

ACTIVE AND ENGAGING ONLINE TEACHING FOR STEM LECTURERS

Cornelius Benekam

25/11/25

KÕRGHARIDUSE KVALITEET JA RAHVUSVAHELISTUMINE'E

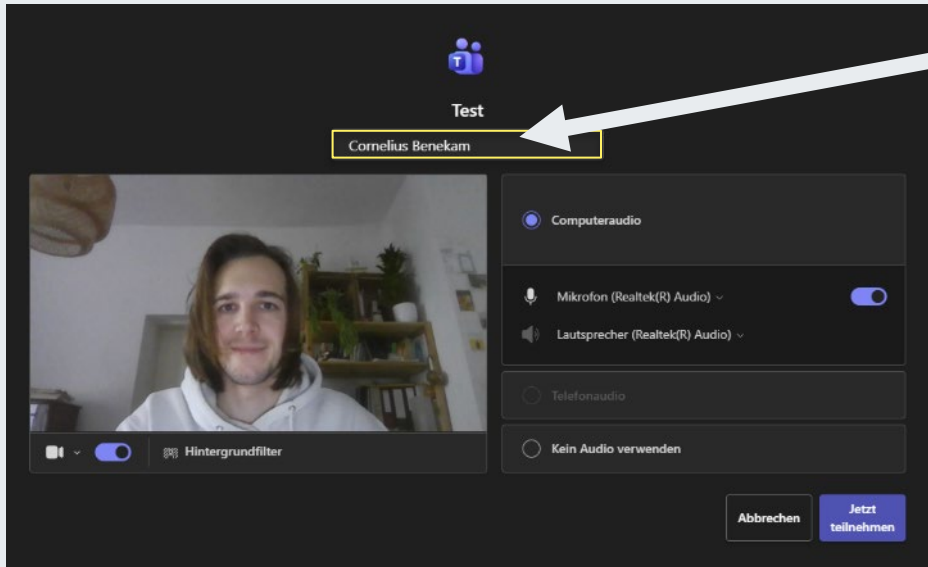


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Euroopa Liit



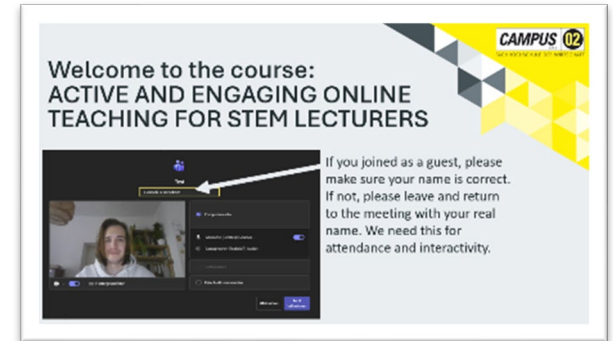
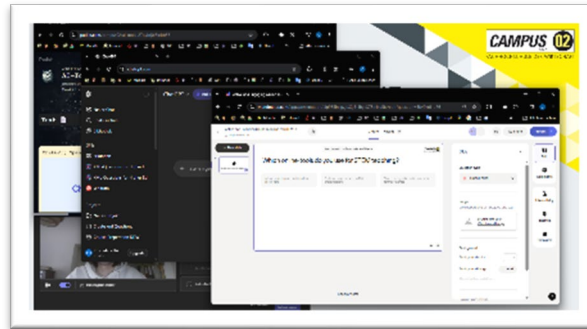
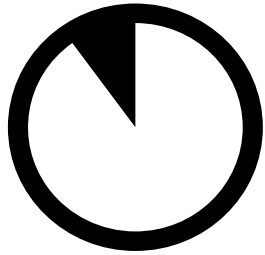
Eesti
tuleviku heaks

Welcome to the course: ACTIVE AND ENGAGING ONLINE TEACHING FOR STEM LECTURERS



If you joined as a guest, please make sure your name is correct. If not, please leave and return to the meeting with your real name. We need this for attendance and interactivity.

PREPERATIONS



LEARNING OBJECTIVES

- ◆ Participants will be able to **facilitate** interactive and enjoyable online sessions.
- ◆ Participants will be able to **apply** basic coaching methods in digital teaching.
- ◆ Participants will be able to **integrate** formative feedback **into** their digital teaching **practice**.
- ◆ Participants will be able to **use** web-based tools to enhance student engagement.

ICE BREAKER – SETTING INDIVIDUAL LOS

Sorry for spamming :)

Stimmungsbarometer

(Add a reaction to the weather symbol — whatever fits your current mood)



Scaling Questions

Where on a scale from 1 to 10 would you place your digital feedback skills?
(Add a reaction to the number)



Where on a scale from 1 to 10 would you place your digital feedback skills after the workshop?



Open-ended question

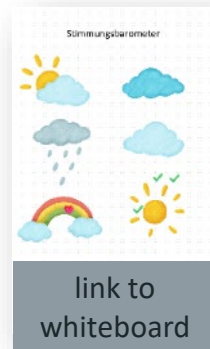
In which area do you see potential for improvement? What would you like to take away from today?

Write down 1-3 points on a sticky note.

<p>Feedback-Review</p> <p>I would like to get better knowledge about different interactive learning tools, which I could use in Teams.</p>	<p>Feedback-Review</p> <p>Didaktik gemäß STEMI</p>	<p>Feedback-Review</p> <p>I would like to learn how to keep student's attention during learning sessions.</p> <p>learn about new tools available</p>
<p>Feedback-Review</p> <p>overview of the tools to use</p>	<p>Feedback-Review</p> <p>I would like to gather ideas from the lecturer and other participants about how to make the online lectures engaging and how the students will actually learn best, and to implement the ideas I like best. :)</p>	<p>Feedback-Review</p> <p>General overview of the possibilities</p>
<p>Feedback-Review</p> <p>How to keep listeners engaged all through the lecture.</p>	<p>Feedback-Review</p> <p>How to encourage teamwork during an online session.</p>	<p>Feedback-Review</p> <p>- How to make online teaching enjoyable - what kind tools are and how to use them</p>
<p>Feedback-Review</p> <p>I would like to know how to motivate students to use camera and microphone during the online session</p>		



