

Scientific Communication

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Biostatistics Biomedicine Bioinformatics

Outline

- **Motivation**
- **Oral communication**
- **Reading**
- **Written communication**

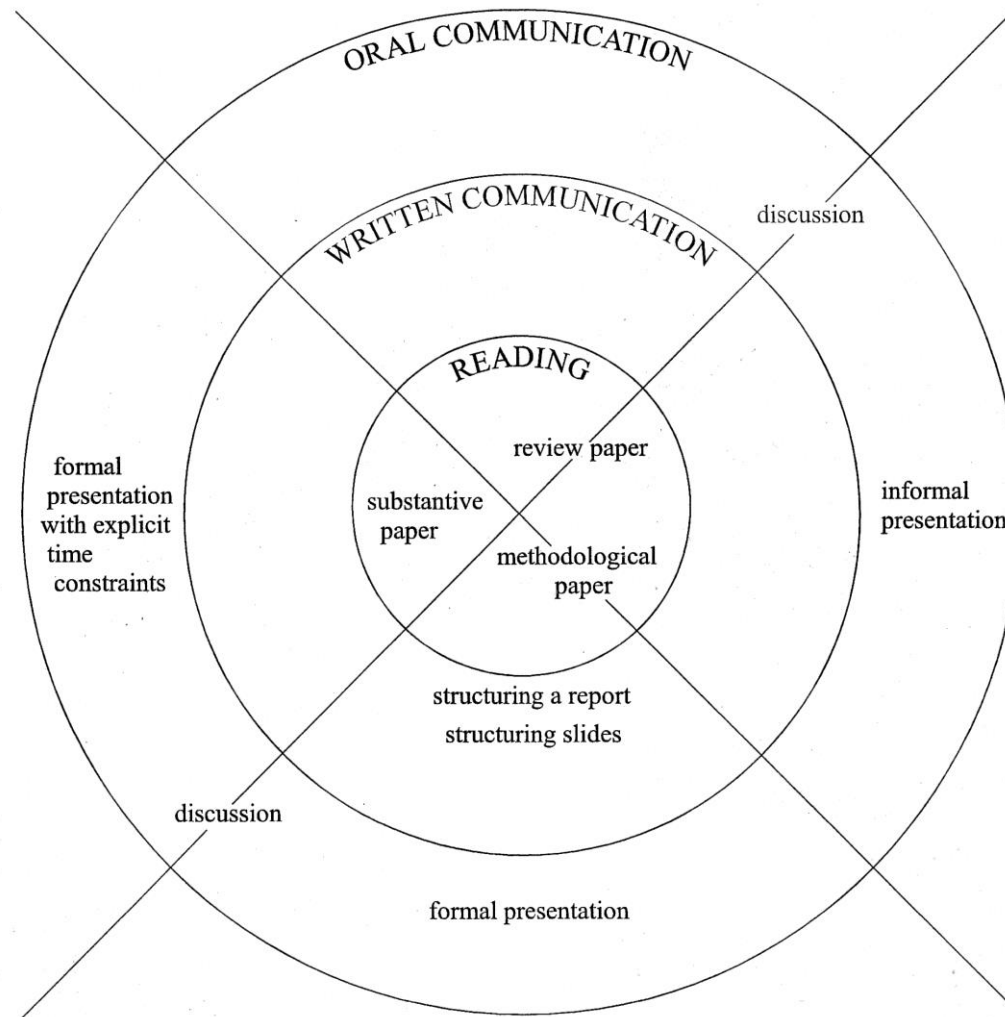
Motivation

What's in a name?

Communication is a process of exchange of information,
ideas, thoughts, feelings and emotions
through speech, signals, writing, or behavior.

Types of communication

- Non-verbal (70% of communication):
 - Appearance
 - Body language
 - Sounds
- Verbal communication
 - Oral communication
 - Written communication



