

# “Make Science Make Sense”

## Sharing your research with the wider world

**NDPIA**

**Djurönäset, Sweden**

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**Your Guide...Billy Uber**  
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# Workshop goals

- ❑ Learn principles for sharing your science with non-experts
- ❑ Apply principles to current work and practice your new skills
- ❑ Have fun

# Workshop agenda

- ❑ Welcome and introductions
- ❑ Communicating science...the big picture
- ❑ Your core message
- ❑ Your audience
- ❑ Linking core message with audience via context
- ❑ Dealing with complex ideas
- ❑ Putting your story together
- ❑ Sharing your story
- ❑ Principles of effective communication
- ❑ Networking basics
- ❑ Wrap up

# The big picture

How can I ...

- ❑ ...make contact with the people I want to talk to
- ❑ ...capture their attention
- ❑ ...hold their attention
- ❑ ...make sure they understand me
- ❑ ...make sure they remember what I've said
- ❑ ...encourage them to act

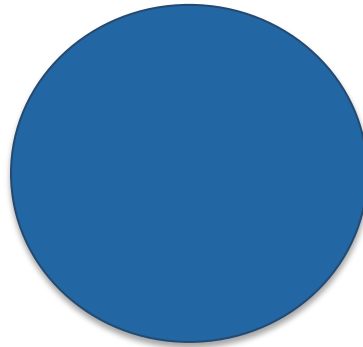
**What makes a conversation enjoyable?**

# **Deciding what to say: an algorithm**

# Deciding what to say

## Thesis statement

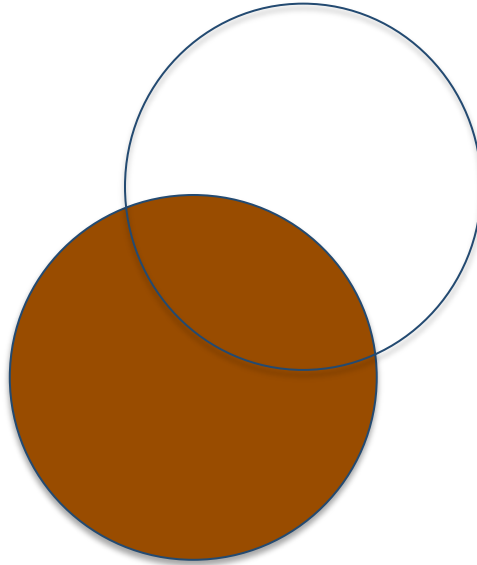
What is really my core message?



# Deciding what to say

## Thesis statement

What is really my core message?



## Setting

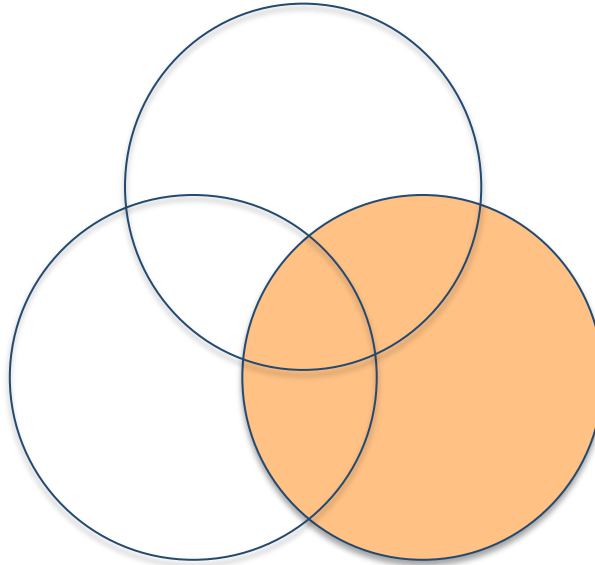
Formal or informal?  
Quiet or distracting?  
Time constraints?



# Deciding what to say

## Thesis statement

What is really my core message?



## Setting

Formal or informal?  
Quiet or distracting?  
Time constraints?

