

# Data Visualization and Infographics: Using Data to Tell Your Story

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University Life

Assessment, Research, and Retention

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# Session Outcomes

Participants will be able to:

1. Identify the process and analytical design principles required for effective data visualization.
2. Evaluate the usefulness of data visualization techniques and infographics for making meaning of and sharing higher education data.
3. Identify tools and resources for getting started with data visualization and infographic design.

# The Beauty of Data Visualization



Link: [http://www.ted.com/talks/david\\_mccandless\\_the\\_beauty\\_of\\_data\\_visualization.html](http://www.ted.com/talks/david_mccandless_the_beauty_of_data_visualization.html)

# Excellent Examples are Everywhere

- ESPN

<http://www.espn.com>



- National Weather Service

<http://www.weather.gov/>



# Tell Your Story With Data

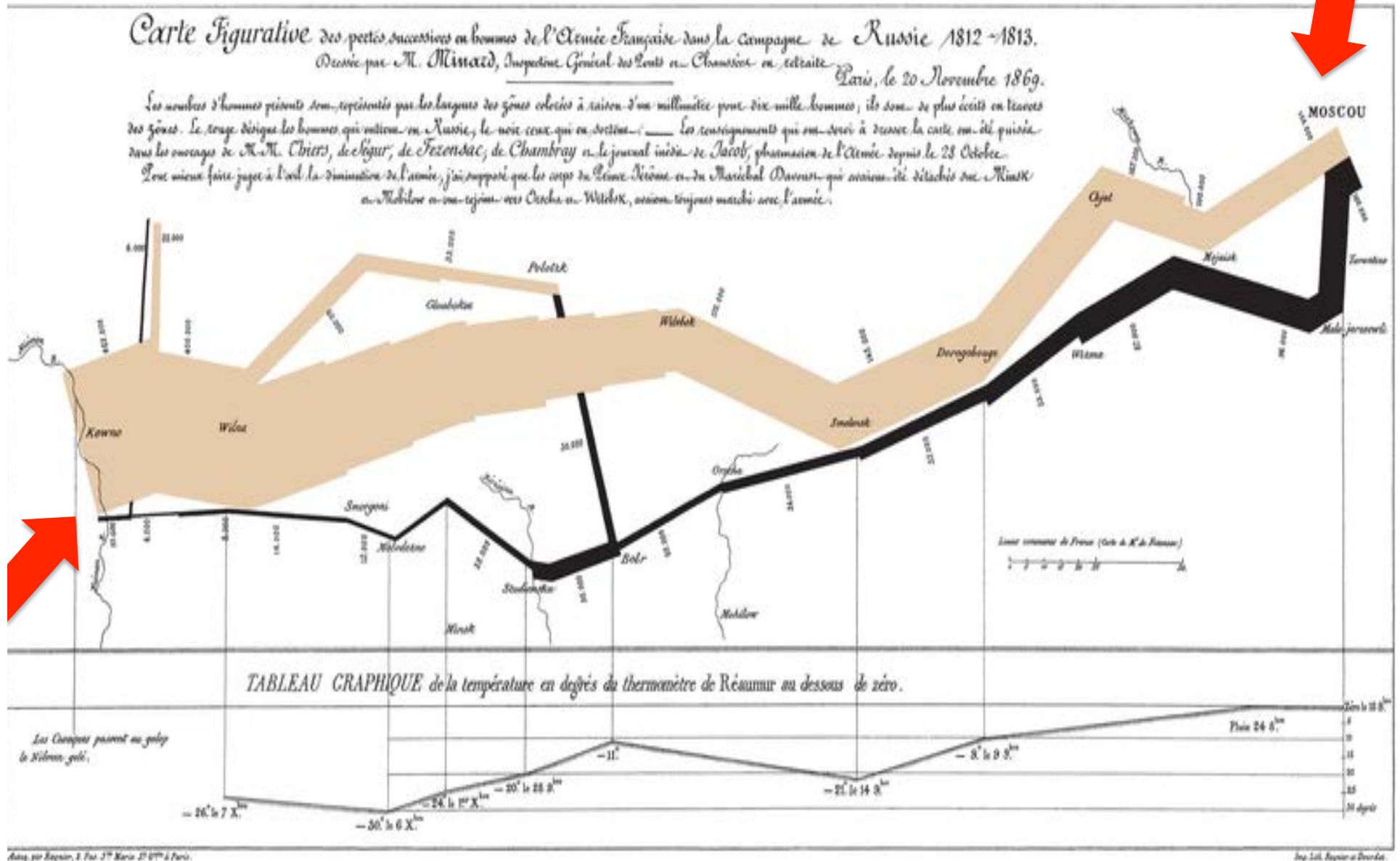
- Collect your data
  - primary and/or secondary sources
- **Think, Think, Think**
  - Question
  - Explore
    - trends, patterns, differences, relationships
    - across categories, space, time
  - Identify your story
- Design your visual
  - start simple
  - keep it clear and interesting
  - keep your audience in mind

# Analytical Design Principles

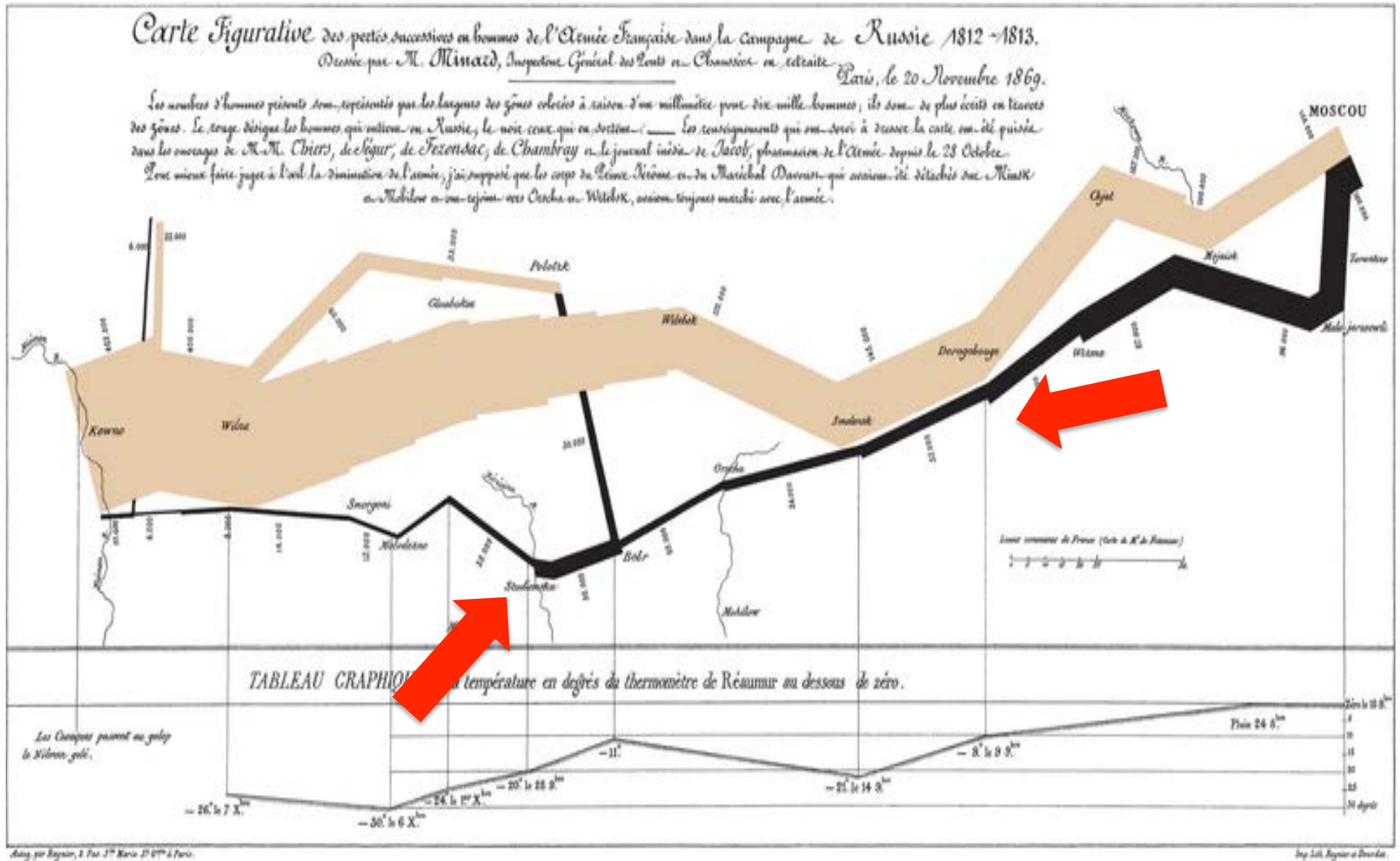
(Tufte, 2006)

1. Comparisons, Contrasts, Differences
2. Causality, Mechanism, Structure, Explanation
3. Multivariate Data
4. Integrate Words, Numbers, Images, Diagrams
5. Describe and Document Evidence
6. Content Counts Most of All

