

# FOSTERING PRODUCTIVE UNCERTAINTY IN INFORMATION LITERACY CLASSROOMS

Emilia Marcyk & Chana Kraus-Friedberg  
Michigan State University  
WILU 2019

# About Us



## **Emilia Marcyk (presenting)**

Works mostly with first year students in writing classes

Often asked to teach students to find “good” or “reliable” information



## **Chana Kraus-Friedberg (collaborator)**

Works mostly with medical students and graduate students in public health

Involved in teaching Evidence Based Medicine/finding “good” medical research





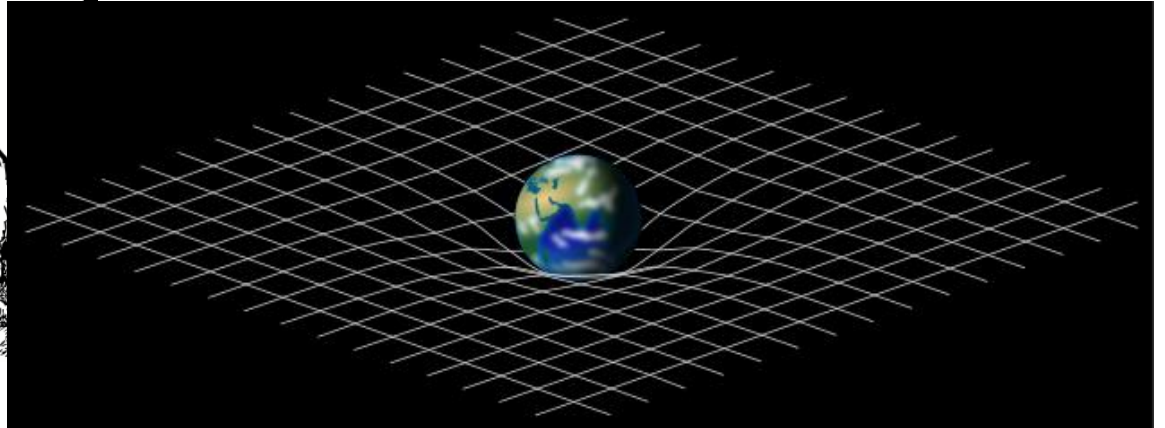
# Defining Productive Uncertainty

# Productive Uncertainty is the...

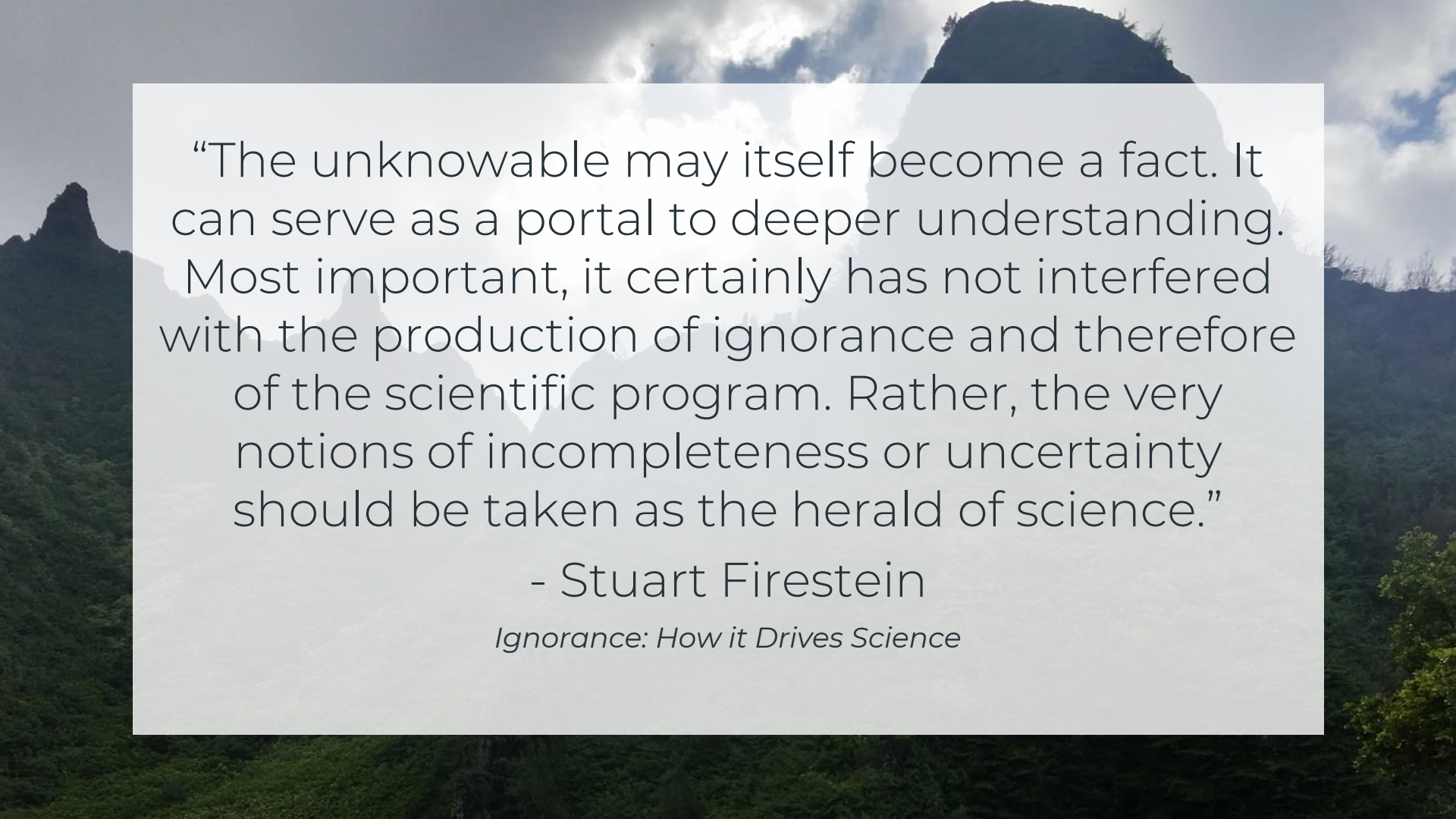
Expectation or understanding that parts of research and learning are necessarily “non-obvious and contingent” (Manz 2018)

Ability to engage with what is still unknown or uncertain, in order to acquire or create further knowledge or to make decisions

# Example: Gravity







“The unknowable may itself become a fact. It can serve as a portal to deeper understanding. Most important, it certainly has not interfered with the production of ignorance and therefore of the scientific program. Rather, the very notions of incompleteness or uncertainty should be taken as the herald of science.”

- Stuart Firestein

*Ignorance: How it Drives Science*

# Example: Breaking News

✂ CUT OUT AND TAPE NEAR YOUR COMPUTER OR TV

## BREAKING NEWS CONSUMER'S HANDBOOK

1. In the immediate aftermath, news outlets will get it wrong.
2. Don't trust anonymous sources.
3. Don't trust stories that cite another news outlet as the source of the information.
4. There's almost never a second shooter.
5. Pay attention to the language the media uses.
  - *"We are getting reports"...* could mean anything.
  - *"We are seeking confirmation"...* means they don't have it.
  - *"[News outlet] has learned"...* means it has a scoop or is going out on limb.
6. Look for news outlets close to the incident.
7. Compare multiple sources.
8. Big news brings out the fakers. And photoshopers.
9. Beware reflexive retweeting. Some of this is on you.

ON [THE MEDIA]

On the Media (2013).  
Breaking news  
consumer's handbook.