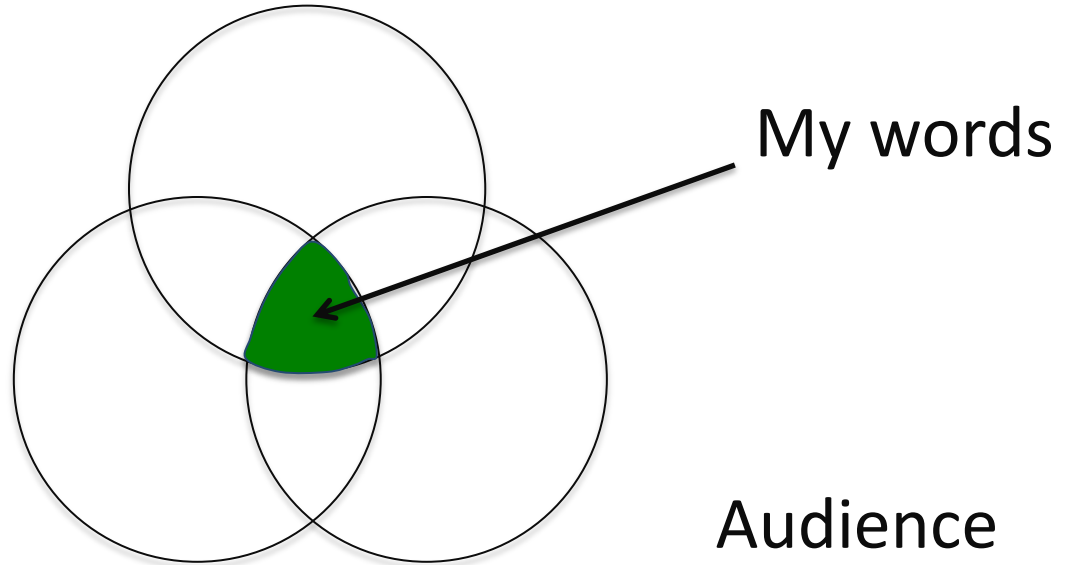
## Audience

Who is that person?  
With which ears is  
he or she listening?

# Deciding what to say

## Thesis statement

What is really my core message?



## Setting

Formal or informal?  
Quiet or distracting?  
Time constraints?

## Audience

Who is that person?  
With which ears is  
he or she listening?

# Thesis statement

# A thesis statement...

...is a claim about the nature of the universe.

...is a simple, declarative sentence about your piece of research.

...tells what you have already proved or are trying to prove.

# Thesis statement...some examples???

1. Host-derived nitrate boosts growth of *E. coli* in the inflamed gut.

# Thesis statement...some examples???

1. Host-derived nitrate boosts growth of E. coli in the inflamed gut.

Thesis statement

# Thesis statement...some examples???

2. Germany has the largest population of any EU nation.

# Thesis statement...some examples???

2. Germany has the largest population of any EU nation.

Not a thesis statement



# Thesis statement...some examples???

3. The release of mitochondrial DNA from damaged lung cells leads to a toxic shock reaction.

# Thesis statement...some examples???

3. The release of mitochondrial DNA from damaged lung cells leads to a toxic shock reaction.

Thesis statement

# Thesis statement...some examples???

4. Smoking involves inhaling the combustion products from cigars, cigarettes, and pipes.

# Thesis statement...some examples???

4. Smoking involves inhaling the combustion products from cigars, cigarettes, and pipes.

Not a thesis statement

# Thesis statement...some examples???

5. Drinking one glass of red wine per day reduces the incidence of heart attacks in American males over 50.

# Thesis statement...some examples???

5. Drinking one glass of red wine per day reduces the incidence of heart attacks in American males over 50.

Thesis statement

# Thesis statement...some examples???

6. Bungee jumping is a sport for crazy people.

# Thesis statement...some examples???

6. Bungee jumping is a sport for crazy people.

Not a thesis statement



# **Your audience**

# Some possible audiences

- ❑ Experts from my field
- ❑ Researchers from other fields
- ❑ Students
- ❑ Policy-makers
- ❑ Industrial sponsors
- ❑ Media representatives
- ❑ (Wo)man on the street
- ❑ School children