# Comparisons, Contrasts, Differences

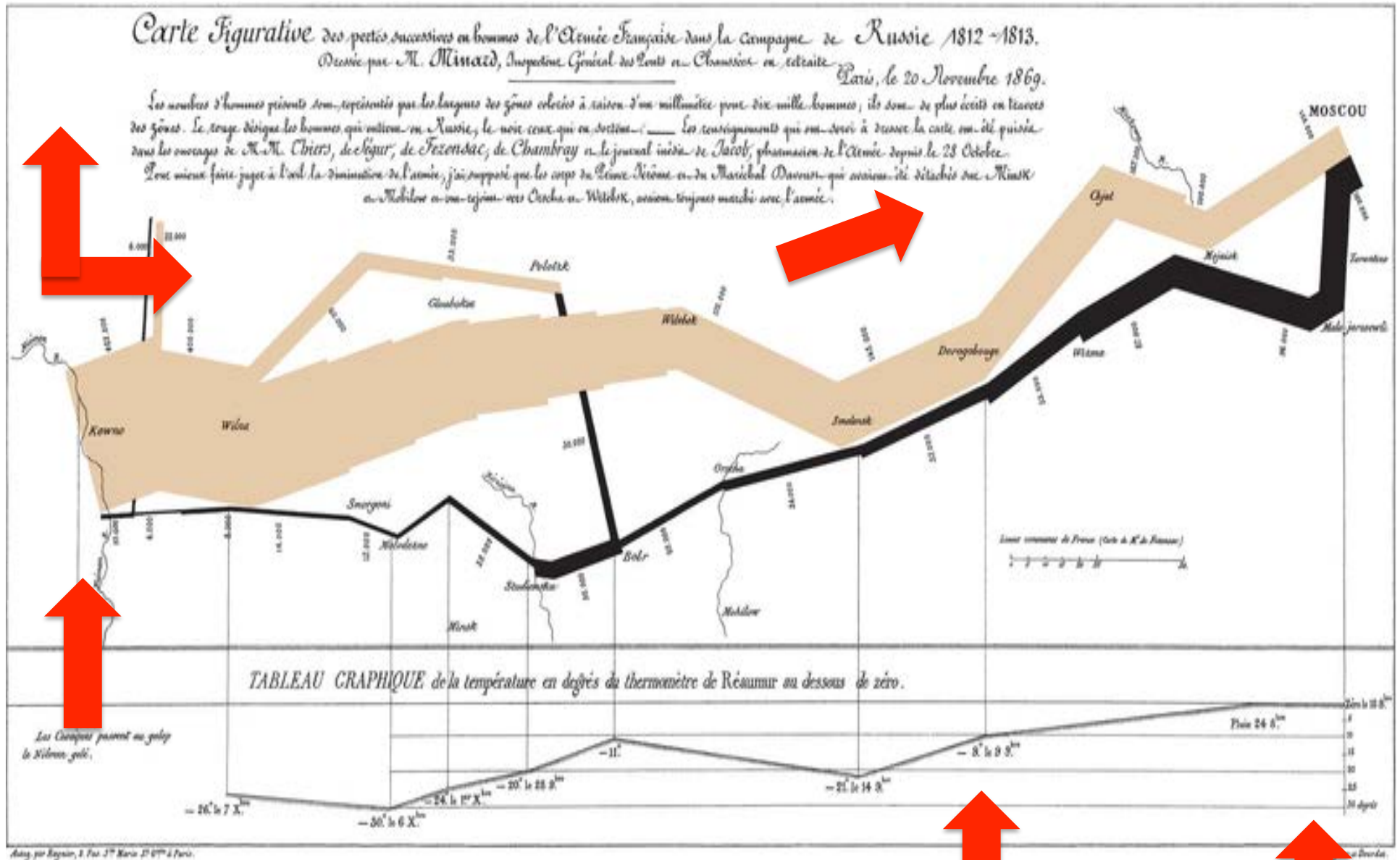


# Causality, Mechanism, Structure, Explanation

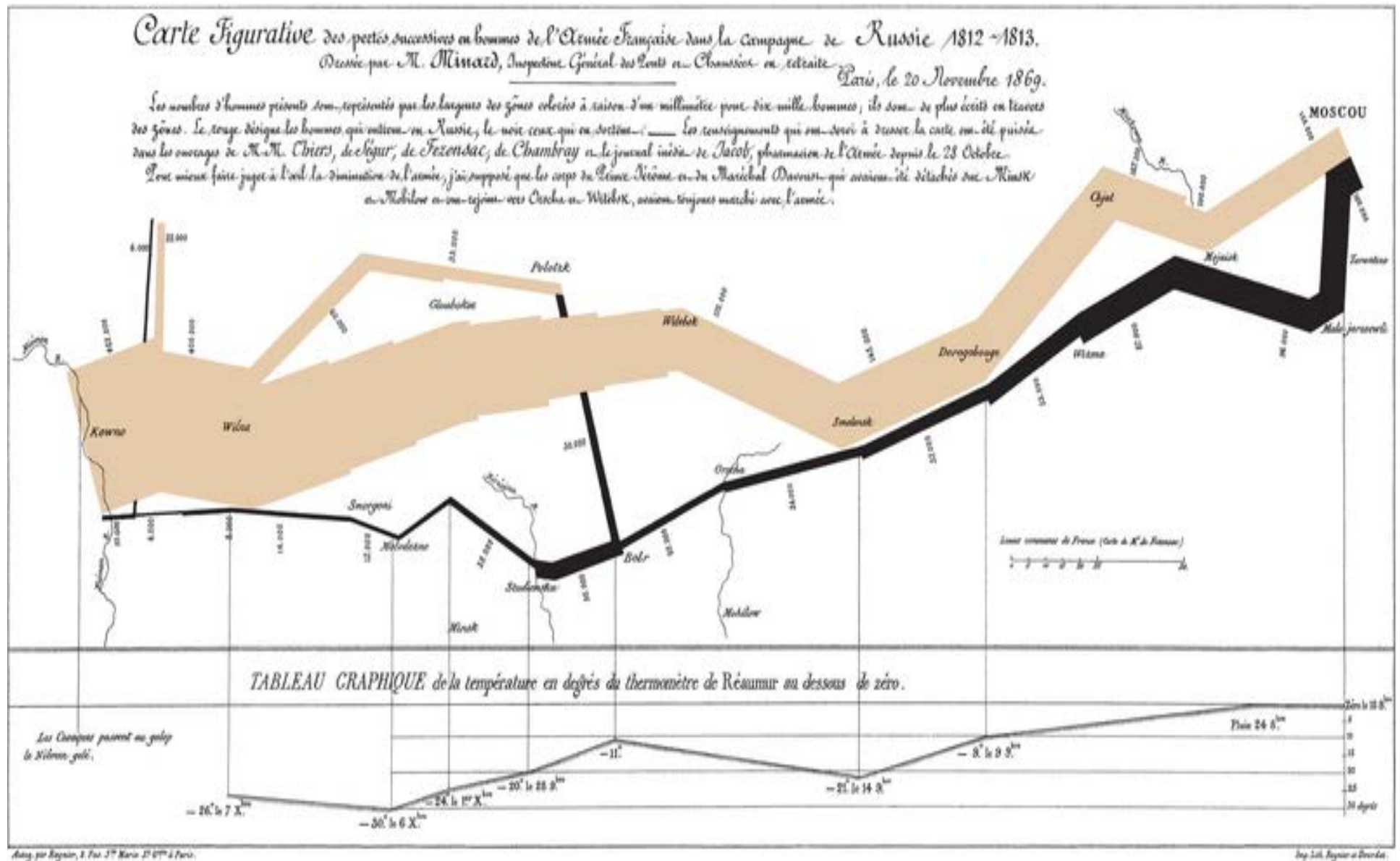




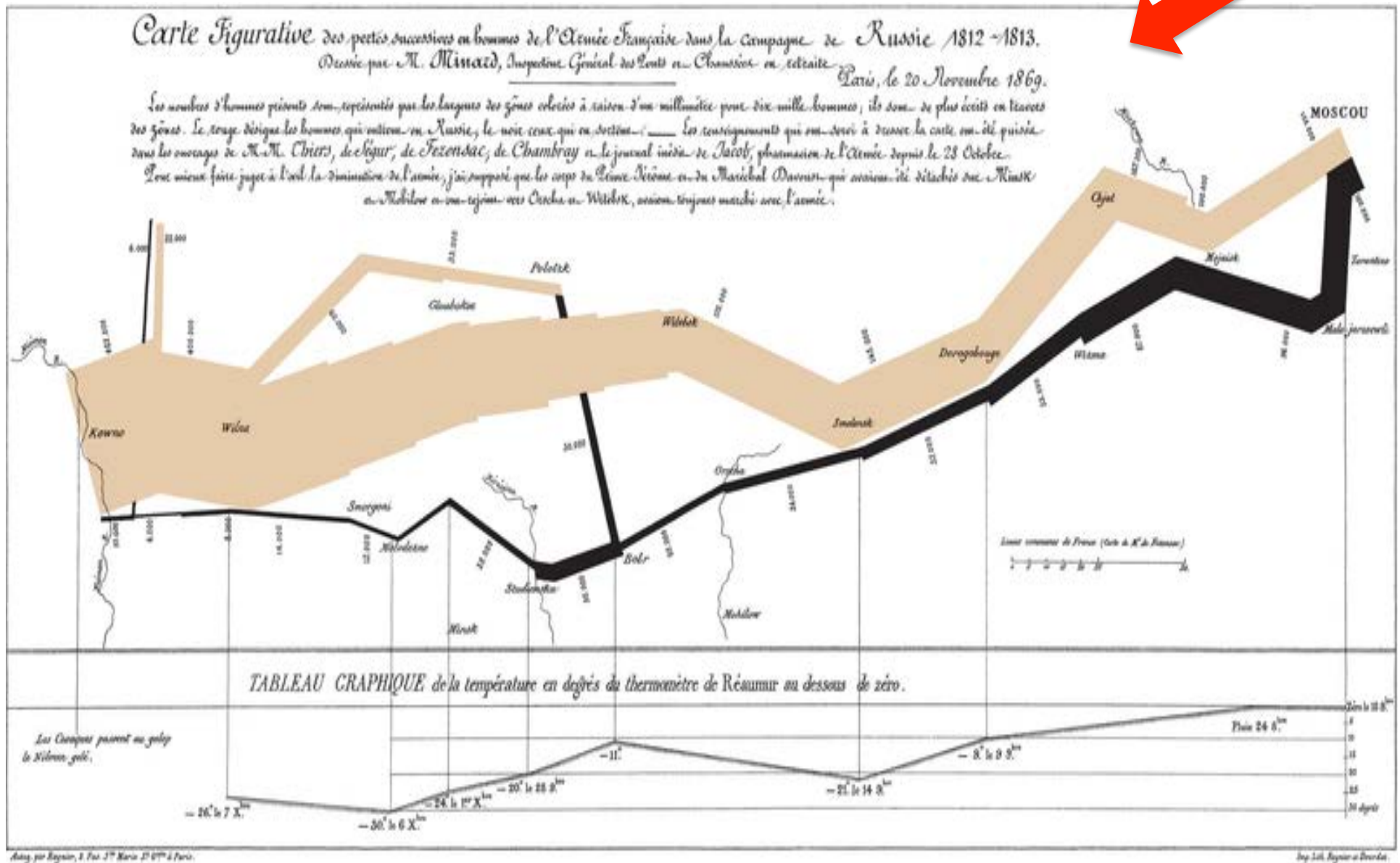
# Multivariate Data



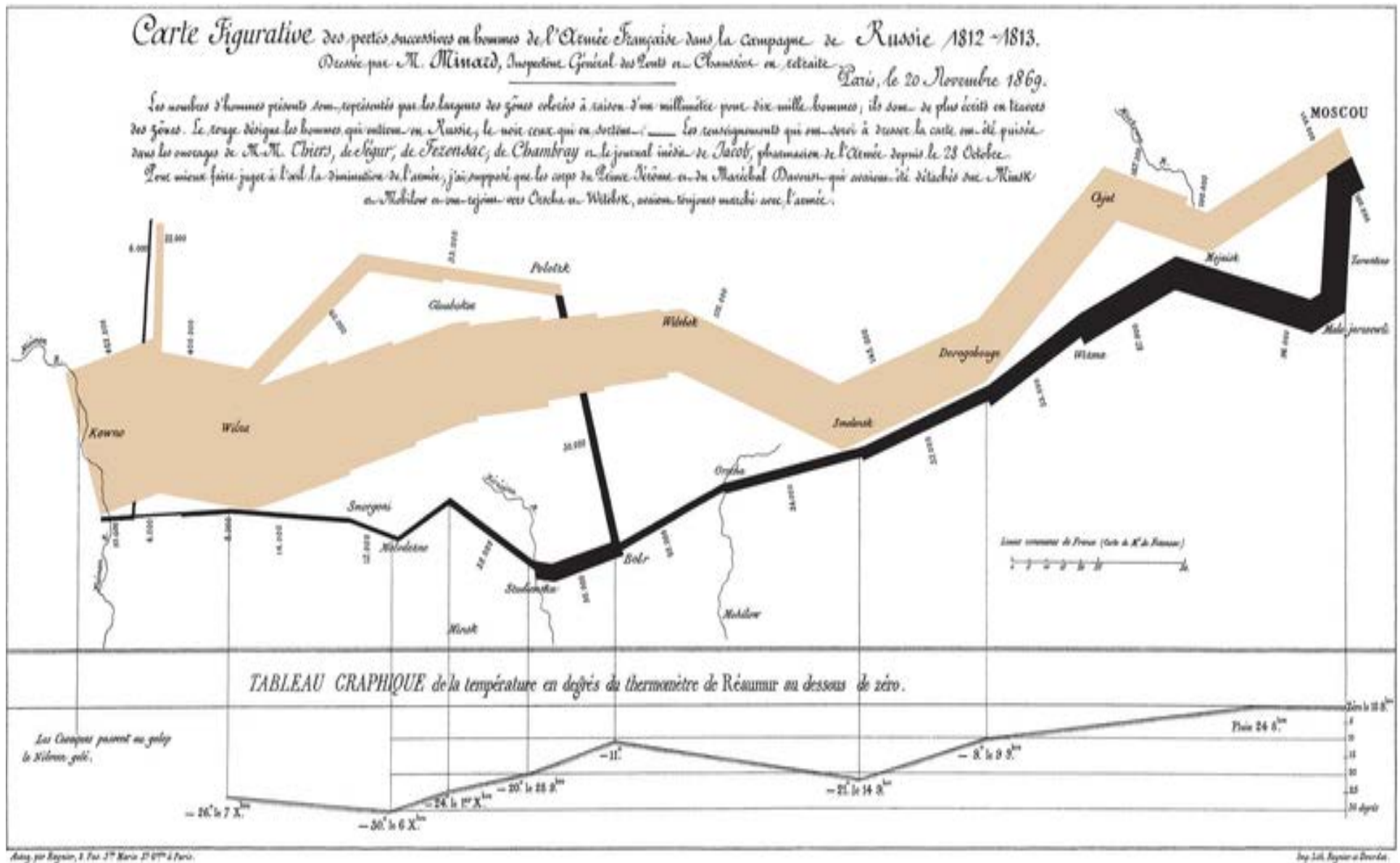
# Integrate Words, Numbers, Images, and Diagrams



