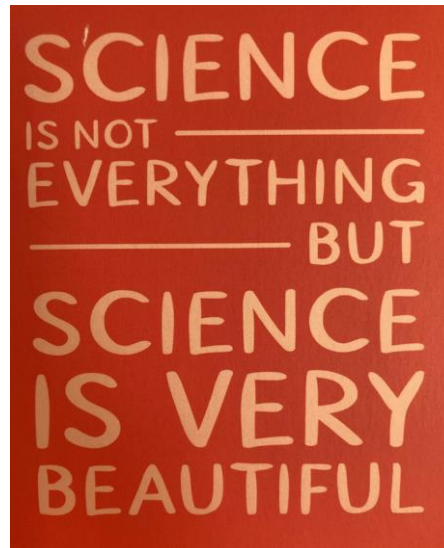


"The art of teaching"

How to communicate scientific content to a non-scientific audience



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Physics Center Bad Honnef

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Agenda / Times (planned – we orientate ourselves to needs)

Monday, Day 1 15:00 – 18:30



- Welcome to the workshop!
- Exercises and theoretical input
- coffee break as needed (30')
- 18:30 Dinner

Wednesday, Day 3 8:30 – 13.30

- Video presentations and feedback
- Look back at day 2
- Informations about „Netzwerk Teilchenwelt“
- Feedback
- coffee break as needed (30')

End of the workshop 13:30

Tuesday, Day 2 8:30 – 18.30

- 8:30 – 10:00
 - Theoretical input
 - Exercises
 - Recording video sessions
- Lunch break 12:30 – 13:30
- 13.30 – 17:00
 - Start video presentations and feedback
 - coffee break as needed (30')
 - Video presentations and feedback
-  17:00 Physics show 
- 18:30 Dinner

Practical exercise: Activate prior knowledge

- Form 4 groups
- what is **important** in order to design a **presentation or teaching event** in which you impart specialist knowledge to a non-specialist audience?
- **Discuss, collect and note** your thoughts and ideas → paper cards (use one subject for one card) **or** create a poster
- think about the **content** as well as the **structure** and the speakers **performance**
- **20 - 30'**

Practical exercise: Activate prior knowledge

Collecting the results:

- one of **each group** fixes cards on the pin board **or** presentate your poster to the audience
- **explain** your ideas and **briefly report** what you've collected in your discussion
- **30'**

Practical exercise: Activate prior knowledge

Why is it important to activate prior knowledge before learning new stuff?

- In our brains the new learning material is linked to existing knowledge → if one activate existing knowledge → right connections between existing and new knowledge can be made
- *In addition: as a teacher you can find out if there is any incorrect prior knowledge.*

Practical exercise: Do we understand each other?

➤ This exercise is about

- changing perspectives
- listen carefully
- decide what is important to pass on the audience
- what is absolutely needed to be named
- how to structure the „content“ (*what is the most important, what comes first and so on*)

→ points that you need to consider when designing a course

Practical exercise: Do we understand each other?

Part 1: Pair work

- One telling the other what he or she is currently working on in research work
 - Talk to each other for 15/20 minutes

Part 2: Short presentation in the plenary session

- one of the couple introduces the other one in the plenary session
- you should address a group of non-specialist, but interested persons (**don't use too many technical terms**)

