

**Communicating Science through Visuals – Visualizations & Infographics**  
**11:374:240, Fall 2018**

When: Tuesdays/Thursdays 2:15-3:35pm

Where: Blake 131

**CONTACT INFORMATION:**

Instructor: Kristin Hunter-Thomson

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Office Hours: Tuesdays and Thursdays 3:35-4:30pm

**COURSE WEBSITE, RESOURCES AND MATERIALS:**

- *Course website:* Canvas site
- *Required Texts:*
  - Storytelling with Data: A Data Visualization Guide for Business Professionals (2015) by Cole Nussbaumer Knaflic (ISBN: 978-1119002253)
  - Effective Data Visualization: The Right Chart for the Right Data (2016) by Stephanie D.H. Evergreen (ISBN: 978-1506303055)
- *Resources & Materials:* Additional handouts will be provided as needed in class and posted on course Canvas site

**COURSE DESCRIPTION:**

The course objective is to build student's skills in developing visualizations and infographics to tell a science story with data. The activities and discussions will expand abilities to engage with and communicate science more effectively and improve their public science communication skills (general and technical). Students will practice many types of science visualizations, and develop a final visual and presentation relevant to a current research project. We will focus on a scientific and non-scientific audiences.

*Participants in this course will:*

- Explore and discuss bad, good, and better ways to visualize and communicate data to tell science stories effectively.
- Develop broader understanding and confidence with visualizing a range of types of data and data visualizations.
- Explore storytelling with data principles, design considerations, and visualization techniques/strategies to deliver the most effective science visuals alone and as part of an infographic.
- Engage in an authentic experience of designing and presenting science stories with data through visualizations and infographics to peers and scientists to apply gained skills and confidence.

**ASSIGNMENTS/RESPONSIBILITIES:**

This course has been designed to model effective communication, including the importance of discussions, peer review, and sharing of ideas. Therefore, the success of the course is dependent on everyone's active participation and being open to both sharing and respectfully considering others ideas. Class expectations include: 1) being prepared for each class; 2) actively listening and sharing ideas; 3) keeping an open and curious

mind; 4) disagreeing productively; 5) actively working toward a deeper understanding including asking questions; and 5) building on and appreciating the contributions of others in class.

1. *Assignments & Online Discussion Prompts (30%)*. The assignments and discussion prompts have been developed to facilitate your mastery of the skills and understanding of the topic areas, thus thorough and on time completion of the assignments are important for being successful in the course.
2. *Class Participation (30%)*. Attend class. Participate in discussions and activities in class and online.
3. *Final Science Visual & Learning Reflection (30%)*. Develop and submit a science data story, as an infographic with effective visualizations, upon your chosen research project and complete a 2-page reflection of the skills and knowledge gained throughout the course.
4. *Science Visuals Showcase Presentation (10%)*. Present your science data story to others in the class and department for feedback on December 12<sup>th</sup> (location TBD).

### ABSENCE POLICY

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

**COURSE SCHEDULE:** (items to be completed by the date they are listed)

<i>Module Title</i>	<i>Date</i>	<i>Homework Assignments</i>	<i>Readings</i>
<i>1: Introductions, Data, &amp; Visualization Types</i>	5-Sep	<b>none</b>	<b>none</b>
	7-Sep	<ul style="list-style-type: none"> <li>• Create a graph in Excel/Google Sheets/R (pick your platform).</li> <li>• Collect 4 samples of different science visualizations that you come across in your daily lives, print and bring to class.</li> <li>• Post &amp; comment on online discussion prompt</li> <li>• Watch 2 Mini-Lectures</li> </ul>	Knaflic Introduction Online articles
<i>2: Design, Evaluation, &amp; Choosing a Topic</i>	12-Sep	<ul style="list-style-type: none"> <li>• Find 2-4 online resources with tips for designing effective data visualizations.</li> <li>• Download Evergreen sample data files.</li> <li>• Post &amp; comment on online discussion prompt</li> <li>• Watch 2 Mini-Lectures</li> </ul>	Lankow et al. Chap. 1 & 3 Online articles
	14-Sep <b>(no class)</b>	<ul style="list-style-type: none"> <li>• Pick a topic area and brainstorm things you would be interested in communicating with data.</li> <li>• Post &amp; comment on online discussion prompt</li> <li>• Watch 2 Mini-Lectures</li> </ul>	Evergreen Chap. 1 Online articles
<i>3: Visualizing Tables &amp; Text</i>	19-Sep	<ul style="list-style-type: none"> <li>• Remake one of the tables that you post.</li> <li>• Post &amp; comment on online discussion prompt</li> <li>• Watch 2 Mini-Lectures</li> </ul>	Knaflic Chap. 1
	21-Sep	<ul style="list-style-type: none"> <li>• Interview 10 friends of summer vacation to make heat map.</li> <li>• Find 2-4 sources of data that will help you develop your visualization and infographic.</li> <li>• Post &amp; comment on online discussion prompt</li> <li>• Watch 2 Mini-Lectures</li> </ul>	Evergreen Chap. 8 Online articles
<i>4: Visualizing Single Numbers</i>	26-Sep	<ul style="list-style-type: none"> <li>• Make a sketch of a remake of one of the images your post.</li> <li>• Post &amp; comment on online discussion prompt</li> <li>• Watch 2 Mini-Lectures</li> </ul>	Knaflic Chap. 3
	28-Sep	<ul style="list-style-type: none"> <li>• Find visuals of variability and revise.</li> </ul>	Evergreen Chap. 2