# Describe and Document Evidence

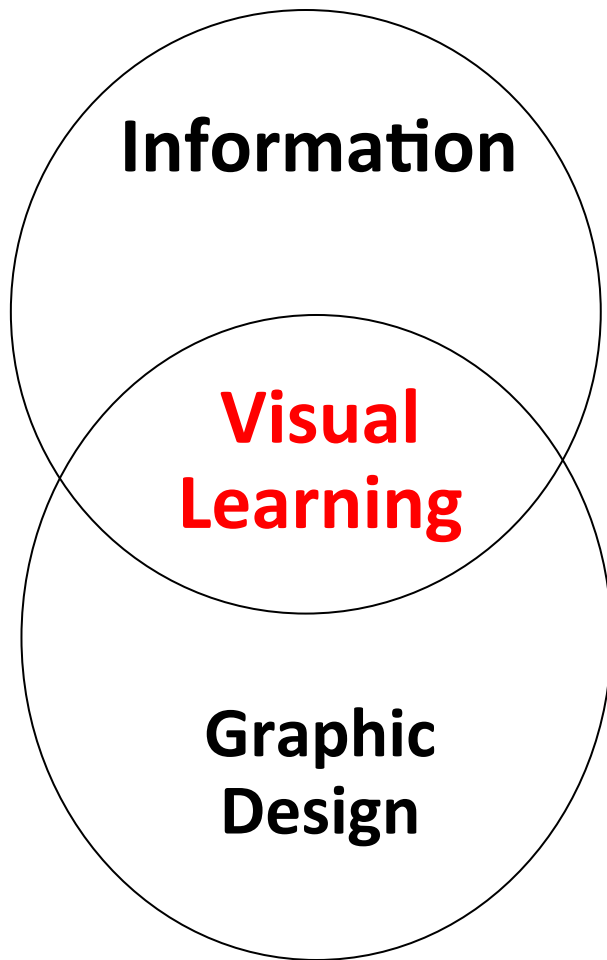


# Content Counts Most of All





# Infographics



“A visualization of data or ideas that tries to convey complex information to an audience in a manner that can be quickly consumed and easily understood”

Smiciklas (2012, p. 3)

# Types of data can be visualized

(Smiciklas, 2012)

- **Statistics** – KPIs, surveys, research
- **Processes** – pathways, customer service
- **Ideas** – concepts, theories, thought leadership
- **Chronology** – history, timelines, schedules
- **Geography** – metrics by region
- **Hierarchy** – organizational structure
- **Relationships** – internal, external, products/services
- **Personality** – brand, culture

# Who is doing this well?

- Journalists (e.g., The Chronicle, USA Today)
- Bloggers
- Non-profits (e.g., Educause, PewInternet)
- Marketing agencies
- Federal, state, and local government agencies
- Others?

# Examples from Higher Education (the good and the bad...)

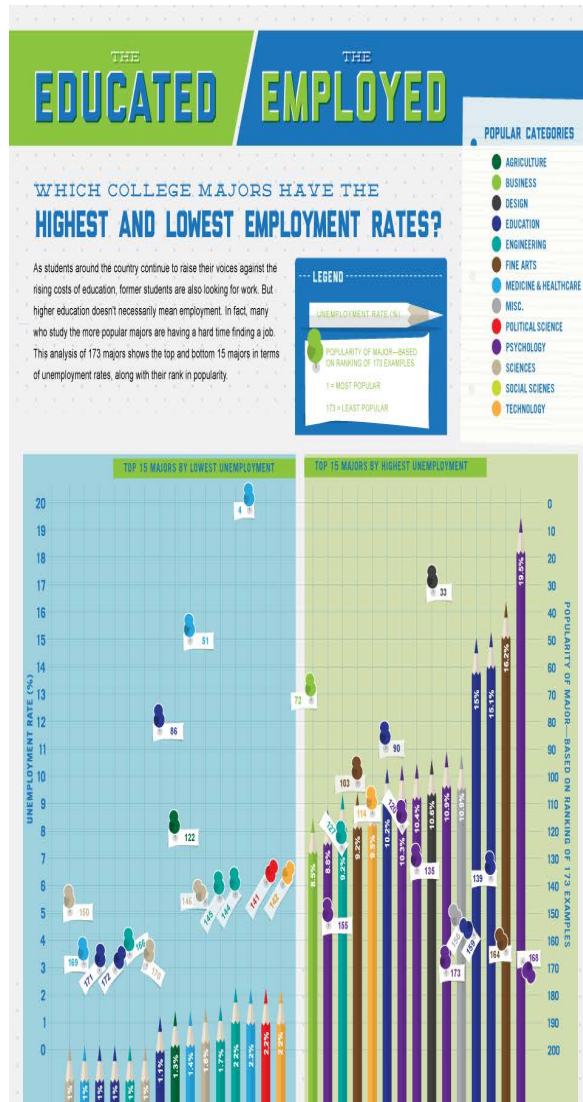


# Analytical Design Principles

(Tufte, 2006)

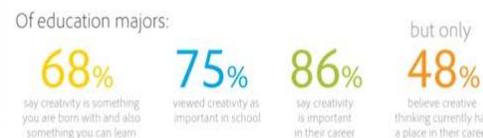
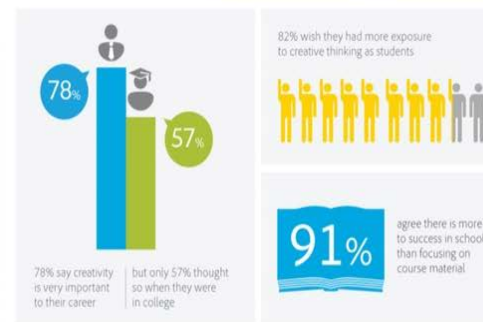
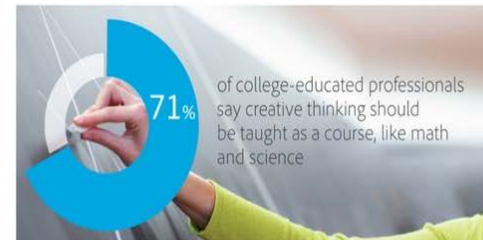
1. Comparisons, Contrasts, Differences
2. Causality, Mechanism, Structure, Explanation
3. Multivariate Data
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6. Content Counts Most of All

# Examples from Higher Education: Statistics (KPIs, Survey Results, Research)



## Creativity and Education: Why it Matters

The value of creativity in education and impact on career success

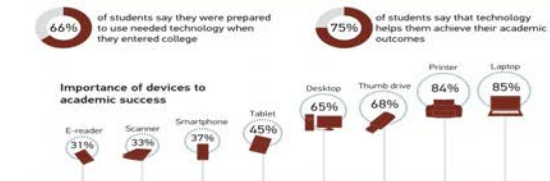


Interestingly, math and science ranked nearly as high as traditional creative subjects in contributing to creative thinking

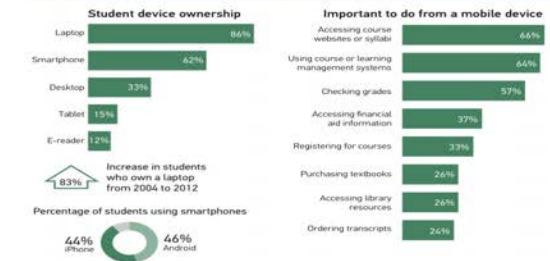


## 2012 STUDENTS AND TECHNOLOGY

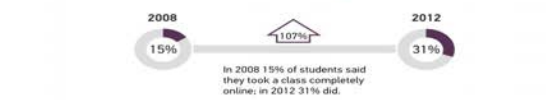
### TECHNOLOGY CRITICAL TO SUCCESS



### MOVING BEYOND PLATFORMS AND DEVICES



### LEARNING ENVIRONMENTS AND ENGAGING STUDENTS WITH TECHNOLOGY



### MODES OF COMMUNICATION

# Examples from Higher Education: To Explore a Question

## THE FLIPPED CLASSROOM

Turning Traditional Education on Its Head

Many educators are experimenting with the idea of a flipped classroom model. So what is it and why is everyone talking about it?

### WHAT IS THE FLIPPED CLASSROOM?

The flipped classroom inverts traditional teaching methods, delivering instruction online outside of class and moving "homework" into the classroom.

### THE INVERSION

**The Traditional Classroom**  
Teacher's Side: Sage on the Stage

LECTURE TODAY

Homework: "Do this at home"

➔

**The Flipped Classroom**  
Teacher's Side: Guide on the Side

ACTIVITY TODAY

Watch lecture videos at home

### WHAT A FLIPPED CLASSROOM MODEL DOES

- Students watch lectures at home at their own pace, communicating with peers and teachers via online discussions.
- Concept engagement takes place in the classroom with the help of the instructor.

### A THEORETICAL FRAMEWORK

Educational technology and activity learning are two key components of the flipped classroom model. They both influence student learning environments in fundamental ways.

```

    graph TD
      ET(Educational Technology) -- uses --> CF(Classroom Flip)
      CF -- provides opportunity for --> LA(Learning Through Activity)
      LA -- influences --> LE(The Learning Environment)
      LE -- influences --> ET
  
```

### HOW IT CAME TO BE

Many factors influenced the creation and adoption of the flipped classroom model. However, two specific innovators played a key role.

### ITS INFANCY

2007: Teachers Jonathan Bergman and Aaron Samms at Woodland Park High School in Woodland Park, CO discovered software to record PowerPoint presentations.

They recorded and posted their live lectures online for students who missed class.

THE FLIPPED CLASSROOM

Bergman and Samms were asked to speak to teachers around the country about their methods.

The online lectures started spreading.

Teachers began using online videos and video podcasts to teach students outside class, reserving class time for collaborative work and concept mastery exercises.

### WHAT'S DRIVING IT?

Two key factors are driving increased adoption of the flipped classroom model.

#### POOR LEARNING OUTCOMES

The traditional one-size-fits-all model of education often results in limited concept engagement and severe consequences.

Yearly High School Dropouts

69% graduate 31% don't

Only 69% of students who start high school finish four years later.

7,200 each day 1.3 million a year

An average of 7,200 students DROP OUT of high school each day, totalling 1.3 million a year.

#### PREVALENCE OF ONLINE VIDEO

The availability of online video and increasing student access to technology has paved the way for flipped classroom models.

Adults Who Have Viewed an Online Educational Video

2007 18% of Internet Users

2010 30% of Internet Users

+2,400 online video lessons in Khan Academy

## THE GAMIFICATION OF EDUCATION

Gamification has tremendous potential in the education space. How can we use it to improve student learning and engagement?

"Game players regularly exhibit persistence, risk-taking, attention to detail, and problem-solving, all behaviors that ideally would be regularly demonstrated in school." —The Education Arcade at MIT

### 1.2 MILLION STUDENTS

In the U.S. 64% to graduate from high school every year. According to Pew Research Center at Columbia University, the default environment of school often results in predictable outcomes such as disengagement, cheating, learned helplessness, and dropping out.

### 28 OVER 5

million people harvest their session every 2 day.

million play an average of 45 hours a week of games.

As a planet, we spend 3 billion hours a week playing video and computer games.

### What elements of gaming can we harness for educational purposes?

#### PROGRESSION

See success visualized incrementally

- Levels:** Ramp up and unlock content.
- Points:** Increase the running numerical value of your work.

#### INVESTMENT

Feel pride in your work in the game

- Achievements:** Earn badge recognition for completing work.
- Collaboration:** Work with others to accomplish goals.
- Vitality:** Be incentivized to involve others.
- Appointments:** Check in to receive new challenges.
- Self-Meaning:** Work to achieve something sublime or transcendent.

