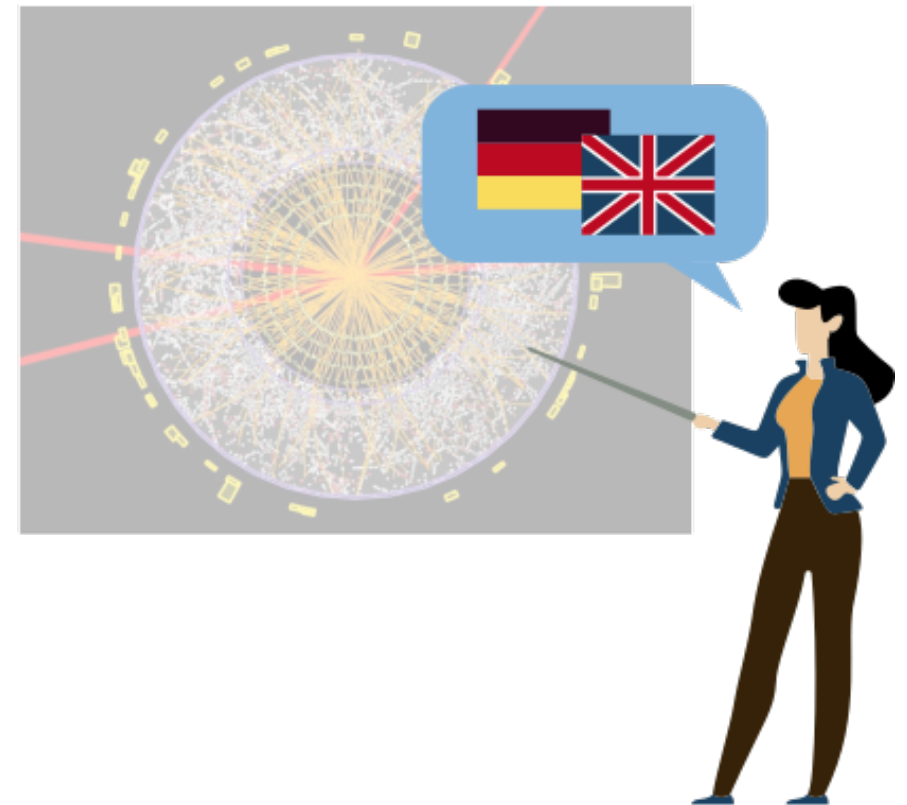


Maike Hansen*, Laura Rodríguez Gómez, Barbara Valeriani-Kaminski, Florian Bernlochner, Sebastian Laudage

Bilingual Masterclasses for German High School Students

DPG Frühjahrstagung 2024

March 7, 2024



Why Offering Bilingual Masterclasses?

- **Bilingual formats used in high school** for a long time
- Students **used to understand English** from watching TV series etc.

- Learn how to **familiarize with complex topic in a language different from mother tongue**
 - **Prepares for studying & work live**
 - **Strengthens self confidence** in language skills

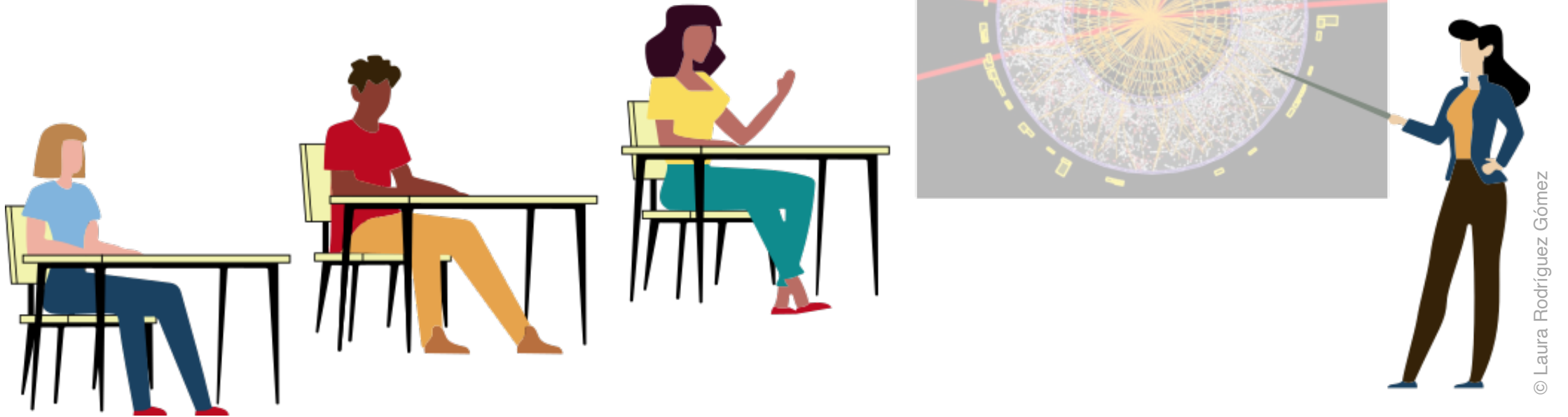
- Give **realistic insight into research**
- Represent **international character in science**

