



Study Guide – Inventing Tomorrow

By Lucy Carr

Overview

Language: English

Duration: 1 hour 27 minutes

Ages: 13+ (years 9 – 12)

Synopsis

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).

Director's Bio

Laura Nix is a Chicken and Egg Breakthrough Filmmaker Award winner in 2018, and was awarded the Sundance Institute/Discovery Impact Fellowship in 2017. She previously directed *The Yes Men Are Revolting*, (Toronto Film Festival 2014, Berlinale 2015), which was theatrically released and broadcast in the US and in multiple international territories. Her film *The Light in Her Eyes* premiered at IDFA; was broadcast on the PBS series POV, and toured the world as part of Sundance's Film Forward program. Other feature directing credits include the comedic melodrama *The Politics of Fur*, which played in over 70 festivals internationally and won multiple awards including the Grand Jury Prize at Outfest; and *Whether You Like It or Not*, about the phenomenon of *Hedwig and The Angry Inch*.

Nix has broadcast her work through various outlets including New York Times Op-Docs, and on television via Al Jazeera Arabic, PBS, HBO, Arte, ZDF, VPRO, CBC, NHK, Canal+, and IFC. Her work has received support from the Bertha Foundation, BritDoc, Cal Humanities, COBO Fund, the Danish Film Institute, the Redford Center, and the Sundance Documentary Fund. She has received fellowships from the MacDowell Colony, Film Independent and the Independent Feature Project, and is currently is a film expert for the U.S. State Department's American Film Showcase. Based in Los Angeles, she is the owner of Felt Films, a production company that produces non-fiction shorts and features.



Curriculum Links

STEM and STEAM – Science, Technology, Engineering, Art and Math*

Inventing Tomorrow can be directly integrated into any of the disciplines within STEM and STEAM programs. STEM and STEAM responds to the need to prepare young people to deal positively and productively with 21st century global challenges, address contemporary issues such as the environment, and create innovative solutions to real world problems with confidence and skills.

Years 9 – 10 ACARA The Arts (Media Strand)
([ACAMAR078](#))

Years 11 & 12

Design (2019 Syllabus)

Engineering (2019 syllabus)

Film, Television and New Media (2019 syllabus) Units 3 & 4

* Further information about Queensland's STEM/STEAM initiative can be obtained at <https://education.qld.gov.au/curriculum/school-curriculum/stem>



Narrative

INVENTING TOMORROW follows six young scientists from Indonesia, Hawaii, India and Mexico as they tackle some of the most complex environmental issues facing humanity today – right in their own backyards. Each student is preparing original scientific research that he or she will defend at ISEF, the Intel International Science and Engineering Fair. Framed against the backdrop of the severe environmental threats we now face, we immerse the audience in a global view of the planetary crisis, through the eyes of the generation that will be affected by it most.

Considered the Olympics of high school science fairs, ISEF is the largest gathering of high school scientists in the world, attracting approximately 1,800 finalists from over 75 countries, regions and territories. All the finalists want to do a good job, but the heart of the story isn't about whether they go home with an award. As they take water samples from contaminated lakes, dig up the dirt in public parks, board illegal pirate mining ships, and test their experiments in a lab, we see each student display a tenacious curiosity, and a determination to build a better future. Motivated by the desire to protect their homes, these young people are asking questions about the issues they observe in their communities, and proposing innovative solutions to fix them.

The students spend close to 600 hours each on their projects, guided in their scientific quest by dedicated university mentors. At home with their parents, grandparents, and siblings, they compare the world their elders knew with the stark reality of the one they're inheriting.

But they're still teenagers, with their own unique struggles. We spend time with them in classrooms, at after-school jobs, behind the wheel as they learn to drive, and in their rooms hanging out with friends, and learn more about the obstacles they face just to get to the fair. As each finalist prepares to leave home, some for the very first time, we witness their unique intellectual and emotional journeys on the way to ISEF 2017 in Los Angeles.

Once they land in Los Angeles, our characters join a vibrant, excited community of young students from around the globe. They meet peers who are just as bright and determined as they are, competing in every category of STEM, from Robotics to Computer Science. The tension builds as they practice how to defend their research in front of 1000 volunteer judges, all specialists in their fields.



Beyond the gauntlet of judging, the week is a whirlwind of social activities, field trips, and exploring brand-new foods in the cafeteria. The students form bonds that many call life changing. Regardless of who wins an award, they all discover a community that celebrates their ingenuity and enthusiasm. They meet peers who turn into lifelong friends; other kids like themselves who believe in a shared vision of environmental stewardship and collective action.