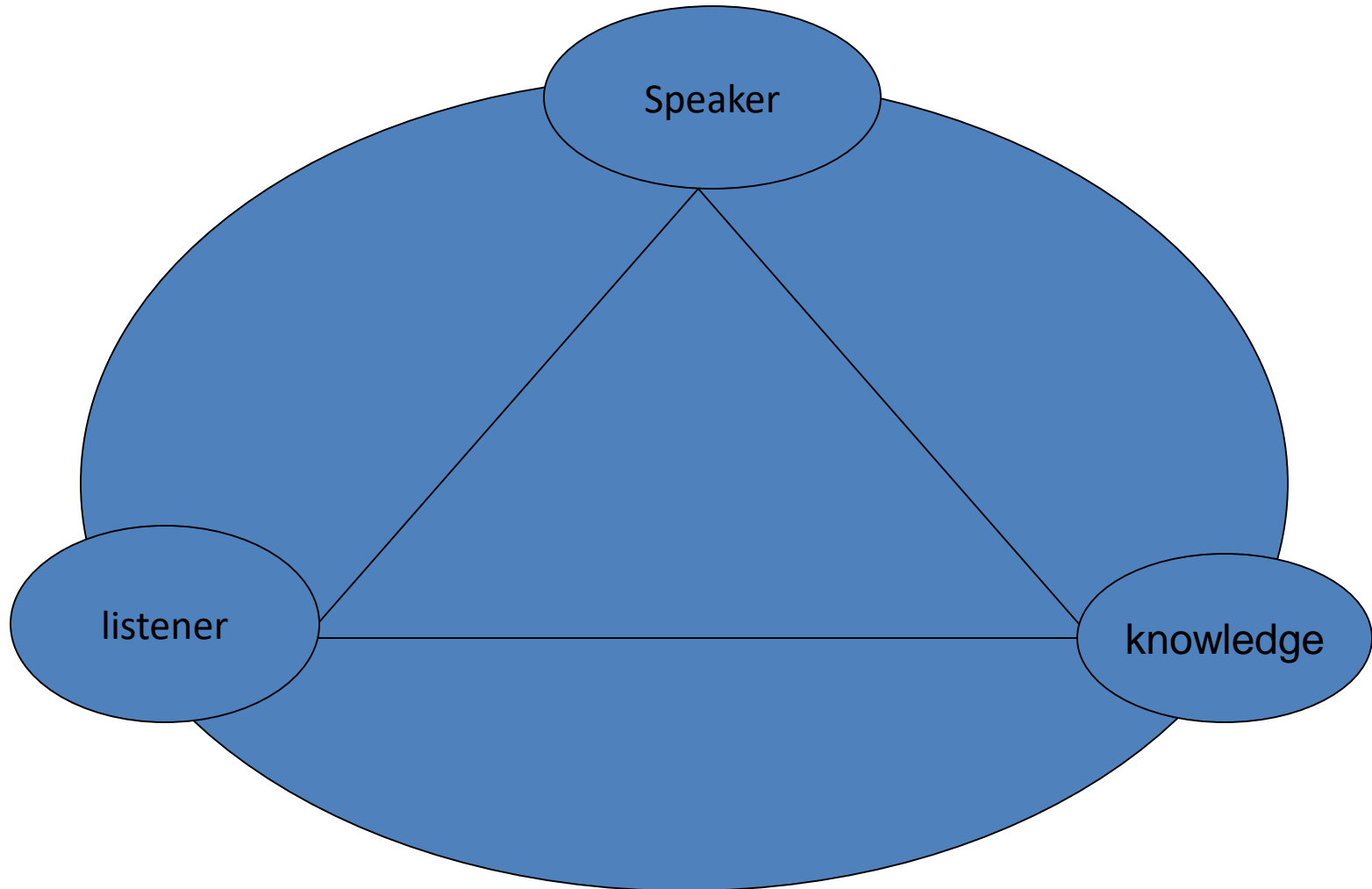


CONTENT

Contents of the workshop

- Basics
 - Teaching-learning-triangle
 - speaker and target group
 - How does learning work?
- Conception and structure of course/presentation
 - different phases
 - motivation and activation of listeners/students
 - performance and media
- **Individual presentation training**

The lecture world is triangular



The lecture world is triangular

The teaching-learning triangle tries to model the complex relationships of a learning process

1. Knowledge cannot be imparted directly, but must be **actively acquired** by the listener
2. Listeners must **get in touch with the topic themselves**

→ When planning the course, you should not only think about the topics → a few thoughts should be about the speaker and the target group

Role models

Role models - good and bad - often influence our actions

Do you have role models?

- What are the characteristics of your role models?
- YOU, as a speaker, are of course also a **ROLE MODEL** for your students

The speakers

- <https://www.youtube.com/watch?v=-FOCpMAww28>
- Text TED Talks EXERCISE → the ideal public speaker



The ideal speakers

- Are...
- experts → have an extensive specialist knowledge
- very well prepared
- emotionally connected to their topic

- Are able to...
- communicate enthusiasm for their topic



**THINK
BEFORE
YOU
START**

Before you start...you should consider that...

Who do you want to reach?

- pupils / students
- colleagues
- science administration (to give money...)
- interested “laypersons” (e.g. citizens)
- media (journalists)
- politic and economy (to give money...)

Before you start...you should consider that:

What do you want to achieve?

- answering questions
- clarifying facts
- imparting knowledge
- explain your points of view
- generate understanding
-

The target group



The target group

„The worm must be tasty to the fish, not the angler”

Do you know your target group?

- prior knowledge, needs and expectations?
- learning and attention barriers
- different learning types
- *Example:* High school students →...

Needs of older teenagers

- Pupils in the upper school: grown up mentally, but sometimes they are still “kids” (phase of "late adolescence" → identity formation processes are still going on)
- “Coming up with the right solution by myself” - this is the motto of adolescents
- Bearers of a large amount of prior knowledge → learning experts
- Clueless beginners, quickly overwhelmed
- need to be motivated for a new topic

How does learning work?



