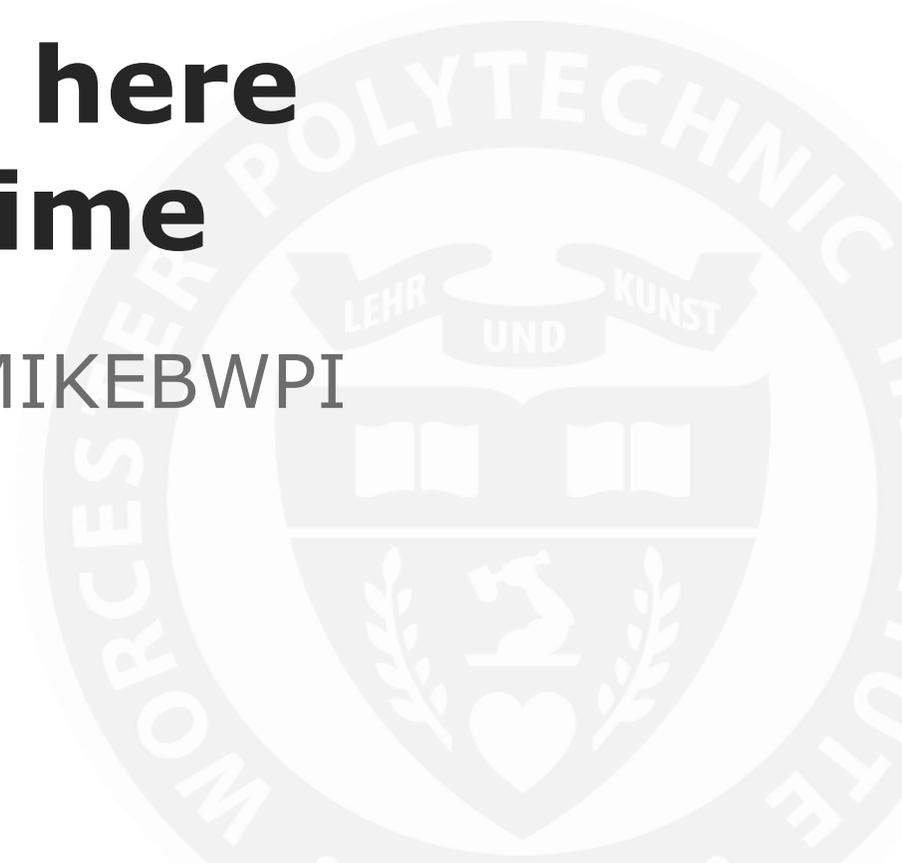




# WPI

**We will have a few Poll  
everywhere questions so here  
is the poll info ahead of time**

Respond at [PollEv.com/mikebwpi](https://PollEv.com/mikebwpi), text MIKEBWPI  
to 22333 one to join, then A,B,C,D,E



# What is your academic home?

Social Science

Humanities

Arts

Basic Science

Engineering/ Applied Science

other

**Do your students try to put everything they know on the page and hope that the answer to the question is somewhere in what they wrote..... (and that you will find it and give them credit? )**

often

sometimes

Rarely

Never

Start the presentation to see live content. Still no live content? Install the app or get help at [PollEv.com/app](https://PollEv.com/app)

# Do your students have a preference for visual or graphic presentations over written text?

yes

no

Start the presentation to see live content. Still no live content? Install the app or get help at [PollEv.com/app](https://PollEv.com/app)



# WPI

## **Assessing Infographics as an Alternative to Text-Based Assignments**

Michael Buckholt<sup>1</sup>, Jill Rulfs<sup>2</sup>, & Kimberly LeChasseur<sup>3</sup>  
WPI (Worcester Polytechnic Institute)  
Worcester, MA

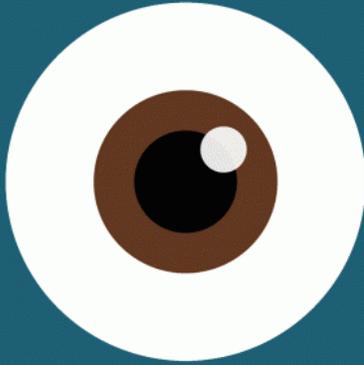
1,2 Biology & Biotechnology Department

3 Morgan Teaching & Learning Center and the Center for Project-Based Learning



50%

Of your brain is involved in visual processing.



70%

Of your sensory receptors are in your eyes



90%

of information that enters the brain is practically non-verbal



1/10

The brain can get a sense of a visual scene in less than a 1/10 of a second.



60,000

The brain processes visual information 60,000 times faster than the time it takes to decode

**An infographic is a form of visual communication that presents information in a graphic format designed to capture attention and enhance comprehension. Infographics take advantage of the human visual system's ability to see patterns and trends.**

# How we have used infographics

---

Designed 5 assignments with rubrics that were used in 7 different courses:

Cell Biology, Human Biology, Environmental Biology, Freshman Seminar and 3 different Biology Labs.

Generally students were asked to

- read a paper or chapter, distill to 3-5 main points, design an infographic
- research a health claim, present findings as infographic
- substitute a lab report introduction with an infographic,
- present lab report results and discussion in an infographic
- redo a multimedia report (talking over slides or video lab report) as an infographic

# Jill Case context

---

## Learning outcomes:

Through project work in the class, students will gain and demonstrate:

- basic skills in finding and evaluating information from credible sources.
- an ability to read the original scientific literature related to course concepts and use the information therein.
- use of several modes of communicating biologic information to a general audience.