Retrieved from:

<https://www.wnyc.org/story/breaking-news-consumers-handbook-pdf/>





Implications:  
In the Classroom



## **Perry: Intellectual Development**

- Dualism
- Multiplicity
- Relativism
- Commitment in  
Relativism

## **Kuhn et. al: Development of Epistemological Understanding**

- Realist
- Absolutist
- Multiplist
- Evaluativist

# CRAAP Test

**Currency:** *The timeliness of the information.*

**Relevance:** *The importance of the information for your needs.*

**Authority:** *The source of the information.*

**Accuracy:** *The reliability, truthfulness and correctness of the content.*

**Purpose:** *The reason the information exists.*



# Implications: Outside the Classroom



# OGDEN'S GUINEA GOLD Cigarettes



The Largest sale in the World

**IS THIS YOU FIVE YEARS FROM NOW?**

*When tempted to over-indulge*

**"Reach for a Lucky instead"**



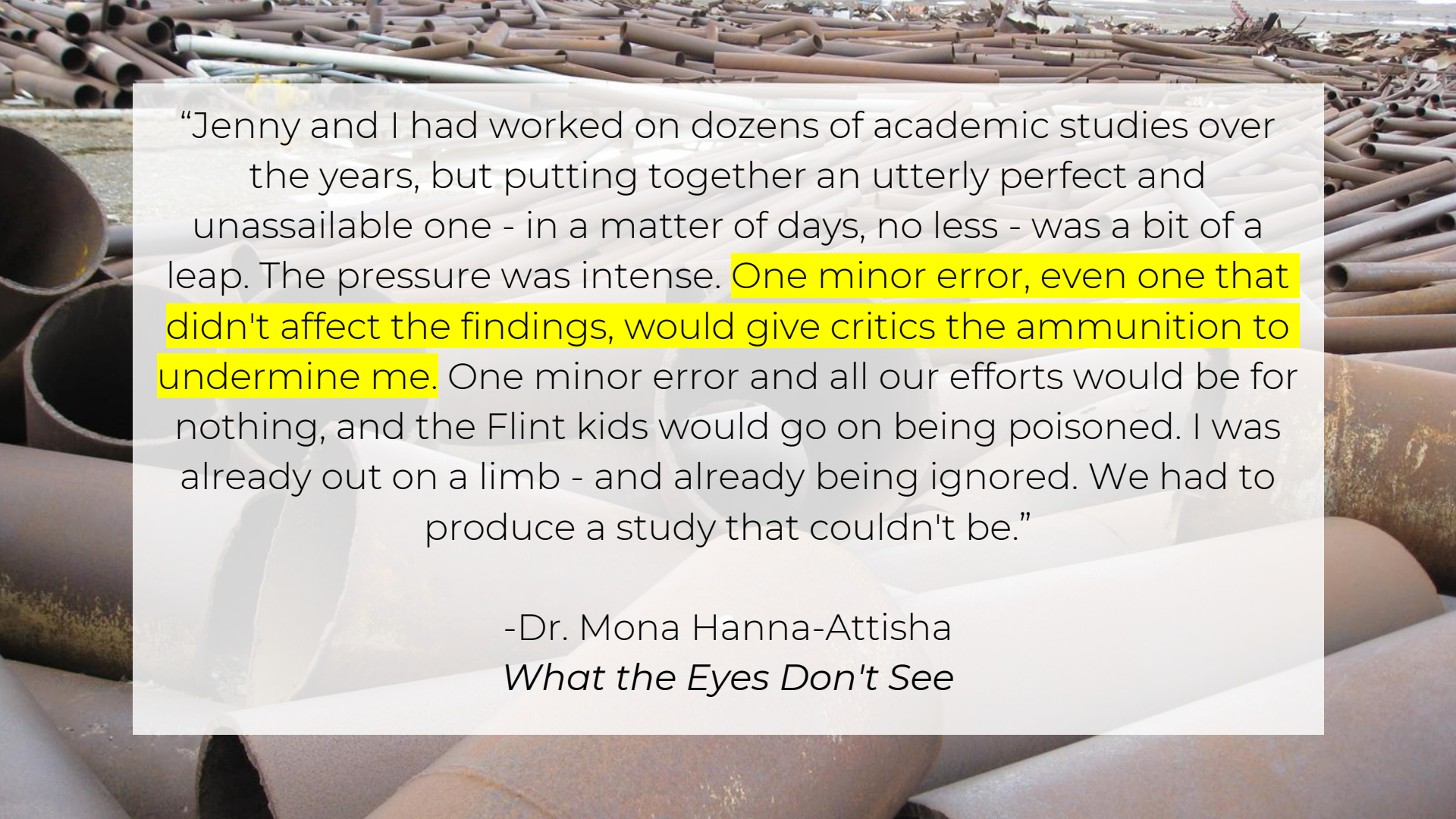
Be moderate—be moderate in all things, even in smoking. Avoid that future shadow\* by avoiding over-indulgence, if you would maintain that modern, ever youthful figure. "Reach for a Lucky instead."