#### CASCADING INFORMATION THEORY

Unlock information continuously

- Bonuses:** Receive unexpected rewards.
- Discovery:** Navigate through color, text, and sound to discover pockets of knowledge.
- Infinite Play:** Learn become an expert.
- Countdown:** Tackle challenges in a limited amount of time.
- Loss Aversion:** Play to avoid losing what you have gained.
- Synthesis:** Work on challenges that require multiple skills to solve.

### According to the MIT paper, "Moving Learning Games Forward," games in schools today can be used as...

<b>Authoring Platforms:</b> Game is used to produce an artifact, be it another game, a model, visual text, or written text.	<b>Ex:</b> Students produce a model in <i>StarCraft</i> .
<b>Content Systems:</b> Games deliver content about a particular subject area.	<b>Ex:</b> Students gain knowledge of Caribbean history by playing <i>Pirates</i> .
<b>Simulations:</b> Students use games to test theories about systems and tinker with variables.	<b>Ex:</b> Students gain a systematic understanding of ecosystems by playing <i>SimCity</i> .
<b>Triggers:</b> Games are used as a jumping point for discussion.	<b>Ex:</b> <i>CrashGame &amp; Progress</i> is used to explore probability.
<b>Technology Gateways:</b> Students use games to familiarize themselves with technology.	<b>Ex:</b> Instead of taking a class on how to use PCs or mobile devices, students simply engage in their favorite game.
<b>Examples of Point of View:</b> Games allow students to take on different identities.	<b>Ex:</b> Students learn to think like a city mayor in <i>SimCity</i> .
<b>Documentary:</b> Students use games to document their learning process and reflect on it.	<b>Ex:</b> Students reflect on their playing to recognize patterns in their own performance and decision-making.
<b>Tools to be Critiqued:</b> Students critique the ideology behind the game.	<b>Ex:</b> <i>Animal Crossing</i> is analyzed as an expression of late 20th century capitalism.
<b>Research Assignments:</b> Students design games themselves and in doing so, research the subject matter of the game.	<b>Ex:</b> Students decide to make a game about the Great Depression and learn history in the process.

### A Short History of Gamified Learning

EMERGENCE OF CHILDREN'S SOFTWARE INDUSTRY IN THE '80S

1980s: *German Shepherd*, *The Legend of Zelda*, *Shuttle Rescue*, *Teaches Typing*

1990s: *Aladdin*, *Aladdin*, *Aladdin*

2000s: *Excitement*

2010s: *Virtual Worlds* (e.g. Second Life), *Virtual worlds (learning platform)*

EMERGING GAMIFICATION OF EDUCATIONAL GAMES IN THE LATE '90S

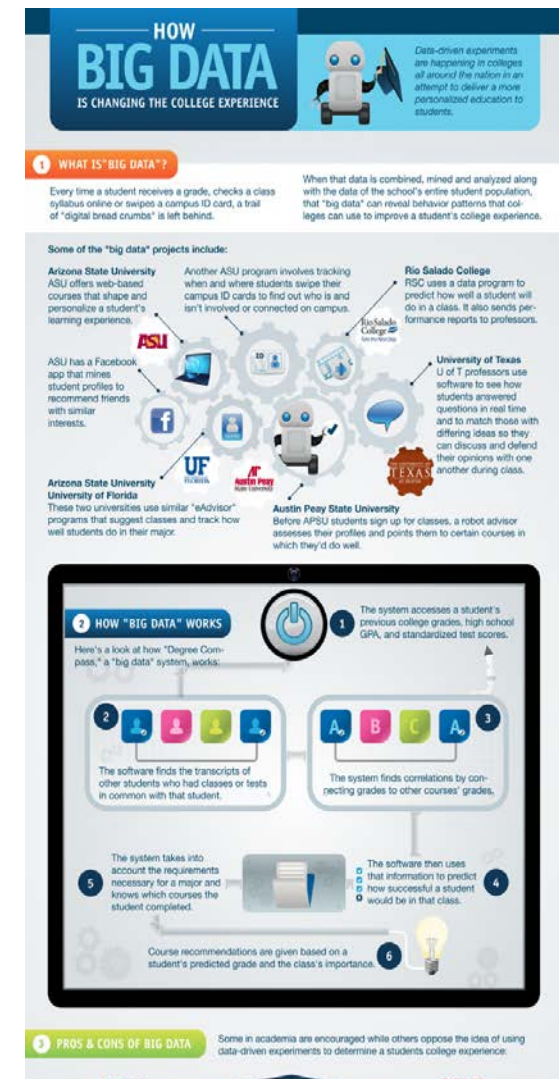
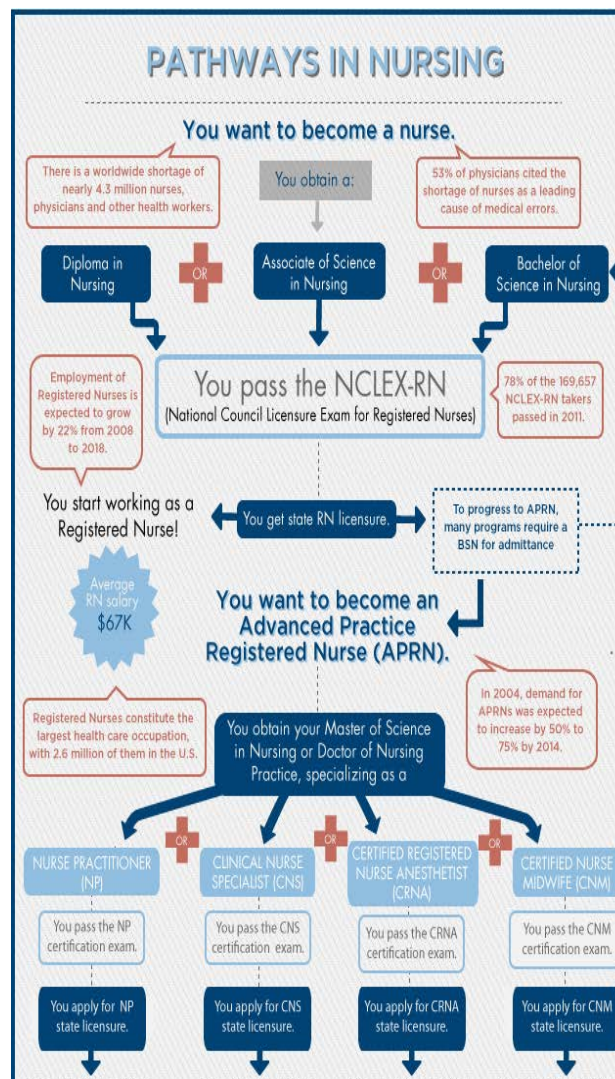
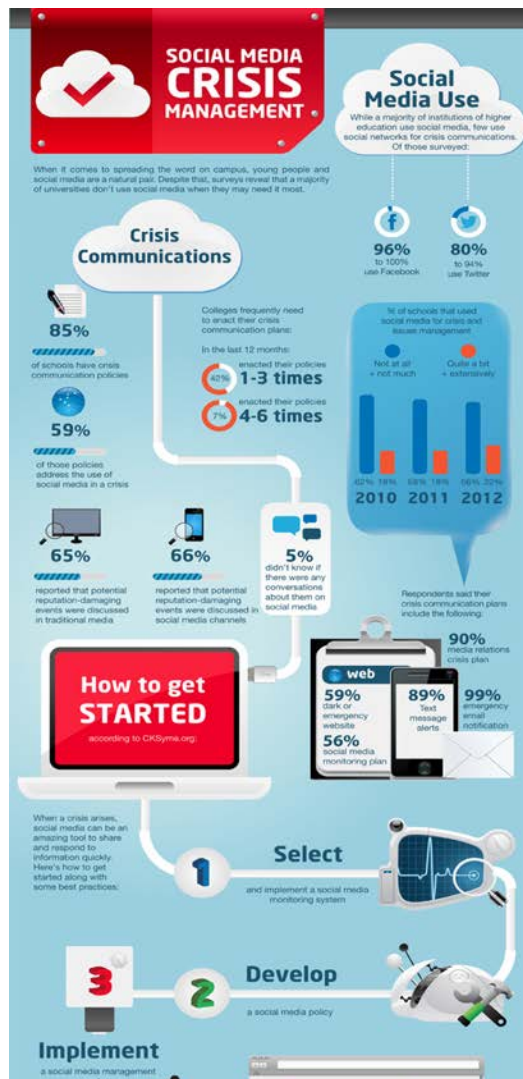
2000s: *Excitement*

2010s: *Excitement*

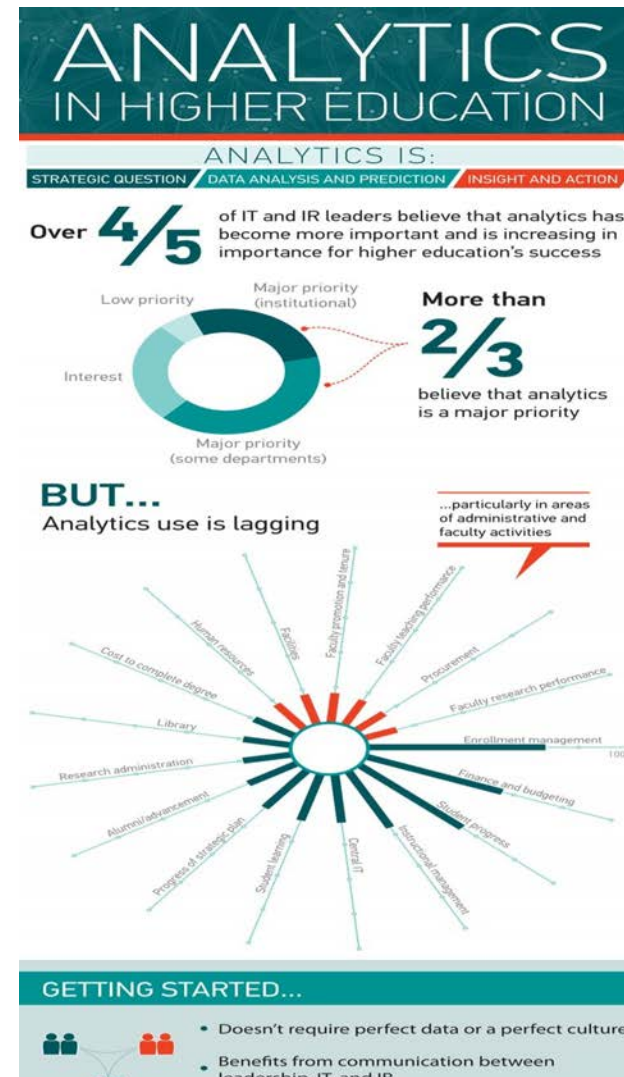
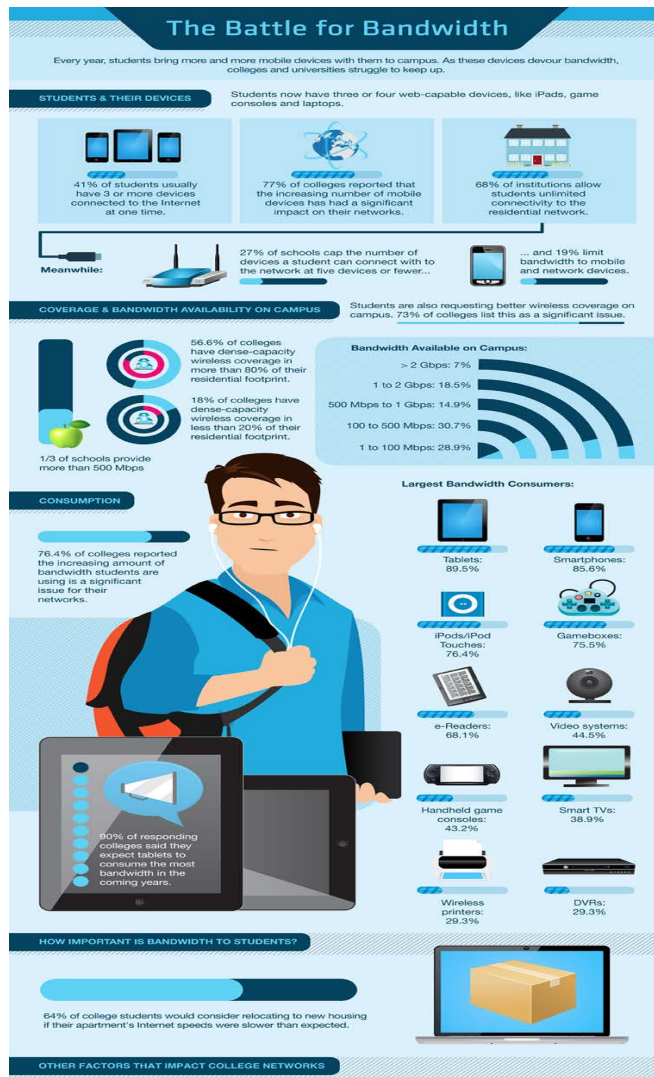
2020s: *Excitement*



