Carrie M.

### Science Fair Logbook

2020-2021

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### [OLD PROJECT]

Project Description:

~ Test how the concentration of water can impact water droplets

~ Mixture of water + food colouring

~ More food colouring = higher concentration, less food colouring = lower concentration

~ How fast does the surface tension/droplet break?

~ If it is faster, the droplet/mixture is weaker, if the droplet lasts longer, then the droplet/mixture is stronger

QUESTION

 How does the concentration of water and food colouring impact the speed of how fast water droplets break?

### HYPOTHESIS

### **If** the concentration of the water is lower, **then** the water droplets will take less time to break, **because** water evaporates faster than propylene glycol, and food colouring has propylene glycol.

### MATERIALS

~ food colouring

~ water

~ eye dropper

~ mixing utensil

~ small bowl

~ flat surface

~ filming device

### PROCEDURE

1. Prepare the materials
2. Use a flat surface like a plate or paper and put it somewhere on an elevated surface
3. Set up the camera somewhere so it can film the droplets at a low/side view angle. This is so you can better see when the droplets melt.
4. Get some sort of small bowl and fill it with water
5. Use the eyedropper to squeeze drops of water onto the flat surface. Make sure you hit the record button before this so you can capture each droplet
6. Wait until the droplets look ‘melted’
7. Stop recording
8. Replace/clean the surface and repeat steps 4-7 only with different solutions: 5 drops of water and 1 drops of food colouring, and 10 drops of water and 1 drop of food colouring
9. Put the footage into an editing software. Cut the parts until you have the time it took for each droplet to ‘melt’
10. Record and analyze results

### Project Questions:

**Why use food colouring?**

* Because food colouring contains a chemical called propylene glycol
	+ Propylene glycol has different evaporation rates and surface tensions compared to water, and that should get some interesting results

**What is the purpose of this experiment?**

* Artificial chemotaxis is the action of manmade chemotaxis. Chemotaxis is when an organism interacts or responds to another chemical, organism, or species
* This experiment is a varied version of the Dancing Droplets experiment
	+ The Dancing Droplets experiment is studying how these droplets mixed with food colouring begin to interact and move together as if they are living species (though it’s actually just water)
	+ It’s like a phenomena of being able to create something so live-like
* The Dancing Droplets experiment helps understand the movement of artificial chemotaxis better, and how we can move forward to study it and possibly find more objects other than water that can do this
* My experiment is like a subsection to that, I think that eventually if we do take the step to experiment with other objects to create artificial chemotaxis, this could help understand how much propylene glycol could/should be used, and what creates better results

### Nov. 12th, 2020

~ Starting research

~ Looking for sources

Google Query History:

~ artificial chemotaxis

~ artificial chemotaxis water droplets

~ how does the concentration of water affects its droplets

~ how long does a water droplet hold its shape

~ what are water droplets

~ how do water droplets break

~ what are water droplets held together by

~ water droplets surface tension

### Nov. 23rd, 2020

~ More research

~ Finished research on website:

<https://news.stanford.edu/2015/03/11/dancing-droplets-prakash-031115/>

~ Starting to plan out Question, hypothesis, materials

Question ideas:

~ How does the concentration of water and food colouring impact the speed of how fast water droplets break?

Hypothesis ideas:

**If\_\_\_then\_\_\_\_\_because\_\_\_\_\_**

**If** the concentration of the water is lower, **then** the water droplets will take less time to break, **because** \_\_\_\_

**If** the concentration of the water is higher, **then** the water droplets will take more time to break, **because** \_\_\_\_

**If** the concentration of the water is lower, **then** the water droplets will take more time to break, **because** \_\_\_\_

**If** the concentration of the water is higher, **then** the water droplets will take less time to break, **because** \_\_\_\_

Materials ideas:

~ food colouring

~ water

~ eye dropper

~ mixing utensil

~ small bowl

~ flat surface

~ filming device

### Nov. 26th, 2020

~ more research

~ started looking at pdf: <https://www.mitpressjournals.org/doi/pdf/10.1162/isal_a_00234>

