1. understand the context for the need to communicate:

   - who are you trying to communicate to? be specific (do they trust you as an expert? or do you also need to establish credibility when you write? will they need to use your work to prove things to others?)

   - what do you need them to know/do?
     "This can be an uncomfortable space for many. Often, this discomfort seems to be driven by the belief that the audience knows better than the presenter and therefore should choose whether and how to act on the information presented. This assumption is false. If you are the one analyzing and communicating the data, *you* likely know it best ... In general, those communicating with data need to take a more confident stance when it comes to making specific observations and recommendations based on their analysis." pg 22-23

   - how will the data help you do this?
     "You might assume that showing only the data that backs up your point and ignoring the rest will make for a stronger case. I do not recommend this. Beyond being misleading by painting a one-sided story, this is very risky. A discerning audience will poke holes in a story that doesn't hold up or data that shows one aspect but ignores the rest. The right amount of content and supporting and opposing data will vary depending on the situation, the level of trust you have with your audience, and other factors." pg 27

   Useful questions (pg 29):

   - What background information is relevant or essential?

   - Who is the audience or decision maker? What do we know about them?

   - What biases does our audience have that might make them supportive of or resistant to our message?

   - What data is available that would strengthen our case? Is our audience familiar with this data, or is it new?

   - Where are the risks: what factors could weaken our case and do we need to proactively address them?

   - What would a successful outcome look like?

   - If you only had a limited amount of time or a single sentence to tell your audience what they need to know, what would you say?

   Goal: conciseness = clarity in thinking ... better product sooner

   "When it comes to explanatory analysis, being able to concisely articulate exactly who you want to communicate to and what you want to convey before you start to build content reduces iterations and helps ensure that the communication you build meets the intended purpose." pg 33

2. choose an appropriate visual display - right tool for the right job

   "If you're wondering *What is the right graph for my situation?*, the answer is always the same: whatever will be easiest for your audience to read." pg 69

   - simple text: just a number or two

   - tables: when we want to read the data (across rows or down columns) ... use borders (and empty space) to improve legibility (only use it if it helps)

   - heatmap: table with color coding (darker is more, lighter is less); conditional formatting in Excel

   - scatterplot: show a relationship between two things

   - line graphs: plot continuous data (values changing over a range of values)

   - bar graphs:

     "Sometimes bar charts are avoided because they are common. This is a mistake. Rather, bar charts should be leveraged because *they are common*, as this means less of a learning curve for your audience." pg 50

     "Note that, because of how our eyes compare the relative end points of the bars, it is important that bar charts always have a zero baseline (where the x-axis crosses the y-axis at zero), otherwise you get a false visual comparison." pg 50

     "But what if changing the scale on a bar chart or otherwise manipulating the data better reinforces the point you want to make? Misleading in this manner by inaccurately visualizing data is not OK. Beyond ethical concerns, it is risky territory. All it takes is one discerning audience member to notice the issue ... and your entire argument will be thrown out the window, along with your credibility." pg 53

     - vertical: standard, add multiple series (careful too many series can make reading the graph hard)

     - horizontal: especially when the names are longs

     - stacked bar charts: use only when you've clearly identified that they are the most valuable

     ** make sure to order the categories strategically - either a natural ordering, or ordering based on the data values

   - to be avoided

     - pie charts: "pie charts are evil" pg 61 - only the experts can easily compare portions (who really has the bigger piece?)

     - 3-D: "perspective" skews values compared to labels making it hard to read, pg 65

3. eliminate clutter - you require your audience to think about every single mark you put of your page, only add stuff that improves communication

   - remove anything from graphs that doesn't contribute information (borders, background colors, gridlines?)

   - "When design is thoughtful, it fades into the background so that your audience doesn't even notice it. When it's not, however, your audience feels the burden." pg 81

   - make strategic use of white space (it can emphasize where there is text/graphics), try to keep things lined up, use contrast to emphasize what is really important to your audience

4. focus attention where you want it - use size, color, and position to direct your audience's attention and to provide a hierarchy of importance (not everything is equally important)

   - assume your audience can retain no more that 4 things in short term memory

   - use size, color, position sparingly (otherwise it defeats the purpose)

   - don't use color just to be colorful (or because that's what Excel defaulted to ...) - avoid color blind problems (blues are a good choice, reds/greens not so much) - shades of the same color maybe better than a bunch of different colors

   - don't change a visual style just "for variety" - consistency is easier to read

5. think like a designer - "(1) highlight the important stuff, (2) eliminate distractions, and (3) create a clear hierarchy of information" pg 129

   - make it legible - consistent, easy-to-read font

   - keep it clean

   - use straightforward language - avoid jargon and complex words, don't use 10 words when 5 will do

   - remove unnecessary complexity - simpler is always better

   Text is essential - every chart/graph needs a title, both axis need titles - "Don't assume that two different people looking at the same data visualization will draw the same conclusion." pg 141 - tell them in words what to conclude

6. tell a story - "Keep it simple. Edit ruthlessly. Be authentic. Don't communicate for yourself- communicate for your audience." pg 170-171

   "The most beautiful data visualization runs the risk of falling flat without a compelling narrative to go with it." pg 175