Self-evaluation Form

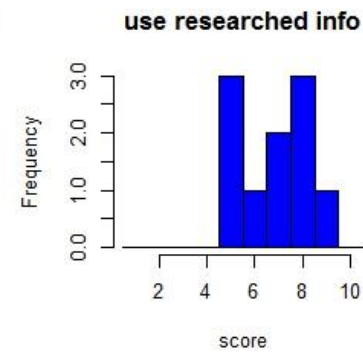
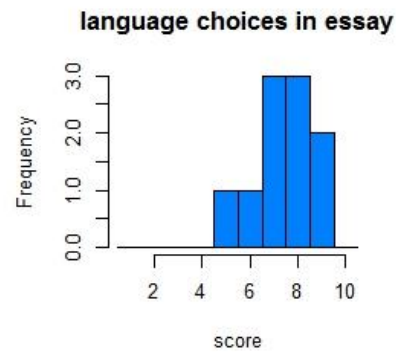
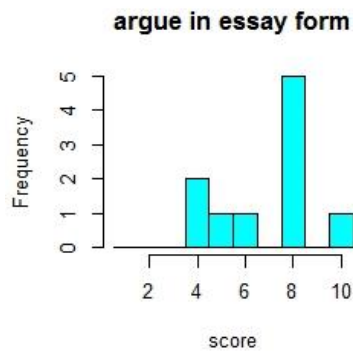
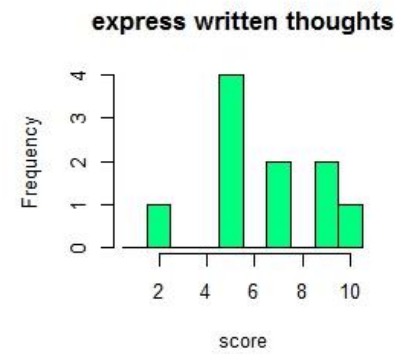
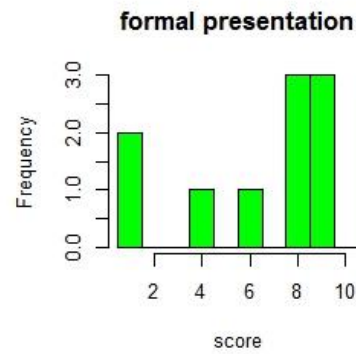
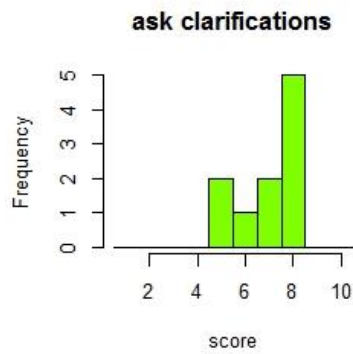
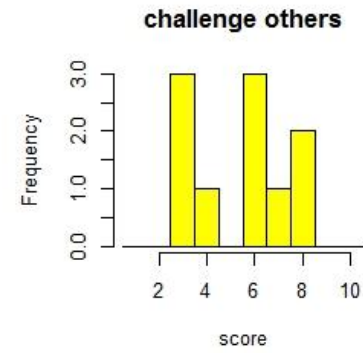
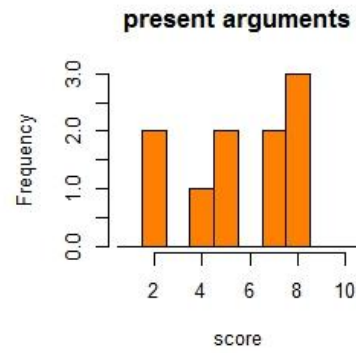
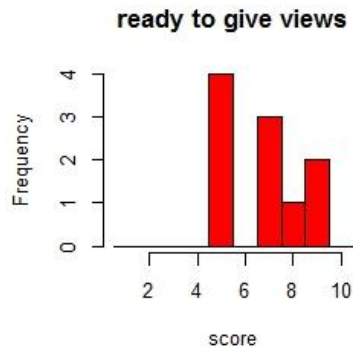
Please take some time to go over this self-evaluation form. It is an existing exercise to enable you to gain an impression of how you see yourself as a student regarding communication skills.

Please score yourself on a scale from 1 to 10, circling a number. Be as honest as possible and do not leave any score line blank.

1	I hardly ever give an opinion in an academic discussion	1 2 3 4 5 6 7 8 9 10	I am always ready and willing to give my views
2	I find it very difficult to put over anything more than a simple argument in academic discussion	1 2 3 4 5 6 7 8 9 10	I am confident of my ability to present complex arguments in academic discussion
3	I rarely challenge the views of others in discussion	1 2 3 4 5 6 7 8 9 10	I frequently challenge others to substantiate their views in discussion
4	I am very unskilled in questioning others in order to get them to clarify what they are saying	1 2 3 4 5 6 7 8 9 10	Questioning others so that they are able to be clear about the points they are making is one of the skills I am proudest of

Self-evaluation Form

5	I am not confident about making a formal presentation	1 2 3 4 5 6 7 8 9 10	I am confident of my ability to give an interesting formal presentation
6	I usually find it difficult to express complex thoughts in writing	1 2 3 4 5 6 7 8 9 10	Others often compliment me on the quality of my written work
7	I do not really know how to present an argument in essay form	1 2 3 4 5 6 7 8 9 10	I am confident of my ability to put forward complex arguments in essay form
8	I am unsure what is appropriate or inappropriate language for essays	1 2 3 4 5 6 7 8 9 10	I instinctively use the right kind of language when writing an essay
9	I am not confident of how to use information I have researched to support points I make in an essay	1 2 3 4 5 6 7 8 9 10	I am able to use the information I have researched both to support points I want to make and as a material to criticize



Scientific Communication

Oral communication

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Outline

- Why?
- How?
- Tips and tricks in a nutshell

Why?

