/ engineer

\*\* Electric Company (TEP) liaison

\*\*All the above highlighted will be on the presentation panel

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Prompts on \* role cards;

- Is the artificial lighting in the neighborhood you are connected with adequate for you to feel safe/ conduct your job/duties?
- Draw/ describe the typical light fixtures (city provided and residential/commercial) used now.
- What are your suggestions to improve the existing situation?

Prompts on \*\* cards;

- How is artificial night lighting a problem or perceived problem for your group /community?
- What could possibly be done to help lessen this problem?
- How would this possibly help you do your job in a better way?

5. Next class session-- after conducting interviews...

Class comes together in role groups (**community activist** is 1 large group) to blend information they collected. A reporter is appointed from each group and the information is shared with the entire class. The class can discuss any similarities/difference they find among the different groups. This will be important for Part 2 when they have to represent the different groups in the video. This is the bridge to Part 2

Students have outlined the concerns and needs of each role. Now it is time to develop a video to inform and address all aspects surrounding the issue of light pollution and propose some actions.

### Part 2

#### Overview--Conducting and production of the Symposium

Each student can choose a NEW role in Part 2. Some of the original roles from Part 1 are gone; five roles remain the same. Role responsibilities will be changing in Part 2 however. The class will be divided into numerous groups (depending on class numbers) of Presentation (6 roles\*\*) and Production (4 students) Teams. Rubrics are distributed and reviewed so students understand responsibilities before they are asked to sign up for a specific team. Members of the **Presentation Team\*\*** will practice their roles while members of the **Production Team** organize how, when and where they will be filming.

Production Team + Presentation Team =Symposium Group

6. Students sign up for a NEW specific role\*\* within a group that consists of a Presentation team (6 students) and a Production team (4 students). Teachers can add or delete roles and adjust team size so every student will have an important contribution to make. Grade here for participation.

**Important:** Have students make signs for themselves so you, as well as others, know what their role is within each group. A suggestion is to color code these for each group.

#### **Presentation Team\*\***

- Astronomer
- Wildlife Biologist
- Electric Company liaison
- Inventor/lighting engineer
- Community Activist
- City Council Member

#### **Production Team**

- Camera person
- Director (directs production of symposium)
- Editor-downloads and edits production, up loads to teacher tube (with teacher assistance).
- Moderator- Intros Symposium and all presenters. Concludes segment and develops credits to be entered on screen.

Classes will have more than 1 group filming at a time so arrangements will have to be made for groups to film in other rooms. All students who have the same role but are in different groups can meet through out this part to help one another. In fact, that would be preferable to a student working alone.

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7. Separate classroom into Group areas. Have each group meet with their two teams (P&P) and develop a 3 to 4 day schedule with specific tasks each person is responsible for. (The presenters (6) will have 3 to 4 minutes each for their separate presentation.) The group's outline has to be handed to the teacher and approved BEFORE any member can leave their group area to meet with any other person from another group.

Student responsibilities on **Presentation Team**

- Meet with the 6 members of the Presentation team so all verbalize to each other what their roll is and the overall Goals and schedule is.
- Create individually and as a group a polished presentation –practice.
- Use their 3 - 4 minutes to state specifically how nighttime artificial light affects them.
- Propose possible solutions that will help alleviate any problem situation(s).

Student's responsibilities on **Production Team**

- Review rubric.
- Devise a production schedule that the presenters will have to follow.
- Come up with a seating arrangement, how will graphics be displayed while filming?
- Agree on filming time frame, signals to be used, etc.

8. Once a group has their outline reviewed by the teacher, each team member has 2 to 3 days to complete their written task. Each presenter will write up their talk (and hand in) and create a graphic they will be using to highlight their talk.  
PRACTICE.

Production members will write up their schedule/plan. Both the cameraperson and editor have to become proficient with the camera and downloading procedures. PRACTICE.

(HINT: Go over the importance of the schedule. Times will have to be adhered to. Use the example of a TV show. When a show is scheduled to be taped, it has to happen on a certain day; schedules are meant to be kept. You cannot ask the audience to come back!)