school kids



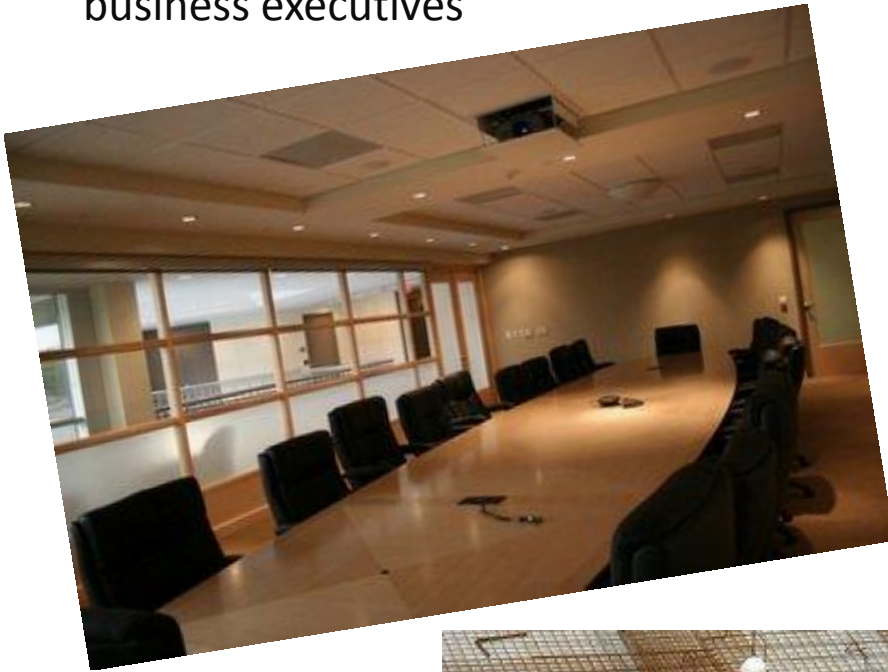
senior citizens



policy makers



business executives



the media



working people



# A word or two about stereotypes

Stereotypes are a useful starting point for understanding a group of people.

AND

As soon as we actually meet an individual from that group, we must let go of the stereotype.

**Brainstorm for answers to the following questions  
and write your answers on the flipchart paper provided**

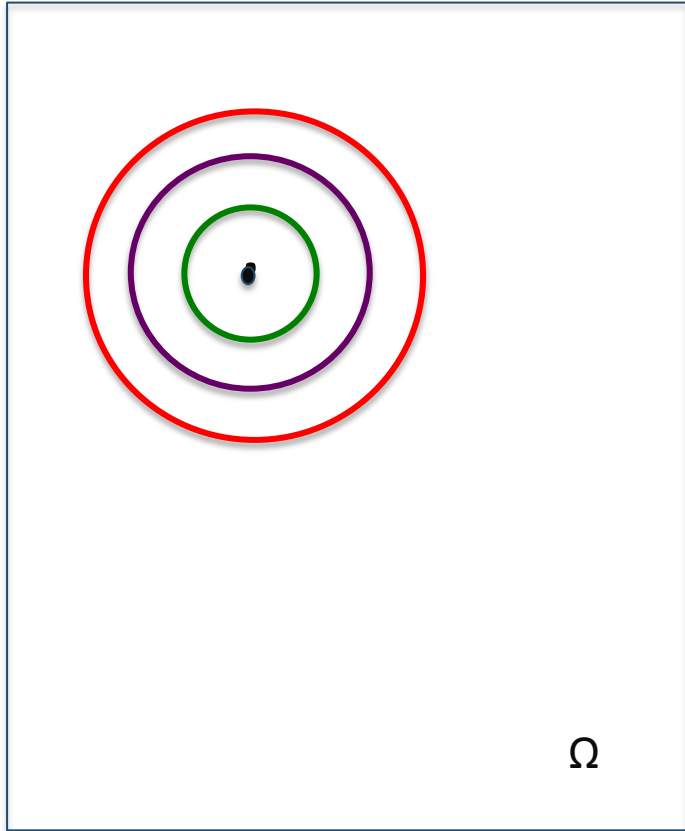
What do you assume about them?