# Examples from Higher Education: Processes and Pathways

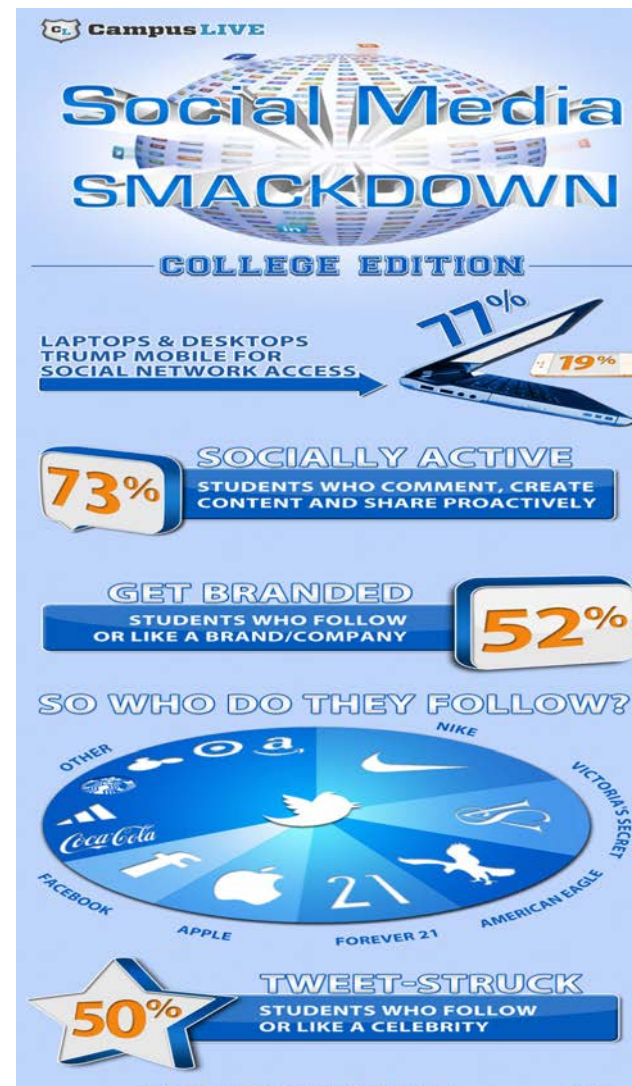
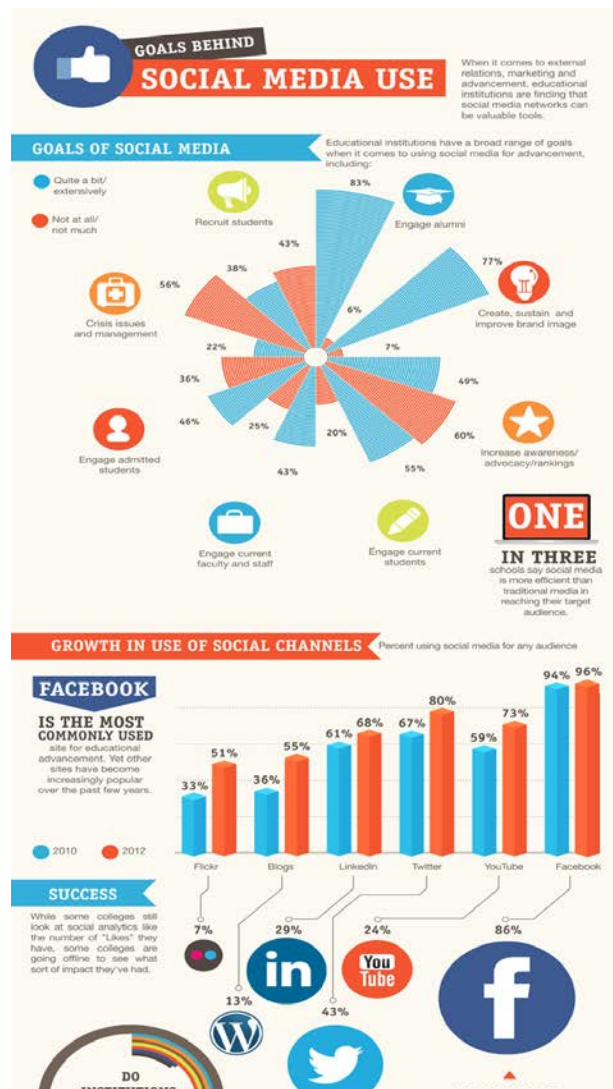


# Examples from Higher Education: Ideas/Concepts/Thought Leadership

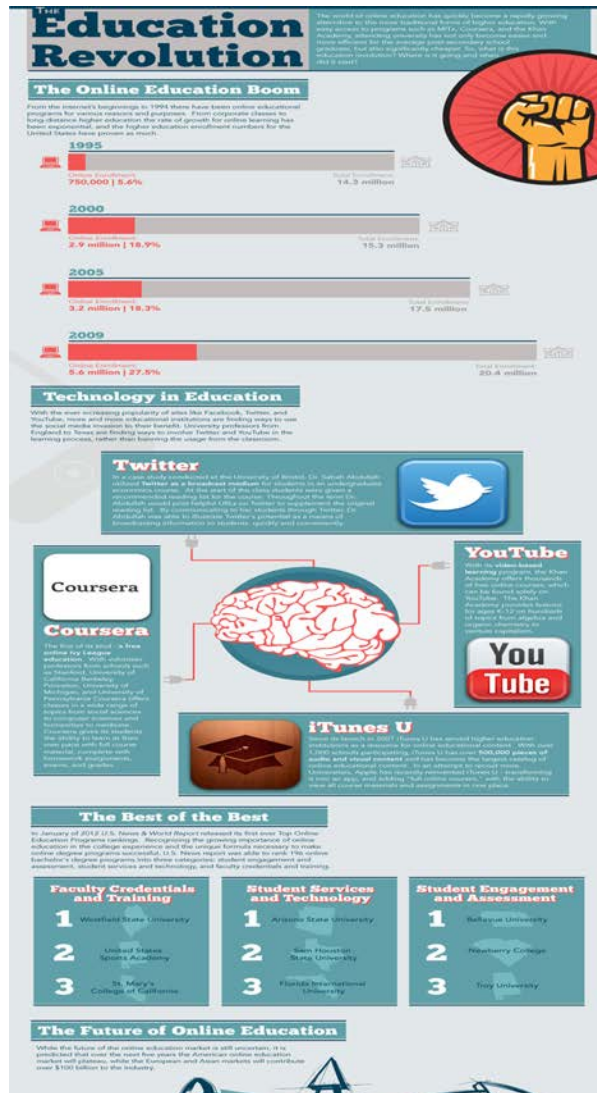




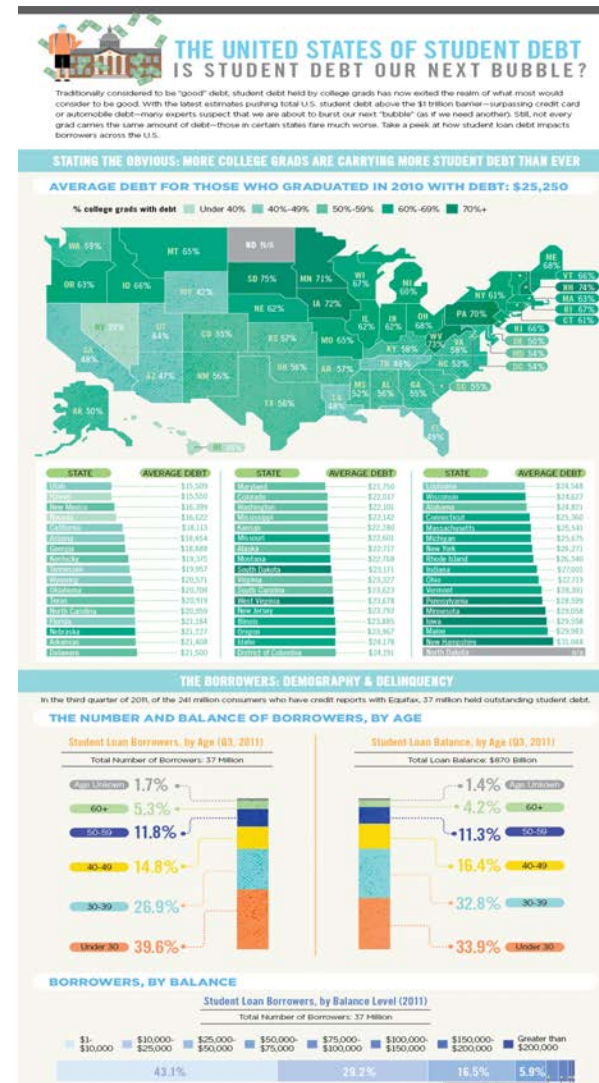
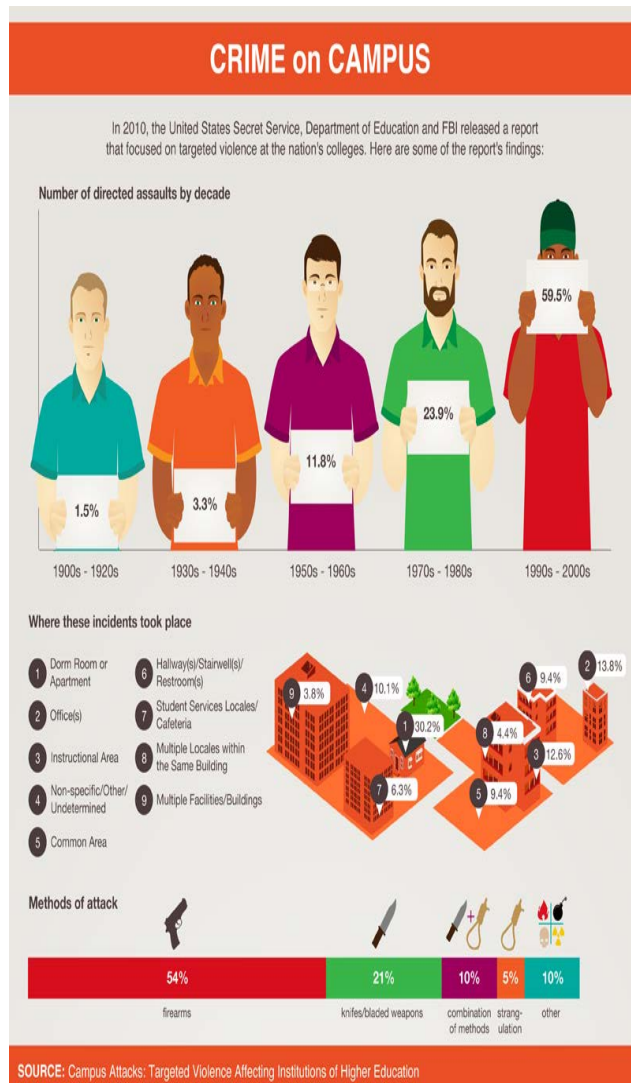
# Examples from Higher Education: Relationships/Patterns of Behavior