MOOD BAROMETER

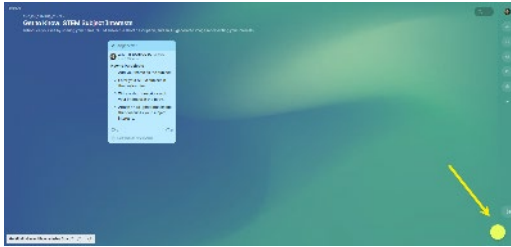


SCALING QUESTIONS

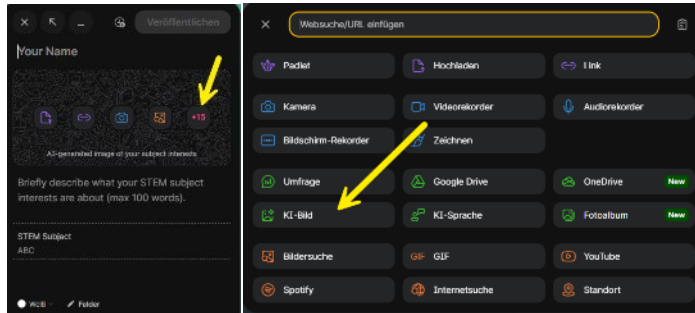


[Link to the whiteboard](#)

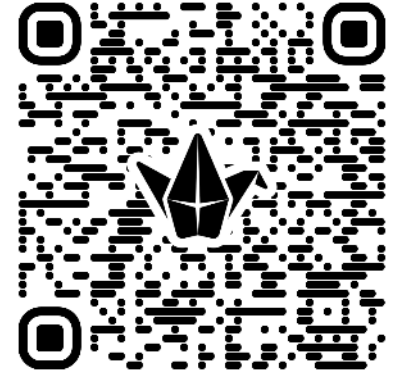
How to Participate



1. Add your name as the subject.
2. Enter your STEM subject in the custom field.



3. Attach an AI-generated image that describes your subject interests.
4. Write a short description of this image in the body.



<https://padlet.com/campus02/stemsubjects>

Link still works and
Padlet will be
deleted in 1 year
for privacy

COLLABORATIVE CLASS RULES

- ◆ **Task:**
Work together to develop class rules for effective online learning.
- ◆ 🖱️ **Step 1: Introduction**
Introduce yourself and share what you posted on Padlet.
- ◆ 💬 **Step 2: Discussion**
Talk about rules that are important to you in online learning.
Use these guiding questions to support your discussion:
 - ▶ Imagine you are a student in your own online course: What would you wish for?
 - ▶ Which rule might currently be missing?
 - ▶ What is important to you to make online learning successful?
 - ▶ What needs to happen so that everyone can be active and engaged?
- ◆ 💻 **Step 3: Mentimeter**
Each person in your group posts **one different rule** in the **Mentimeter**.
- ◆ 👥 **Step 4: Plenary Discussion**
Afterwards, we meet together to discuss and reflect on all results.

CLASS RULES

Participants emphasized the importance of active engagement during sessions, highlighting participation in discussions, timely task completion, and interaction through chat or questions. Practical suggestions included using AI tools for assignments, short tests with peer feedback, and maintaining technical readiness such as checking internet connection and sharing screens. There was a clear focus on maintaining attention and interaction, with rules like turning on cameras and muting microphones when not speaking. Although no online tools for STEM teaching were specified, the overall discussion centered on structured, interactive, and supportive learning environments.

Chat Personen Heben Reagieren Ansicht Weitere Kamera Mikro Teilen **Verlassen**

👍 ❤️ 🙌 😄 😲

IMPLEMENTING PURPOSEFUL BREAKS

- ◆ When: More often than face-to-face lessons
- ◆ Let timer run.
- ◆ Maybe let licence free music plays when students should return or a gong to be more professional / habits to get everyone back in time.

SYNCHRONOUS ONLINE TEACHING: REDUCING FATIGUE

- ◆ Aim: sustain attention and engagement, reduce mental exhaustion.
- ◆ Self- and peer-viewing increase cognitive load → Zoom fatigue
- ◆ Limit lecture length; focus on key points and active learning
- ◆ Insert interaction every 5–10 min (polls, hand signals, chat questions)
- ◆ Alternate formats: whole-class, individual, small-group (Breakout Rooms)

eCampus (2020) Eine interaktive Videokonferenz in der Lehre abhalten. <https://e-campus.st/moodle/course/view.php?id=60>

Tu, Y., Wang, Q., & Huang, C. (2025). Facilitating Students' Emotional Engagement in Synchronous Online Learning: A Systematic Literature Review. *The International Review of Research in Open and Distributed Learning*, 26(1), 261–282. [rg/10.19173/irrodl.v26i1.7732](https://doi.org/10.19173/irrodl.v26i1.7732)

Hung, C.-T., Wu, S.-E., & Chen, Y.-H. (2024). The evaluation of synchronous and asynchronous online learning: student experience, learning outcomes, and cognitive load. *BMC Medical Education*, 24:326. <https://doi.org/10.1186/s12909-024-05311-7>



FEEDBACK DEFINITION

“feedback is **information** with which a learner can **confirm, add to, overwrite, tune, or restructure** information in memory, [...]”

(Hattie & Timperley, 2007, p. 82)

domain
knowledge

meta-cognitive knowledge

Cognitive tactics
and strategies

beliefs about self

beliefs about task



The Power Of Feedback Revisited (Wisniewski et al., 2020)

- ◆ Moderate effect size ($d = 0.48$) of feedback on learners' achievement.



FEEDBACK TO STUDENTS: WHAT DO THE STUDENTS WANT?

- ❖ Happy about any kind of feedback
- ❖ Prefer written feedback
- ❖ Feedback on
 - ▶ How to improve
 - ▶ Explanation for Grades
- ❖ Particularly want teacher-oriented feedback and appreciate it more

THE POWER OF FEEDBACK

„High-information feedback contains **information on task, process** and (sometimes) **selfregulation** level. Its effect is very large, which suggests that students highly benefit from feedback when it helps them not only to understand **what mistakes** they made, but also **why they made these** mistakes and **what they can do to avoid them the next time**. These results are in line with claims of Hattie and Timperley (2007) who assume forms of feedback “most useful when they assist students in rejecting erroneous hypotheses and **provide direction for searching and strategizing**” (pp. 91–92).”