Situation: You have been asked to present your work in front of the department. Worse, you have been asked to justify it. All of a sudden, it's high school all over again. You picture yourself at the front of the room: sweaty palms, initially speechless. When you finally start, you speak too fast for anybody to understand. Your 20-minute presentation is over in 5 minutes; but, at least, you can sit down again.

How?

Getting started

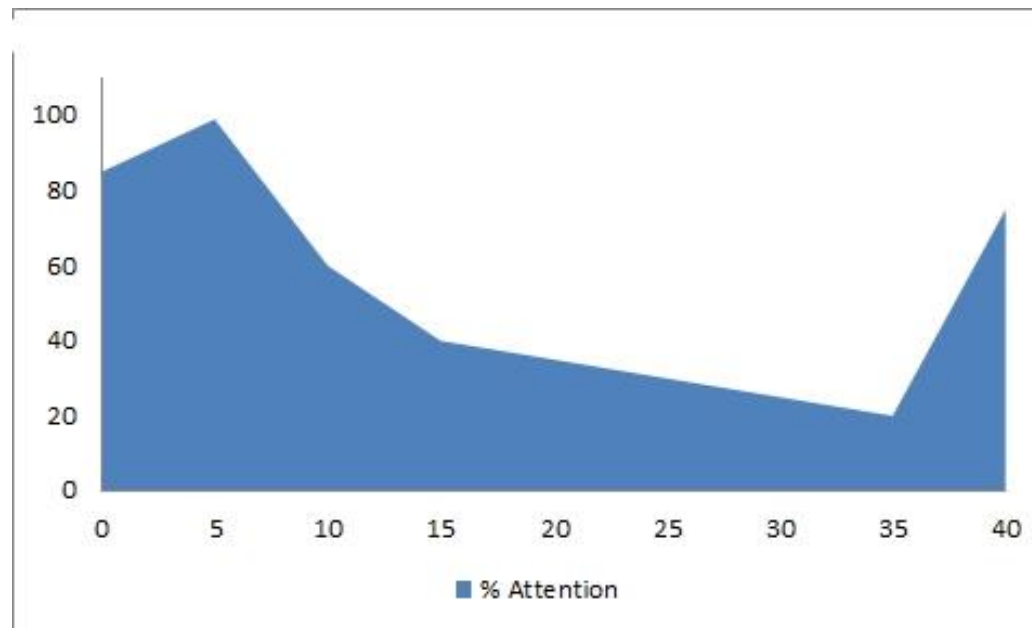
- What is the best presentation you have been to?
- Why was it so good?
- What was the worst presentation you have been to?
- Why was it that awful?

Parameters of a presentation

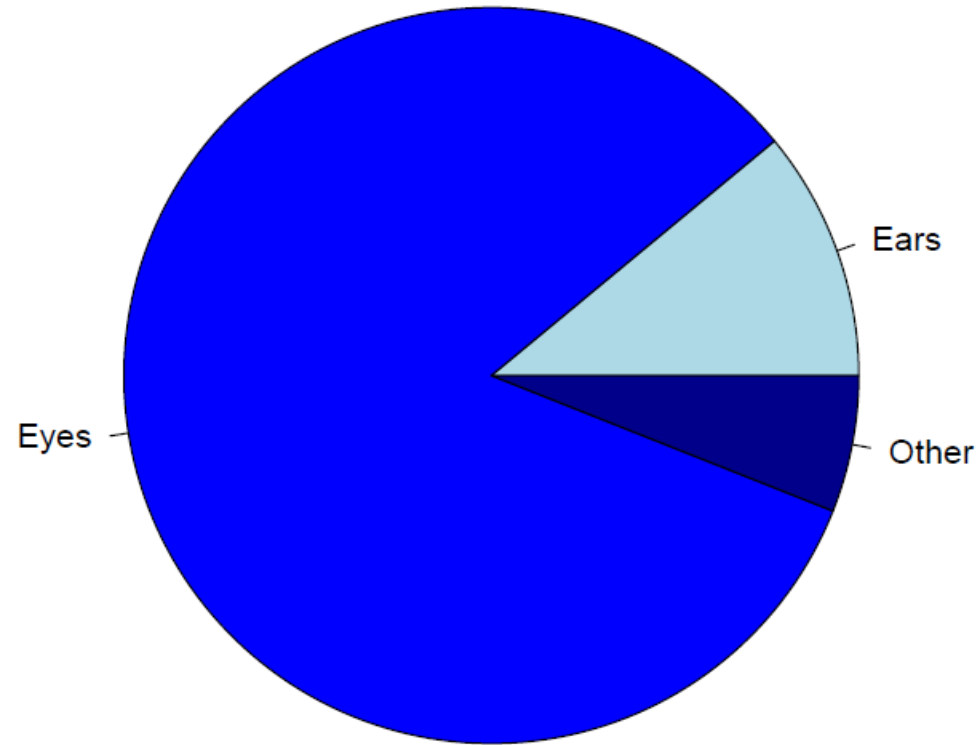
- Structure (outline, ear catcher, clarity, timing)
- Content (dosage, understandable, directness)
- Presentation
 - Language (sentence structure, word choice)
 - Voice (volume, intonation, pronunciation, articulation, color)
 - Non-verbal (attitude, movement, eye contact, mimicry, gesticulation)
- Aids (variation, stage-management, efficiency)
- Interaction (group contact, handling questions and remarks or comments)