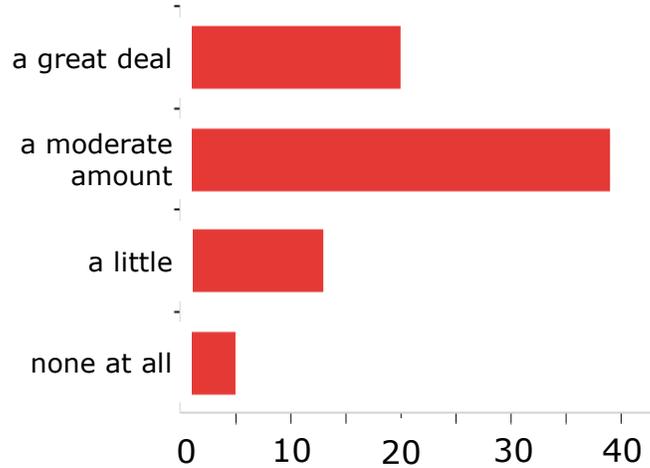
# Jill Case context

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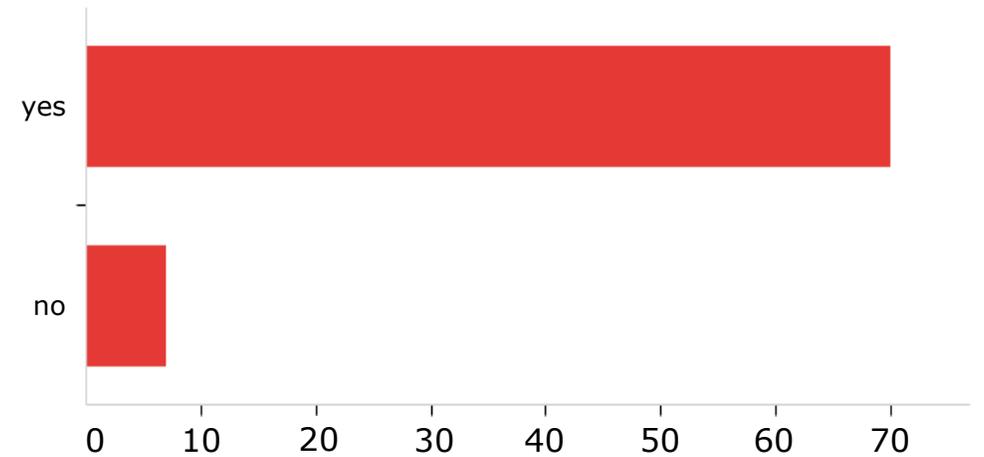
- Teams of 3-5 students
- Individual team members independently read the same article.
- The team identified three major ideas the members wanted to convey.
- The class was given an introduction to infographic design and software.
- Each team designed an infographic based on the selected or assigned article.
- Each student in the class reviewed an infographic using a faculty designed rubric.
- Each student responded to a Qualtrics survey regarding their experience.

# What students think

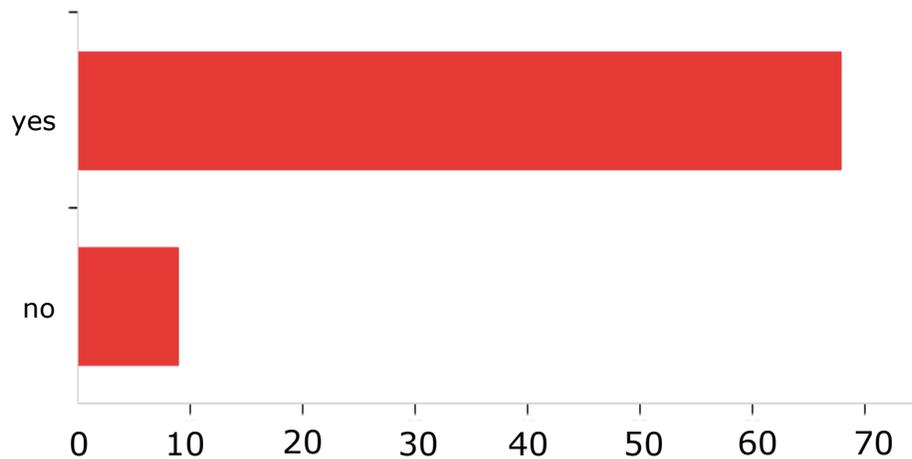
**I enjoyed the process of making an infographic**