### Dec. 3rd, 2020

~ continued researching

~ Finished looking at the pdf

### Dec. 11th, 2020

~ brainstorming procedure and variables

Procedure Ideas:

1. Prepare materials
2. Use a flat surface like a plate or paper and put it somewhere on an elevated surface
3. Set up the camera
4. Get some sort of small bowl and fill it with water
5. Use the eyedropper to squeeze drops of water onto the flat surface. Make sure you hit the record button before this so you can capture each droplet
6. Wait until the droplets look ‘melted’
7. Stop recording
8. Replace/clean the surface and repeat steps 4-7 only with different solutions: 5 drops of water and 1 drops of food colouring, and 10 drops of water and 1 drop of food colouring
9. Put the footage into an editing software. Cut the parts until you have the time it took for each droplet to ‘melt’
10. Record and analyze results

### Jan. 02, 2021

* Tried to do experiment trial 1
* Didn’t exactly work out very well. The results were very muddy and unclear
* It’s hard to calculate the exact amount of time it took for the droplets to fully melt.
* I’m looking for more specific results. It’s hard to be specific down to milliseconds when the droplets looks the exact same if you skip a second or two
* There wasn’t a very good system of gathering results. Filming the water droplets melting made it very hard to decide when it had fully melted. The results would be very general, and typically specific results are more wanted

**PROJECT REPORT:**

Over the winter break, I tested the first trial of my original experiment. The goal was to find out if the higher concentration in water droplets lasted longer than regular water droplets.

**EXPECTED RESULTS:**

The expected result was that the droplets with higher concentration would outmatch the regular droplets.

**MATERIALS:**

~ food colouring

~ water

~ eye dropper

~ mixing utensil

~ small bowl

~ flat surface

~ filming device

**PROCEDURE:**

1. Prepare the materials
2. Use a flat surface like a plate or paper and put it somewhere on an elevated surface
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8. Replace/clean the surface and repeat steps 4-7 only with different solutions: 5 drops of water and 1 drops of food colouring, and 10 drops of water and 1 drop of food colouring
9. Put the footage into an editing software. Cut the parts until you have the time it took for each droplet to ‘melt’
10. Record and analyze results

**ANALYSIS:**

Soon the realization came of how difficult it was to trim the exact time it took for the droplets to melt.

First, to get results down to the millisecond would be extremely difficult, as each second forward or backward looked the same in the footage, and it was hard to see what exactly was going on.

Second, the droplet didn’t have a specific destination where it would be considered “melted”. Only assumptions could be made with the footage, since there was no specific marker where the droplet would pass to be considered melted.

The controlled variables of the experiment were also complicated.

For example, the pressure applied to the eye dropper couldn’t be controlled to stay consistent, so the size of droplets varied. This would be a problem, because if droplets with higher concentration lasted longer, but the droplets were bigger, it would be hard to tell if the concentration actually impacted the results, or if the size of the droplets was the reason the droplets held for a greater duration.

When droplets melt, they spread out, and the distance between the droplets was also not properly measured.

Another controlled variable that wasn’t applied was the temperature of the water. The temperature of the water also was not calculated, so if a solution held longer than another, temperature could also have been the reason.

**CONCLUSION:**

In conclusion, the original experiment was faulty and didn’t work out due to the reasons explained earlier. Specific results could not be achieved, flaws intervened, and I had already experimented twice. The experiment turned out to be more difficult than expected, and the realization that a new experiment should be equipped came. However, the ideas that came to head did not seem to stick, so instead, a research project was chosen. I decided to pursue my passions, which included film lighting and psychology.

**NEXT STEPS:**

The next step forward is to take this new research project, and work hard to achieve success that could not be achieved before. This research project will be taking the question of how lighting in filmmaking influences and triggers different emotions in a viewer’s brain to make them think that a character in a film is good or bad.