# Examples from Higher Education: Student Profiles/Peer Comparisons

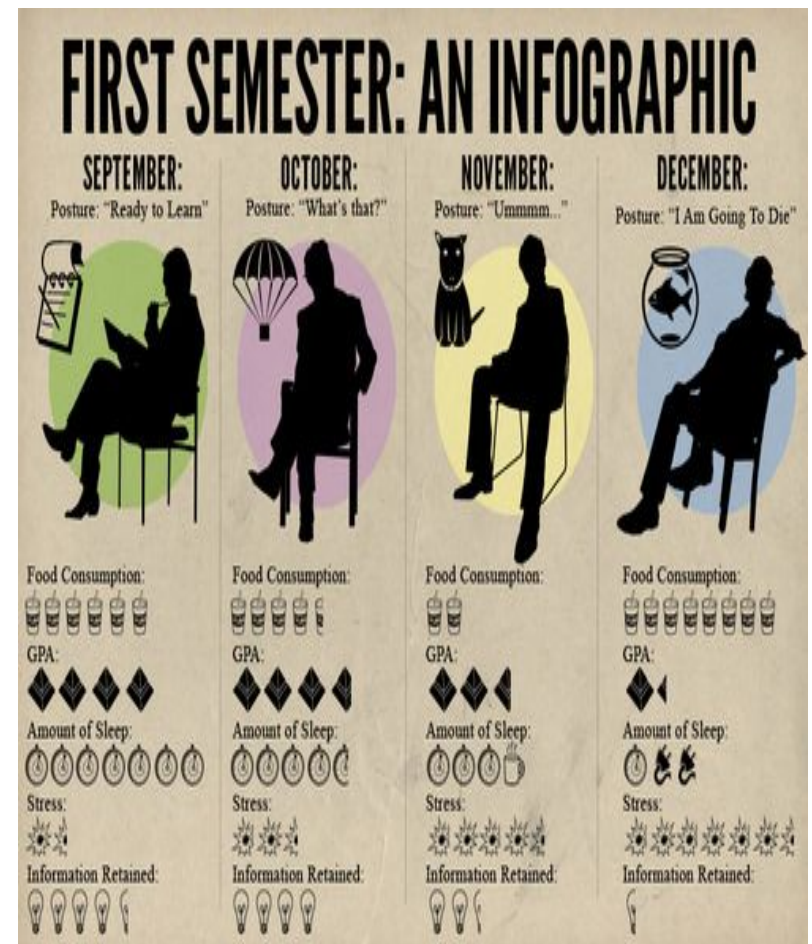
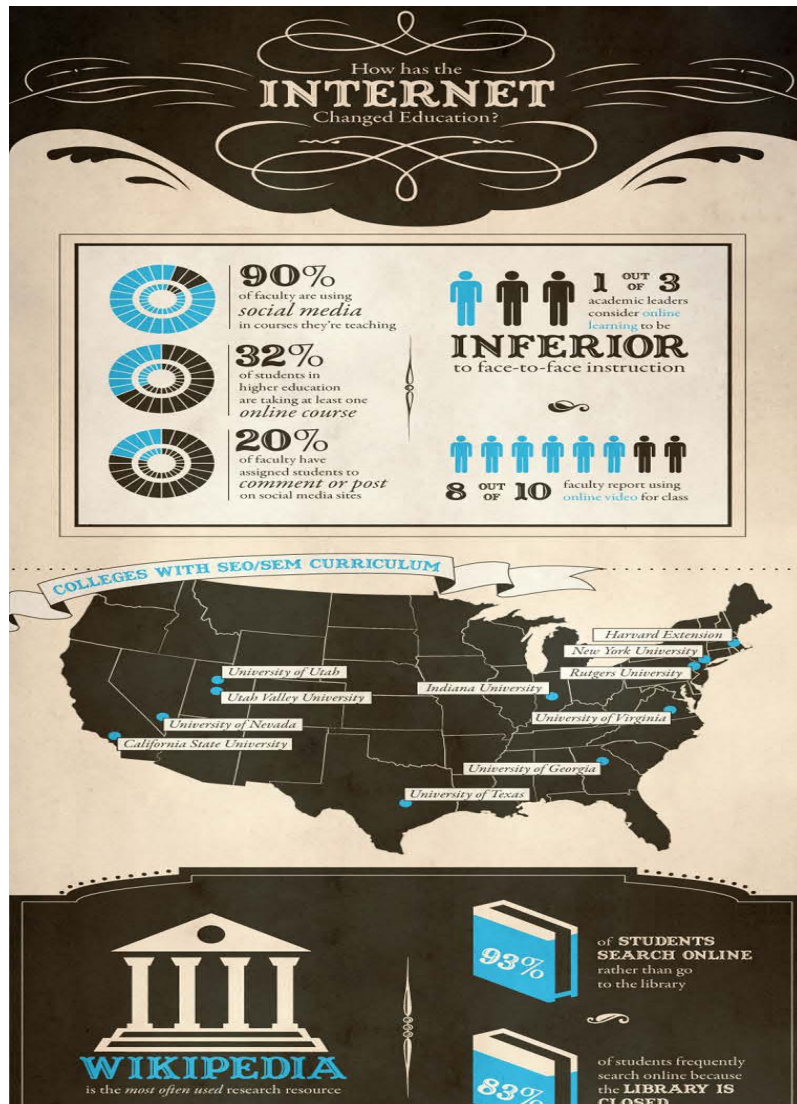


# Examples from Higher Education: Geographical

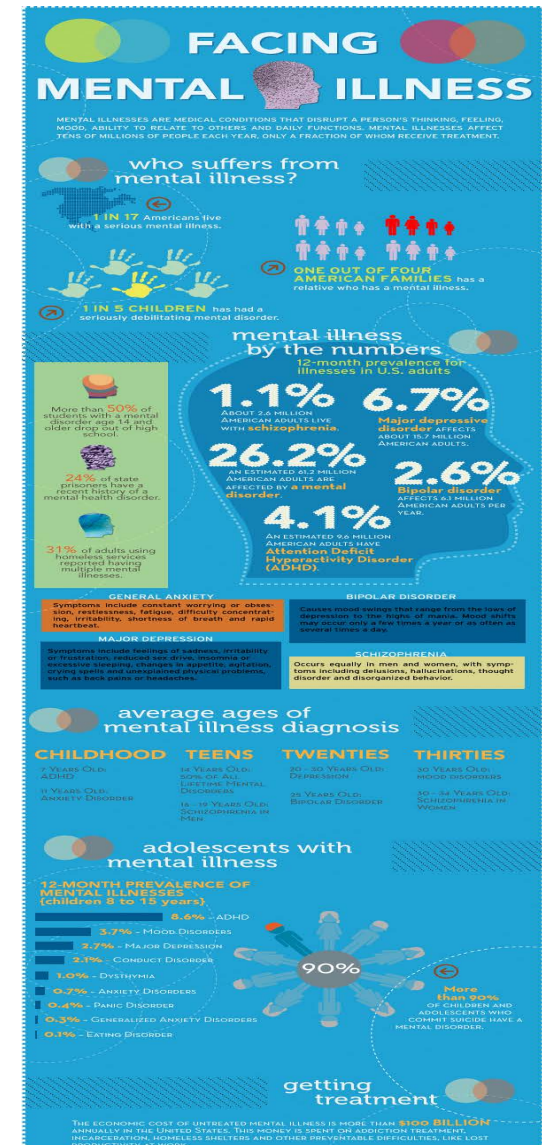
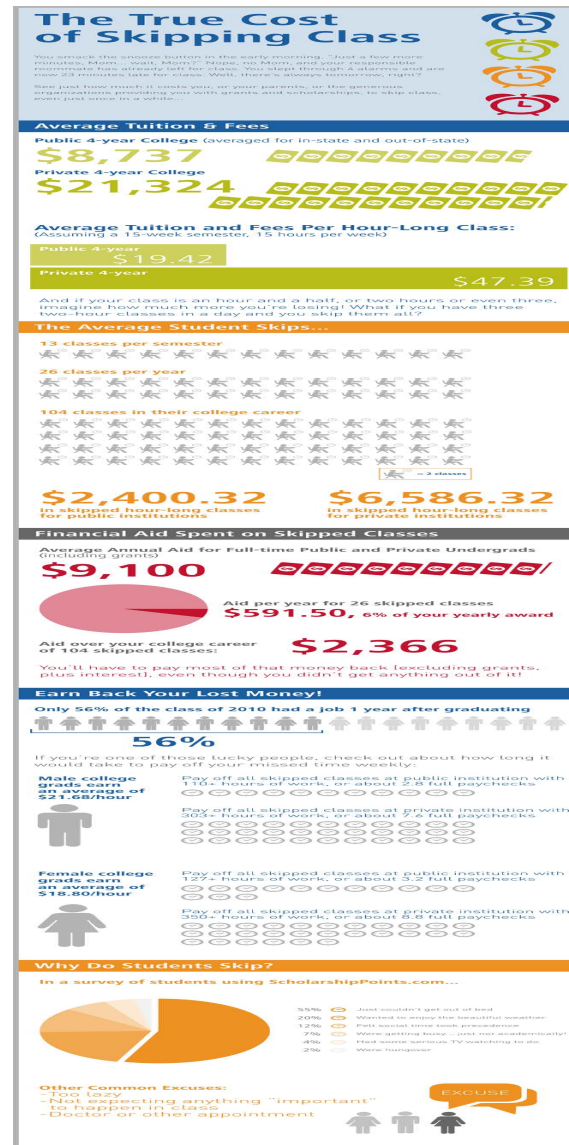




# Examples from Higher Education: Chronology (History, Timeline, Schedules)



# Examples from Higher Education: Education





# Just for Fun

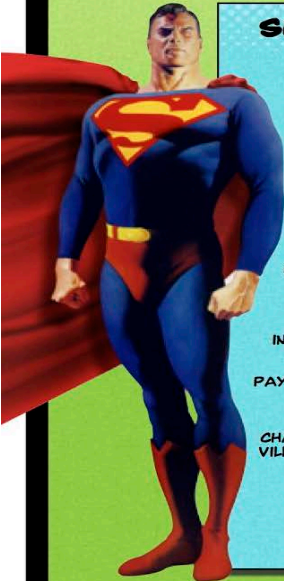
**Why Student Affairs Professionals are REALLY**

## **SUPERHEROES**

ISSUE 1


OUR ORIGIN STORY BEGINS WITH A STUDENT HAVING ENORMOUS POTENTIAL. IN TIME & WITH MENTORSHIP THIS STUDENT WILL COME TO RECOGNIZE THEIR POWER. WITH GREAT POWER COMES GREAT RESPONSIBILITY, AND THUS, THE STUDENT AFFAIRS PROFESSIONAL WAS BORN...