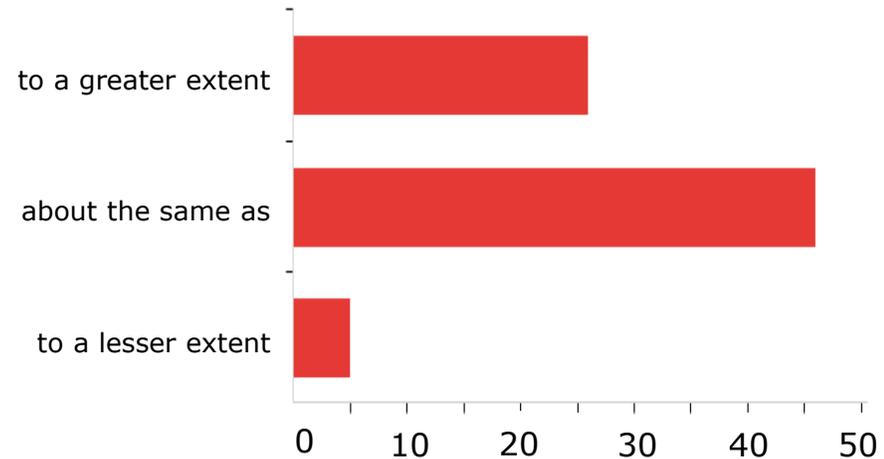
**Through the process required to make the infographic, I learned new information related to cell biology.**



**By reviewing someone else's infographic, I learned new information related to cell biology.**



**The infographic assignment supported my learning of the material in the article \_\_\_\_\_ than other assignment types with which I have experience ( e.g. lab report, written summaries, essay exams, etc)**



# General observations

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- **Student teams selected 11 from 17 possible articles.**
- **Of the 22 teams, 14 (64%) clearly identified 3-5 main points they intended to represent before starting.**
- **Eight teams wrote paragraphs rather than concise messages.**
- **On average, student reviewers identified points also identified by the creators 81% of the time**
- **There was no correlation between faculty assigned grade and peer learning identified in the 3 points.**

# Assigning an Infographic Does Not Mask Student Comprehension of the Content Material

There is a fair degree of variability among peer reviewers of the same infographic's biology content (eg, story) and data use...  
...and far less variability in assessing the more purely visual elements.

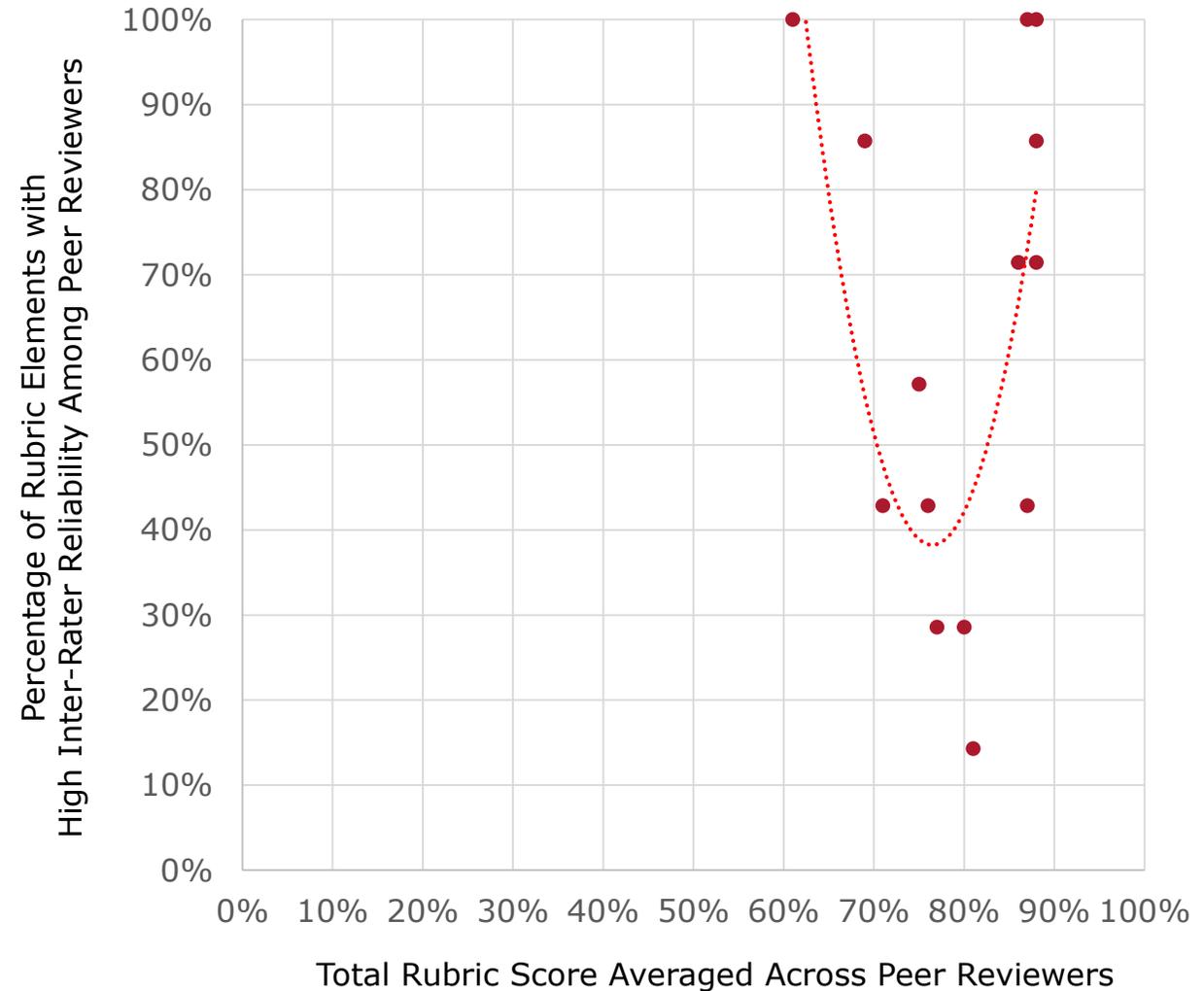
Element of the Rubric	% of Infographics with IRR* among Peer Reviewers
Is the story clear and easy to understand?	50%
Are there data to support the message?	57%
Is the visual balance consistent with the emphasis of the message?	64%
Is it visually attractive (color and design)?	71%
Is it easy to read (size and distribution of text and graphics)?	79%
Is it effective?	79%

\*IRR (inter-rater reliability) defined here as all peer reviewers being within 1 rubric point of each other; eg, all 3s and 4s for a particular rubric element

# Complexity in Infographic Quality Is Difficult for Students to Parse

Students are more adept at scoring really good and really bad infographics...