Build-up targeting your audience

- Beginning: 85%
- Ending: 75%
- Location, moment, participants, circumstances



How much information do the senses take up?



Preparing a presentation: setting

- Who is my audience?
- Program?
- Location (room)?
- Aid, technical devices?
- Environmental (circumstantial) factors?

Preparing a presentation: content

- What is already known to my audience?
- What does my audience need to know?
- What does my audience want to know?
- How will it receive the message?

Preparation scheme

Major Thought / Theme / Topic			
Key Idea 1	Key idea 2	Key idea 3	Key idea 4
Sub idea	Sub idea	Sub idea	Sub idea
Sub idea	Sub idea	Sub idea	Sub idea

Pitfalls

- Urge for completion
- Urge for competence
- Urge for providing proofs

Keep in mind that listeners have one chance to hear your talk and can't "re-read" when they get confused (possible exception: handouts)

Structure your story



KISS: Keep It Simple Stupid

- bring your message in a simple way, stick to the important information, use plain language
- tells you something about content not build-up



OLYMPIC model

- Contains Head-Body-Tail (within or between circles)
- Circular build-up in which you connect Tail with Body again

Structure: introduction

- Goal(s)
- Interest
- Structure and method
- Commitment (timing, material, questions)

Structure: middle

- Options (e.g., report of research: problem setting, methods – hypothesis – set up, progress in the research work, results, conclusions and advice, ...)
- Inductive versus deductive
- Road maps
- Summaries

Structure: end

- Reminder to goals
- Summary of key (central) message
- Invitation to questions, discussion
- Final words (reminder, actions)

Assessment of presentation

- First impression
- Eye contact
- Gestures
- Movements
- Clothing
- Voice
- Attitude
- Dealing with questions
- Dealing with opposition

Movements

- Hand and arm movements
 - Increase span (a bit)
 - Natural (as in conversations)
 - Illustrate (non-rhythmic)
- Leg movements
 - Functional (pacing up and down)
 - Vary relation with audience
 - Vary relation with visual aids
 - Strengthen ideas

Voice

- Sound
 - Tone height
 - Decibels
 - Quality
- Resonance
- Articulation
 - Open
 - Flexible, smoothly
 - Up front in mouth
- Speed

Language

- Presentation language is different from written language
- Be concrete
- Use metaphors
- Use moments of silence
- Use variation
- Dose information content
- Talk in a personal way
- Avoid expletives
- Jargon? Abbreviations? Synonyms?

Questions

- Announce (timing)
- Replace yourself in the mind of the one who asks the question
- Appreciate
- Recapitulate / reformulate / summarize
- Define terms
- Distinguish between opinion and facts
- Decompose the question
- Refer to arguments (literature, own work, presentation)
- Follow-up

Tools: using the beamer

- Particularly handy when >50 people
- Allows projecting impressive presentations in “no time” (software)
- Pros:
 - Hold on to the red thread of your story using visual presentations
 - Have a backup text for the audience and you (but be careful)
 - Handouts
- Cons:
 - Some degree of technical expertise required
 - Tendency to include too much information
 - Dropping letters and too many colors blur the real story behind

Slides

- At a glance
- Not more than 2/3 of the space
- 1 mental thought at a time → 1 message per slide
- Avoid full sentences (however depends on audience and aims of the presentation)
- Homogeneous (tranquil) layout
- The number of slides is not the problem, the number of objects on a slide is ...