- **Enlarge pool of facilitators**
- Show **diverse role models**

Why not?



Possible Challenges



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- Do the students understand everything?
- Do they ask questions in English?
- Do they feel comfortable?

- How to motivate & reach out to international facilitators?

How to Make Students Feel Comfortable

- **Talk about diff. languages** as mother tongue
 - Facilitators often no native speakers either
→ **Nobody's perfect**
 - **Nobody's judged** for their language skills
 - Common language = **common ground for communication**



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How to Make Students Feel Comfortable

- Talk about diff. languages as mother tongue
- **Play games** in English to break the ice:
 - **Two sides** (show two contrary words, students need to align according to their preference)
 - **Two truth + one lie** (students present each other to the group)
 - **Musical chairs** (who speaks the named language has to find a new chair)







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How to Make Students Feel Comfortable


- Talk about diff. languages as mother tongue
- Play games in English to break the ice
- **Preparation course** on particle physics in English (incl. worksheet for discussion)

→Get familiar with technical vocabulary

4 The Four Fundamental Interactions

<p>Why does the moon move around the earth and doesn't just fly away?</p> 	<p>Why is it possible for an atomic nucleus to consist of several protons that repel each other electrically?</p> 	<p>Why do electrons and the nucleus hold together as an atom?</p> 	<p>How can the conversion of a neutron into a proton be explained?</p> 
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Responsible for the described phenomena are the so-called **four fundamental interactions of nature**. They are called gravitation, electromagnetic interaction, strong interaction and weak interaction. All processes can be explained by at least one of these interactions. They explain how particles interact with each other or explain how transformations of particles into other particles take place. These four interactions will be presented in this section of the preparation course.