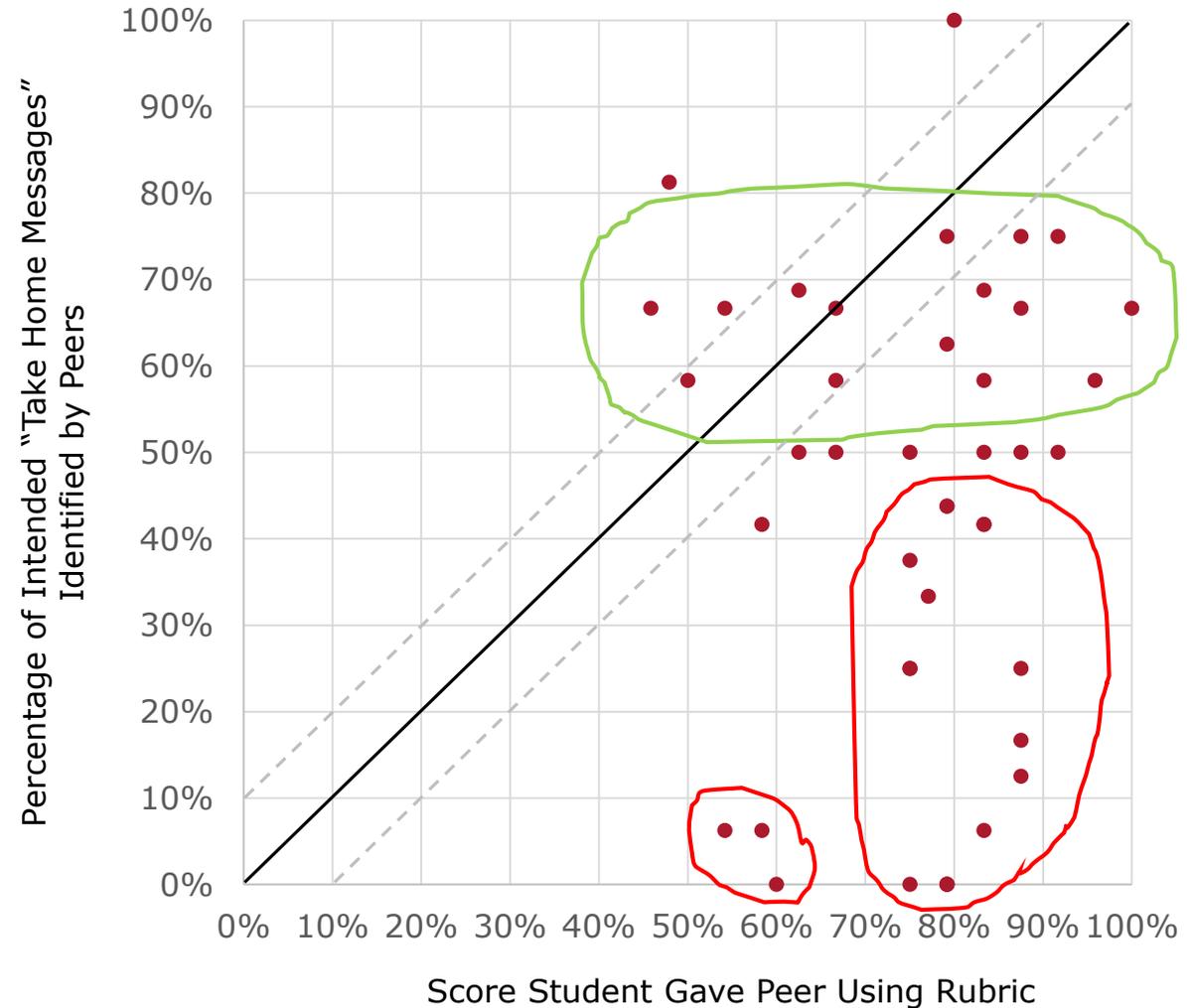
...than at scoring those that have more complex quality.



# Not All Students Just Give Their Friends High Scores... ...But Some Do

Students with more successful infographics (eg, more of their intended messages were received by peers) are more balanced in assigning lower and higher scores to their peers.

Students with less successful infographics (eg, few of their intended messages were received by peers) give relatively high scores to their peers' infographics.