**IN DISGUISE!**



**SUPERHEROES**

- DEDICATED TO CIVIC DEVELOPMENT
- USES REGULAR CLOTHES TO ESCAPE FROM HERO DUTIES
- WEAKENED BY KRYPTONITE OR SUPER VILLAIN
- BATTLES ARCHENEMY TO AVERT DISASTER
- CAN BE MISTAKEN AS A VIGILANTE DUE TO BROODY/MYSTERIOUS PERSONA
- IN TOUCH WITH MULTIPLE IDENTITIES
- PAYS MORE ATTENTION TO CRIME FIGHTING THAN LEGAL OUTCOMES
- CHALLENGES & SUPPORTS VILLAINS TO SEE A WORLD WITHOUT THEM
- ORIGIN OFTEN OTHERWORLDLY: KRYPTON OR RADIOACTIVE: SPIDERS



**SA PROS**

- DEDICATED TO STUDENT DEVELOPMENT
- USES DRESS CLOTHES TO NOT BE MISTAKEN AS A STUDENT
- WEAKENED BY DISMISSIVE FACULTY & HELICOPTER PARENTS
- BATTLES APATHY, ALCOHOL & ATTITUDES
- CAN BE MISTAKEN AS VIGILANTE DUE TO OVERZEALOUS ENFORCEMENT OF POLICY
- IN TOUCH WITH MULTIPLE IDENTITY THEORIES
- PAYS MORE ATTENTION TO PROGRAMMING THAN ASSESSMENT OUTCOMES
- CHALLENGES & SUPPORTS STUDENTS TO SEE A NEW WORLD VIEW
- ORIGIN OFTEN OTHERWORLDLY: CALIFORNIA, OR RADIOACTIVE: NEW JERSEY

**Student Affairs Professionals** **IN ACTION**

THE SOUND OF "BREAKING THE ICE" **CRASH!**

THE SOUND OF BROKEN DREAMS OF BECOMING A MILLIONAIRE **POP!**

# Why Infographics Work

- Convey a lot of information in a small space
- Easy to digest
- Shareable (and trackable)
- Aesthetically interesting

# Why You Should Give It a Try

- Challenge yourself to engage with your data in new and different ways
- Learn new skills
- Identify new insights
- Set yourself apart from your peers

# Getting Started: Plan Your Work

- **Identify your purpose**
  - What goals do you hope to achieve by visually communicating your data?
- **Identify and understand your audience**
  - Who are the infographics for? Parents? Students? Broader Community?
- **Identify your reporting objectives and outcomes**
  - What do you need to communicate?
  - How often, on what timeline?
  - What do you expect for your ROI?
  - How will you know you were effective?

# Getting Started: Get Inspired

(But, be a critical consumer...not all you find will be good examples)

**Pinterest:** Infographic

**Twitter:** #infographic

## **Blogs/Websites:**

- [coolinfographics.com](http://coolinfographics.com)
- [dailyinfographic.com](http://dailyinfographic.com)
- [edtechmagazine.com/higher](http://edtechmagazine.com/higher)
- [flowingdata.com](http://flowingdata.com)
- [good.is/infogrphics](http://good.is/infogrphics)
- [chartporn.org](http://chartporn.org)
- [infographicsshowcase.com](http://infographicsshowcase.com)
- [pdviz.com/blog](http://pdviz.com/blog)

# Getting Started: Data Synthesis

- Understand your data
- Start simple
  - Think about ways that you can take existing charts and graphs to the next level
  - Add additional layers to explore your story
  - Adhere to the analytical design principles
- Record and distill your thoughts
- Synthesize, synthesize, synthesize
- Create a concept map (paper and pencil)



# Getting Started: The Right Tools

## **Software**

Excel, Google Analytics, Facebook Insights

Pages (Mac)

Photoshop

InDesign/Adobe Illustrator

Microsoft Publisher

## **Visualization tools:**

Campus Labs – Baseline ([campuslabs.com](http://campuslabs.com))

Chartle ([chartle.net](http://chartle.net))

Tableau ([tableausoftware.com](http://tableausoftware.com))

Wordle ([wordle.net](http://wordle.net))

Visual.ly ([visual.ly](http://visual.ly))

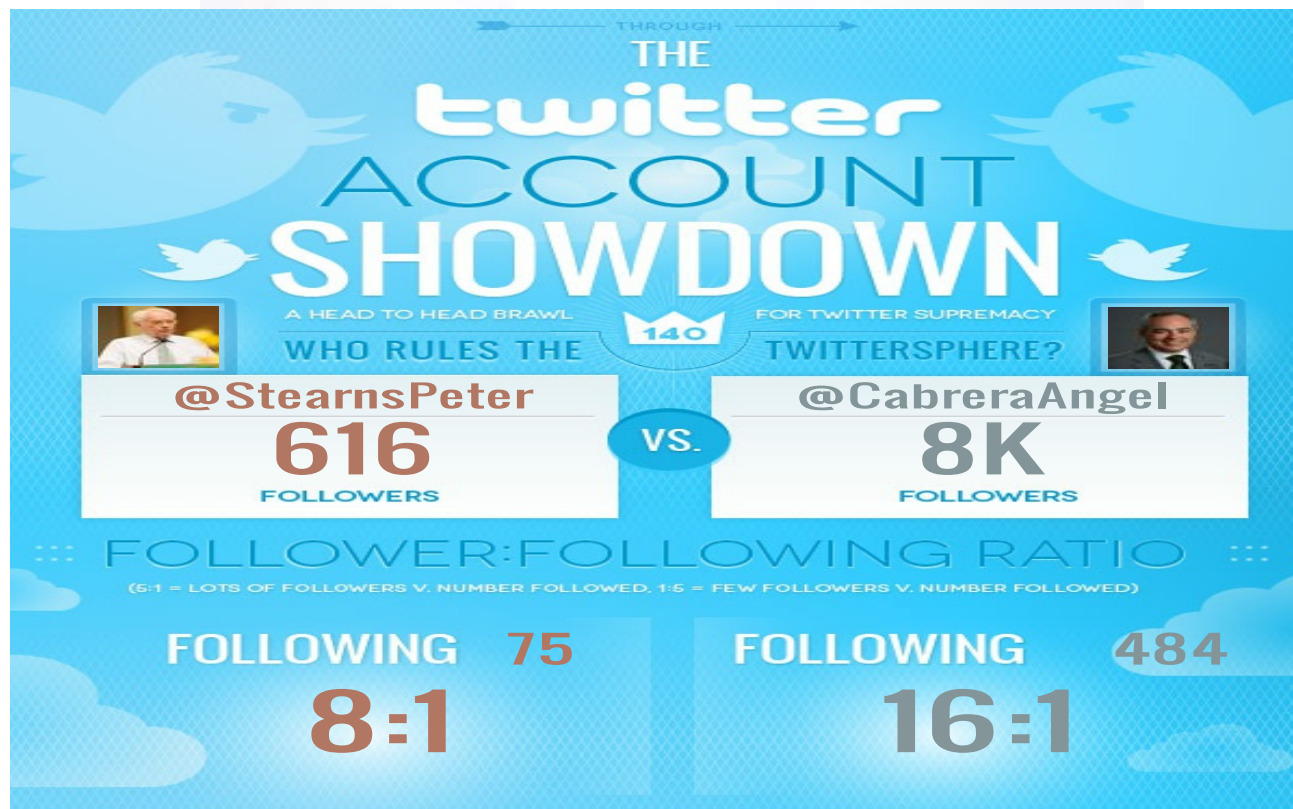
The Noun Project ([thenounproject.com](http://thenounproject.com))

Open Clipart ([openclipart.org](http://openclipart.org))

# Getting Started: Try It Out



Seeing is believing.

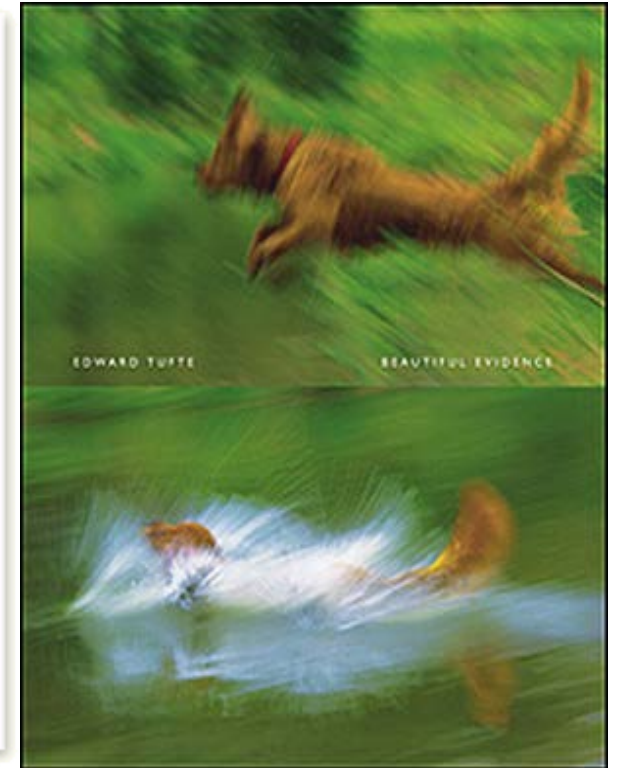
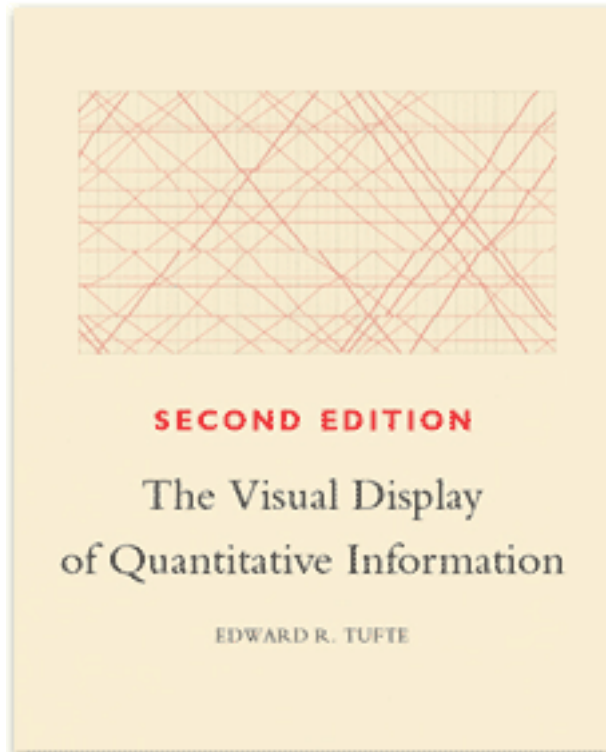


# Additional Resources: Try a MOOC

- Knight Center – Introduction to Infographics and Data Visualization

# Additional Resources: Further Reading

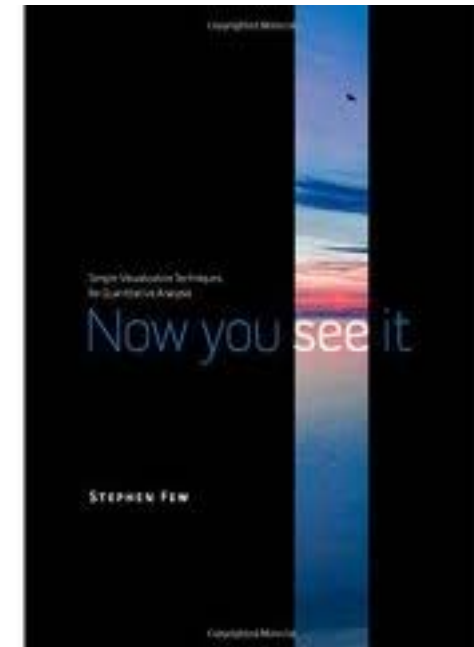
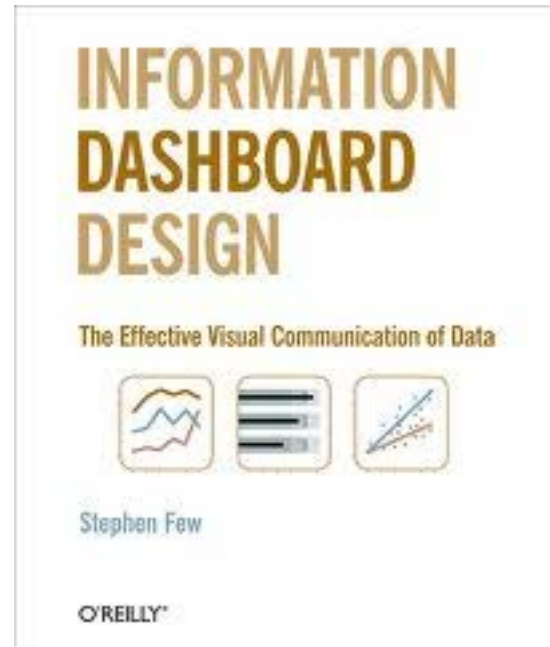
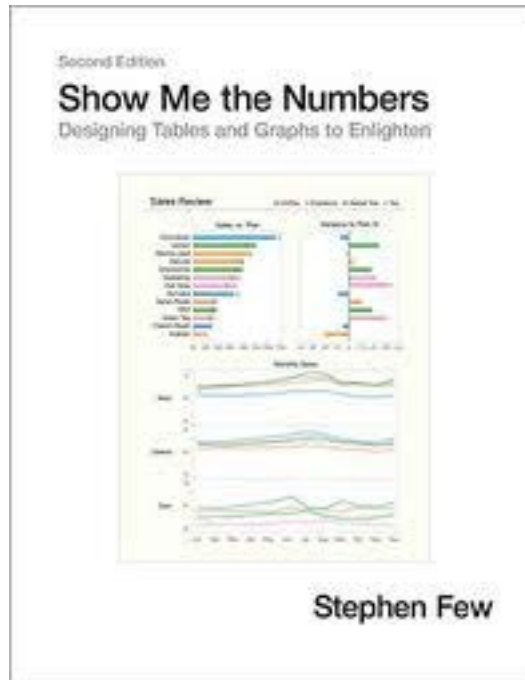
Edward Tufte ([www.edwardtufte.com](http://www.edwardtufte.com))