FEEDBACK LEVELS

Tipp

It is also better to leave out well-intentioned personal feedback, such as "Well done".

Feedback Level	Example	To Whom & When to Apply
Task	"The first definition is correctly restated."	Novices , low level of knowledge
Process	"The respective first paragraphs of both definitions are correctly described. Take another close look at the remaining content points."	All
Self-regulation	"What could help you to more clearly differentiate the two definitions from each other?"	Experts , high level of knowledge
Person	"Well done"; "You are a good student"; "That is a very intelligent answer."	--- Must be avoided as much as possible ---



HIGH INFORMATION FEEDBACK

- ◆ Provide feedback shortly after the relevant event.

DEAL WITH EMOTIONS IN FEEDBACK GIVING

Important: Feedback
affects motivation

- ◆ Adress changeable aspects!
- ◆ Give more reinforcing than critical feedback.
- ◆ Ask for permission / Let students ask for feedback
- ◆ To enhance acceptance, start by asking for a brief self-assessment
- ◆ Positive and negative feedback refer to the comparison of the desired state to the actual state, and not to the formulation of the message.



Organize feedback

Consider opportunities for feedback during course planning.

Communicate feedback criteria or objectives to the participants in advance or develop them together with the participants.



Inform participants about planned feedback processes and explain why feedback is given.



ANSWER THESE
QUESTIONS:

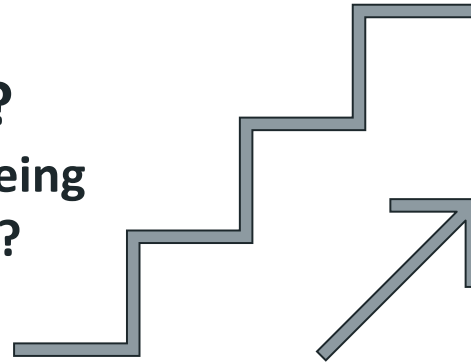


1. Where am I going?
What are the goals?

2. How am I going?
(What progression is being
made toward the goal?)



3. Where to next?
What activities need to be
undertaken to make better progress?





OIR MODEL

◆ **Observation**

- ▶ Free of judgment: What did I see or hear?

◆ **Impact**

- ▶ Personal feelings: How did that observation affect the situation/me?

◆ **Recommendation**

- ▶ Request for change in behavior: What would I like to see happen next time?



ACTIVE FEEDBACK PRACTICE: OIR

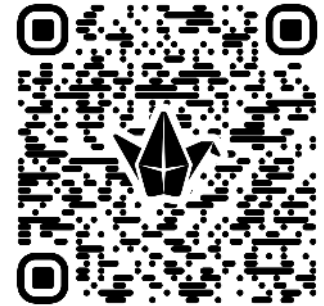
Reinforcing Strengths in Master/Bachelor Theses: **YOUR 3-STEP TASK**

1. Read the Artifact
Select and read the Padlet post (case excerpt) that fits your subject matter.

2. Identify One Strength
Choose ONE single, non-personal strength (a resource) in the student's work to focus on.

3. Write & Post OIR
Write your complete OIR statement and post it as a Comment on that Padlet post.

9 min



The OIR Method Focus (Strength-Based)

O - Observation: State the **specific, non-personal** skill or action you noticed.

I - Impact: Explain the **positive result** of that action on the thesis or project.

R - Recommendation: Tell the student **what to repeat or integrate** in the future.

KEY RULE: Resource-Oriented Feedback

Use the student's current strength (e.g., 'clear notation', 'rigorous documentation') as the starting point to lead to a **suggested improvement** for their thesis.

How to utilize online-tools for STEM-Teaching - Use Cases

Mentimeter

Menti+Miro

Recall with Menti or SLido.
Content and solving tasks collaboratively with Miro.
Recall and review in Menti or SLido.

Whiteboard

I use the whiteboard to write/solve equations on it

Prepare them beforehand to help with the flow of the class.

The students could use the Whiteboard tool to break a complex STEM problem into smaller parts using sticky notes and arrows.

The students could upload their short solutions to the problems.

I have used whiteboards to visualize complex concepts

Brainstorming

whiteboard/kahoot

I find whiteboard and kahoot quite useful to visualise complex concepts and to check the skills or know how of students.

A practical three-strategy framework for using whiteboards in STEM teaching must focus on collaborative problem solving, visual scaffolding, and real-time feedback.

A set of correct and incorrect conceptions is posted on the whiteboard. Students

Padlet

Padlet use

The goal is to check if homework has been completed. To do this, you can add the assignment to Padlet and ask for a quick vote on it.

PEER FEEDBACK



Lecturer feedback to students

$d = 0.47$, CI [0.43 – 0.51]



Peer feedback between students

$d = 0.85$, CI = [0.59 – 1.11]

REASONS FOR PEER FEEDBACK



Large number of students to receive feedback

Students should become active themselves

Understanding of feedback usually higher (Feedback givers on the same knowledge-level)

Students learn how to deal with feedback

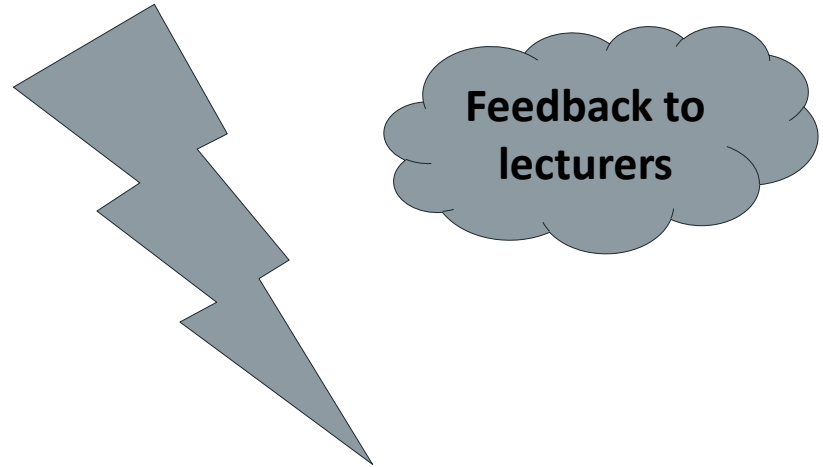
PEER FEEDBACK - PROCESS



- ❖ Explain to students the reason for the activity
 - ▶ Peer feedback as the most effective feedback with a high influence on learning success
 - ▶ Training in feedback skills
 - ▶ Improvement of one's own skills in evaluating texts (learning objective level evaluation)
- ❖ Draw students' attention to copyright

