Writing in Computer Science
CSE 597-3, Fall 2021

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Lecture 8
Introduction and Conclusion
Based on:
Williams and Bizup, *Style: The Basics of Clarity and Grace (5th ed)*, Ch 6
Schimel, *Writing Science*, Ch 3-6
Heath and Heath, *Made to Stick*

Sticky ideas: SUCCES

Heath and Heath, *Made to Stick*, 2007, Schimel Ch 3

- Six elements to an idea's SUCCES
  - Simple
  - Unexpected
  - Concrete
  - Credible
  - Emotional
  - Stories

Simple

- Some ideas that are simple
  - "Build the wall"
  - "$E = mc^2$"
  - Your paper
    - "We develop an algorithm to solve X and an evaluation framework for Y "
    - "We develop an algorithm to solve X"
- Simple but simplistic
  - $E = mc^2$ vs. "Build the wall"

Sticky stories: SUCCES

Heath and Heath, *Made to Stick*, 2007

Unexpected

- Try to identify and highlight what about your work is unexpected
- Highlight a knowledge gap or a method gap that your work closes
  - e.g. It is important to have a method that does X, but most people expect that such a method would be too slow to be of use. In this paper, we develop a method for X and show that it turns out to be fast enough for most applications.

Concrete

- Give concrete examples rather than just abstractions.
  - Our method X is an improvement over some previous methods.
  - For example, we ran X and found 56 percent improvement over method Z on dataset Y.

Credible

- Ground your ideas in previous work, with citations.
- Describe your methods clearly

Emotional

- Yes, even in CSE
- Curiosity!
- Ask a novel/engaging question
- This can get you over the top when competing with other good ideas

Stories

- A narrative is important

Recap: your reader

Your reader categories, roughly:

- Dedicated readers
  - Reading in detail and giving as much effort as necessary
  - e.g. a student working on the same problem
- Time-bounded-dedicated readers
  - Interested in the details of the paper...
  - ...but have a fixed time to understand (e.g. 1-2hours)
    - e.g. faculty in your area
- Reviewers
  - Reading carefully but often on a tight schedule
  - Often adversarial
    - Looking for reasons to not like your paper
- Most readers
  - Skimming through rather than reading thoroughly
  - Looking if its a relevant paper to cite
  - Checking if its a paper worth for them to become a dedicated reader.

Most of your readers are not a captive audience

- You need a story to get them interested
- You need to motivate the readers to keep reading, and reading carefully
- You need to meet their expectations about structure and content of paper
  - We already saw this at the level of sentences

Knowing what the reader knows

Schimel Ch 3

- Schemas
  - What prior ideas/frameworks/knowledge the reader brings
  - A simple story takes advantage of existing schemas
    - . . . but then builds on top of that.
- Its crucial to understand your reader's schemas
  - If you assume your readers know something that they don't,
    - they will not understand you
  - If you re-explain things your readers already know,
    - they will be bored and miss the main point.
- Example:
  - Alligator meat is a light-colored, finely textured meat, with very little fat. It cuts easily and is moist if not overcooked. The flavor is mild.
  - Alligator meat tastes like chicken, but a little meatier.

Your paper is a story

Schimel Ch 4, WB Ch 6

- Requires understanding how your work fits into ongoing community effort.
  - This is hard for newcommers — your advisor helps a lot.
  - Need to understand the bigger questions your field is pursuing and how your work connects to them.
- Do not think of it as writing about a topic and passing on information that interests you.
  - When college students go out to relax on the weekend, many now "binge," downing several alcoholic drinks quickly until they are drunk or even pass out. It is a behavior that has been spreading through colleges and universities across the country, especially at large state universities. It once was done mostly by men, but now even women binge. It has drawn the attention of parents, college administrators, and researchers.
  - So what? Who cares that college students drink a lot?
- Instead, think of yourself as solving some problem or meeting some challenge.
  - Explain to your readers why they should care
    - answer their "so what" question.
- Make it sticky – SUCCES

OCAR elements of a story

Schimel Ch 4

- A good story has four components
  - Shared context/Opening
    - Who are the characters?
    - What is relevant previous knowledge?
    - What is the world in which your contribution lives?
  - Statement of problem / Challenge
    - What do your characters need to accomplish?
    - What specific question do you propose to answer?
    - What knowledge or method gap do you propose to address?
  - Statement of solution / Action
    - What is the work that you did to adress the challenge?
  - Resolution (R)
    - How have the characters and their wold changed as a result of the action
    - What did you learn from your work

Mapping OCAR to IMRaD

- Introduction
  - long Opening
  - long Challenge
  - short Action
- Methods/Results
  - Very Long Action
- Discussion/Conclusion
  - short Challenge
  - short Action
  - long Resolution

The three parts of an introduction

WB Ch 6

- A good intro usually has three parts
  - Shared context/Opening
  - Statement of problem / Challenge
  - Statement of solution / Action
- A condensed example
  - Alcohol has been a big part of college life for hundreds of years. From football weekends to fraternity parties, college students drink and often drink hard. But a new kind of drinking known as "binge" drinking is spreading through our colleges and universities. Bingers drink quickly not to be sociable but to get drunk or even to pass out. Bingeing is far from the harmless fun long associated with college life. In the last six months, it has been cited in at least six deaths, many injuries, and considerable destruction of property. It crosses the line from fun to reckless behavior that kills and injures not just drinkers but those around them. We may not be able to stop bingeing entirely, but we must try to control its worst costs by educating students in how to manage its risks.