Slides

- Background light, text dark
- No vibrant colors (red/green, orange/blue)
- Italic is generally not that clear
- Font type: Calibry versus Courier New versus **ALGERIAN**
- Never entirely in CAPITAL LETTERS
- Avoid underlining
- Font size (here: 24)

Graphics in slides

- Simplicity above all (perceptive limit in brains = 6 objects; seeing 6 objects takes 0.02 of a second)
- Emphasis on one direction
- No horizontal AND vertical lines
- Not more than 3 (?) curves
- No vertical text
- Proportional axes; consistent axis labeling
- Legend

Death by PowerPoint

http://www.youtube.com/watch?v=bOrHxRB3JrQ&feature=player_detailpage



Towards a successful presentation

- **ICEPAC: principles of instruction**

- Interest
- Comprehension
- Emphasis
- Participation
- Accomplishment
- Confirmation

- **CREST: useful types of verbal support or training aids**

- Comparison
- Reason
- Example
- Statistics
- Testimony

A successful presentation

Be concise so that people listen to you

Use simple words so that people understand you

Talk lively so that people remember what you say

Be accurate so that people can trust you

(Adapted from Joseph Pulitzer)

The future

- Interactive web conference courses
 - Website as a partner tool
 - Discussion board to post questions / answers
 - Video for visual contact
 - White board for file storage and sharing

See URL: <http://www.extension.harvard.edu/distance-education/how-distance-education-works/web-conference-courses>

- Web conference presentations?

Tips and Tricks in a nutshell

Top 10 guidelines

- 10: Train before trying
- 9: Presentation first, PowerPoint second
- 8: Know your audience
- 7: Tell a story
- 6: Show it, don't write it
- 5: Embrace color, but carefully
- 4: Follow the rule of 10
- 3: Keep it short
- 2: Keep it legible
- 1: Skip it altogether



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Reading

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Outline

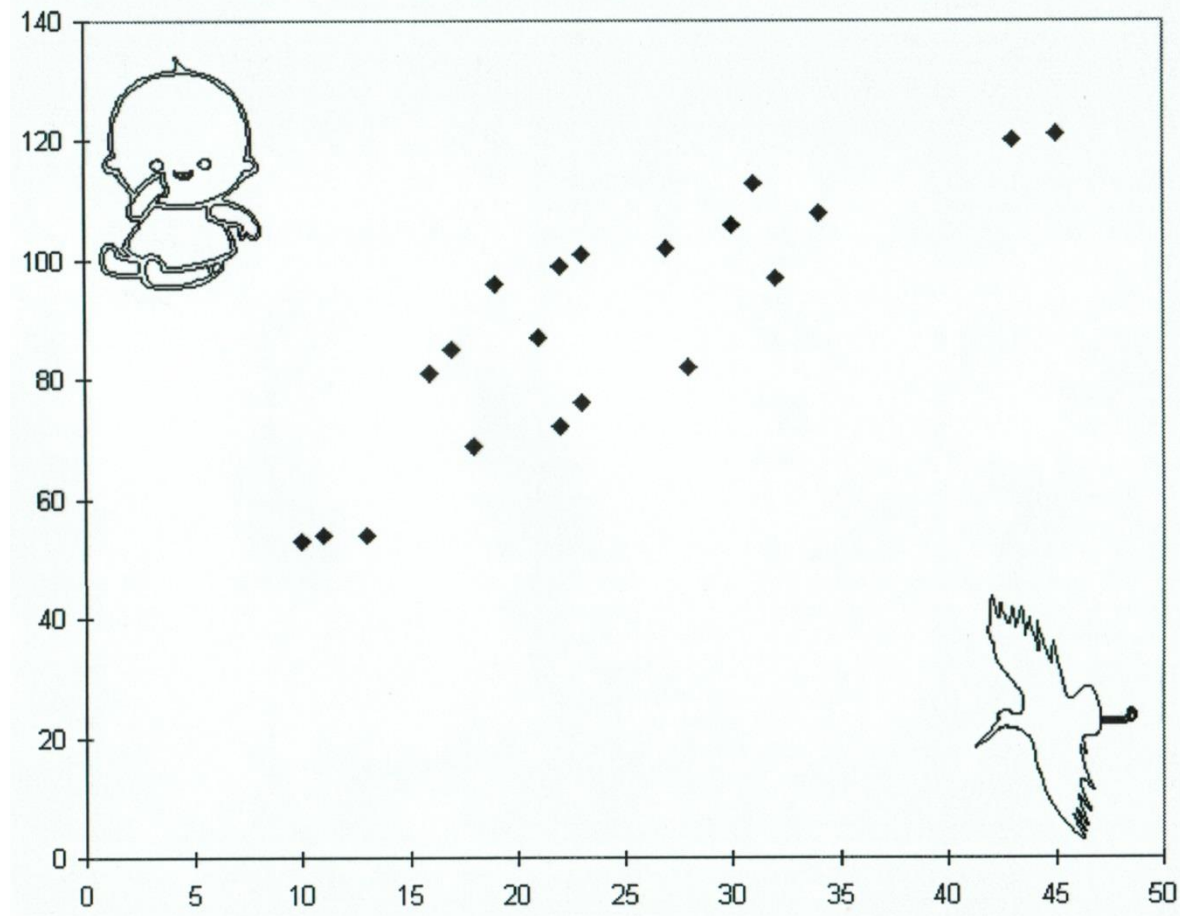
- **Using published data – be cautious!**
- **Why?**
- **How?**
- **Tips and tricks in a nutshell: evaluating a paper**

Using published data – be cautious!