### Jan. 03, 2021

* Thinking of redoing experiment
* Thought of doing rainbow rain experiment (oil over water and food colouring seeps through oil and into water)
* Was going to expand on the rainbow rain experiment by replacing oil with other substances that were less dense than water and were also non water soluble. Then I would test each solution to see which one could provide the best results. The way the results would be considered better is through the speed of which the food colouring completely dyed the water.
* Unfortunately, I could not find a diverse range of substances that were like so. Only oil had this sort of behaviour
* Thought of replacing the oil with different types of oil, but oil is very similar, and it wouldn’t make a huge difference. It would also be very hard to calculate and could raise many questions that would be difficult to answer.

### ----RESTARTING

### [NEW PROJECT]

### Jan. 4th, 2021

* Began thinking about doing a research project instead
* Started brainstorming about psychology based around filmmaking

Interests in? - Literature, Filmmaking, Art, Creative Writing

 Filmmaking

 |

 What scientific aspects are in filmmaking?

 |

 Psychology

 |

 How do films show psychology?

 What factors influence the psychology of the films?

 What emotions are triggered when films show a certain thing?

 What does the viewer believe when seeing different lighting and camera angles manipulated in the film?

 Why is lighting so important in the filmmaking industry?

 How do camera angles impact the way viewers think about the object?

 Cinematography

 |

 What factors in a visual representation trigger emotions in the viewer’s brain to think that a certain character is good or bad?

 |

 How does lighting in filmmaking influence the emotions in a viewer’s brain to think that a certain character is good or bad?

### Jan. 7th, 2021

~ Worked on background research for the new project

### Jan. 8th, 2021

~ Worked on problem/question and hypothesis

Question: How does lighting in filmmaking trick a viewer’s brain to feel a certain emotion towards a hero or villain character?

^ Question is meaningful because it shows how the human brain works, and how easily our minds can be deceived to believe something with a simple trick of light. Organisms like flowers display colours that can attract different pollinators in order for them to reproduce, and colour can also detect different harmful chemicals.

Hypothesis: If the character is portrayed to be the villain antagonist, then low key lighting would be used, and more desaturated and darker colours would be displayed, because low key lighting creates harsh shadows to reflect a dark and ominous mood, and cool colours make the atmosphere more pensive and tense. As the brain is more accustomed to bright, warmer colours in light nature outside, being in darker places with desaturated, cool colours is unnatural to the brain, and it feels more grim and unsettling.

### Jan. 9th, 2021

~ Worked on background research

### Jan. 10th, 2021

~ Worked on background research

~ Cleaned up Question and Hypothesis

### Jan. 11th, 2021

~ Worked on extensive research

### Jan. 12th, 2021

~ Worked on extensive research

### Jan. 13th, 2021

~ Worked on extensive research

### Jan. 14th, 2021

~ Worked on extensive research

### Jan. 15th, 2021

~ Worked on extensive research

### Jan. 16th, 2021

~ Worked on extensive research

### Jan. 17th, 2021

~ Worked on extensive research

~ Composed expert email to Dr. Robert G. Nulph, Ph.D. Professor of Convergent Journalism at Missouri Western State University

Hello, Dr. Robert G. Nulph,

My name is Carrie, and I attend Louis Riel School in Calgary. I am in seventh grade, and this year, I am participating in a Science Fair to compete for the Calgary Youth Science Fair. My project is a research project about how different lighting techniques influence the brain to feel certain emotions. I saw your article on Videomaker about lighting and mood, and as I am looking for expert advice for my project, I decided to contact you.

Here are some questions I have:

- What type of lighting is used in a scene where a hero is shown?

- What type of lighting is used in a scene where a villain is shown?

- Would you use low-key lighting for a scene where a villain or dark moment arises?

- What lighting techniques are commonly used for heroic moments?

If you could also provide any guidance or suggestions to other experts I could contact, that would be appreciated. Thank you!

Thank you for your time and support in my Science Fair Project. Have a nice day!