How does learning work?

- Obstacles to learning and attention
- Learning types

Obstacles to learning and attention

- Students need good teachers and good teaching strategies – This is your job!
- The brain needs points of contact to store new information → activate prior knowledge
- Listeners must get in touch with the topic themselves
- Learning/listening is exhausting → please show love and understanding (-:
- We only learn what interests us → students need motivations → make things interesting!
- Learning/listening requires structure → create an understandable structure of the lesson or the presentation!
- As learned/heard, so forgotten → appeal to several senses / use repetitions

Learning types

- 3 different sensory-specific learning types
→ Different didactic approaches
1. Learn visually → need illustration
 2. Learn auditorily → need audio samples / your voice
 3. Learn kinaesthetic → need to be active him/herself (doing exercises)

Material transfer: Learning style matrix

Three different approaches to the lecture material

1. "What?" - style

- Listener needs information/knowledge (input of facts)

2. "How?" - style

- Listener understands through experience (exercises)

3. "Why?" - Style

- Listener needs reference before understanding

Presentation – Preparation



Presentation – Preparation

➤ Collect and select material

What is important, what is dispensable?

What does the target group need?

➤ Compress

Keep an overview and don't lose yourself in the details

➤ Visualize

Create a meaningful and understandable presentation of the content

Presentation - overview

- Opening
 - Main part
 - Closing
-
- Concentrate on the opening part → ...

Presentation - Getting Started

The Opening

- What is important?
- Criteria for a successful initial phase?
- Discussion with colleagues

Presentation – Opening (1)

Strategy : Attention from the start

- Greeting
- Topics and goals
- Creating personal concern – “connect“ the audience to the presentation
- Short "sightseeing flight" over the lesson/presentation
- Give an overview and stick to it linguistically (“There are three different topics today, first, second, third...use your fingers showing one, two, three)
- Maybe use an anecdote from your own school/study time

Presentation – Opening (2)

TIPS for success

- Be positive → good mood and good attitude
- Schedule - verbal or written “red thread” (gives orientation to your audience)
- Start your lecture/presentation on time
- Make (visual) contact and create a good atmosphere
- Use moderation cards or keyword list on screen
- You have to speak loud, clear, friendly, binding

Presentation- Main part (1)

- Structure: following a red thread
- How to structure the lecture
 - Order of facts is important
 - Link learning content (also linguistically) with one another and build on one another
- Define main and sub-points (*Less is more!*)
- Establish a connection to the world of experience of the listeners

Presentation- Main part

- **Structure** provides orientation and conveys security (reliability) → leads to a positive learning atmosphere!
- Structure options
 - Genetic structure (contents by time: what was first, what was then, and what was after this..)
 - “Rule of three”: What was? What is? What will be?)
- This includes a **linguistic structure** at the beginning of the course (e.g.: "Today three points are important: first..., second..., third..."). This creates **clarity** for the students.
- Start with an **overview**

Presentation- Main part (3)

- Generate attention →
- structure the presentation by asking some questions
- provide variety in media
- divide material into short presentation sections and take breaks
- visualize usefully
- Use examples and metaphors
- Speak in short sentences with deliberate pauses

Presentation – Closing

- Strategy : What should be remembered?
- Significant “last“ words– give a short summary
- Create a bridge to the opening
- Give an exciting thematic outlook (for the next event e.g.)
- Optional: Ask for direct feedback
- Optional: One minute paper →
- Don't forget to say „thanks!“ to your audience

Presentation – Closing

One minute paper

- A one-minute paper is a short activity (you can set a timer at 1 minute) you can use for feedback
- For example: You want to understand whether students find the content difficult or easy
- Students answer **two questions**:
 1. What was the most important thing you learned today?
 2. Something you didn't understand / what was least important?

Presentation – a word on the language...

Technical language/ jargon

- High information density in long sentences
- Many nouns
- Professionally defined terms
- kind of slang that no one outside your bubble will understand

↔ **Everyday (lay) language**

- Information in many short main and subordinate clauses
- Many verbs
- Commonly known terms
- Many examples, metaphors

The simpler the better

- Use **active** wording (instead of passive)
 - Present processes in the **correct order**
 - Make **logical references clear in language** (by, because, after, as a result, ...)
 - It is better to have several **short main and subordinate clauses** with many **verbs** than one or a few sentences in the nominal style (means many nouns)
- helps your students staying focused and engaged

Performance

- Body language and facial expression
- Voice
- Media use

Appearance and body language

Non-verbal signals

- Outer appearance
- Includes posture, gestures, facial expressions (including eye contact)
- **TIP:** Do **hands gestures** only underneath **a thought line** at the level of your chest - don't go any higher (-> this is irritating)
- **Body language** is instinctive and it is a **very old** type of language -> highly believable for us; we have a **deep trust in non-verbal signals**
- It's important to be **congruent**: Your body language has to fit to what you're saying

Body language: Credibility

- Body language 55%
- Voice 38%
- The said 7%

SMILE experiment

Body language not only has a one-way effect, it also affects ourselves

Improve your mood!