Be critical!

- A lot of data is at your disposal
 - Private data collections
 - Public data collections
 - Publications
 - Computerized databanks
- Are they thrust-worthy?

Jumping to conclusions

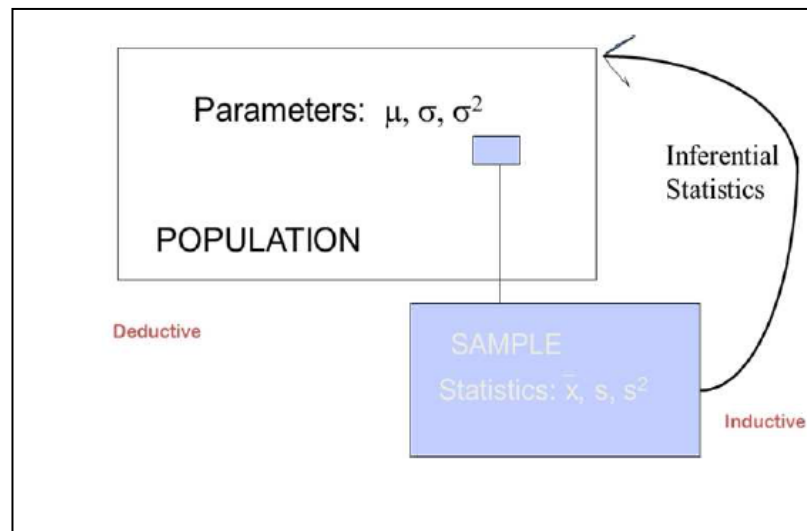


Different sampling schemes

- Non-random selection based sampling
 - quota samples
 - only consider the data that happens to be available
- From statistical point of view, random samples are preferred
 - allows estimating sampling error
- Measurement error may arise from
 - mistakes in conceptualization
 - structural characteristics of the data collection process

Errors will almost surely exist

- How large are the errors?
- What is the probability for a given error range?
- Do errors cluster towards the end of a distribution?
- In which direction does the error go?



Why?

**Situation: Your supervisor gives you a pile of papers to read.
Worse, you are asked to attend a conference and to prepare a presentation about the highlights of the conference, including a personal reflection about the importance of some presentations for your own work. Ouch...**

How?

Reading a scientific paper

- Abstract to understand major points
- What do you know about the topic? (self-education, keep background info at hand)
- Those familiar with the topic often skim/skip the Introduction
- Adhere to logical flow of most papers: from Introduction to Results (Materials and Methods in later stage when in-depth reading)

Code words or shorthand phrases

- “data not shown”
 - Often for reasons of space
 - Acceptable when competence has been documented before
- “unpublished data” (either not of publishable quality or work is part of a larger story to be published later)
- “preliminary data” (e.g., experiment was done only once)

Difficulties in reading a paper

- Due to reader or writer ...
 - No logical connections (description of experiments without motivation or hypothesis formulation)
 - Too much jargon
 - No clear road-map (no distinction between side points and main logical thread; make use of Supplemental Material)

Difficulties in reading a paper

- Understanding the experiment
 - Too many references to previous work, referring to previous work, ... (minor differences between experiments)
 - Too compressed description (space limitations)
 - Not well-written descriptions leading to ambiguity
- Lack of criticism about own experiments (not open-minded for other models)
- Lack of distinction between fact and speculation (discussion; assertive sentence as main title)

Tips and tricks in a nutshell

Critical evaluation of a paper or report

Introduction

1. Did the author(s) indicate why the study was undertaken?
2. Was the background information provided adequate to understand the aims of the study?

Methods

1. Has the source of the data been clearly given?
2. Were the methods described in sufficient detail for others to repeat or extend the study?
3. If standard methods were used, were adequate references given?
4. Have the author(s) indicated the reasons why particular procedures were used?
5. Have the author(s) indicated clearly the potential problems with the methods used?
6. Have the author(s) indicated the limitations of the methods used?
7. (Have the sources of drugs been given?)
8. Have the author(s) specified the statistical procedures used?
9. Are the statistical methods appropriate?

Critical evaluation of a paper or report

Results

1. Were the experiments/calculations done appropriate with respect to objectives of the study?
2. Do the results obtained make sense?
3. Do the legends to the figures describe clearly the data obtained?
4. Are the data presented in tabular form clear?
5. Has the appropriate statistical analysis been performed on these data?

Discussion

1. Were the objectives of the study met?
2. Do the author(s) discuss their results in relation to available information?
3. Do the author(s) indulge in needless speculation?
4. If the objectives were not met, do the author(s) have any explanation?