9. Students will have 2 to 3 days to assemble their presentation, which includes one day to practice and one day to film. The schedule will be posted when each group's sheets have been OK'd by the teacher

10. Filming day will be one class period. The following day the class will review the presentations and select the one from their class that is the most factual, well presented and filmed. All classes will screen the best from each class and make decision for downloading. The most polished and technically sound (could be more than 1) will be put "on-line" on a site decided on by the teacher and class.

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**Assessment:** [www.rubie.star](http://www.rubie.star) is a cite which helps teachers design and create their own rubrics.

## **Student Materials:**

### **ROLE CARDS:**

Print the following and distribute one card to each group member. Number of students in each group will depend on class size. (HINT: if you don't have a color printer print on different color paper OR use highlighters to distinguish roles by color. It will make for a quieter classroom!)

## **Astronomer**

- How is artificial night lighting a problem or perceived problem for your group /community?
- What could possibly be done to help lessen this problem?
- How would this possibly help you do your job in a better way?

## **Wildlife Biologist**

- How is artificial night lighting a problem or perceived problem for your group /community?
- What could possibly be done to help lessen this problem?
- How would this possibly help you do your job in a better way?

## **City Council Member**

- How is artificial night lighting a problem or perceived problem for your group /community?
- What could possibly be done to help lessen this problem?
- How would this possibly help you do your job in a better way?

## **Electric Company Liaison**

- How is artificial night lighting a problem or perceived problem for your group /community?
- What could possibly be done to help lessen this problem?
- How would this possibly help you do your job in a better way?

## **Community Activist**

- How is artificial night lighting a problem or perceived problem for your group /community?
- What could possibly be done to help lessen this problem?
- How would this possibly help you do your job in a better way?

# **Inventor/Lighting Engineer**

- How is artificial night lighting a problem or perceived problem for your group /community?
- What could possibly be done to help lessen this problem?
- How would this possibly help you do your job in a better way?

## **Homeowner in a High Crime Residential Neighborhood**

- Is the artificial lighting in the neighborhood with which you are associated adequate for you to feel safe/conduct your job/duties?
- Draw/describe the typical light fixtures (city-provided & residential/commercial) presently used.
- What are your suggestions to improve the existing situation?

## **Homeowner in a Low Crime Residential Neighborhood**

- Is the artificial lighting in the neighborhood with which you are associated adequate for you to feel safe/conduct your job/duties?
- Draw/describe the typical light fixtures (city-provided & residential/commercial) presently used.
- What are your suggestions to improve the existing situation?

## Rural Area Homeowner

- Is the artificial lighting in the neighborhood with which you are associated adequate for you to feel safe/conduct your job/duties?
- Draw/describe the typical light fixtures (city-provided & residential/commercial) presently used.
- What are your suggestions to improve the existing situation?

## Fire Fighter

- Is the artificial lighting in the neighborhood with which you are associated adequate for you to feel safe/conduct your job/duties?
- Draw/describe the typical light fixtures (city-provided & residential/commercial) presently used.
- What are your suggestions to improve the existing situation?

## Parks and Rec. Coordinator

- Is the artificial lighting in the neighborhood with which you are associated adequate for you to feel safe/conduct your job/duties?
- Draw/describe the typical light fixtures (city-provided & residential/commercial) presently used.
- What are your suggestions to improve the existing situation?

## Policeperson

- Is the artificial lighting in the neighborhood with which you are associated adequate for you to feel safe/conduct your job/duties?
- Draw/describe the typical light fixtures (city-provided & residential/commercial) presently used.
- What are your suggestions to improve the existing situation?

## Retail Store Owner

- Is the artificial lighting in the neighborhood with which you are associated adequate for you to feel safe/conduct your job/duties?
- Draw/describe the typical light fixtures (city-provided & residential/commercial) presently used.
- What are your suggestions to improve the existing situation?

## **Team Cards**

The following cards can be printed out for students to wear or place on their desks so all class members know who is in each team.

**Information Team**

**Production Team**

**Presentation Team**