Quick Feedback Methods

- ❖ Blitzfeedback-Methode
- ❖ Flash Method
- ❖ Position barometer
- ❖ Top-Hashtag
- ❖ Start, Stop, Continue
- ❖ One Minute Paper
- ❖ Exit Ticket 3-2-1



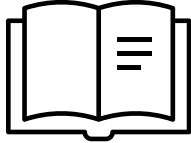
3 things they learned in the lesson
 2 things they liked about the lesson, or 2 interesting facts they learned
 1 question they still have about the lesson

Extended Feedback Methods

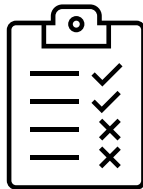


Peer feedback / peer review

Feedback to
students



Write a review



Questionnaire

Feedback to
lecturers


Tools: Feedback for students

- ❖ Peer review: Mutual assessment in Moodle
- ❖ Forum in Moodle (also possible for peer review)
- ❖ Padlet (also possible for peer review)
- ❖ Collaborative writing tools such as Google Docs, shared Word documents, Etherpads
- ❖ Screencasts or voice recordings



Forum in Moodle

Feedbackforum
Abgabe Testperson ⚙️ Einstellungen ▾


Diskussion ins Portfolio exportieren
Anzeige in geschachtelter Form ▾
Das Thema verschieben nach ... ▾
Verschieben


Abgabe Testperson
 von Christina Egger - Monday, 13. February 2023, 11:49

Anbei findet ihr den Entwurf meiner Seminararbeit.


[2022_03_03_Allgemeine-Pruefungsordnung.pdf](#)


Dauerlink
Bearbeiten
Löschen
Antworten
Ins Portfolio exportieren


Re: Abgabe Testperson
 von Sascha Muster - Monday, 13. February 2023, 12:28

Hier nun meine Anmerkungen zum Text:

Das Thema ist sehr gut herausgearbeitet. Insbesondere sind die Ziele des Beitrages klar und auch deutlich dargestellt, sie werden vielleicht etwas zu oft wiederholt.

Dauerlink
Ursprungsbeitrag
Bearbeiten
Thema teilen
Löschen
Antworten
Ins Portfolio exportieren

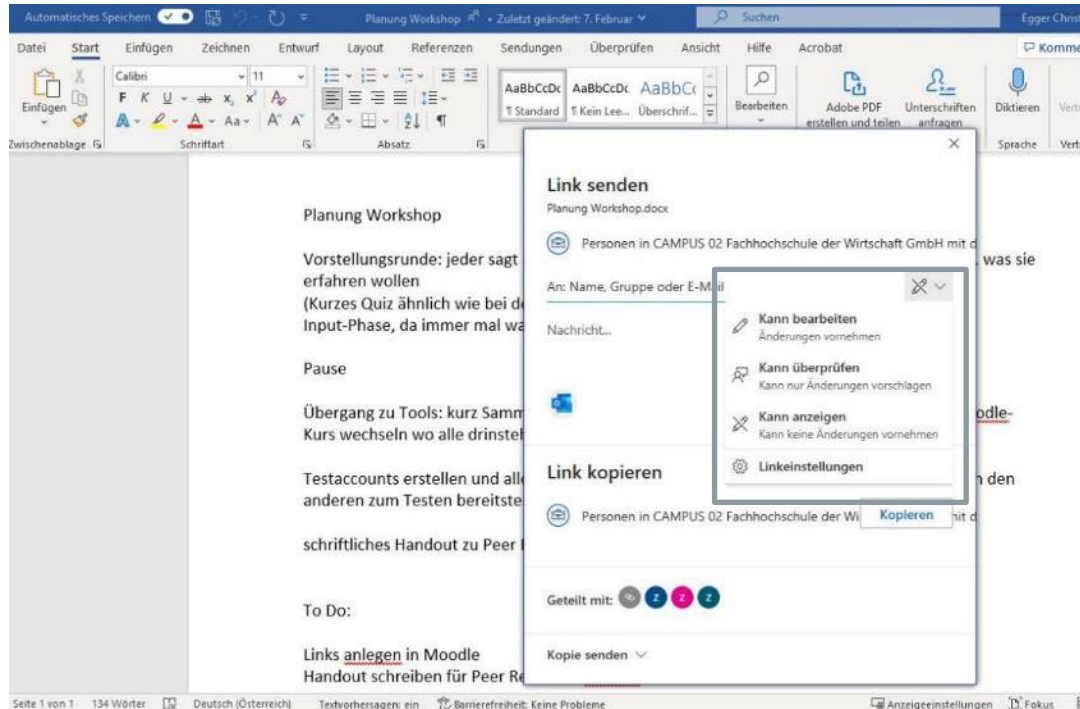
Padlet



Pros	Cons
Available for participants without registration	Registration required for LP
Lots of content such as links, videos, etc. can be inserted	Only 3 Padlets in free version
Mutual commenting of contributions possible	Some privacy concerns