January 11, 2012

# Additional Resources: Further Reading

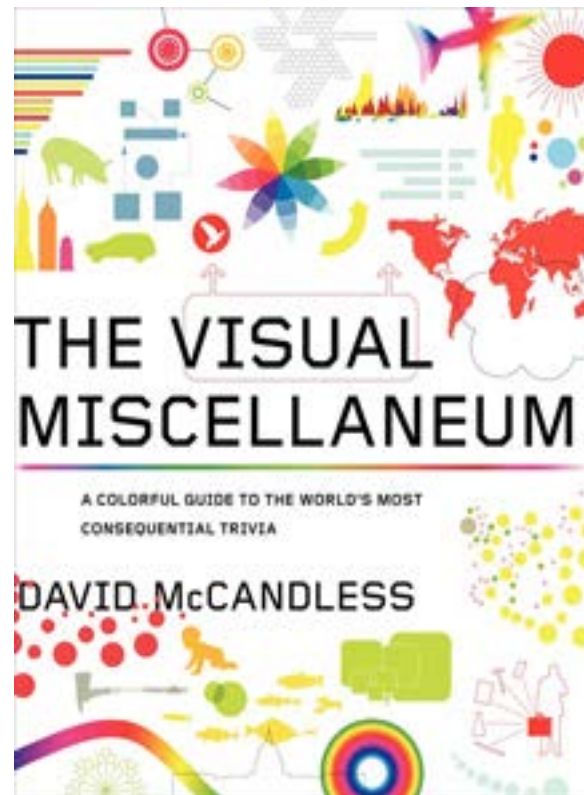
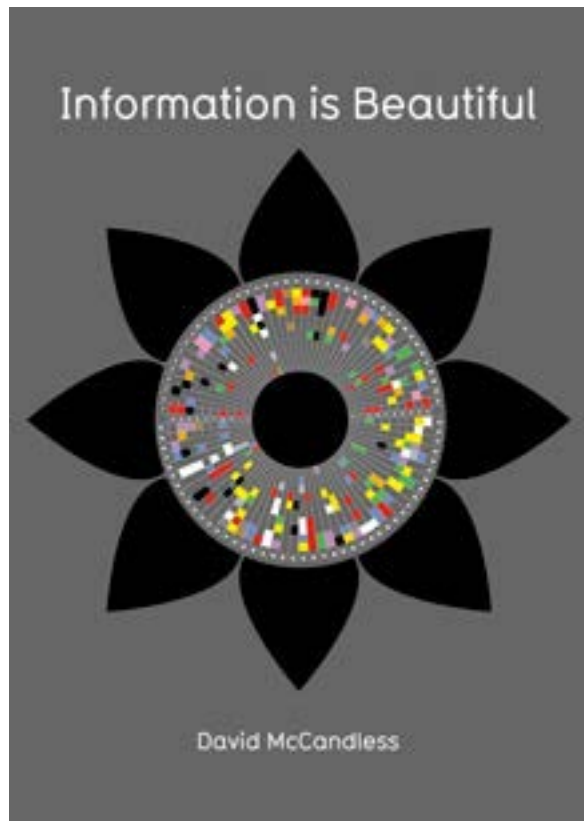
Stephen Few ([www.perceptualedge.com](http://www.perceptualedge.com))



## Additional Resources: Further Reading

(Note: Nice pictures but many visualizations lack necessary details)

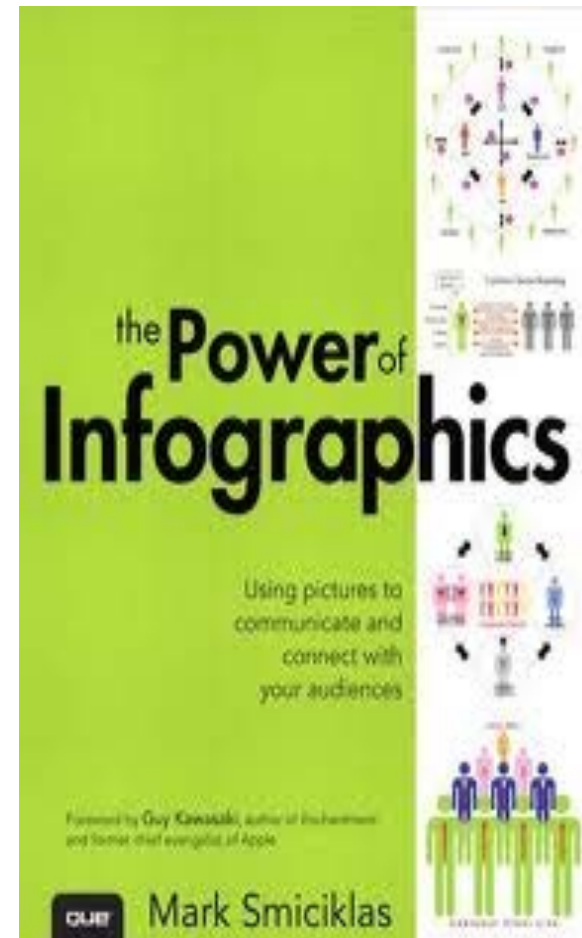
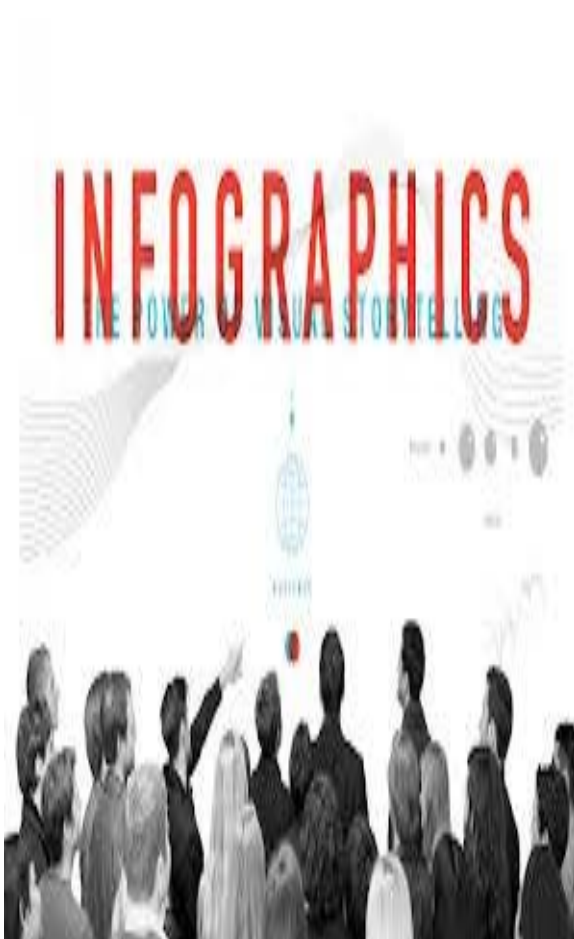
David McCandless ([www.davidmccandless.com](http://www.davidmccandless.com))



January 11, 2012



# Additional Resources: Further Reading



January 11, 2012

# Want to learn more?

- We are thinking of creating a community of learners who are interested in developing knowledge/skills in this area. If you are interested, please contact:

Ashley Sieman

[asieman@gmu.edu](mailto:asieman@gmu.edu)

703-993-4081



# References

Tufte, E.R. (2006). *Beautiful evidence*. Cheshire, CT: Graphics Press LLC.

Smiciklas, M. (2012). *The power of infographics: Using pictures to communicate and connect with your audience*. Indianapolis, IN: QUE.

Lankow, J., Ritchie, J., Crooks, R. (2012). *Infographics: The power of visual storytelling*. Hoboken, NJ: John Wiley & Sons, Inc.

# Infographic Links

- Educated and Employed:  
<http://www.edtechmagazine.com/higher/sites/edtechmagazine.com.higher/files/uploads/12.01.png>
- Creativity and Education:  
[http://media.dexigner.com/article/23057/Creativity\\_and\\_Education\\_Infographic.jpg](http://media.dexigner.com/article/23057/Creativity_and_Education_Infographic.jpg)
- Students and Technology:  
<http://www.edtechmagazine.com/higher/article/2012/10/how-technology-powering-academic-success-infographic>
- The Flipped Classroom:  
<http://www.edtechmagazine.com/higher/article/2012/07/can-flipped-classroom-model-work-higher-education-infographic>
- Gamification of Education:  
<http://www.edtechmagazine.com/higher/article/2012/11/where-does-gamification-fit-higher-education-infographic>
- Social Media Crisis Management:  
<http://www.business2community.com/social-media/social-media-crisis-management-infographics-worth-your-attention-0315203>
- Pathways in Nursing: <http://nursinglicensemap.com/pathways-in-nursing-infographic/>
- How Big Data is Personalizing the College Experience:  
<http://www.edtechmagazine.com/higher/article/2012/09/how-big-data-personalizing-college-experience-infographic>
- Battle for Bandwidth: <http://www.onlinecolleges.net/2012/08/01/the-battle-for-bandwidth/>
- Analytics in Higher Education:  
<http://www.edtechmagazine.com/higher/article/2012/11/evolving-role-analytics-higher-education-infographic/>

# Infographic Links

- How Colleges are Using Social Media:  
<http://www.edtechmagazine.com/higher/article/2012/10/how-schools-actually-use-social-media-infographic>
- Social Media Smackdown:  
[http://www.huffingtonpost.com/2012/06/08/infographic-college-students-twitter-use\\_n\\_1581344.html](http://www.huffingtonpost.com/2012/06/08/infographic-college-students-twitter-use_n_1581344.html)
- Online Education Revolution:  
<http://www.edtechmagazine.com/higher/article/2012/08/online-education-revolution-infographic>
- Profile of an Online College Student:  
<http://www.edtechmagazine.com/higher/article/2012/12/closer-look-online-college-student-infographic>
- Crime on Campus: <http://www.infographs.org/2012/06/crime-on-campus-infographic/>
- The United States of Student Debt:  
<http://www.mint.com/blog/trends/infographic-the-united-states-of-student-debt-042012/>
- How the Internet Changed Education:  
<http://www.coolinfographics.com/blog/2012/5/7/how-has-internet-changed-education.html>
- First Semester: <http://iwastesomuchtime.com/on/?i=16588>
- What You Wish You'd Known Before Your Job Interview:  
<http://visual.ly/what-you-wish-you-d-known-your-job-interview>
- The True Cost of Skipping Class:  
<http://www.studentscholarshipsearch.com/tips/cost-of-skipping-class.php>
- Facing Mental Illness: <http://msw.usc.edu/mswusc-blog/facing-mental-illness-infographic/>
- Student Affairs Superheroes:  
<http://sawomentalktech.com/blog/2012/02/07/infographic-why-sapros-are-really-superheroes-in-disguise-saheroes/>