What are their interests and concerns?

What do they know about your field?

# **How to begin your conversation**

# How to begin your conversation



Ω = Universe of all Knowledge

• = your piece of research

context needed for specialists

context needed for other scientists

context needed for (wo)man on the street  
(alias “Joe Six-pack”)



# Some contexts that impress almost everyone

- ❑ €, \$, £, etc.
- ❑ Health
- ❑ Time (efficiency)
- ❑ Safety
- ❑ Environment

# Some questions that help establish context

- ❑ For what reason is that important?
  - ❑ for (wo)man on the street
- ❑ Whom does that help?
  - ❑ for applier of results (industrial sponsor, etc.)
- ❑ How did you find that out?
  - ❑ researchers interested in your method
- ❑ What new research questions does that generate?
  - ❑ other specialists

# **Making your message memorable**

**a la Chip & Dan Heath**

# Making your message memorable

- ❑ Simple
- ❑ Unexpected
- ❑ Concrete
- ❑ Credible
- ❑ Emotion
- ❑ Story

# Dealing with complex ideas

Beware of the "curse of knowledge"

Make sure your audience understands your terms

# Dealing with complex ideas

Tip number one:

Choose an **organizing principle** that is appropriate for presenting your idea.

Some examples:

chronological (from first to last)

spatial (from top to bottom, left to right, etc.)

problem—>solution

question—>answer

more important—>less important

more general—>more specific

# Dealing with complex ideas

Tip number two:

Use **examples**:

“One example of convergent evolution is the development of flight in birds, bats, insects, and pterodactyls.”

# Dealing with complex ideas

Tip number three:

Use **analogies**:

“Viruses dock onto a cell membrane and unload their genetic material into the cell, much like ships dock at a harbor and unload their cargo into the city.”

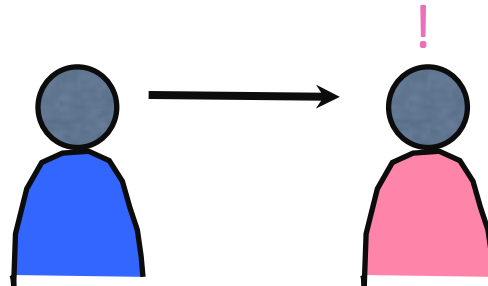


**What are some complex ideas you might want to explain to non-experts?**

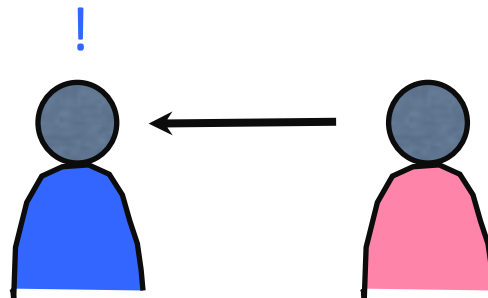
# Conference mixer drill

Before you begin your story, tell your partner what audience he or she is representing— e.g., high school student, politician, your grandmother...

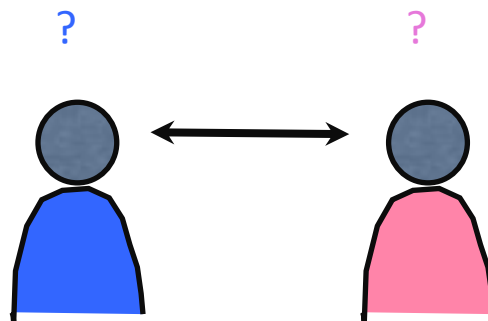
This may be helpful during the feedback portions of the drill.



60 seconds  
(blue shares his or her story; pink is astonished)



60 seconds  
(pink shares his or her story; blue is astounded)



90 seconds  
(pink & blue exchange feedback and reflect on next round)

# Conference mixer drill II

You have complete freedom to use your 60 seconds as you wish and to choose the audience type that suits you best.