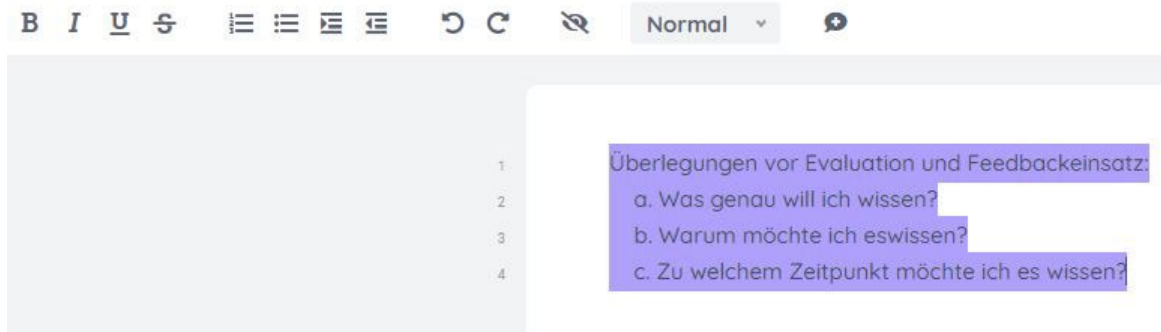
<https://padlet.com/>

Collaborative writing tool: Microsoft Word



Pros	Cons
Easily accessible via Microsoft 365	Microsoft 365 is required, and sharing may be restricted by IT.
Traceability because all contributors have different colors in their comments	Only when sharing with editing rights can you actively participate
All functions of a Word document can be used together	Must be saved to One Drive beforehand

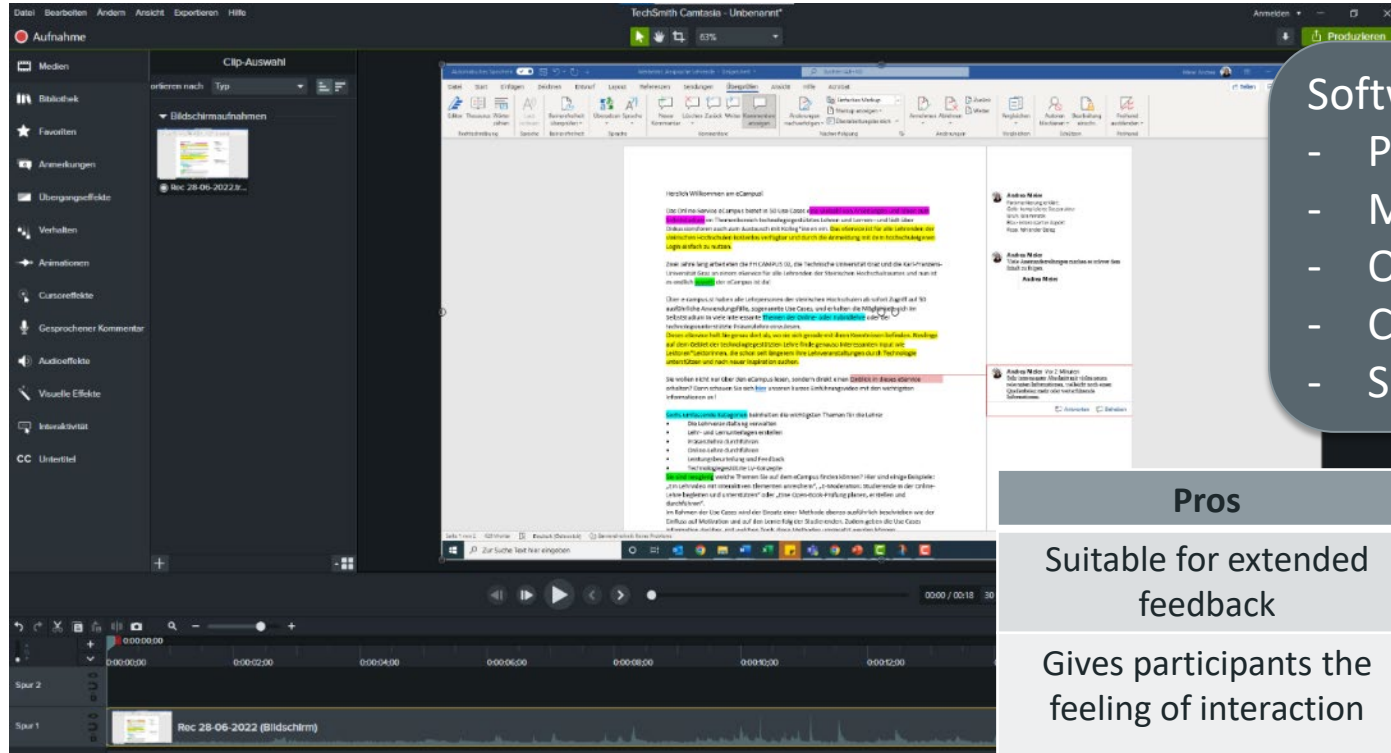
Collaborative writing tool: etherpad



[Feedback | yopad.eu](https://yopad.eu)

Pros	Cons
Freely available online	Anyone with a link can make changes
Contributions tracable through different font colors	When saved, colors are lost

Screencasts or voice recordings



Software:

- PowerPoint
- MS Teams
- OBS
- Camtasia (paid)
- Snagit (paid)

Pros	Cons
Suitable for extended feedback	May take longer to create
Gives participants the feeling of interaction	Sharing with participants may be more difficult (file size)

Peer Review

❖ Participants

- ▶ Individually evaluate sample submissions for an assignment.
- ▶ Create their own solutions to assignments.
- ▶ Perform self-assessment.
- ▶ Receive feedback from other participants.
- ▶ Receive feedback from instructors.