# Mike Case Context-the course

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- Used 3 different ways in lab courses
- Authentic research laboratory course- part of the SEA-PHAGES program
- Lots of notebook writing
- Most students previously trained to write traditional lab reports.
- 26 students
  - 8 seniors
  - 9 juniors
  - 8 sophomores
  - 1 other
- Used as a final product

# Mike Case Context- the assignment

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- Students worked individually or in pairs for both the lab and the assignment (their choice)
- The class was given online video and written tutorials on how to make an infographic and in using Piktochart in particular
- The students were given the usual directions and reminders for a written lab report (used the year before and too long to show here)
- The rubric was provided
- Some infographic specific suggestions were provided
  - As a general infographic reminder, the steps in the process end with design, so don't begin there. First decide what it is you want to say.
  - Tell a Story!

# Mike Case Context-the rubric

Criterion				
<b>organization (4 points)</b>	The sequence of steps in the process of discovery were evident, logical and clearly presented (4.0)	Steps in the discovery process were present but order or logic in the presentation could be improved (3-3.5)	Some steps in the discovery process were missing or out of order. Logical flow was missing, making following the process difficult (1.5-2.5)	Steps in the discovery process were missing or poorly described preventing understanding of the process (0-1)
<b>evidence (4 points)</b>	Data or information including figure captions for each step was present and clearly and succinctly described. (4.0)	Data or information for each step were present and adequately described. Some missing captions or explanations left inference to the reader. (3-3.5)	Data or information was absent for some steps or misplaced relative to the text. Explanations or captions were confusing. (1.5-2.5)	Data or information for several steps was absent or the data did not match the step described. Explanations or captions for data were missing. (0-1)
<b>conclusions (4 points)</b>	The conclusions were clearly stated and followed easily from the data. (4.0)	Conclusions were present and could be inferred from the data with some effort. (3-3.5)	Conclusions were missing or not clearly stated. The data provided did not clearly lead to the conclusions . (1.5-2.5)	Conclusions were missing or were contrary to the data presented. (0-1)
<b>visual (4 points)</b>	Visual aids were used effectively to communicate necessary information. Figures are of high quality and easy to interpret. Text is kept to a minimum necessary to support understanding. (4.0)	Visual aids are present and generally well used, but perhaps do not clearly contribute to the message. Text is generally kept to a minimum, but could use some editing for brevity and/or clarity. (3-3.5)	Visual aids are partially useful but don't deliver useful information. Figures may be of poor quality. Amount of text may be too brief or too long to clearly support understanding. (1.5-2.5)	Visual aids detract from or confuse the message. Text overwhelms the eye. Images are unclear, out of focus, hard to look at. (0-1)
<b>efficacy (4 points)</b>	Process and conclusions can be clearly understood by the reader without additional information. (4.0)	Process and conclusions can generally be understood but require work some work on the reader's part. (3-3.5)	Process and conclusions can be inferred by the reader but significant work is necessary to find or understand them. (1.5-2.5)	Part or all of the process and or conclusions are unclear, fragmented and/or unsupported. (0-1)

# Mike Case Context General Observations

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- TAs found it quicker to grade
- Grades similar on infographic and written assignments
- Some students like, some hate it
- Need to assess disciplinary learning.

# Kim's Rubric Stuff

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- Few rubrics available, but many sets of visual literacy standards
  - ACRL Visual Literacy Competency Standards for Higher Education
  - Visual Literacy Competency (VLC) Rubric (Bowen, 2017)
  - AASL Standards for the 21<sup>st</sup> Century Learner
  - enGauge 21<sup>st</sup> Century Skills
  - Partnership for 21<sup>st</sup> Century Learning
  - National Writing Project – Multimodal Assessment Project (MAP)
- The rubric used here is aligned, particularly with ACRL, VLC, & MAP
- Calibrated for reliable rating
  - All four were reliable most of the elements most of the time
  - Harder to reliably assess poor quality infographic

# Omega-3 Fatty Acids

## Omega-3 Fatty acid

Omega-3 fatty acids, also called w-3 fatty acids or n-3 fatty acids, are polyunsaturated fatty acids characterized by the presence of a double bond three atoms away from the terminal methyl group in their chemical structure

Omega-3 fish oil contains two omega-3 fatty acids

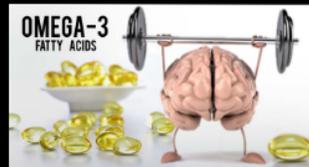
- Eicosapentaenoic acid (EPA)
- Docosahexaenoic acid (DHA)



Examples of foods containing omega-3 are most species of fish, fish oil, walnuts, canola oil, chia seeds, and eggs

## Fish oil and seafood have a positive impact on the brain and mental health

"Fatty fish like salmon, trout and sardines are among the highest natural dietary sources of omega-3's. And there's good evidence that older adults who eat diets high in fish tend to have better brain health outcomes than those who skimp on seafood."



Omega-3s help build membranes around each cell in the body, including the brain cells. They can, therefore, improve the structure of brain cells called neurons.