-Sent Jan 17, 2021, 9:58pm

### Jan. 18th, 2021

~ Worked on extensive research

### Jan. 19th, 2021

~ Worked on extensive research

~ Received expert email reply!

Hi Carrie,

Interesting topic. Lighting is so much fun to play with. Here are some suggestions:

- **What type of lighting is used in a scene where a hero is shown?** For heroes, you want them to look as powerful and bold as possible while also making them look aesthetically pleasing and approachable. So I would light a hero with a Large soft light positioned close to the camera to reduce the shadows as their "Key " light and include a good backlight to increase the glamour of the shot. I would also place the camera at about their chest level to create a low-angle shot which makes them look powerful. High key lighting is created when the fill light is almost as bright as the key light. This creates a feeling of peace and quiet.

Now... all of this said, if I was lighting a dark hero like Batman, I would use very hard lights (small intense lights that create hard edged shadows,) and combine them with sharp side angle placement so that there would be lots of shadow.

- **What type of lighting is used in a scene where a villain is shown?** Villains usually are shot with hard lights set above or below them to create either a skull effect (above) or the spooky underlit effect (from below.) The fact that the lights are coming from unusual angles makes the shot feel uncomfortable and adds to the villainous quality of the character. Of course you want as little light as possible so backgrounds are often dark and scary. Using hard lights gives you very sharp edged shadows and if the villain's face has a rough complexion or lots of lines - it will emphasize this.

- **Would you use low-key lighting for a scene where a villain or dark moment arises?** Low-key lighting is essential for dramatic scenes. The low fill or even absence of a fill light creates deep shadows and makes the key light sharper and more distinct. With villains this is fun to play with because you can catch a single eye, emphasize parts of their costume and create more of a sense of mystery and perhaps danger because we cannot see everything. The further away from the camera a key light is set, the more dramatic. (Place the subject at the center of a clock. The camera would be a 6, a very dramatic key light would be at 3:30 - 4 and the back light would be at 11. Do not use a fill light. Then just light sections of the background. Remember, you want there to be stark contrast between the dark and bright parts of the scene.

- **What lighting techniques are commonly used for heroic moments?** Heroes eventually come into the light bringing joy or peace to the world. You may start with your hero shrouded in shadow but eventually they will come into the light. The lighting for heroes is soft on their face to reveal a pleasant, likable, attractive image while being harder on their body to show strength. You would light their faces with broad soft lights while using more hard light to produce a more textured look to their bodies. Always remember soft lights (Big diffused lights) have very soft shadows and smooth out textures, blemishes etc. on the face and other surfaces while hard light creates shadow which emphasizes texture such as lines, crevasses, pock marks, rough skin or scars and what not on someone's face. Camera angles are also very important. You would always want to shoot the hero from a slightly lower angle to make them seem taller and more powerful.

I hope this helps,

Enjoy!

Robert

Robert G. Nulph, Ph.D.

Professor of Convergent Journalism

Department of Communication

Chair, University Undergraduate Curriculum Committee (UGCC)

Missouri Western State University

Owner/Producer/Director

Visual Logic

Robert G. Nulph Photography

### Jan. 20th, 2021

~ Worked on extensive research

~ Started working on analyzing research

~ Sent an expert email to Torben Grodal:

Hello Torben Grodal,

My name is Carrie, and I attend Louis Riel School in Calgary. I am in seventh grade, and this year, I am participating in a Science Fair to compete for the Calgary Youth Science Fair. My project is a research project about how different lighting techniques influence the brain to feel certain emotions. I saw your articles on Google Scholar and decided to contact you for professional help.

Here are some questions I have:

- What type of lighting is used in a scene where a hero is shown?

- What type of lighting is used in a scene where a villain is shown?

- Would you use low-key lighting for a scene where a villain or dark moment arises?

- What lighting techniques are commonly used for heroic moments?

- How does the brain think that a character is a hero or villain based on the lighting of the scene?

If you could also provide any guidance or suggestions to other experts I could contact, that would be appreciated. Thank you!

Thank you for your time and support in my Science Fair Project. Have a nice day!