Übung zum Peer Review

Iyubova Anastasiya

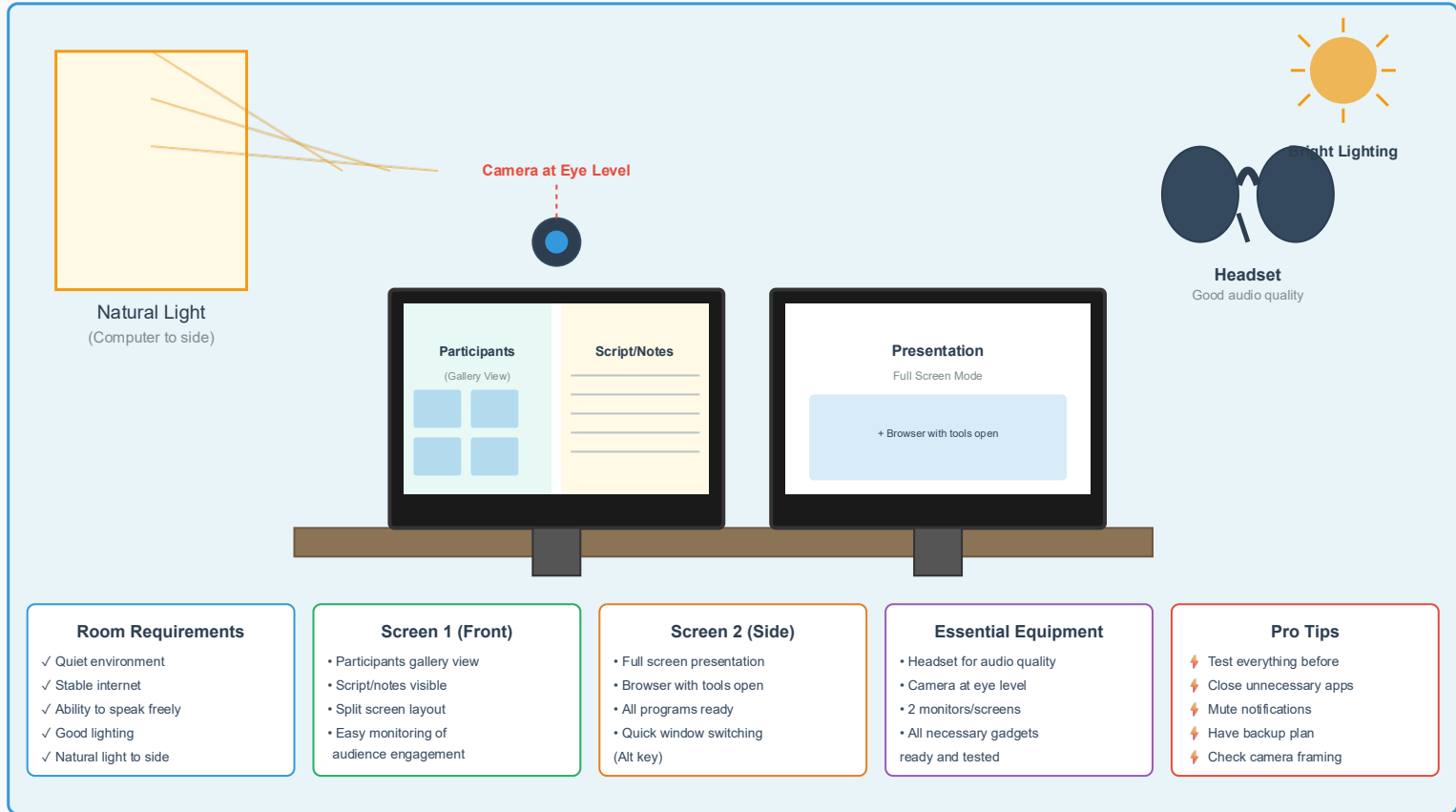
Als erledigt kennzeichnen

Vorbereitungsphase

Vorbereitungsphase Aktuelle Phase ●	Einreichungsphase In Einreichungsphase wechseln ○	Beurteilungsphase In Beurteilungsphase wechseln ○	Bewertungsphase In Bewertungsphase wechseln ○	Geschlossen Gegenseitige Beurteilung abschließen ○
<ul style="list-style-type: none"> ✓ Beschreibung für gegenseitige Beurteilung verfassen ✓ Hinterlegen Sie hier die Anleitungen für die Einreichung ✓ Beurteilungsbogen bearbeiten ✓ Zur nächsten Phase wechseln 	<ul style="list-style-type: none"> ✓ Hinterlegen Sie hier Hinweise zur Durchführung der Beurteilung ✓ Einreichungen zuordnen <p>antwortet: 0 zustudiert: 0</p>		<ul style="list-style-type: none"> ✓ Punkte für die Einreichungen berechnen antwortet: 1 beantwortet: 0 ✓ Punkte für die Beurteilungen berechnen antwortet: 1 errechnet: 0 ✓ Abschluss der gegenseitigen Beurteilung aktivieren 	

Peer Review is a special multi-level type of task.

Perfect Video Conference Setup for Lecturers



USE POWERPOINT IN PRESENTATION MODE AND ADJUST SLIDES IN THE BACKGROUND WITH SMARTART

Idea 1

Idea 2


Idea 3

Idea 4


ESSENTIAL SHORTCUTS

Alt + Tab

Switch between open windows. To cycle through multiple windows, continue to hold the Alt key and press Tab multiple times.

Windows key  +
Left arrow

Snap the window to the left side of the screen.