When the fair ends, we follow our characters home to witness how they process their experiences. Some leave with a renewed sense of purpose and continue their project at university. Others are inspired to pursue a new direction. But as they integrate their time at ISEF into the next phase of their lives, they all realize they're not alone. They've finally met other kids like themselves who believe in a shared vision of environmental stewardship and collective action.

Characters

The Scientists

JARED GOODWIN - Age at Filming: 15
Hilo, Hawaii USA

Project: Arsenic Contamination
Through Tsunami Wave Movement in
Hawaii:

Investigating the Concentration of
Heavy Metals in the Soil from the 1960
Hilo, Hawaii Tsunami.



Jared passionately documents his love for his home of Hawaii through nature photography. His project studies the contamination of a local pond where arsenic was dumped by a company for nearly 30 years.

Inspired by his family, who survived two major tsunamis in Hilo, he developed a new model to study tsunami debris patterns, so he could track the disbursement of arsenic into local neighbourhoods. He wants to use his project to motivate state officials to create more accurate safety measures for land use zoning.

SAHITHI PINGALI - Age at Filming: 16

Bangalore, INDIA

Project: An Innovative Crowd-Sourcing Approach To Monitoring Fresh Water Bodies

After seeing the lake behind her home burst into flames, Sahithi decided to combine her love for science and social activist skills to create an innovative method for citizens to gather and share data about the severe water pollution in Bangalore. In order to protect her local lakes, she is developing technological solutions to amplify citizen voices, in an effort to stop the dumping of raw sewage into the watershed.



SHOFI LATIFA NUHA ANFARESI & INTAN UTAMI PUTRI - Age at Filming: 16
Bangka, INDONESIA

Project: Bangka's Tin Sea Sand - Fe_3O_4 as A Removal of $\text{Pb}(\text{II})$ Ions in By-Product of Tin Ore Processing (Tailing)

Nuha and Intan live on an island in Indonesia called Bangka, which is the world's 2nd largest source of tin ore. They have seen legal and illegal tin mining expand to the point where the bright blue waters around their home are now brown, and have observed the local fish and coral reefs dying. They are developing a filter that would process the effluents from the dredging process to protect the fragile oceanic ecosystem of their island, allowing the local fish supply to flourish again.



FERNANDO MIGUEL SÁNCHEZ VILLALOBOS, JESÚS ALFONSO MARTÍNEZ ARANDA,

JOSE MANUEL ELIZADE ESPARAZA -

Age at Filming: 17, 17, 18

Monterrey, MEXICO

Project: Photocatalytic ceramic paint to purify air

Fernando, Jesus and José live in one of the most polluted city of Latin America: Monterrey, Mexico.





After a lifetime of riding diesel-powered public buses that exposed them to harmful pollutants, they decided to try and address local air quality as well as global warming. While holding part-time jobs – and riding the bus several hours to meet with their university mentor – they invented a photocatalytic paint. This paint could remove two pollutants that contribute to global warming from the air: sulphur dioxide and titanium dioxide. The first in their families to attend university, the three friends were ecstatic to visit the United States when they attended ISEF.



Context and Concept

Director's Statement - The Concept

"We live during a time characterized by environmental degradation and climate change. Unprecedented drought, pollution, mass extinctions, rising sea levels, dramatic weather patterns, and an ocean that is slowly dying. It took me the majority of my adult life to come to terms with this reality, but teenagers today were born into this environmental chaos and instability. They face a daunting truth about the planet they're inheriting, as soon as they have the mental ability to comprehend it.

I wanted to create an immersive, emotional and cinematic experience about what it would be like to be one of those teenagers today; specifically a teen who is smart, observant and has some ideas about how he or she might address these extreme problems. When I first went to the Intel International Science and Engineering Fair (ISEF), I fell in love with the kids and immediately saw the story potential. There's built in tension and a unified narrative at the fair, but I always knew I wanted to push beyond the genre of a kids' competition doc. I was more interested in students whose research was motivated by a deep sense of purpose and personal motivation. I wanted to spend time following characters not because I thought they had a good chance of winning, but because their goal was bigger than scoring a prize at a science fair. Their science projects could help us survive."

The International Science and Engineering Fair (ISEF) - The Context

The International Science and Engineering Fair (ISEF) is the largest pre-college science competition in the world. Initially established in 1950 as the National Science Fair in Philadelphia, Pennsylvania, the competition was organized and run by Society for Science & the Public. Eight years later this fair transitioned into an international competition as finalists came from Canada, Germany, and Japan. Almost twenty years later in 1997 Intel, a Silicon Valley California based company inventor of the microprocessor and today one of the world's leading manufacturers of semiconductors, microchips, and other communications systems for Apple, Lenovo, HP, and Dell, came on as the leading title sponsor for ISEF.