		<ul style="list-style-type: none"> <li>Find 2-4 examples of visualizations that other people have made on your topic. Make list of 3 likes to keep and 3 dislikes to change for your project.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	
<i>5: Visualizing when Two or More Number are Alike/Different</i>	3-Oct	<ul style="list-style-type: none"> <li>Visit colorbrewer2.com to find your favorite color schemes to work with, use it to remake one of the images that you posted.</li> <li>Come up with draft questions for final project.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knaflic Chap. 2 Online articles
	5-Oct	<ul style="list-style-type: none"> <li>Download data to make slopegraph and dot plots.</li> <li>Determine what question you are interested in asking/posing with your visualization/infographic.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Evergreen Chap. 3
<i>6: Visualizing Temporal Data</i>	10-Oct	<ul style="list-style-type: none"> <li>Sketch two different ways to remake one of the temporal data graphs you posted.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knaflic Chap. 4 Online articles
	12-Oct	<ul style="list-style-type: none"> <li>Play with David Merle Montgomery's intersecting line chart with colored areas to make own graphs</li> <li>Make a sketch that remakes 1-2 examples of visualizations others have made that relate to your topic.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Evergreen Chap. 9 Online articles
<i>7: Visualizing Parts of a Whole</i>	17-Oct	<ul style="list-style-type: none"> <li>Choose a calculator to play with from Dave Paradi's website, make a graph using the calculator</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knaflic Chap. 5
	19-Oct	<ul style="list-style-type: none"> <li>Choose an example from "The Top Ten Worst Graphs" to remake into something more interpretable</li> <li>Sketch out 3 ideas of types of visualizations you may want to make for your project.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Evergreen Chap. 6
<i>8: Visualizing Spatial Data</i>	24-Oct (no class)	<ul style="list-style-type: none"> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knaflic Chap. 6 Online articles
	26-Oct	<ul style="list-style-type: none"> <li>Revise a spatial graphic that you find online.</li> <li>Decide which approach you are going to take with your visualization and make a detailed sketch.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Cleveland & McGill (1984)
<i>9: Visualizing How Things Change in Relation to Each Other</i>	31-Oct	<ul style="list-style-type: none"> <li>Sketch a remake of one of the relationship visualizations that you posted.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knaflic Chap. 7
	2-Nov	<ul style="list-style-type: none"> <li>Find an example on Spurious Correlations, explain what problem is and remake the graph for better understanding</li> <li>Make a draft version of your visualization.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Evergreen Chap. 7 Online articles