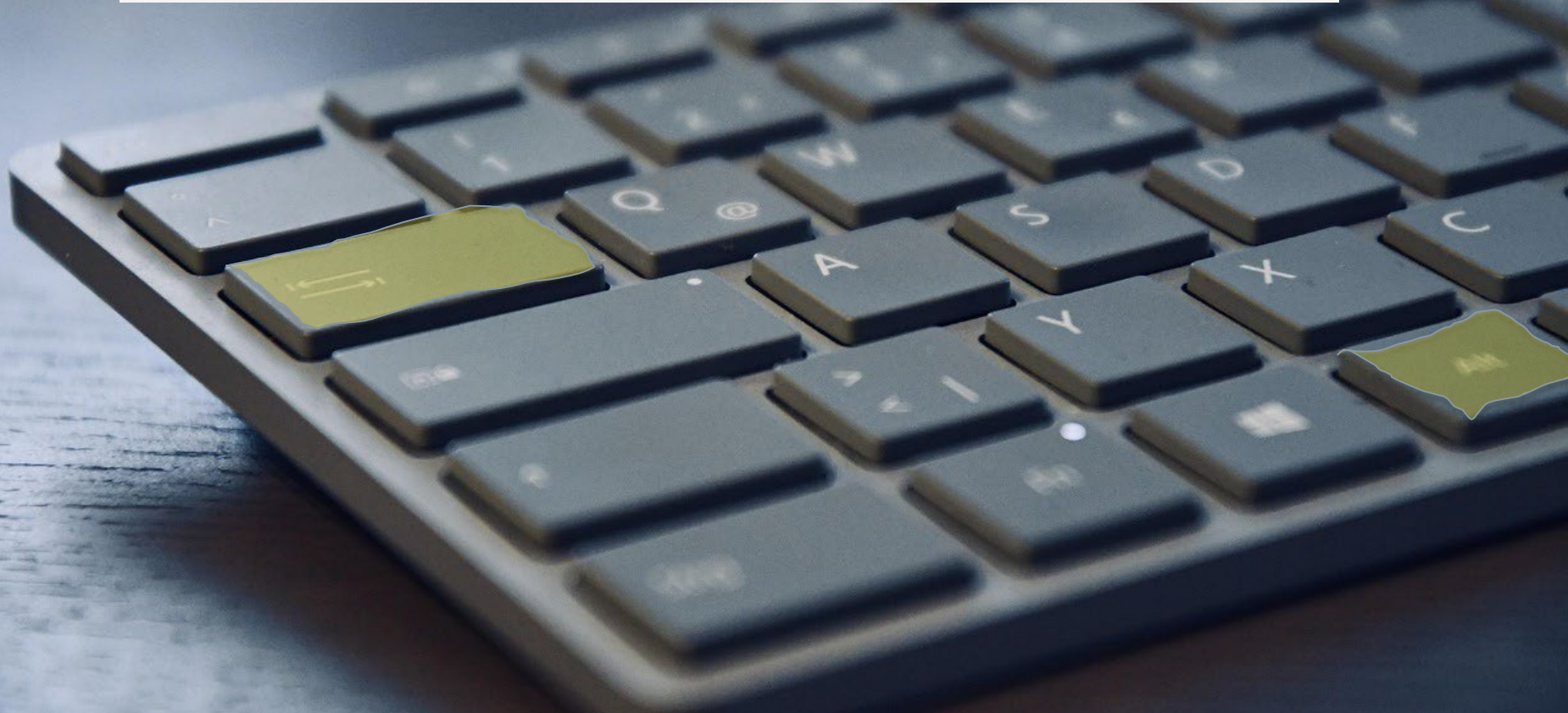
Windows key  +

Open [Task View](#).

Tab

Alt + Tab

Switch between open windows. To cycle through multiple windows, continue to hold the Alt key and press Tab multiple times.



Activity: Collaborative Brainstorm

Generating High-Impact STEM Teaching Strategies

Your Mission (The Next 30 Mins)



Share Practice

Leverage your collective expertise. You are the experts in your STEM fields.



Brainstorm Solutions

Discuss current teaching challenges and generate practical, tool-based solutions.



Identify Top 3

Filter your ideas to find the 3 highest-impact strategies for your group's tool.

Step 1: Choose Your Station



Live Polling

(Mentimeter)



Live Polling

(Kahoot!)



Whiteboard

(Miro)



Whiteboard

(MS Teams)



Pinboard

(Padlet)

TOOLS AND DESCRIPTIONS

- ◆ Link to Descriptions of Mentimeter, Padlet & Kahoot:
https://educampus02-my.sharepoint.com/:f:/g/personal/b54532_campus02_at/IgBltXf7BAwZToDJlEFVZnlRAdhNSdtb9pHAXJbnl8CZ5ig?e=rnHJoM
- ◆ Link to our list of webbased tools in German language:
<https://www.campus02.at/hochschuldidaktik/lehre/web-basierte-tools/>

Your 30-Minute Workflow

Phase 1: Share

(5 Mins) Each person shares one specific engagement challenge.

Phase 3: Upload

(5 Mins) Post your 3 ideas to the shared Padlet and return to the main room.

Join & Introduce

Join your room (max 5) and do quick intros (Name, Discipline).

Phase 2: Brainstorm

(20 Mins) Generate ideas. Discuss, filter, and select your Top 3.

Phase 1: Share Your Practice

5

Minutes

1. Quick Intros

Name, Discipline, STEM Area.

2. Share Your Challenge

Each person quickly shares ****one specific, current challenge**** they face in their online STEM lectures.

(e.g., "Students won't review formulas," "They get lost in complex diagrams," "They don't ask questions.")

Phase 2: Collaborative Brainstorm

15

Minutes

1. Brainstorm Solutions

Individually and as a group, generate ideas for using your room's tool (Mentimeter, Miro, or Padlet) to solve the shared challenges.

2. Select Your Top 3

Discuss, filter, and choose the **3** most important, high-impact ideas. Make them actionable and specific to STEM teaching needs.

Phase 3: Final Deliverable

5

Minutes

1. Access the Shared Padlet

The link will be provided in the chat.

2. Post Your 3 Ideas

You could add additional material like screenshots or links to padlets

3. Return to Main Session

Once your post is complete, please rejoin the main meeting.



Activity in Progress

30 Minutes

The link to the shared Padlet is in the chat.

STEM Tool Deep Dive & Showcase

Visualizing Complex Concepts for Formative Feedback

5
min

Phase 1: Input & Tool Assignment

****The Challenge:**** Formative feedback is most powerful when students can **see** the complex, invisible concepts in our fields.

Your task is to explore a tool that makes these concepts visible, allowing for more precise feedback.

Suggested Tools & Focus Areas



Math Group

Tool: **GeoGebra**

Focus: Dynamic Geometry, 3D Plotting,
Function Visualization



Physics Group

Tool: **PhET Simulations**

Focus: OER Simulations, e.g., 'Energy
Skate Park', 'Circuit Construction Kit'



Enviro/Sustain. Group

Tool: **En-ROADS Simulator**

Focus: Dynamic Modeling of Global
Climate & Policy Scenarios



CompSci Group

Tool: **Live Code Visualizers** e.g.

Focus: Code Execution, Debugging, Data
Structure Visualization



Chemistry Group

Tool: **PhET Chemistry**

Focus: OER Simulations, e.g., 'Build a
Molecule', 'Balancing Chemical Equations'

Engineering Group

Tool: **Interactive Plotters**

Focus: Real-time Data Plotting (e.g.,
Plotly, Datawrapper)

PHASE 2: GROUP DEEP DIVE

15
min

1. Explore

5
min

Briefly decide on, if you want to use the assigned tool or another one. Open this tool. What is its core function? How could a student use it to explore a key concept?