AND, here is one possible template for a story:

Context for my work

What we know already

What I want to find out

What I've learned so far

What my results mean

Who my results help

What I want to do next

# **Some principles of effective communication**

**Open questions permit an infinite number of answers.  
Closed questions permit two.**

E.g., open:

What...?  
Where...?  
Who...?  
How...?  
When...?

E.g., closed:

Do you...?  
Can you...?  
Have you...?  
Will you...?

**Thus, open questions help keep conversations alive.**

# Active listening has some big advantages

It takes account of both the speaker's message and the emotion behind it.

It reassures the speaker that he or she is being heard.

It encourages the speaker to share freely what is most important.

# Giving useful feedback : the royal road in 3 easy steps

1. Make an **observation**...what you saw or heard  
(no interpretation or judgment, just data)
2. State its **impact** on you  
(how you felt and why)
1. Present **request** for future behavior  
(for change requests, get commitment)

# Feedback in three steps: example 1

1. “On your second slide, there were three abbreviations that I had never seen before.”
2. “I got so frustrated that I lost track of what you were saying for the next 10 slides.”
1. “When you use abbreviations, will you please make sure your audience understands them?”



# Feedback in three steps: example 2

1. “At several points during your presentation, you stopped to ask the audience questions.”
2. “I was delighted by this interactive approach. It helped me stay alert and engaged.”
3. “I think you should use the same approach for all your future presentations.”

# Observation or interpretation?

Your presentation was excellent

Your presentation started and ended on time

You showed each slide long enough for me to read all the text it contained

Joe is always late

Joe is sometimes late

Joe was late today

Joe arrived 10 minutes past the scheduled start of our meeting

Jenny works hard

Jenny averaged 60 hours per week in the lab the first quarter of this year

My father is a generous person

My father donates 10 percent of his net income to charities every year.

# Networking

**What are some promising conversation starters?**

**What about body language?**

# Workshop take-home messages

Science is the best way to understand our universe.

Science first becomes meaningful when it is communicated.

The more people who understand how science works and can appreciate the importance of **your** research, the better it will be for both you and the rest of the world.

**Thank you for sharing**

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# Audiences



**Assumptions:**

Busy Profit oriented - Data/statistics	age: 40+ male critical appearances
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Interests/concerns    Become leaders in the field  
 Spend money well - return on investment  
 Visibility/recognitions    Probability of success/risk  
 Time spent/deadlines    Status/image

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**Knowledge:**

Their company/business awards/break through hot topics	no details, only results
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Audience Types

Kids 4

Students 1.5

grandparents 3

lay audience

religious audience 5

experts in my field 1

politicians 3.5

well-educated non-experts 2

funding agents 2

journalists 3

my friends 3

Joe Six-pack

*Note: An arrow points from 'Joe Six-pack' to 'grandparents 3'.*

# Audiences

the media

Make headlines  
Spread news  
Explicit story  
Kill the enemy  
They spread as well as break  
Superstition  
False conclusion  
'misleading'  
SPREAD (EDUCATE)  
SPREAD (EDUCATE)  
Take stories  
Mighty in telling  
Knowledgeable in the field.  
Breaking News!  
Crazy people working on animals.  
Dangerous experiments  
Trying to save the world

Broad to an answer

## ASSUME

- ASK MANY QUESTIONS
- SHORT ATTENTION SPAN
- CREATIVE
- CRITICAL
- IMAGINATION
- STORY TELLING

## ACTIVE INVOLVEMENT

## INTERESTS / CONCERNS

- HIGH LEVEL EXCITATION
- HAVING FUN / FUN STUFF
- REWARD (PRIZES)
- BEING POPULAR / NOT A NERD
- FEELING ACCEPTED
- KNOW

• VISUAL AIDS

- WHAT IS VISIBLE
- BELIEVE WHAT THEY ARE TOLD / SEE





# Audiences

- I. Biassed
- II. Manipulative
- III. Hidden Agenda/Self interest
- IV. High self esteem
- V. Ignorant of practical problems
- VI. They love ideas which make them famous