<i>10: Visualizing Comparisons to a Benchmark</i>	7-Nov	<ul style="list-style-type: none"> <li>Sketch a remake of one of the benchmark visualizations that you posted.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Lankow et al. Chap. 2 Online articles
	9-Nov	<ul style="list-style-type: none"> <li>Develop a class list of Dos &amp; Don'ts for Data Visualizations.</li> <li>Revise draft version of your visualization and bring all iterative steps.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Evergreen Chap. 4 Online articles
<i>11: Diving into Infographics</i>	14-Nov	<ul style="list-style-type: none"> <li>Collect 5-8 samples of a wide variety of science infographics that you come across in your daily lives, print and bring to class.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Lankow et al. Chap. 8 Online articles
	16-Nov	<ul style="list-style-type: none"> <li>Find examples of infographics used in a variety of mediums and for a range of audiences. Bring examples to class.</li> <li>Brainstorm ideas of how to integrate your visualization into an infographic.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knafllic Chpa. 8 Online articles
<i>12: Why do Infographics Work</i>	21-Nov	<ul style="list-style-type: none"> <li>Visit <a href="http://viz.wtf/">http://viz.wtf/</a> pick one that made you laugh the hardest and remake it so it is better, sketch on paper (scan) and try to make on computer)</li> <li>Outline content you are interested including in infographic. Identify the key idea want to communicate.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Lankow et al. Chap. 9 Online articles
	23-Nov ( <b>no class</b> ) Happy Thanksgiving!		
<i>13: What To Do &amp; What To Avoid with Infographics</i>	28-Nov	<ul style="list-style-type: none"> <li>Find a climate change and/or health dataset and corresponding infographic to bring to class to share.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Lankow et al. Chap. 10 Online articles
	30-Nov	<ul style="list-style-type: none"> <li>Develop a class list of Dos &amp; Don'ts for Infographics.</li> <li>Develop draft infographic that includes your content and visualization.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knafllic Chap. 9 Online articles
<i>14: Other Visualizations &amp; Being Publication Ready</i>	5-Dec	<ul style="list-style-type: none"> <li>Find an online resource about a different kind of data to visualize that has not been covered in class to share/demonstrate to others.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Evergreen 5 Online articles
	7-Dec	<ul style="list-style-type: none"> <li>Revise your infographic, bring all iterative steps to class to share with everyone.</li> <li>Post &amp; comment on online discussion prompt</li> <li>Watch 2 Mini-Lectures</li> </ul>	Knafllic Chap. 10 Evergreen Chap. 10
<i>15: Presenting Your Work &amp; Receiving Feedback</i>	12-Dec	<ul style="list-style-type: none"> <li>Students finalize science visuals and put together 5-minute visual story with data for Science Visuals Showcase.</li> </ul>	<b>none</b>
	14-Dec	<b>none</b>	<b>none</b>
<i>16: Revising and Pulling it all Together</i>	19-Dec	<ul style="list-style-type: none"> <li>Final versions of visual and final reflection of skills learned uploaded to Canvas by December 19<sup>th</sup> at 11:59pm (eastern).</li> </ul>	<b>none</b>

**FINAL EXAM/PAPER DATE AND TIME**

Final versions of the visualization must be uploaded to the course Canvas site by December 19<sup>th</sup> at 11:59pm (eastern).

**LEARNING GOALS:**

- A. Students will be able to articulate the basic components of telling a story with data and how to utilize it in science visualizations and infographics.
- B. Students will become more confident in developing a range of different science visualizations, depending on the data available and message being conveyed.
- C. Students will become more confident in developing an infographic to communicate their science story.
- D. Students will be able to employ best practices of design and layout consideration when developing their science visualizations and infographics.
- E. Students will become more confident in presenting science stories with data to peers and other scientists.

*Human Ecology Environmental Policy, Institutions and Behavior Learning Goals:*

- 2.1. Assess the relevant contexts for addressing the question this problem, at the appropriate spatial, temporal, and organizational scale(s).
- 2.3. Identify what constitutes valid and relevant evidence to address the question and demonstrate an ability to understand and work with quantitative information.
- 2.5. Analyze and interpret evidence.
- 2.10. Identify relevant audiences, determine communication goals and communicate the results in oral and/or written form in a manner effective for each targeted audience.
- 2.11. Work effectively in team settings.

*Science Communication Minor Learning Goals:*

- Demonstrate the ability to effectively communicate science issues to audiences who have limited backgrounds in science.
- Understand how scientific information and evidence is perceived and used by different audiences in particular contexts, demonstrating how appropriate communication strategy integrates social science evidence about learning and framing.
- Be able to argue claims in writing and through oral presentation based on causal links and multiple evidentiary sources.
- Be able to promote the public understanding of science and scientists.
- Demonstrate the ability to develop and use visuals, construct narrative in public presentations of science.

**ASSESSMENT:**

Learning Goal A: Students will be able to articulate the basic components of telling a story with data and how to utilize it in science visualizations and infographics. The assessments will be in-class and homework assignments to track growth in skills. Also, students will create their own infographic with science visualizations as well as write an essay about the process through which they took to develop the work in the Final Science Visuals Project & Reflection.

<b>Outstanding Achievement</b>	<b>Passing Achievement</b>	<b>Non-Achievement</b>
Student creates science visualizations and infographics that successfully and effectively communicate the story, using data.	Student creates science visualizations and infographics, that communicates the story but that could be clearer or more effective.	Student creates science visualizations and infographics, but the communication is unclear. Or, student does not create the

		required visualizations and/or infographic.
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**Learning Goal B:** Students will become more confident in developing a range of different science visualizations, depending on the data available and message being conveyed. The assessments will be in-class and homework assignments to track growth in skills and develop a portfolio of their work. As well students will complete written reflections that encourage the students to reflect on their confidence.