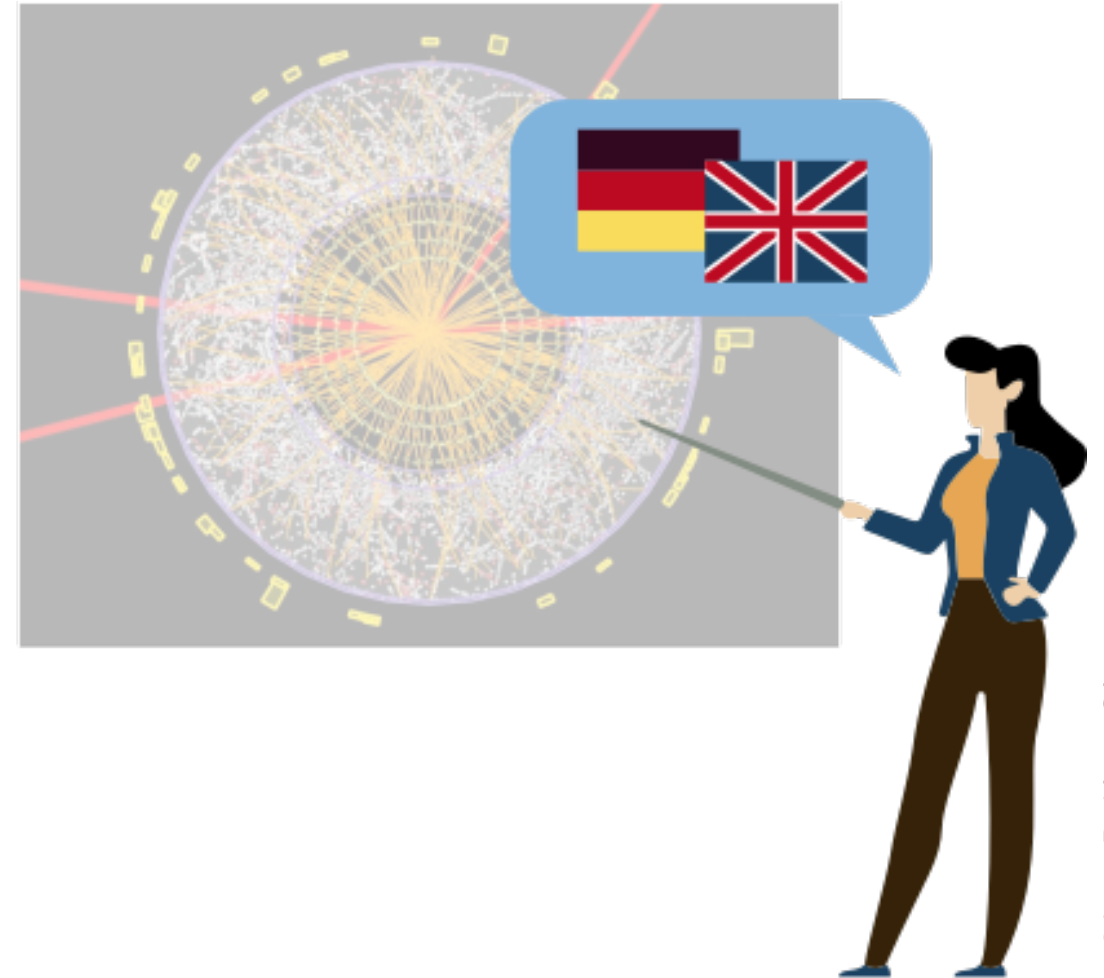
 The goal of the section is for you to be able to assign exam interactions. You will also learn about the causes of the interaction.

Online Preparation Course for the Particle Physics

- ▶ 1 Welcome
- ▶ 2 Help and Support
- ▶ 3 The Structure of Matter
- ▶ 4 The Four Fundamental Interactions
 - 4.1 Gravity
 - 4.2 Electromagnetic Interaction
 - 4.3 Strong Interaction
 - 4.4 Weak Interaction
 - 4.5 Exercise
- ▶ 5 Charges
- ▶ 6 Elementary Particles
- ▶ 7 Closing Quiz
- Image Sources