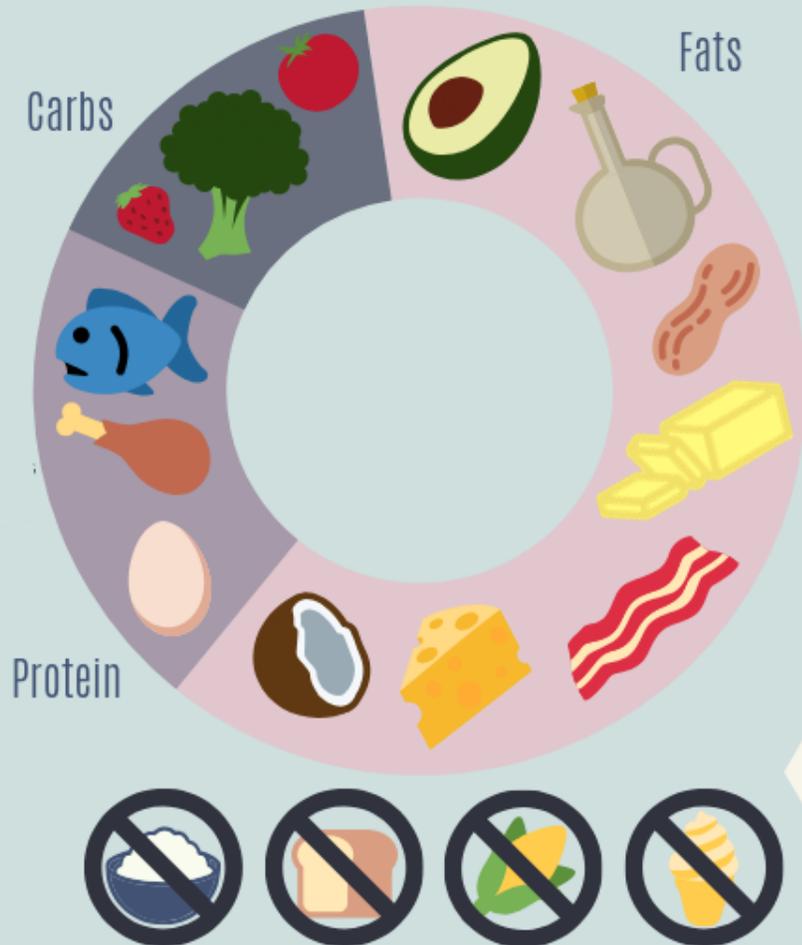
Low levels of DHA (Docosahexaenoic Acid) have been associated with a greater risk of Alzheimer's disease in later years

Emerging research suggests a role between omega-3s and cognitive disorders including depression, bipolarism, schizophrenia and Attention Deficit Hyperactivity Disorder (ADHD)



Long-term consumption of adequate DHA is linked to improved memory, improved learning ability and reduced rates of cognitive decline

# KETO DIET



## What is Keto?

A high fat, low carb diet (under 20g net carbs per day)  
net carbs = total carbs - fiber

## What is Ketosis?

A metabolic state where your body burns fat instead of carbohydrates

## Benefits



Digestive Support



Lower Blood Pressure

Rapid Weight Loss



Increased Brain Power



	EXCELLENT	GOOD	FAIR	DEFICIENT
<p><b>Is the message clear and easy to understand?</b></p> <p><b>(20 points)</b></p>	Message was clear and focused. Specific information items were easy to identify and interpret. Information followed a logical flow. ( 18-20 pts)	Message was generally clear, although some information necessary for understanding was missing. Information flow was generally logical.(16-17.5 pts)	The message was somewhat unclear, internally inconsistent or generally not easy to follow. Information seemed disjointed. (14-15.5 pts)	
<p><b>Is it appropriate for the audience?</b></p> <p><b>(10 points)</b></p>	Language/graphics were easy to understand as presented. Unfamiliar terms were functionally defined to allow understanding. (9-10 pts)	Language was at an appropriate level but some effort was needed to understand the data or ideas. (8-8.5 pts)	Language was too technical or too simple to engage the identified audience. Graphics were difficult to interpret. (7-7.5 pts)	
<p><b>Are there data to support the message?</b></p> <p><b>(20 points)</b></p>	Data were verbally or graphically presented and came from credible sources. Data shown were critical to the message.	Data was present and supported the message but the sources or credibility of the sources was unclear.	Data seemed disconnected from the message or context for the data was unclear.	
<p><b>Is the visual balance consistent with the emphasis of the message?</b></p> <p><b>(15 points)</b></p>	Important ideas were given consistent space, size and color emphasis. Color use was consistent with the tone of the message. (13.5-15 pts)	There was some inconsistency in things like font size, but not so much it detracted from the message. (12-13 pts)	Attention to visual balance was lacking. Font size or layout detracted or distracted from the message (11.5-10.5 pts)	
<p><b>Is it visually attractive (color and design)?</b></p> <p><b>(10 points)</b></p>	Use of color was consistent with the emphasis and did not detract from the message.	Color scheme was consistent but made reading the text difficult or was inconsistent with the message.	The color scheme was inconsistent or generally visually difficult to look at. It distracted or detracted from the message.	
<p><b>Is it easy to read (size and distribution of text and graphics)?</b></p> <p><b>(10 points)</b></p>	Text did not overwhelm the eye. Font sizes were consistent and appropriate for the relative importance of the information.	Text was abundant and could have used editing. Graphics might have been used to limit text. Overall message was still available to the reader.	Lots of text, inconsistent font sizes in the context of the message. Figures were not used effectively to convey the message.	
<p><b>Is it effective?</b></p> <p><b>(15 points)</b></p>	After looking at the infographic, the reader could list 3-5 facts or pieces of information learned.	While looking at the infographic, the reader could list 3-5 facts or pieces of information learned.	The reader would have trouble succinctly listing 3-5 pieces of information that were conveyed.	