Shared context

WB Ch 6

Types of shared contexts

- Historical background
  - Alcohol has been a big part of college life for hundreds of years. From football weekends to fraternity parties, college students drink and often drink hard. But a new kind of drinking known as "binge" . . .
- A recent event
  - A recent State U survey showed that 80% of first-year students engaged in underage drinking in their first month on campus, a fact that should surprise no one. But what is worrisome is the spread among first-year students of a new kind of drinking known as "binge" . . .
- A common belief
  - Most students believe that college is a safe place to drink for those who live on or near campus. And for the most part they are right. But for those students who get caught up in the new trend of "binge" drinking, . . .

The suprise twist

- Setup the shared context but then challenge it (the BUT)
- Recall SUnexpectedCCES

Common mistakes in Shared Context/Opening

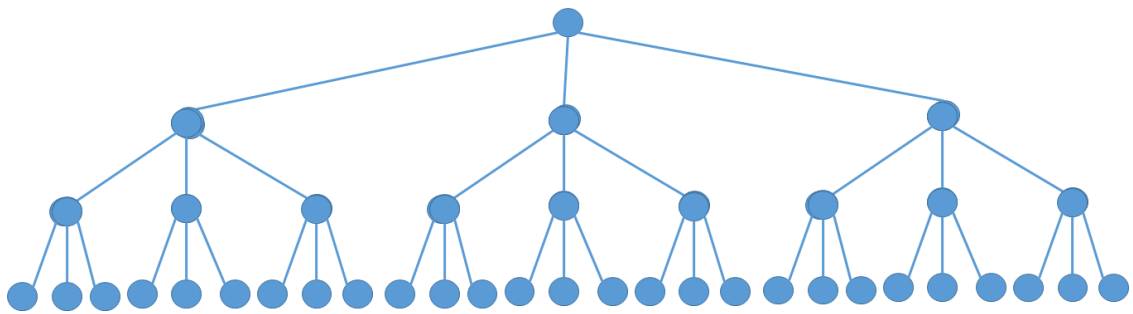
Schimel Ch 5

- Misdirection
  - Algorithms for problem X have tended to be too slow for most applications. . . [give examples] . . . Another concern has been their memory consuptiong. They often cannot run on a typical server. In this paper, we develop a memory-efficient algorithm for X.
- No direction
  - Computer science is concerned with the efficiency of algorithms. The famous P vs NP question crystalizes this by attempting to partition problems into those that can be solved in poly time and those that cannot. Many researchers believe P does not equal NP, and these two classes are distinct. But there is also a possibility that the two classes of problems are the same.. . . In this paper, we look at the problem of inferring semantic meaning from English sentences and develop a polynomial-time algorithm that uses machine learning based on syntactic annotations.
- Assuming wrong schemas
  - E.g. assuming your reader knows more than they do.
- Being too broad or to narrow with respect to your solution/action
  - Talking about curing cancer in the opening, when you just improve running time of an algorithm by 10%.
  - Talking about importance of run time when you actually improve accuracy as well.

Common mistakes in Shared Context/Opening

Schimel Ch 5

- Being a literature review
  - A lit review focuses on listing everything that is known.
  - The shared context/opening is ultimately focused on getting to the point of what is not known.
  - It should not list anything that is not in service of the challenge/action/resolution
  - To the extent the citation list needs to be complete, condense, e.g.
    - Paper 1 solved problem X with approach A. Paper 2 solved it with approach B. Paper 3 solved it with approach C, and paper 4 solved it with approach D. The approaches A and B fall into the category of machine learning, while approaches C and D fall into the category of graph theory.
    - "There are different approaches to problem X, with some tools using Machine learning (1, 2) and others using graph theory (3,4)



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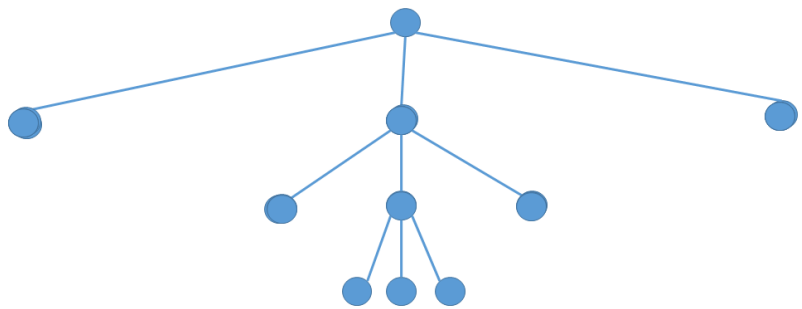

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Statement of Problem

WB Ch 6

Two parts to a problem

- The condition/situation
  - binge drinking, terrorism, high running time
- The intolerable consequence (i.e. cost) of the condition.
  - The "so what"?
  - Don't assume that cost is obvious to the reader
  - Binge drinking costs
    - Maybe there are none? Its just kids being kids and they will grow out of it.
    - Dangerous behavior? Poor grades? Waste of money?
    - Bingeing is far from the harmless fun long associated with college life. In the last six months, it has been cited in at least six deaths, many injuries, and considerable destruction of property. It crosses the line from fun to reckless behavior that kills and injures not just drinkers but those around them.