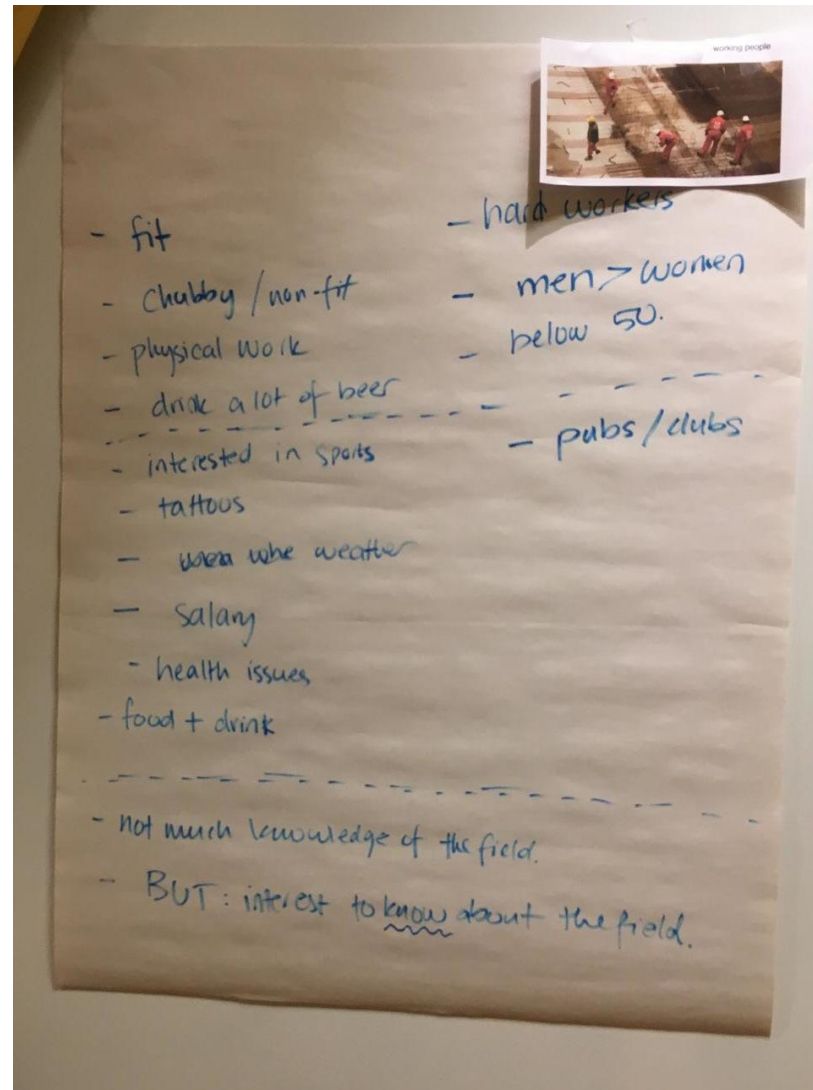
They don't know  
but they are nice  
Interested in health  
Experience and practical  
Good listeners  
Curious  
See the bigger picture



No technical words


hand and body  
language

# Audiences



A photograph of a piece of brown paper with handwritten notes and a small photo of construction workers. The notes are organized into two columns with dashed lines separating them. The left column lists characteristics of the audience, and the right column lists interests. A small photo of construction workers is pasted at the top right.

**working people**



- fit
- chubby / non-fit
- physical work
- drink a lot of beer
- interested in sports
- tattoos
- ~~when~~ when weather
- salary
- health issues
- food + drink

- hard workers
- men > women
- below 50.
- pubs / clubs

- not much knowledge of the field.

- BUT: interest to know about the field.