2. Synthesize

5
min

Discuss and define: What is the single most valuable "Aha! Moment" this tool can create for a student?



3. Prepare

5
min

Structure a 1-minute pitch (see next slide) to teach the other groups why this tool is valuable.

YOUR 1-MINUTE SHOWCASE STRUCTURE

1
min



1. The Tool (15 sec)

Clearly state the tool's name and its primary function. (e.g., "GeoGebra is an app for...").



2. The "Aha!" Moment (45 sec)

Describe the single best use case for visualizing a complex concept. (e.g., "The 'Aha!' is when...").

PHASE 3: SHOWCASE & SYNTHESIS

Showcase

Each group presents their 1-minute pitch. (Time is strict!)

Debrief

Final Reflection: "Which tool *outside your own discipline* did you see today that you are most likely to try?"

COACHING: A PROCESS FOR TARGETED DEVELOPMENT

- ◆ **Definition:** "Coaching is a specific form of individual counselling and serves to support targeted and conscious personal development."
- ◆ **Core Role of the Coach:**
 - ▶ The coach is the **Process Manager**.
 - ▶ They facilitate the client's self-discovery and goal achievement.
 - ▶ The coach does not provide the solution; they provide the structure and questions.

COACHING VS. OTHER INTERVENTIONS

Coaching vs. Mentoring:

- **Mentor:** Transfers **domain-specific knowledge and advice** (content-driven, experienced specialist) (Hoffmann, 2001)
- **Coach:** Facilitates self-discovery and goal achievement through **process methodology** (structure-driven).

Coaching vs. Therapy:

- **Therapy:** Focuses on **clinical treatment**, healing past psychological issues, and mental health.
- **Coaching:** Focuses on **future performance**, skill enhancement, and achieving defined goals (Coaching not illness).

Coaching vs. Consulting:

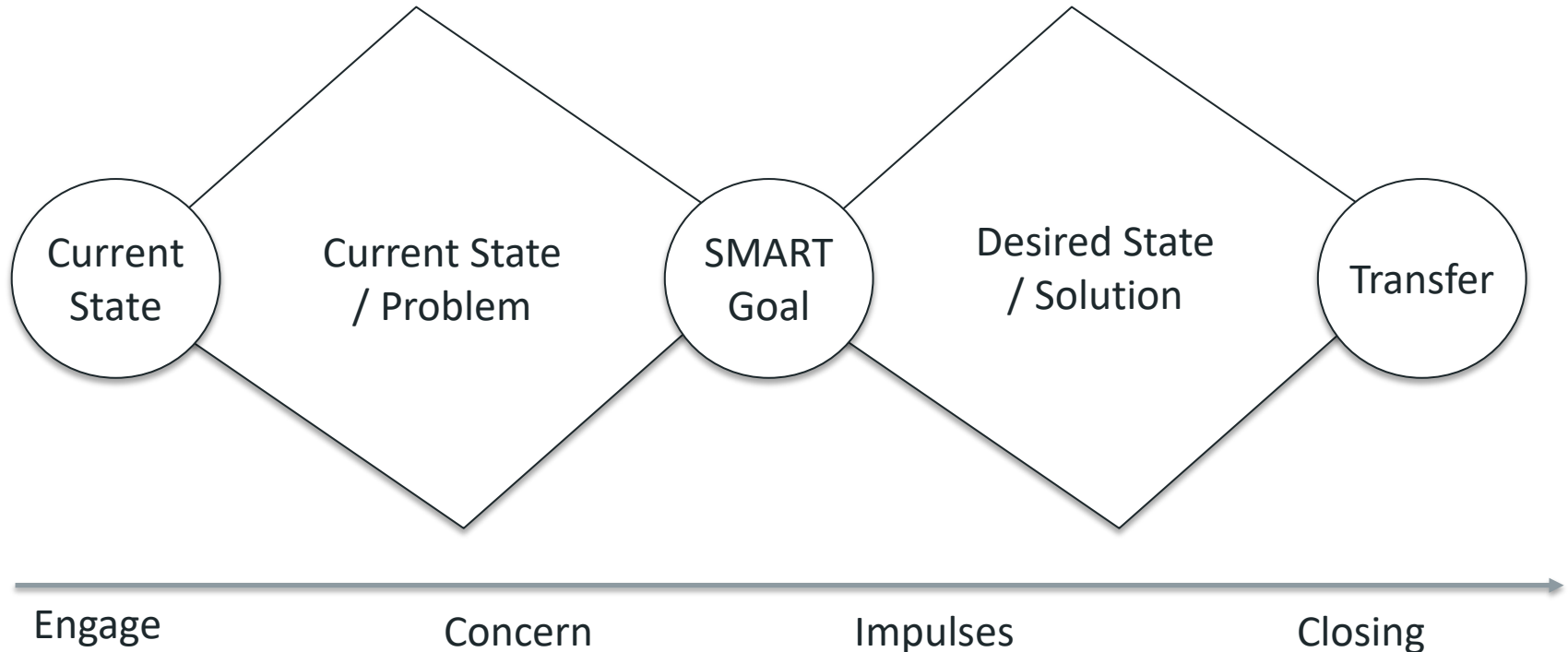
- **Consulting:** Provides **expert solutions** and concrete recommendations (one-way instruction).
- **Coaching:** Supports the client in **developing their own, optimal solution** (facilitated dialogue).

NON-NEGOTIABLE PRINCIPLES OF EFFECTIVE COACHING



- ❖ **Voluntariness:** Crucial for engagement. Clients must be a willing and active participants.
- ❖ **Confidentiality:** Essential for building the trust required for open, honest exploration of issues.
- ❖ **Personal Responsibility:** Clients take full ownership of all actions, decisions, and results



METHODOLOGY: THE DIAMOND MODEL STRUCTURE



GENERATING VALUABLE QUESTIONS

- ❖ Constantly react to the video with the reaction buttons
 - ▶  → if you **currently use this question-type** in your classes
 - ▶  → if you find this question type so **interesting**, that you want to try **using it in the future** (also note that type for yourself, to remember!)

The Art of the Question



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