**Lucky Strike**, the finest Cigarette you ever smoked, made of the finest tobacco—The Cream of the Crop—"IT'S TOASTED." **Lucky Strike** has an extra, secret heating process. Everyone knows that heat purifies and so 20,679 physicians say that **Luckies** are less irritating to your throat.

**"It's toasted"**

**Your Throat Protection—against irritation—against cough.**

\*We do not say smoking **Luckies** reduces flesh. We do say when tempted to over-indulge, "Reach for a **Lucky** instead."



“Jenny and I had worked on dozens of academic studies over the years, but putting together an utterly perfect and unassailable one - in a matter of days, no less - was a bit of a leap. The pressure was intense. One minor error, even one that didn't affect the findings, would give critics the ammunition to undermine me. One minor error and all our efforts would be for nothing, and the Flint kids would go on being poisoned. I was already out on a limb - and already being ignored. We had to produce a study that couldn't be.”

-Dr. Mona Hanna-Attisha  
*What the Eyes Don't See*





# Teaching Examples



# EMBRACING UNCERTAINTY



MICHIGAN STATE UNIVERSITY | Libraries

▶ 🔊 0:00 / 4:50

CC 🚩 1x ↗️ HELP

Video created by Emilia Marcyk: [view video on MSU MediaSpace](#)

# Peer Reviewed Article Questions (Standard)

- Who is the author of the article? Are they an expert in their field?
- Does the document use straightforward or technical language? Would you describe the writing as formal, informal, or in between?
- Where was the article published? Who is the audience for that publication?
- What evidence does the author use to support their claims?

# Rewritten Peer Reviewed Article Questions (with Productive Uncertainty)

- What can we know and what can we not know from reading this article?
- How certain/uncertain is the author about their claims? Do the data support that level of certainty?
- How does the article relate to other information about the same or similar content?
- Who is the author, and what is their connection to the content?
- How is the publisher/journal connected to larger conversations about similar topics?



# Exercise: Deflating headlines

☰ **FORTUNE** [SUBSCRIBE](#)

**PAID CONTENT**  
What's in store for the future of  
From Supermicro

**TECH**  
Alphabet's Latest Moonshot Graduate Is Tackling Cybersec...

☰ **FORTUNE** [SUBSCRIBE](#)

**PAID CONTENT**  
What's in store for the future of  
From Supermicro

**TECH**  
Alphabet's Latest Moonshot Graduate Is Tackling Cybersec...

**OBESITY**

## Obesity Can Spread Like Flu Between Friends and Neighbors



**OBESITY**

## Study Shows Correlation Between Community Lifestyle and Obesity



# Exercise: Looking at Uncertainty in Scientific Literature

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## Attention Deficit–Hyperactivity Disorder and Month of School Enrollment

Timothy J. Layton, Ph.D., Michael L. Barnett, M.D., Tanner R. Hicks, B.S.,  
and Anupam B. Jena, M.D., Ph.D.

### CONCLUSIONS

Rates of diagnosis and treatment of ADHD are higher among children born in August than among children born in September in states with a September 1 cutoff for kindergarten entry. (Funded by the National Institutes of Health.)

# Uncertainty in Scientific Literature Questions

- Where does the conclusion apply, and to whom?
- Note that one thing the conclusion is lacking is an explanation of WHY this is true--if you had to guess, what would your guess be?
- If you were a journalist writing a headline for this conclusion, what would you write?