# Complex ideas

## Some Complex ideas in Science

immune system

coagulation

biofilm

quorum sensing

gene expression

antibiotic resistance

## IMMUNE SYSTEM

TARGET GROUP: JOE SIXPACK

EXPLAIN USING MILITARY ANALOGY

- DEFENSE SYSTEM AGAINST INVADERS
- INVADERS = BACTERIA / VIRUS = FLY
- ATTACK = SICKNESS

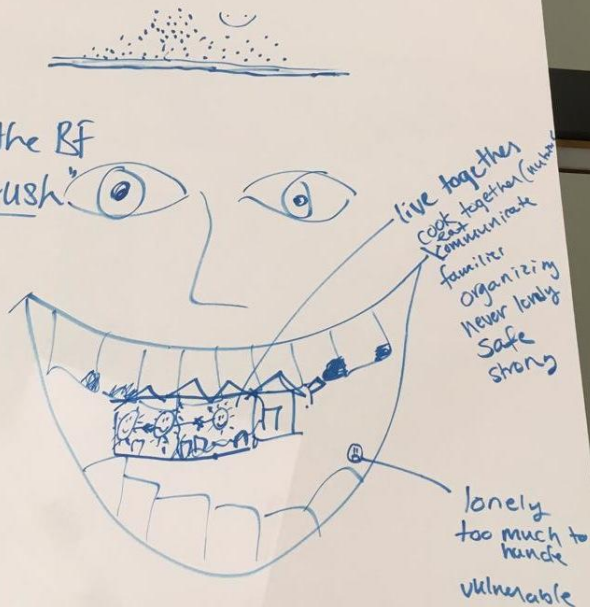




# Complex ideas

## BIOFILMS - Kids

Break the BF  
"Tooth Brush"



## Antibiotic resistance EXPLAINED TO CHILDREN

- Bacteria (little bugs) can make you Sick.
- Antibiotics <sup>is a medicine that</sup> can make you better (kill bacteria)
- Sometimes, bacteria are not completely killed by ~~bacteria~~ <sup>antibiotics</sup> (eg. super strong bugs)
- These bacteria are resistant to antibiotics  
= Antibiotic resistance
- This is bad because we can not treat bacterial infections anymore.

# Complex ideas

## Gene expression

Gene = information that makes  
you you / building block of life  
inherited from your parents.

Ex: color of your eyes (alleles)

coded by 4 letters ATCG  
arranged in sequences.

works only if expressed.

## "Quorum"

Sensing.

- Communication in of a group
- Chemical Signalling.
- Army of the dead without  
a White Walkers.  
e.x. pulling dead dragon from  
the lake.
- Reaching out to friends  
to achieve a common  
interest.

# Complex ideas

## Coagulation

~~Example~~: Like boiling an egg

Analogy: Coagulation is a process similar to tying multiple knots in a thread.

: traffic jam obstructing a highway due to an accident or other event.

Example: Coagulation is basically thickening of the blood.

Analogy: The process of coagulation is similar to a beaver dam blocking the flow of a river.

For the general public



# About conversations

## Hallmarks of an enjoyable conversation

original  
good sense of humor  
common interest  
inspiring  
idealistic  
be yourself  
not a monologue  
equality  
body language  
respect

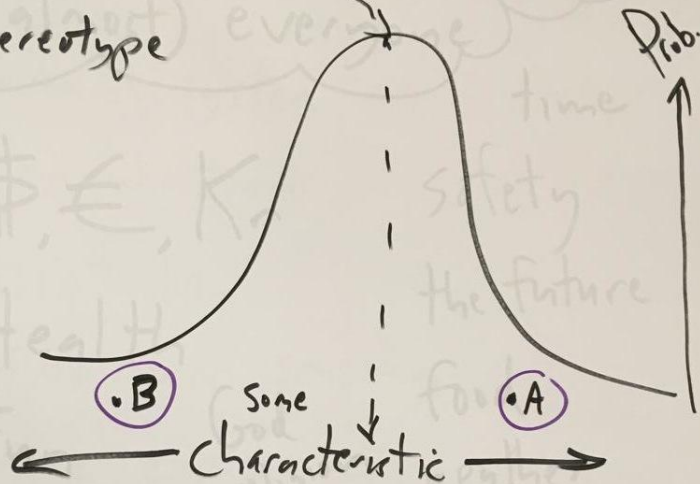
polite  
learn something from it  
out of the box

## Conversation Starters

Something positive  
Weather  
beautiful eyes  
Commonalities that you observe  
Compliments  
Start with an open question

# About stereotypes

Group Stereotypes  
Average  
= Stereotype



▲ individual "A" knows more than average

▲ individual "B" knows less than average

# Contexts for your research results

