

**MARY PICKFORD FILM CENTER, Bellingham  
DOC-ED Documentary Film Event for Whatcom Youth**

**FILM DISCUSSION GUIDE**

***INVENTING TOMORROW (2018)***

**Executive Producer and Director: Laura Nix**

<https://www.imdb.com/name/nm0633177/>

**SUMMARY:**

*“Meet passionate teenage innovators from around the globe who are creating cutting-edge solutions to confront the world's environmental threats - found right in their own backyards - while navigating the doubts and insecurities that mark adolescence. Take a journey with these inspiring teens as they prepare their projects for the largest convening of high school scientists in the world, the Intel International Science and Engineering Fair (ISEF), a program of the Society for Science and the Public.” -IMDb trailer*

**FEATURING:**

**MONTERREY, MEXICO**

Team: Jesus Aranda, Jose Esparza, Fernando Villalobos

Secondary School: Preparatorio 16 (affiliated with Autonomous Univ. Nuevo Leon)

University Research Partner: Dr. Azael Martinez de la Cruz, Mechanical & Electrical Engineering Department, Autonomous University of Nuevo Leon

**BANAGLORE, INDIA**

Team: Sahithi Pingali, (Prashaant Ranganathan)

Secondary School: Indian Learning Foundation School, Inventure Academy

University Research Partner: Dr. TV Ramachondra, Professor, Centre for Ecological Sciences, Indian Institute of Science

**ISLAND of BANGKA, INDONESIA**

Team: Nuha Anfaresi, (Intan Putri)

Secondary School: ?

Government Research Partner: Dr. Rudi Subagja, Research Center for Metallurgy & Materials Research Center, Indonesian Institute of Sciences

**HILO, HAWAII, USA**

Team: Jared Goodwin

Secondary School: Hilo High School

University Research Partner: Dr. Steve Lundblad, Geology Dept., University of Hawaii-Hilo

## **CONNECTING TO SELF**

1. Have you ever entered a science fair or other academic competition? If so, describe how your prior experiences helped you relate to the experiences of these ISEF contestants.

2. *Sahithi: "Water, earth, air—we all share them. With the environment, you see the same issues repeated across the world. It's inevitably our job—as the next generation—to tackle this."*

Did the film intensify your concerns about the global nature of environmental degradation? Do you agree with Sahithi that it's "inevitable" that the next generation will need to clean up problems caused by prior generations?

3. *Sahithi: "The people who are approaching this [environmental crisis] through the eye of science are the people who can fix it and are going to fix it."*

Do you share Sahithi's certainty that the world's environmental problems can be solved by scientists and engineers alone? Should scientists and engineers shoulder the entire burden? What responsibilities do other stakeholders have to prevent or resolve the problems? For example, what are the roles and responsibilities of government, manufacturers, and consumers?

4. If this film inspired you to take action, in what way(s) do you see yourself contributing to solutions? What global issues do you care most deeply about?

5. When Nuha and Intan returned home one evening, they sang a Taylor Swift song. Later, we see them eating donuts. Did it surprise you that Taylor Swift and American donuts are part of rural Indonesian youth culture? As you observed all of the teams at family dinners, work sites and other locations, did you feel that you had more/less in common with them than you thought originally? Describe significant similarities and differences. Here are a few categories for comparison.

Clothing, grooming  
Mealtime  
Hobbies/ interests  
Communication  
Team identity

Interactions with parents, elders, and friends  
Social class and economic pressures  
Religious values and behaviors  
Technology  
Cultural identify; Pride

5. As the competition grew near, the students' fears and anxieties mounted. What concerned them the most? How did they try to overcome technical obstacles as well as their nerves? Have you ever felt that way? Under pressures of performance and judgment, how have you stayed calm so that you could do your best?

## **SCIENTIFIC PROCESS:**

1. Problem Finding: To compete at ISEF, students needed to do original research. The first step in original research is identifying a problem that hasn't yet been solved. Describe the central problem of each project.
2. Solution Finding: What was the hypothesis of each project?
3. Tools and Materials: What tools did the students use to collect their data? What kinds of complex data analysis tools were they able to access at their partner universities and research centers?
4. Data Collection: What data did each team collect and how did each collect it?
  - a) Describe Jared's data collection process and how he organized the data into maps of arsenic distribution within several inundation zones.
  - b) Sahithi planned to invite the general public through crowd sourcing to collect data on contaminated lakes. Explain her "citizen science" approach to the collection of local data. Do you think it will be both simple and appealing to the public? What obstacles should she consider?
5. Communicating Results: The teams prepared visual poster displays of their projects and practiced how they would orally communicate important information to observers and judges. They also tried to anticipate questions that the judges might ask through practice sessions with younger students and peers. In the end, how did it go for each team? Why do you think that the Monterrey team felt very disappointed by their presentation. What did you learn about how to communicate effectively?
6. Application: Manu Prakash, Assistant Professor of Bio-engineering at Stanford University, left an impression on Sahithi about the importance of collaboration.

*Sahithi: "You cannot do it alone. You need to collaborate with others so it can grow. The science—there is really no value in creating this data and creating these inventions. You do need to actually make a difference in the world."*

Recall how the teams described the applications of their research. With whom would they collaborate? To what human and planetary purposes would their conclusions be applied?

## **INSPIRATION and SUPPORT**

1. Many students described why they became student scientists. For example, Jared was inspired by his grandmother's stories about the impact of tsunamis on Waiakea Mill Pond. After Fernando's uncle died from respiratory disease, Fernando became very concerned about Monterrey's air quality. Do you remember other personal stories or events that inspired team members to devote so much time and energy to their science projects?