How to Make Students Feel Comfortable

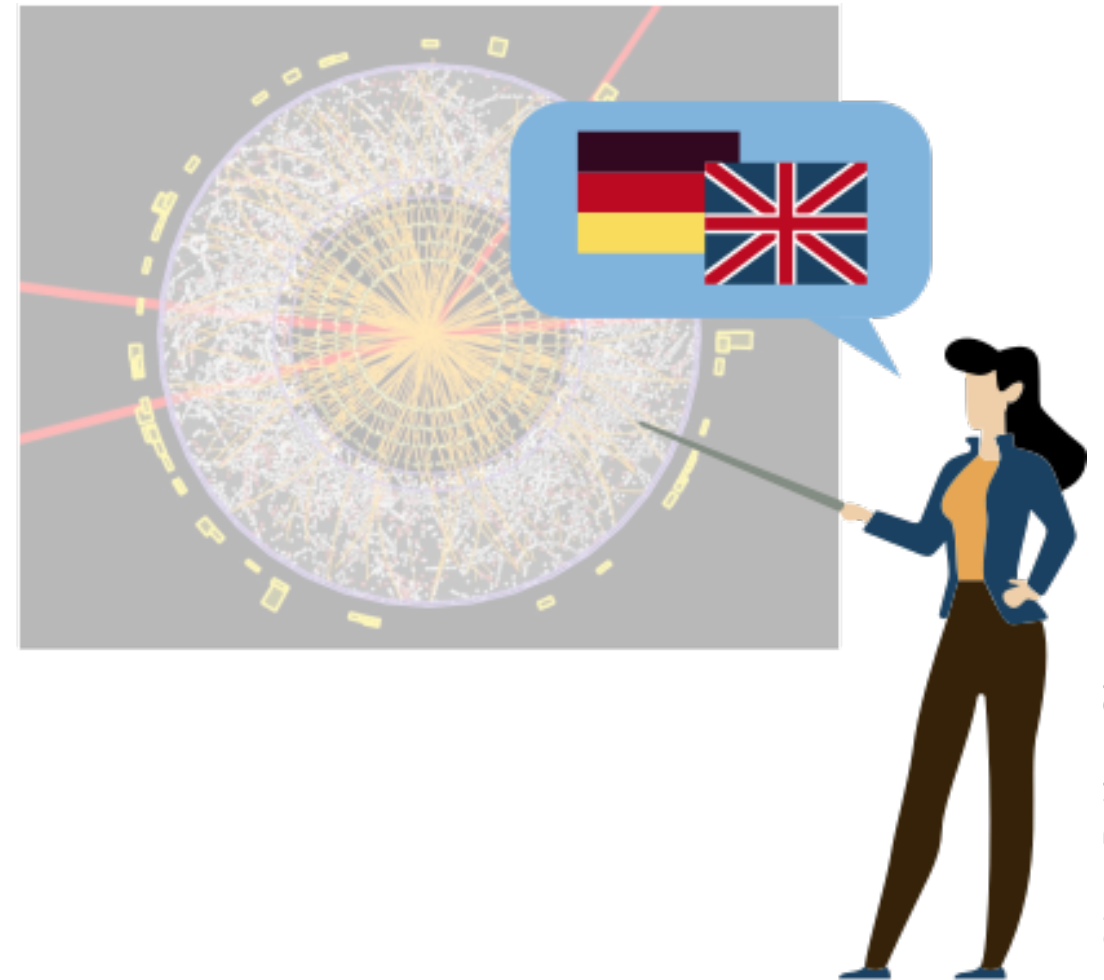
- Talk about diff. languages as mother tongue
- Play games in English to break the ice
- Preparation course on particle physics in English (incl. worksheet for discussion)
- **Alternate languages** during the MC
 - Students **get into the flow** more easily
 - **Default language English**
 - **Communicate with all facilitators equally often**



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How to Make Students Feel Comfortable

- Talk about diff. languages as mother tongue
 - Play games in English to break the ice
 - Preparation course on particle physics in English
 - Alternate languages during the MC
- + **Everything is important at any other masterclass**



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How to Reach Out to International Facilitators

- Facilitators Workshop (April 15-17th, 2024): <https://indico.cern.ch/event/1360155/>
- Onboarding & Spotlight On in English (June 4, 2024): <https://indico.cern.ch/event/1367584/>



How to Reach Out to International Facilitators

- Mailings for facilitators bilingual (in German & English)
- Present possibilities for outreach e.g. in working group meetings, seminars etc.

Netzwerk Teilchenwelt

- Funded as integral part of research by the German Ministry of Education and Research since 2010
- KONTAKT2 project funded since 2018 stands for
- **Communication of research in Particle-, Astroparticle-, Hadrons and Nuclearphysics**
- **Participation of the Public**
- **Promotion of the next generation of scientists**
- Current funding period: 1.7.2021 - 30.6.2024 in ErUM (Erforschung von Universum und Materie) research framework




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Netzwerk Teilchenwelt

- **Over 30 locations:** universities/research labs & CERN
- **Facilitators:** ~150 PhD & Master students
- **Site contacts**
 - Local contact persons
 - Organize Masterclasses/Workshops
 - Maintain contact to schools & high school students