Critical evaluation of a paper or report

References

1. Do the author(s) cite appropriate papers for comments made?
2. (Do the author(s) cite their own publications needlessly?)

Abstract

1. Is the abstract intelligible?
2. Does the abstract accurately describe the objectives and results obtained?
3. Does the abstract include data not presented in the paper?
4. Does the abstract include material that cannot be substantiated?

Scientific Communication

Written communication

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Outline

- Why?
- How?
- Tips and tricks in a nutshell
- Highlight: Getting your work published

Why?

Setting: You would like to give the scientific community a chance to find out about your work. That way, people are more likely to be able to build on it rather than reinvent the wheel and duplicate research. Making results accessible is not only a good principle on its own, but is also a way of paying back those who fund you or invest in you.

How?

An accessible text in 7 steps

- Step 1: Draft a reader's profile
- Step 2: Determine your writing aim
- Step 3: Choose a form
- Step 4: Fix your viewpoint (angle)
- Step 5: Develop a structure
- Step 6: Attract
- Step 7: Use fresh formulations

Step 1: Draft a reader's profile

- What do you readers already know about the topic?
- What is the background of your audience?
- What would they like to read?
- How would they like to be addressed?
- What does the community in general think about the subject / your audience in particular?
- Does your audience have prejudice regarding your subject?
- Can they deal with numbers or rather figures?
- What is the level of abstraction your audience can take?

Step 2: Determine your writing aim

- You would like to inform your reader
- You would like to convince your reader about something
- You would like to amuse your reader
- You would like to shock your reader
- You would like to educate your reader
- You would like to give advice to your reader
- You would like to motivate your reader towards actions

Step 3: Choose a form

- Report
- Letter
- E-mail
- Press release
- News announcement
- Column
- Background article
- Review article
- Opinion paper
- Short communication
- Software paper

Step 4: Fix your viewpoint (angle)

- The angle is your key research question
- The angle puts boundaries on the content
- The angle determines the structure

Step 5: Develop a structure

- Head – Body –Tail

Type of subject	Head	Body	Tail
Problem	What is the problem? Why is it a problem?	What are the causes?	What can be done about them?
Research	What is investigated? Why and by whom?	What were the results of the research?	Which consequences emerged from them?
Developments	What does the current situation look like? Why does it deserve attention now?	How did it emerge / arise? What are the relevant backgrounds?	Which direction do developments take now? What can we expect in the future?
Opinions, policy proposals	What is it about? Problem?	Arguments in favor or against	Conclusion

Step 5: Develop a structure

- Funnel (deductive writing; not optimal yet typical for scientists)
- Upside down funnel (inductive writing)

- Sand glass



- Circles



- Spirals (involve your audience)
- Metaphors (legends)

Step 6: Attract

- Scientific material for non-scientific journals / general public
 - Less structured or predictable than for scientific audience
 - Quotes, pictures, cartoons to increase accessibility
- Illustrations
 - Make things clearer or more alive
 - To highlight an important component (aid in structure)

Step 6: Attract (continued)

- Whether newspapers or (scientific) journals ...
 - Importance of a title / headline (comes second after illustration)
 - Headlines should be informative and catching (often decision maker to continue reading)
 - Quotes

Have attractive subparagraphs

- Think about the support of your key sentences:
 - Give a definition
 - Illustrate
 - Give an example
 - Use summing up
 - Make a comparison
 - Describe the cause
 - Give reasons

Have a smashing beginning

- In a nutshell
- Announcement
- Conjecture
- Anecdote
- Joke
- Shocking figures
- Suggestive summary
- Riddle or paradox
- Portrait, creating a particular atmosphere
- Back in time
- ME or YOU - opening
- Question
- Contrast

“As Above, So Below” (Rudy Rucker)



Pieter Bruegel (*Brueghel*) the Elder, c. 1525 – 9 September 1569: “the Dutch proverbs”)

Have a stunning ending

- The circle is round
- Summary
- Conclusion
- Recommendation
- Anecdote
- Rhetorical question
- Drawing
- Reference to future
- Comparison

“Everything, however finely spun, finally comes to the sun”

(nothing can be hidden forever)



Human complex disease (gen-)omics

- Complex disease research aims/should aim to find answers to particular questions that are of interest to “people”
 - Requires an interdisciplinary approach (goes beyond multidisciplinary)
 - Requires an international approach
[\(\[http://www.cost.eu/domains_actions/bmbs/Actions/BM1204\]\(http://www.cost.eu/domains_actions/bmbs/Actions/BM1204\)\)](http://www.cost.eu/domains_actions/bmbs/Actions/BM1204)
 - Requires an atmosphere of openness and complementarity (rather than competitiveness)

Use frames for

- Technical notes / additional info
- Background information
- Mini-bios
- Historical notes
- Practical information
- Quantitative facts as supporting info
- Each text part that is standalone and attractive as information piece