## **CONCLUSIONS**

Rates of diagnosis and treatment of ADHD are higher among children born in August than among children born in September in states with a September 1 cutoff for kindergarten entry. (Funded by the National Institutes of Health.)



# Looking at Uncertainty in Scientific Literature

ence of ADHD symptoms in children born in August as compared with children born in September and that the difference is much smaller when parents make these assessments, which suggests that teachers have a stronger role in ADHD diagnosis than parents.<sup>12,23</sup> The age of the child relative to peers may be useful to physicians in assessing whether behaviors reported by teachers and parents are indeed indicative of ADHD.

There are several limitations of our study. First, we were unable to assess the appropriateness of an ADHD diagnosis in any child or the outcomes related to treatment. Because of this, we cannot conclude that ADHD is overdiagnosed in children born in August relative to children born in September. It is possible that the additional August-born children who receive ADHD diagnoses are receiving the appropriate diagnosis, and that there are September-born children who have ADHD that remains undiagnosed. In addition, children born in August who are among the youngest in their class may benefit from the additional attention that is associated with an ADHD diagnosis, especially given evidence that younger children in a school cohort do not perform as well as older children in academic and athletic measures, that fewer of them attend college, and that they are more likely to engage in juvenile criminal behavior.<sup>19,24,25</sup> We are able to conclude only that a child's age relative to peers has an association with diagnosis and treatment rates of ADHD, not whether this association is harmful or helpful.

Second, data from insurance claims do not

allow us to determine when a child starts school. Parents may delay school entry for children born in August, which would mean that those children start school at 6 years of age rather than 5 years of age. Because we did not directly observe children's ages when they entered school, we cannot know how often this occurred. However, this behavior on the part of parents should mean that our results underestimate the true effects on children of being among the youngest members of a grade cohort as compared with the oldest members of a grade cohort in the probability of receiving a diagnosis of ADHD, since some of the children with August birthdays actually start school at the same age as the children with September birthdays. Finally, our claims data included only children who had employer-provided insurance coverage and specifically excluded Medicaid and uninsured patients, which yielded a selected group with a lower rate of ADHD diagnosis than the national average.<sup>4</sup>

In conclusion, using recent data and several analytic approaches, we confirmed findings from previous studies that in states with September 1 cutoffs for kindergarten entry, children born in August are significantly more likely to receive a diagnosis of and treatment for ADHD than children born in September. Our findings are consistent with the hypothesis that the context of behaviors within a grade or school class influences the likelihood of a diagnosis of ADHD.

Supported by a National Institutes of Health Director's Early Independence Award (1DP5OD017897-01 [to Dr. Jena]).

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

A hiker with a large backpack and a red sleeping bag is standing on a rocky path in a forest. The hiker is looking towards a large, fallen log that spans across the path. The scene is dimly lit, suggesting a shaded forest environment.

# Your Turn

<http://bit.ly/uncertainWILU>

# Bibliography

- Boykoff, M.T., & Boykoff, J.M. (2007). Climate change and journalistic norms: A case-study of US mass-media coverage. *Geoforum*, 38(6), 1190-1204. <https://doi.org/10.1016/j.geoforum.2007.01.008>
- Douglas, K. M., Sutton, R. M., & Cichocka, A. (2017). The Psychology of Conspiracy Theories. *Current Directions in Psychological Science*, 26(6), 538-542. <https://doi.org/10.1177/0963721417718261>
- Drummond, C., & Fischhoff, B. (2017). Individuals with greater science literacy and education have more polarized beliefs on controversial science topics. *Proceedings of the National Academy of Sciences of the United States of America*, 114(36), 9587-9592. <https://doi.org/10.1073/pnas.1704882114>
- Dugas, M. J., Hedayati, M., Karavidas, A., Buhr, K., Francis, K., & Phillips, N. A. (2005). Intolerance of uncertainty and information processing: Evidence of biased recall and interpretations. *Cognitive Therapy and Research*, 29(1), 57-70. <https://doi.org/10.1007/s10608-005-1648-9>
- Firestein, S. (2012). *Ignorance: How it drives science*. New York: Oxford University Press.
- Gallagher, B. & K. Berger (2019, Feb 14) Why Misinformation is about Who You Trust, Not What You Think. *Nautilus*, 69. Retrieved from <http://nautil.us/issue/69/patterns/why-misinformation-is-about-who-you-trust-not-what-you-think>.
- Han, P. K. J., Zikmund-Fisher, B. J., Duarte, C. W., Knaus, M., Black, A., Scherer, A. M., & Fagerlin, A. (2018). Communication of scientific uncertainty about a novel pandemic health threat: Ambiguity aversion and its mechanisms. *Journal of Health Communication*, 23(5), 435-444. <https://doi.org/10.1080/10810730.2018.1461961>
- Hanna-Attisha, M. (2018) *What the eyes don't see: A story of crisis, resistance, and hope in an American city*. One World: New York, NY.