- Carrie

### Jan. 21st, 2021

~ Looking for more extensive research

~ Looking for more experts to contact

~ Analyzing research

### Jan. 22nd, 2021

~ Analyzing research

~ Writing conclusion

~ Citing sources APA format

### Jan. 24th, 2021

~ Started google slides powerpoint presentation

~ Got structure of slides down

~ Writing conclusion

### Jan. 25th, 2021

~ Finished conclusion

~ Working on google slides powerpoint presentation

### Jan. 26th, 2021

~ Finished conclusion

~ Working on google slides powerpoint presentation

~ Started script

~ Sent out more expert emails to Greg M. Smith, Carl Plantinga, Michelle Park, David Bordwell

Hello Greg Smith,

My name is Carrie, and I attend Louis Riel School in Calgary. I am in seventh grade, and this year, I am participating in a Science Fair to compete for the Calgary Youth Science Fair. My project is a research project about how different lighting techniques influence the brain to feel certain emotions towards a character. I saw that your expertise is in film, so I decided to contact you for expert advice.

Here are some questions I have:

- What type of lighting is used in a scene where a hero is shown?

- What type of lighting is used in a scene where a villain is shown?

- Would you use low-key lighting for a scene where a villain or dark moment arises?

- What lighting techniques are commonly used for heroic moments?

- Why does the brain think that a character is a hero or villain based on the lighting of the scene?

- Are there any studies that prove that film lighting can have an impact on the audience's emotions?

If you could also provide any guidance or suggestions to other experts I could contact, that would be appreciated. Thank you!

Thank you for your time and support in my Science Fair Project. Have a nice day!

- Carrie

Hello Carl Plantiga,

My name is Carrie, and I attend Louis Riel School in Calgary. I am in seventh grade, and this year, I am participating in a Science Fair to compete for the Calgary Youth Science Fair. My project is a research project about how different lighting techniques influence the brain to feel certain emotions towards a character. I saw that your expertise is in film theory and philosophy, so I decided to contact you for expert advice

Here are some questions I have:

- What type of lighting is used in a scene where a hero is shown?

- What type of lighting is used in a scene where a villain is shown?

- Would you use low-key lighting for a scene where a villain or dark moment arises?

- What lighting techniques are commonly used for heroic moments?

- Why does the brain think that a character is a hero or villain based on the lighting of the scene?

- Are there any studies that prove that film lighting can have an impact on the audience's emotions?

If you could also provide any guidance or suggestions to other experts I could contact, that would be appreciated. Thank you!

Thank you for your time and support in my Science Fair Project. Have a nice day!

- Carrie

Hello Michelle Park,

My name is Carrie, and I attend Louis Riel School in Calgary. I am in seventh grade, and this year, I am participating in a Science Fair to compete for the Calgary Youth Science Fair. My project is a research project about how different lighting techniques influence the brain to feel certain emotions towards a character. I saw that your expertise is in film theory, so I decided to contact you for expert advice

Here are some questions I have:

- What type of lighting is used in a scene where a hero is shown?

- What type of lighting is used in a scene where a villain is shown?

- Would you use low-key lighting for a scene where a villain or dark moment arises?

- What lighting techniques are commonly used for heroic moments?

- Why does the brain think that a character is a hero or villain based on the lighting of the scene?

- Are there any studies that prove that film lighting can have an impact on the audience's emotions?

If you could also provide any guidance or suggestions to other experts I could contact, that would be appreciated. Thank you!

Thank you for your time and support in my Science Fair Project. Have a nice day!

- Carrie

Hello David Bordwell,

My name is Carrie, and I attend Louis Riel School in Calgary. I am in seventh grade, and this year, I am participating in a Science Fair to compete for the Calgary Youth Science Fair. My project is a research project about how different lighting techniques influence the brain to feel certain emotions towards a character. I saw that your expertise is in film theory, so I decided to contact you for expert advice.

Here are some questions I have:

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- What lighting techniques are commonly used for heroic moments?