Step 7: Use fresh formulations

- Write clearly
- Write correctly
- Write personally
- Write in a dynamic way
- Write excitingly
- Write varying
- Write concretely

Write clearly

- Avoid complicated sentences
 - long sentences, long words, difficult words, expensive words, abbreviations, long introductory sentence parts
- Avoid vague sentences
 - empty words, neutral words, euphemisms, unclear references, unanswered questions, vague connections

Test how clearly you write

- Flesch

Ease of reading = $206.84 - (0.85 \times \text{the number of syllabi per 100 words}) - (1.02 \times \text{the average sentence length})$

Score	Difficulty	Level
0-30	Very difficult	academic
30-50	Difficult	students
50-60	Rather difficult	Higher secondary school
60-70	Standard	Lower secondary school
70-80	Rather easy	6 th grade (~ 12 years)
80-90	Easy	5 th grade (~ 11 years)
90-100	Very easy	4 th grade (~ 10 years)

Write concretely

- Choose specific words
- Choose the single correct word
- Show highly informative details
- Give examples
- Prove with figures
- Use examples

Write personally

- Use personal sentences and words (cf Human interest-formula)
- Let people take the stand
- Bring people alive
- Embark on a dialogue with your readers
- Avoid sexist language

Write in a dynamic way

- Be active instead of passive
- Choose verbs instead of nouns
- One time instead of twice or three times
- Deeds instead of words
- Be sober rather than pompous

Write excitingly

- Play with telling time
- Use the time bomb
- Take time to your advantage
 - Flashback
 - Flash-forward
 - Cliffhangers

Write varying

- In your choice of words
 - Synonyms
 - Reference words
- In your choice of sentence build-up
 - Break with the standard word sequence
 - Use different sentence types
 - Use direct style (US versus European writing style)
 - Bring variation in the length of your sentences

Write concretely

- Choose the correct words
- Construct grammatically correct sentences
- Check the spelling
- Use the correct punctuation

Tips and Tricks in a nutshell

Top 10 academic writing virtues

1. Abstraction
2. Generalization
3. Completeness
4. Carefulness
5. Accurateness
6. Verifiable
7. Concrete and recognizable examples
8. Representative cases
9. Certainty
10. Attractiveness



Virtues
of
accessible
writers

Getting your work published

Why should you publish?

- ...
- It improves your writing and analytical skills
- It gets you and your work known in the wider scientific community
 - Good for your career (having a good track record makes it easier to attract funding)
 - Good for your organization

How to get your work published?

- Remember why you are writing and adhere to the good common practice rules:
 - determining the proper structure and writing style
 - grabbing the attention
 - holding the attention
 - giving the reader a reason for reading
- Be critical, as if it were someone else's paper
- Choose the right journal
- Persevere!

A rejection may be or may not be your fault



Schulz

Questions you should ask (yourself) - attending to the content

- Are the facts true, complete, and controllable?
- Are the conclusions, beliefs, and opinions well founded and supported?
- Do the facts legitimate the conclusions, beliefs, and opinions?
- Is there an overgeneralization?
- Are the cause and effect relations properly given?
- Is there a proper distinction between facts, opinions, and beliefs?

Questions you should ask (yourself) – attending to the internal consistency:

- Is the order of presentation logical and consistent?
- Is there unnecessary redundancy?
- Have conclusions been drawn before the necessary and sufficient facts have been presented?
- Is there enough emphasis on the main point / is there too much emphasis on matters of secondary or minor importance?
- Is the product too verbose / lengthy? “Pardon me that this letter is so long, I didn’t have the time to make it shorter”

Editor's advice on how to get your work published

- Study the journal (get to know the journal)
- Use good English (avoid rejection based on bad grammar)
- Be realistic (be aware of the value of your results but avoid over-interpretation)
- Tell a coherent story
- Don't make sweeping conclusions (you cannot support)
- Don't try too hard to sound important (avoid being pompous)
- Make sure the title matches the content
- **Read lots of papers and learn from them**

References

- Slides from short courses and printed material
 - “WeCom: wetenschappelijke communicatie” (short course presented in Belgium) / Technical writing and presenting – Baylor University/Maastricht University
 - Tropical Biology Association - Skills Series: Scientific writing and publishing results
 - Scientific writing booklet compiled by ME Tischler (department of biochemistry and molecular biophysics at the University of Arizona)
- Material from URLs:
 - <http://money.howstuffworks.com/business-communications/effective-powerpoint-presentations.htm/printable> (effective presentations)
 - <http://www.biochem.arizona.edu/classes/bioc568/papers.htm> (how to read a scientific paper)
 - <http://msdn.microsoft.com/en-us/library/cc168581.aspx> (ICEPAC and CREST)
 - <http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWtoc.html> (how to write)