Practical vs. Conceptual problems

- Practical problem concerns a condition in the real world and asks for *doing* a physical action
  - The problem is that binging creates injury. Lets stop binging.
  - The problem is that system X does not support feature Y. Lets create method Z to achieve Y in system X.
- In CS, this is often a **methods gap**

Conceptual problems

- Conceptual problem concerns what we think about something and asks for a change in *understanding*.
  - The problem is that we don't understand why students binge. Lets understand binging.
- The condition is usually something we do not know or understand — a **knowledge gap**.
  - The condition can be expressed as a question.
    - why do students binge drink?
- The cost is often not knowing another larger question
  - not the pain in a real sense, but a dissatisfaction of not understanding something important.
    - Biologists don't know why some hair keeps growing and other hair stops. So what? If they knew, they might understand something more important: What turns growth on and off?
    - Administrators do not know why students underestimate the risks of binge drinking. So what? If they knew, they might figure out something more important: Would better information at orientation help students make safer decisions about drinking?
- A good knowledge gap often engages curriousity (SUCCES)

Funneling down from wide to narrow problems

- Typically, the challenge you ultimately address is narrow, while the challenge that people can relate to is larger
  - (a) Being able to computationally predict the structure of a protein with high accuracy will revolutionize medicine.
  - (d) In this paper, we improve the accuracy of existing methods by 1% on some proteins.
- You can funnel down using intermediate challenges
  - (b) However, the field has been stuck, with the most accurate algorithm being over five years old.
  - (c) In fact, even for low-complexity instances, there has not been improvements.

Common mistakes with stating the problem (challenge)

- Failing to identify the problem.
  - (a) There has been very little work in integrating fairness schemes into wireless networks.
  - (b) In this paper, we develop a fairness algorithm that can be applied to 802.11 networks.
- Offering a solution before defining the problem
  - (c1) This algorithm will allow wireless network users streaming high-priority zoom calls to not be interrupted by background updates to their operating systems.
- Not concrete enough
  - (c2) This algorithm will allow some wireless users to greatly benefit.

Stating the solution

Practical problems

- Solution is to do something (or a method to do something)
- . . . behavior that crosses the line from fun to recklessness that kills and injures not just drinkers but those around them. We may not be able to stop bingeing entirely, but we must try to control its worst costs by educating students in how to manage its risks.
- We designed and implemented an algorithm to add feature Y to system X

Conceptual problems

- Solution is adding some knowlege
- . . . we can better understand not only the causes of this dangerous behavior but also the nature of risk-taking behavior in general. This study reports on our analysis of the beliefs of 300 first-year college students. We found that students were more likely to binge if they knew more stories of other students bingeing, so that they believed that bingeing is far more common than it actually is.
- We studied how method X effects performance and found that (in some cases) it is (good) and (in other cases) it is bad.

Prelude

- A catchy opening in the intro
  - A quotation
  - A starling fact
  - An illustrative anectode
- Example
  - It is often said that "if you're old enough to fight for your country, you're old enough to drink to it." Tragically, Jim S., president of Omega Alpha, no longer has a chance to do either. When he accepted a dare from his fraternity brothers to down a pint of whiskey in one long swallow, he didn't expect to become this year's eighth college fatality from alcohol poisoning. According to a recent study, at most colleges, three out of four students have, like Jim, drunk five drinks at a sitting in the last thirty days. And those who drink the most are not just members of fraternities but, like Jim S., officers. Drinking, of course, has been a part of American college life since the first college opened . . . But in recent years . . . .
- Not common in CS writing but occasionally happens.

But must I follow this template? What about creativity?

- Remember, you do not have a captive reader.
- Reader will often skim paper and will expect to find the familiar pattern.
- If you deviate, you are at risk of loosing the reader.
- Small, strategic deviations can work
  - but think twice if you're unexperienced.

Conclusion

- Discussion/Conclusion
  - short Challenge/problem
    - already done in intro, so be short
  - short Action/solution
    - already done in methods/results
    - but now that readers know the solution in more detail, you can restate it in a condensed way but more meaningfully than in the intro.
  - long Resolution
    - Restate your "So what" answer
    - You can elaborate much more now
    - Go further to answer "Now what"?
    - The conclusion is your place to speculate, much more so than any other section.

End of lecture 8