<b>Outstanding Achievement</b>	<b>Passing Achievement</b>	<b>Non-Achievement</b>
Student develops a successful science visualization for each type of data and question explored in class. And student reflects deeply on his/her growth in skills, knowledge and confidence.	Student develops a science visualization for each type of data and question explored in class, but it could be clearer. And student reflects on his/her growth in skills, knowledge and confidence.	Students do not develop a science visualization for each type of data and question explored in class. And/or student does not reflect on his/her growth in skills, knowledge and confidence.

**Learning Goal C:** Students will become more confident in developing an infographic to communicate their science story. The assessments will be in-class and homework assignments to track growth in skills and develop a portfolio of their work. As well students will complete written reflections that encourage the students to reflect on their confidence. Also, students will create their own infographic and write an essay about the process through which they took to develop the work in the Final Science Visuals Project & Reflection.

<b>Outstanding Achievement</b>	<b>Passing Achievement</b>	<b>Non-Achievement</b>
Student develops a range of successful infographics, increasingly more on their own throughout the semester. And student reflects deeply on his/her growth in skills, knowledge and confidence.	Student develops a range of infographics, increasingly more on their own throughout the semester. And student reflects on his/her growth in skills, knowledge and confidence.	Student does not develop a range of infographics or still requires a lot of teacher support at end of semester. And/or student does not reflect on his/her growth in skills, knowledge and confidence.

**Learning Goal D:** Students will be able to employ best practices of design and layout consideration when developing their science visualizations and infographics. The assessments will be in-class and homework assignments to track growth in skills. Also, students will create their own infographic with science visualizations in the Final Science Visuals Project & Reflection.

<b>Outstanding Achievement</b>	<b>Passing Achievement</b>	<b>Non-Achievement</b>
Student creates his/her science visualizations and infographics successfully and effectively using best practices of design and layout considerations.	Student creates his/her science visualizations and infographics using some best practices of design and layout considerations.	Student creates his/her science visualizations and infographics without using best practices of design and layout considerations.

**Learning Goal E:** Students will become more confident in presenting science stories with data to peers and other scientists. The assessments will be in-class practice as well as the Science Visuals Showcase, in which the students will present their work to one another and members of the broader Rutgers community. Also, students will write an essay about their experience presenting their science stories with data.

<b>Outstanding Achievement</b>	<b>Passing Achievement</b>	<b>Non-Achievement</b>
Student clearly and effectively communicates his/her science	Student communicates his/her science story, using some of the	Student communicates his/her science story, without using best



story, using best practices of communication and presentation. And student reflects deeply on his/her growth in skills, knowledge and confidence.	best practices of communication and presentation. And student reflects on his/her growth in skills, knowledge and confidence.	practices of communication and presentation. And/or student does not reflect on his/her growth in skills, knowledge and confidence.
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**ASSESSMENT SCALE:** Grade is based on mastery, not on a curve. Grade scale: 100-90%= A, 87-89%= B+, 80-87%= B, 77-79%= C+, 70-75%= C, 66-69%= D+, 60-65%= D, <60%= F.

Note: All assignments are due at the start of class on the due date. 5% will be deducted for each day that the assignment is late. No extra credit will be awarded, but students are encouraged to submit work early for initial comments. Any requests for a grade change or make-up (in advance) must be in writing.

It is important that students have the tools to succeed in this course. Please see the instructor \*as soon as possible\* with any difficulties or questions regarding the course materials. In addition, if necessary we encourage you to contact student affairs (<http://studentaffairs.rutgers.edu/>) for any needs or concerns.

### ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Captions for video mini-lectures are machine-generated. Please contact me regarding any inaccuracies.

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>

### ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

Cheating on assignments and/or plagiarizing materials deprives you of the educational benefits of preparing these materials appropriately. It is personally dishonest and unfair to your fellow classmates. In this class we will take cheating and plagiarism very seriously. All suspected cases will be automatically referred to the Office of Judicial Affairs, and we will recommend penalties appropriate to the gravity of the infraction. [*modified from Spring 2010 Andy Egan 01:730:252 Eating Right*]

### **STUDENT WELLNESS SERVICES**

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

#### Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / [www.rhscaps.rutgers.edu/](http://www.rhscaps.rutgers.edu/)

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

#### Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / [www.vpva.rutgers.edu/](http://www.vpva.rutgers.edu/)

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

#### Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

#### Scarlet Listeners

(732) 247-5555 / <http://www.scarletlisteners.com/>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.