# Bibliography, continued

Houtman, E. (2015). "Mind-blowing": Fostering self-regulated learning in information literacy instruction. *Communications in Information Literacy* 9(1), 7-18. <https://doi.org/10.15760/comminfolit.2015.9.1.178>

Kuhn, D., Cheney, R., & Weinstock, M. (2000). The development of epistemological understanding. *Cognitive Development* 15, 309–328. [https://doi.org/10.1016/S0885-2014\(00\)00030-7](https://doi.org/10.1016/S0885-2014(00)00030-7)

Lenker, M. (2017). Developmentalism: Learning as the Basis for Evaluating Information. *Portal: Libraries and the Academy* 17(4), 721-737. <https://doi.org/10.1353/pla.2017.0043>

Manz, Eve. (2018). Designing for and analyzing productive uncertainty in science investigations. In Kay, J. & Luckin, R. (Eds.), *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences Volume 1* (288-295). London, UK: International Society of the Learning Sciences.

Meriam Library (2010). Evaluating Information - Applying the CRAAP test [PDF file]. Retrieved from <https://library.csuchico.edu/sites/default/files/craap-test.pdf>

Perry, W. G. (1970). *Forms of intellectual and ethical development in the college years: A scheme*. New York: Holt, Rinehart and Winston.

Rabinovich, A. & Morton, T. A. (2012). Unquestioned answers or unanswered questions: beliefs about science guide responses to uncertainty in climate change risk communication. *Risk Analysis*, 32(6), 992-1002. <https://doi.org/10.1111/j.1539-6924.2012.01771.x>



# Image Credits

## Slide 2

- [Chana](#) via MSU Libraries (photo by Katie Diamond)

## Slide 5

- [Newton](#) via Wikimedia Commons (Public Domain)
- [Spacetime lattice analogy](#) via Wikimedia Commons (user [Mysid](#))

## Slide 7

- Screenshot of [Breaking News Handbook PDF](#)

## Slide 12

- [Cigarette ad](#) via Wikimedia Commons (Public Domain)
- [Lucky Strike](#) via Wikimedia Commons (user [Ms3qz](#))

## Slide 13

- [Thule recycles scrap metal](#) via US Air Force

## Slide 18

- Price, E. (2018). Obesity can spread like the flu between friends and neighbors. Retrieved from <http://fortune.com/2018/01/24/obesity-spread-flu/> (screenshot, Emilia Marcyk, modified headline also by Emilia Marcyk)

## Slides 19-21

- Layton, T. J., Barnett, M. L., Hicks, T. R., & Jena, A. B. (2018). Attention Deficit–Hyperactivity Disorder and Month of School Enrollment. *New England Journal of Medicine*, 379(22), 2122-2130. doi:10.1056/NEJMoa1806828. (Screenshot, Chana Kraus-Friedberg).

All other images by Emilia Marcyk



QUESTIONS?

Group Document

<http://bit.ly/uncertainWILU>

**Emilia Marcyk**

marcyk@msu.edu  
@ermthebookworm

**Chana Kraus-Friedberg**

krausfri@msu.edu