- Why does the brain think that a character is a hero or villain based on the lighting of the scene?

- Are there any studies that prove that film lighting can have an impact on the audience's emotions?

If you could also provide any guidance or suggestions to other experts I could contact, that would be appreciated. Thank you!

Thank you for your time and support in my Science Fair Project. Have a nice day!

- Carrie

### Jan. 27th, 2021

~ Working on google slides powerpoint presentation

~ Working on script

~ Received expert email reply from David Bordwell:

Dear Carrie,

Thank you for your inquiry. Here are some places to look.

On lighting techniques, you could look at the basic discussion in our book FILM ART: AN INTRODUCTION. I think it may be in a local library. A more advanced account is Patrick Keating’s

<https://www.amazon.com/Hollywood-Lighting-Silent-Film-Culture/dp/0231149034>

As for brain issues, I’m not an expert. You could contact Professor Keating, at Trinity University in San Antonio, who may know some studies on the subject.

Good luck!

best regards,

David

~ Sent an expert email to Patrick Keating:

Hello Patrick Keating,

My name is Carrie, and I attend Louis Riel School in Calgary. I am in seventh grade, and this year, I am participating in a Science Fair to compete for the Calgary Youth Science Fair. My project is a research project about how different lighting techniques influence the brain to feel certain emotions towards a character. I saw that your expertise is in film studies, so I decided to contact you for expert advice.

Here are some questions I have:

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- Why does the brain think that a character is a hero or villain based on the lighting of the scene?

- Are there any studies that prove that film lighting can have an impact on the audience's emotions?

If you could also provide any guidance or suggestions to other experts I could contact, that would be appreciated. Thank you!

Thank you for your time and support in my Science Fair Project. Have a nice day!

- Carrie

### Jan. 28th, 2021

~ Working on google slides powerpoint presentation

~ Working on script

~ Received expert email reply from Patrick Keating:

The first thing I would say is that there are a lot of ways to light a scene, and the conventions might be different in different decades and in different industries. That said, there are a few generalizations:

- You might decide to light a hero attractively and a villain unattractively. The ugliest lighting is generally believed to be lighting from below. Old horror films do that a lot. The most attractive lighting -- well, that depends on who the star is, and it changes over time. In the old days of Hollywood, you would light a woman with soft frontal lighting and a strong backlight to make the hair glow. You would light a man with similar technique, but more from the side, to model the face. But many cinematographers today would say these conventions are old-fashioned, and they don't want to get locked into one particular technique.

- You might use low-key lighting for a dark moment or a scene with a villain. But that again changes over time. Some scholars have done a study of films from 1935 to the present, and they have found that films have gotten significantly darker over the years. So an upbeat scene in a movie from 2020 might look darker than a bleak scene from 1935.

- What does the brain have to do with it? Well, there are two ways to think about it. One way is to search for a "naturalist" explanation -- to say that the brain is hard-wired to read lighting in a particular way. The other is to search for a "conventionalist" explanation -- to say that different industries at different times have different techniques, and it is a matter of learning the conventionalist. I am a historian, and so I tend toward conventionalist explanations -- I study how lighting conventions change over time.

That said, there are some scholars who have studied this problem from a psychological angle. Torben Grodal has an article on "Film Lighting and Mood," and I think he talks about lighting and the brain. Then there are articles by the psychologist V. S. Ramachandran, who has studied the phenomenon "shape-from-shading," whereby the brain figures out spatial information by reading the shadows.

I hope this is helpful. Good luck!

Patrick Keating

~ finished slideshow and script

~ submitted on google classroom

~ practiced presentation

### Jan. 29th, 2021

~ Science fair day

~ Got a reply from Carl R. Plantinga

Hi Carrie,

 This sounds like a great project.

I’m not much of an expert on the brain, but I’ll answer a few of your questions as best I can. I also cc’d my answer to Patrick Keating, who is an expert on cinematography (including lighting). And Tim Smith might be able to say if there are any empirical studies about our response to lighting. I just don’t know. I hope that Patrick and Tim don’t mind.