ISEF is open to all students around the globe in grades 9-12 who have competed and won in an Intel ISEF affiliated science fair. Currently there are affiliated fairs in all 50 states, the District of Columbia, and more than 75 countries, regions, and territories. Each student's or teams' research project must contain no more than 12 months of continuous research.



For a student to have the opportunity to attend ISEF, they have already competed on many levels and are presenting their research project and findings after going through a rigorous review process to qualify.

Background excerpted from <https://www.societyforscience.org/mission-and-history>.

Pre-viewing Discussion Questions

STEM/STEAM

1. Make a list of environmental problems specific to your local community.
2. In pairs, choose one local environmental problem. Brainstorm possible solutions to that problem - inventing technologies.
3. Explain how you would convince people of the importance of solving the problem you have identified. Share your idea with the class, convincing them of its importance.
4. Now make a list of environmental problems on a global scale.
5. As a class, choose one URGENT global environmental problem. Brainstorm possible solutions to that problem - inventing new technologies.
6. **Extension Activity** - research your chosen local environmental issue: Is the local government taking initiative to solve the problem? Explain your answer identifying the technologies used, research conducted.

Media Studies/Film, Television and New Media

1. In one or two sentences, predict what the documentary may be about based on the title *Inventing Tomorrow* and its tagline "The Future is Brighter Than You Think".
2. In *Inventing Tomorrow* we meet students from India, Indonesia, Hawaii, and Mexico. Brainstorm environmental issues facing these countries.
3. List some environmental issues you know of in other parts of Queensland and/or Australia.
4. How can one scientist or activist make a difference?

Post-viewing Discussion Questions

STEM/STEAM

1. List obstacles the students faced when working on the research and presenting at ISEF.
2. Explain the similarities between the different projects.
3. Which project did you find most inspiring or compelling? Explain why.
- 4.



5. Is there anything you would have done differently for any of the projects?
6. Did watching the film inspire you to start your own science project? If so, explain in a short paragraph the type of project you would undertake.

Media Studies/Film, Television and New Media

1. Choose two students/teams, explain what inspired them to start a science project.
2. Where there any cultural issues/barriers the teams faced? Explain those issues.
3. Create a table identifying the similarities and differences between each teams' community.

For further writing prompts/discussion questions you can access the screen guide from the *Inventing Tomorrow* official website at https://www.dropbox.com/sh/ky686yf3ispt427/AABb-DYFvvM6vLfSisYypbJ1a?dl=0&preview=IT_Guide.pdf



Style

Inventing Tomorrow follows the conventions of a documentary film.

Documentary Styles

- Commentator (the filmmaker or someone comments on the action)
- Fly on the wall (a bit like a reality TV show, where video runs endless then is massively edited to create meaning.)
- Essay style (heavily researched and instructional)
- Observational style (like fly on the wall but with 'the voice of god')
- Drama Documentary (dramatic recreations of historical or famous events)
- Cinema verite - truth with the camera operator as part of the action (includes interviews with talent)
- Propaganda (generally political)

Documentary Codes and Conventions

- Narrator (not always director/producer)
- Talking heads (interviews)
- Subjects talking to the camera
- Voice-over ('the voice of god')
- Photographs (stills)
- Music
- Facts (you must heavily research your issue/topic/person)
- Different perspectives on issues (even if you have an opinion on the subject you must present both sides)
- Live footage
- B roll footage and cutaways
- Graphics/animation
- Archival footage
- Titles
- Recreations

Discuss questions

1. Which documentary style/s is *Inventing Tomorrow*?
2. How has *Inventing Tomorrow* used documentary codes and conventions to:
 - a. convey its message?
 - b. create tension?
 - c. evoke emotion in the audience?



Additional Resources

Further reading, viewing or resources

Essential Resources

www.InventingTomorrowMovie.com : Official film website

<https://www.youtube.com/watch?v=PzTj1h1sxEw&t=> : Trailer

<https://www.imdb.com/title/tt7527564/>

Recommended/Optional

www.SocietyForScience.org

<http://www.queenslandstem.edu.au> : STEM Education in Queensland

<http://miff.com.au/program/film/inventing-tomorrow>

<https://www.sff.org.au/program/browse/inventing-tomorrow>