# Infographic info (presentation will be posted)

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## Contact Info

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Jill Rulfs [jrulfs@wpi.edu](mailto:jrulfs@wpi.edu)

Kim LeChasseur [kalechasseur@wpi.edu](mailto:kalechasseur@wpi.edu)

## Helpful Demos

<http://piktochart.com/>

<https://infogr.am/>

<https://color.adobe.com>

<http://www.dafont.com>

## Articles to Check out

[How to make infographics: a beginner's guide to data visualizations](#)

[Tips & Tricks](#)

[15 Free PowerPoint Infographic Templates](#)

[What Makes an Infographic Bad](#) and How to Fix It

## Sources

<http://www.peddlecloud.com/wp-content/uploads/2015/07/Content-Diversity-in-Online-Marketing.jpg>

[http://cdn.history.com/sites/2/2014/01/July-4th-infographic\\_final.png](http://cdn.history.com/sites/2/2014/01/July-4th-infographic_final.png)

<http://www.dailyinfographic.com/wp-content/uploads/2011/07/howlawsmadeWIRTH21.jpg>

<http://visual.ly/color-emotion-guide>

What 3 things do you remember?

**EVR LEADING TRENDS**

# What is an Infographic?

An intersection of disciplines. **100+** years old?

**THEME** **DATA** **GRAPHICS**

So how does this work in practice?  
Here is an Exercise I borrowed from my colleague Jill Rulfs. I will show an infographic for 30 seconds  
See what you can remember.

**Content explosion**  
2007 2011

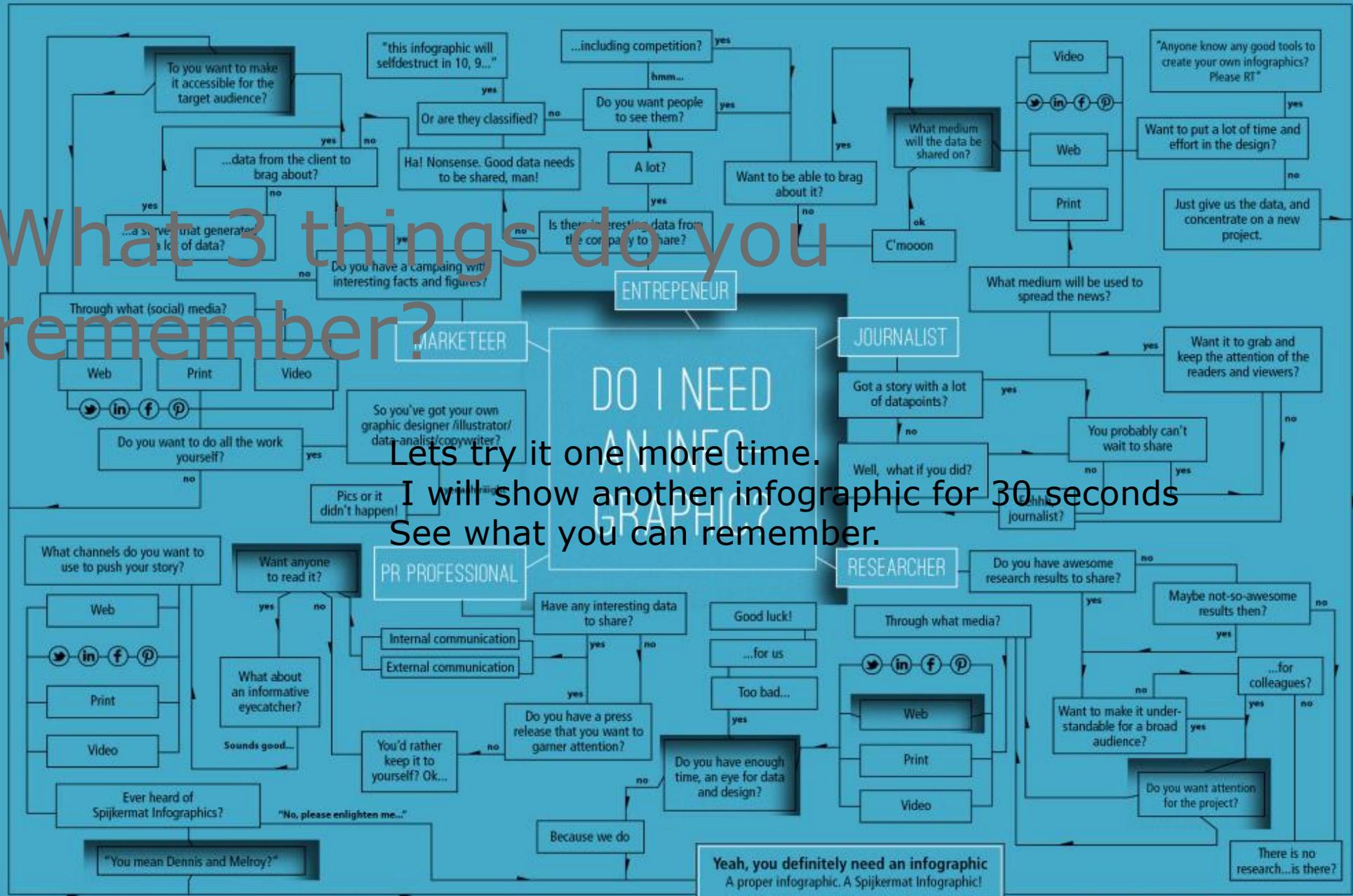
**Going viral**  
More content  
More inbound links  
More website traffic

Infographics give variety to blog content and allow readers to "infosnack."