Villains are sometimes lit from below, and especially when the villains are also represented as monstrous or unnatural. Lighting from below, sometimes called Halloween lighting, is not often seen in the natural world and thus seems odd and unnatural to us. Perfect for a monster, which is by definition an unnatural being.

How are good guys lit? Patrick Keating can say a few words about that (if he has time), but it depends on the era and gender of the good guy. In the past, women were often lit with soft light, men with harder light. The three-point lighting system is used in part because it plays up the attractiveness of the face and of the image generally, providing a nice gradation of dark and light areas (called “chiaroscuro”).

In general, there isn’t any one way to light a hero or a heroic moment, but Patrick would know more about this than I would. You should get his book, *Cinematography.* Did you know that cinematography includes lighting?

Some of “the brain’s” responses to lighting are based on the way we respond to light in the world outside the movie theater. But some of our responses are learned and the result of conventions of lighting that we see over and over again. It is often hard to separate those influences out. But we associate darkness with mystery and danger, light with happiness and knowledge. Thus comedies and musicals are often lit high key, while detective films and mysteries often low key.

I hope this helps, and good luck with your project.

Best wishes,

Carl Plantinga

### Feb 5th, 2021

~ Joined CYSF platform

~ Also joined Louis CYSF Google Classroom

### Feb 7th - Feb 15th, 2021

~ Worked on CYSF

~ Preparing for classroom presentation

~ Worked on more research + adding primary sources

~ Looking for more experts

### Feb 16th, 2021

~ Classroom presentation

### Feb 17th, 2021

~ Received feedback from classroom presentation:

Strengths:

Excellent oral presentation overall - you speak clearly and confidently about your topic and you communicate effectively

Your background research is well-selected overall and effectively outlines the purpose of your topic

I think your primary research studies are well chosen and they do a good job of illustrating and explaining your overall conclusions.

Growths:

- I think maybe *one* more primary study would be helpful in terms of confirming your findings here. The study you present has a couple of interesting counter-intuitive findings about low key lighting which would be interesting to confirm with further research

- You mention a really cool study at the end that talks about the use of lighting in architectural applications - it would be interesting if you were to draw some conclusions based on your research about ways to engineer lighting in homes or businesses to generate specific psychological effects (feelings of happiness, well-being, safety etc.)

- This is a really good project overall and the scientific bones are all present and clearly elaborated - I think the thing that would really elevate it is a clear objective or plan for further action that would explain how we're going to deploy this information - either for individuals in their daily lives or for companies and firms who are trying to design lighting for others

- Perhaps there's an application for schools here? Based on your research, how would our overall school lighting rate in terms of what's it's trying to achieve? Could this be an opportunity for further study and application?

~ originally had a third source but had to cut it out due to time (15 min)

~ asked about feedback, confirmed 2 sources is ok (due to time)

### Feb 18th - March 17th, 2021

~ Worked on CYSF

~ Filled in platform

~ Worked on adjusting speech

~ Recording + editing + creating video

Links:

[Sci Fair Research](https://docs.google.com/document/d/1an48uu_nBOiolnuqiW42_wUu44hvG4fr5ZH3gaVqjrw/edit)

[Old Science Fair Findings](https://docs.google.com/document/d/1cVC4oI27n0bDs3Vifk-mcKB0IuldNWcNZmMgS5b2mmA/edit)

[New Science Fair Project](https://docs.google.com/document/d/1JG_sliUAmxhigZHtJSEw2M_7oWPH6wFQrxzapM96fDQ/edit)

[Presentation Script](https://docs.google.com/document/d/1hky_ttJ6dMit8q2R0IOQ2O592YRz2I-DNjy6cRAAjag/edit)

[Presentation Slideshow](https://docs.google.com/presentation/d/11uadXat4X46sPuQxOYmBjDliV76ftsHXR9lpuvZZOjg/edit#slide=id.gb8dcbcf6e2_0_85)