2. All of the students needed help to complete their final presentations. In addition to guidance from their high school teachers and technical instruction/equipment from their industry partners, most of the teens also found needed encouragement from their parents. Describe the ways in which family support was critical to each person's success.

### **AFTERWARDS:**

1. At the ISEF opening ceremonies, Manu Prakash told the contestants, "Solutions [to climate change, biodiversity loss, denial of science] lie in the spark of eyes of people like you. We have to build an army of scientists around the world. .... [You] are our only hope." For those who are inspired and called to into service by Prakash, what personal qualities and habits of mind will you need to develop in order to be successful?

2. *Jesus: "I think the competition will have a big effect on our lives. It's the realization that something we started with very little, could end up being recognized. Then we'd know that we're doing something right."*

The Monterrey team did not win a prize at the competition but still they benefited in many ways from completing their project and participating at ISEF. While in Los Angeles, what do you think they learned? Describe what happened to each of them once home again in Monterrey. Do you recall "next steps" taken by other team members?

3. While most of the team members in the film are from middle or upper-middle class families with parents who are involved in their children's education, some were not. For example, Jose's family struggled to purchase the clothing he needed to wear during the competition and they couldn't afford to send him to university. Thankfully, Jose's participation at ISEF alerted his university to offer a merit scholarship so that he could begin his university studies and thus eventually contribute to a positive future for his community. But how will students like Nuha, a female from a remote island in Muslim Indonesia, overcome entrenched barriers ?

4. The film ends with a sequence of Jared and his dad watching a volcano spew magma into the Pacific Ocean. He reflects, *"It's a sacred feeling as you watch land*

*being created in front of your eyes.” Why do you think the filmmaker ended with this sequence?*

## **RESOURCES**

### **ACADEMIC COMPETITIONS and COURSES: (For students)**

#### **Washington State Academic Competitions**

<http://lwsdgeac.org/resources/student-competition-programs/>

#### **STEM Youth Courses at WWU**

<https://ee.wvu.edu/youth-programs/programs/stem-academy-western>

<https://ee.wvu.edu/youth-programs/programs/gems-academy-girls-engineering-math-science>

#### **Bellingham AAUW offers Scholarship for Tech Trek Summer Camp**

<https://techtrek-wa.aauw.net/>

#### **Univ of Washington Summer Courses**

<https://www.engr.washington.edu/admission/k12>

<https://www.summer-camp.uw.edu/camps-courses/middle-school/>

### **EXPLORING FURTHER \*adult reading only**

#### **Eco-System Health Explained--US Environmental Protection Agency, Interactive Enviro-Atlas**

<https://www.epa.gov/enviroatlas/how-use-enviroatlas>

[https://www.teachengineering.org/curricularunits/view/duk\\_bubble\\_mary\\_unit](https://www.teachengineering.org/curricularunits/view/duk_bubble_mary_unit)

#### **Tin Dredge-Mining on Bangka Island, Indonesia**

\*

<https://www.theguardian.com/environment/gallery/2014/may/29/tin-mining-on-bangka-island-of-indonesia-in-pictures>

\*

<https://www.theguardian.com/environment/2012/nov/23/tin-mining-indonesia-bangka>

<https://vimeo.com/78083529>

[https://www.teachengineering.org/curricularunits/view/wst\\_environmental\\_unit](https://www.teachengineering.org/curricularunits/view/wst_environmental_unit)

## **Sewage Problems Bangalore**

\*

<http://www.thealternative.in/lifestyle/sewage-is-a-much-bigger-problem-than-water-supply-in-bangalore/>

- <https://www.theguardian.com/cities/2017/mar/01/burning-lakes-experts-fear-bangalore-uninhabitable-2025>

<https://www.epa.gov/nutrientpollution/what-you-can-do-your-classroom>

Local problems with nutrient pollution

<https://www.epa.gov/nutrientpollution/problem>

<https://www.youtube.com/watch?v=RMyCcWECbNE>

## **Industrial Pollution Monterrey, Mexico**

<https://www.smithsonianmag.com/innovation/smog-eating-buildings-battle-air-pollution-180954781/>

[https://video.search.yahoo.com/search/video;\\_ylt=Awr9IkxhIZNbksIA8nBXNyoA;\\_ylu=X3oDMTE0OG5ubWFiBGNvbG8DZ3ExBHBvcwMxBHZ0aWQDQjQwMzdfMQRzZWMDcGl2cw--?p=industrial+air+pollution+effects&fr2=piv-web&fr=yfp-t#id=12&vid=522d02c1b861685015149370d398ec92&action=view](https://video.search.yahoo.com/search/video;_ylt=Awr9IkxhIZNbksIA8nBXNyoA;_ylu=X3oDMTE0OG5ubWFiBGNvbG8DZ3ExBHBvcwMxBHZ0aWQDQjQwMzdfMQRzZWMDcGl2cw--?p=industrial+air+pollution+effects&fr2=piv-web&fr=yfp-t#id=12&vid=522d02c1b861685015149370d398ec92&action=view)

[https://www.teachengineering.org/curricularunits/view/cub\\_enveng\\_curricularunit](https://www.teachengineering.org/curricularunits/view/cub_enveng_curricularunit)

## **Arsenic and Tsunamis in Hilo, Hawaii**

<http://www.environment-hawaii.org/?p=3796>

[https://www.epa.gov/sites/production/files/2014-03/documents/arsenic factsheet cdc 2013.pdf](https://www.epa.gov/sites/production/files/2014-03/documents/arsenic_factsheet_cdc_2013.pdf)

<http://www.hawaiisciencemuseum.org/student-research/>

UW Tsunami models for our Pacific coastline

<http://www.washington.edu/news/2015/08/17/uw-researchers-model-tsunami-hazards-on-the-northwest-coast/>