Clamp a pencil between your teeth for about a minute without touching your lips. - This engages the same facial muscles that you use when smiling. This leads to a hormone release that actually improves your mood: your smile will become "real".

Human beings: so called "eye beasts"

- 80% of the stimuli are received by the eye
- Therefore: **Keep eye contact**
- Good eye contact is not rigid (no starring)
- Sign of commitment, respect and appreciation

Voice

This is important

- Speech modulation
- Speech comprehension (voice speed - slow/fast)
- Volume (talking too loudly or too quietly)

Voice

- Try **to raise and lower** your voice and pay attention to **pauses in speaking**, otherwise it will become **boring** and the listener maybe will **mentally drop out**
- Even if you only **have a little time** and **a lot of material** to convey: **Don't** be tempted to **speak** very **quickly** in order to mention as many facts as possible
- → It is better to name links or to prepare a script or to give homework

Media use

What media do YOU usually use?

Media use

Key word: PowerPoint

- A good slide cannot stand alone; it's not explanatory - it needs you!
- The presentation should support YOU, not the other way around!
- Mind reading energy robbers!
- Using Pp: Never turn your back to the audience and don't neglect interaction
- **Don't become a talking robot!**

Simple "rules of conduct" for speakers

Show your presence!

- Adopt an open, welcoming attitude
- Speak kindly and articulate clearly
- Maintain eye contact
- Never show your back to the audience.

Always be yourself!

Planning sketch (general)

1. General conditions (location, material, media, target group)
2. Beginning phase
 - greeting
 - Personal speech
 - Objectives of the event
 - Personal information (transparency)
 - Information about the course (topics, times, breaks, availability)
 - Classification of the course in the subject
 - Activate prior knowledge -> linking to topics that have already been dealt with
 - Encourage listeners for questions and feedback
3. Main Part
 - Structure / Red thread
 - What do you want to achieve with this course/presentation?
 - What are the most important learning outcomes (teaching objectives)?
 - How do you motivate listeners? (motivating factors)
 - Clear structure and breaks
 - Inclusion of the prior knowledge of the students
 - Work in small groups
 - - Use of different media to address different types of learners
4. Closing Phase
 - Securing results / reflecting on personal learning experiences through one-minute papers
 - Feedback rounds

Video analysis

It's your turn now:

6 minutes in front of the camera

- beginning of a presentation/course
- opening sequence

Evaluating the Presentation / Feedback to speaker

Evaluation matrix for presentations

			A	B	C	D	E	
			very well fulfilled	well fulfilled	Fulfilled	insufficiently fulfilled	not fulfilled	
1	structure	clearly structured, common thread, comprehensible						incomprehensible, no visible structure, causes confusion
2	Contents	factually correct throughout						serious factual errors
3	relevance	relevant, exciting and appropriate						irrelevant, no value, inappropriate
4	presentation documents	appealing, supportive media support						unappealing, confusing, way too big, or too little
5	language and expression	understandable and comprehensible, appropriate vocabulary, rhetorical security						not understandable, little vocabulary or overly complicated expression
6	rate of speech	takes breaks, appropriate pace, continuous flow of speech						No breaks or too long breaks, too slow or too fast, halting
7	Voice	good intonation, one likes to listen, appropriate volume						monotonous, drowsy, too quiet or too loud, difficult to understand, listening is exhausting
8	eye contact	free lecture, eye contact with the entire audience						No eye contact, fixing or reading slides or cards
9	Gestures & facial expressions	open and inviting attitude, facing the audience, facial expressions are relaxed and appropriate to the topic						reserved or stiff posture, turned away from the audience, exaggerated or understated facial expressions, irritating gestures

Feedback

- Each speaker chooses two persons of the audience to give a verbal feedback - so-called „master-feedback“
- The other ones note down their feedback
- Maybe the matrix will be helpful for feedback:
- For example: if you think, speaker one has done very well regarding structure one will choose a 1A evaluation for this point
- Add some explanations to your evaluation