**Data Sources:** www.ABCcopywriting.com GeekoSystem.com  
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# What 3 things do you remember?



Lets try it one more time.  
I will show another infographic for 30 seconds  
See what you can remember.

Spijkemat Infographics? Spijkemat Infographics is Amsterdam based Infographic agency (since 2011). Spijkemat turns raw data in a beautiful image, without losing sight of the big picture. Spijkemat made Infographics for Price Waterhouse Coopers, Kieskeur.nl, ING Bank, Bright Magazine. Check our website for more information and infographics, [www.spijkemat.nl](http://www.spijkemat.nl)

Yeah, you definitely need an infographic  
A proper infographic. A Spijkemat Infographic!  
More information or just some small talk, mail to [info@spijkemat.nl](mailto:info@spijkemat.nl) or surf to [spijkemat.nl](http://spijkemat.nl)

### Protecting the Planet Protects Us

The more we destroy other species, the more we destroy ourselves

Is the future of our planet destined for this? **Devoid of life. Barren. Empty.**

Humans have left so little of the planet unchanged, a mere 17% of all land on Earth have avoided human alteration.

IUCN Red List Species % endangerment

The IUCN Red List keeps records of all species that are in a vulnerable and critically endangered status. The graph to the left shows 2016 species percentages of all 3 fields

Many of these endangered species are known as **keystone species**. These species are essential in their surrounding environment without them, the ecosystem would throw into an imbalance.

**CATTLE**

Because of the dangers faced by sixth mass extinction, countries around the world are taking action

### Introducing Bacteriophage

What is a bacteriophage?

Structure of a bacteriophage

Phage Life Cycles

**Lytic Cycle**

**Lysogenic Cycle**

In the lytic cycle after a phage inserts its DNA into the host bacteria it is transcribed and new phages begin to form until the cell lyses.

In the lysogenic cycle when the DNA is inserted in the host bacteria it circulates then inserts itself into the host genome and stays dormant through self-mediated gene suppression.

### Sea-Phages: Phage Hunting

Amate Phage was collected from a soil sample outside of Gordon Library

The Gordon Library soil sample (Sample #3) was originally thought to contain no phages that could lyse *M. foliorum*

A new bacterially seeded enrichment solution for soil sample #3 was made after 2 weeks of testing

For multiple rounds of plaque assays and spot tests for Amate phage (Enrichment #3) looked different than the other enrichments, having circular bacterial colonies instead of a bacterial lawn

Amate Phage was isolated from a soil sample in order to extract DNA for phage characterization.

### Benefits of Phage Research

**TIMELINE OF PHAGE RESEARCH**

- 1919**: Successful first isolation of Bacteriophage against *Escherichia coli* in France
- 1921**: Multiple isolates of typical colic bacteriophages 1 and 2
- 1940s**: Used to fight against bacterial infections in German and Japanese soldiers
- 1950-1980**: Rise of antibiotics, less phage research
- 1970s**: Treatment of children in isolation without toxic effects on the patient
- 1980s**: Prof. S. Stoen established phage therapy center in St. Francis, and Soviet Georgia
- 1996**: Nestlé demonstrated E. coli could be controlled in milk using phages

### HABITAT FRAGMENTATION

70% of remaining forest is within 1km of the edge.

**EDGE EFFECT**

**HUMAN CAUSES**

**RESTRICTION ENZYMES**

**Basic Functions**

**Uses**

**HOW TO HELP**

**Setup**

**Gelelectrophoresis**

### THE PERILS OF POACHING

1 in 12 animals are threatened

2.2 million rhinos were poached in 2012

\$65,000 per rhino

30 years to produce offspring

3x more poached than other mammals

2,500 rhinos poached in 2011

Humans are hunting tigers more rapidly than they are currently restoring their habitats

30 years to produce offspring

As this process takes so long, many tigers are killed before they have the chance to produce offspring.

# We'll have a few Pops everywhere questions so everywhere is the poll info ahead of time

### Problems with the Soy

Imports Exports Agriculture Exports

6 Million Gallons of pesticide dumped on per hectare each year

The soy is genetically modified to resist Roundup a product by Monsanto

Problems with the Soy

Introduced to Paraguay in 1950s

Genetically engineered soybeans

Approved until 2004

Toxicity of all soy is genetically modified

1/3 of all soy beans are genetically modified

2nd Highest Deforestation rate in the world

Farmers are being forced off their land to make way for more soy plants, many of which are genetically modified

### Bacteriophage Discovery Journey

1. Discovery of Amate Phage

2. Isolation of Amate Phage

3. Characterization of Amate Phage

4. DNA Extraction

5. Phage Amplification

6. Phage Purification

7. Phage Titration

8. Phage Characterization

9. Phage Isolation

10. Phage Sequencing

11. Phage Annotation

12. Phage Classification

13. Phage Application

14. Phage Distribution

15. Phage Conservation

16. Phage Research

17. Phage Education

18. Phage Outreach

19. Phage Collaboration

20. Phage Innovation

21. Phage Discovery

22. Phage Research

23. Phage Application

24. Phage Distribution

25. Phage Conservation

26. Phage Research

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