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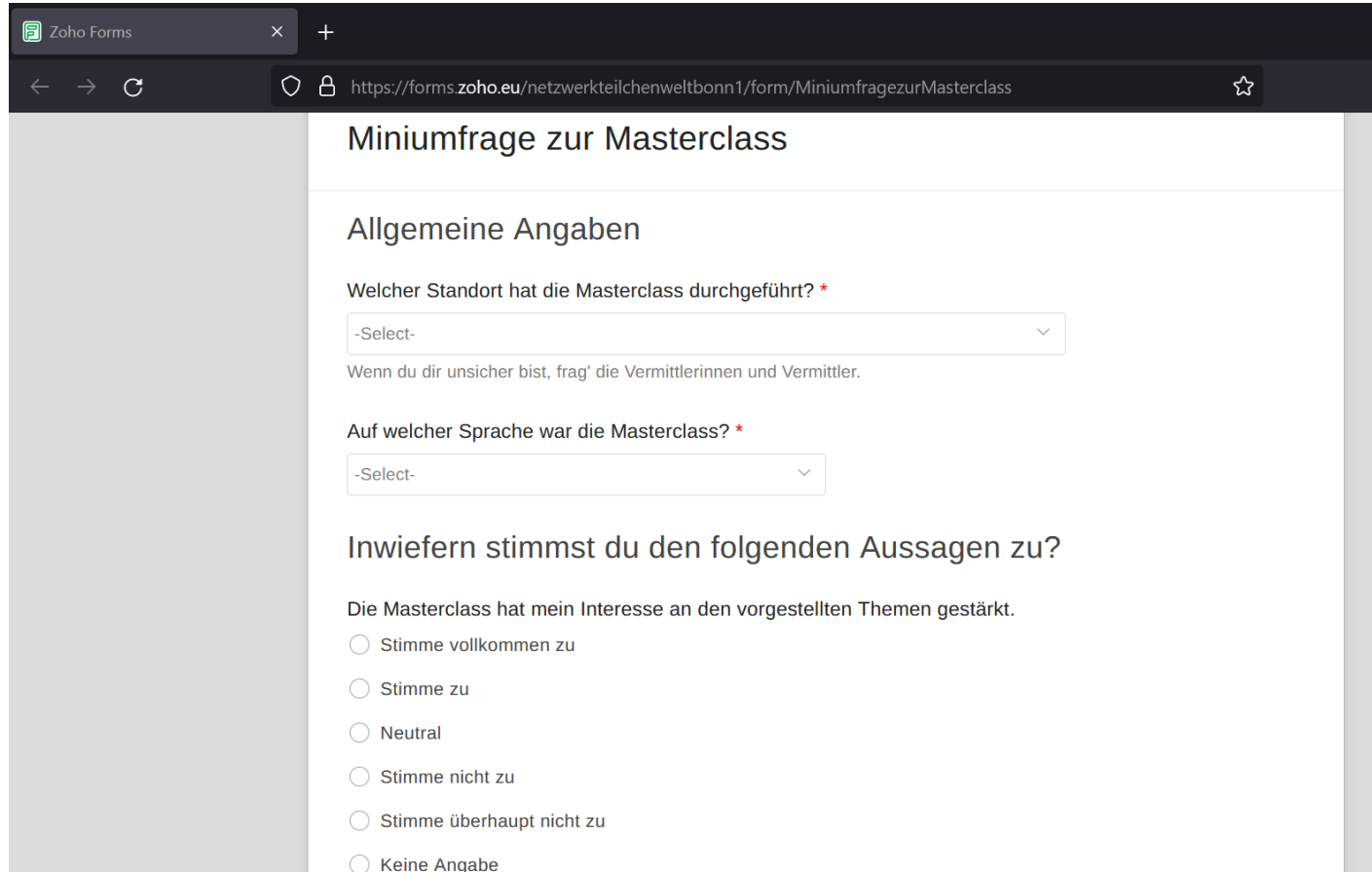
Multistep Program for High School Students



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Evaluation of the Masterclass



The screenshot shows a web browser window with a Zoho Forms survey. The survey title is 'Miniumfrage zur Masterclass'. The first section is 'Allgemeine Angaben' (General Information). It contains two dropdown menus: 'Welcher Standort hat die Masterclass durchgeführt?' (Which location did the masterclass take place at?) and 'Auf welcher Sprache war die Masterclass?' (In which language was the masterclass?). Below these are five radio button options for a Likert scale: 'Stimme vollkommen zu' (I completely agree), 'Stimme zu' (I agree), 'Neutral', 'Stimme nicht zu' (I disagree), and 'Keine Angabe' (No answer). The survey is titled 'Miniumfrage zur Masterclass'.

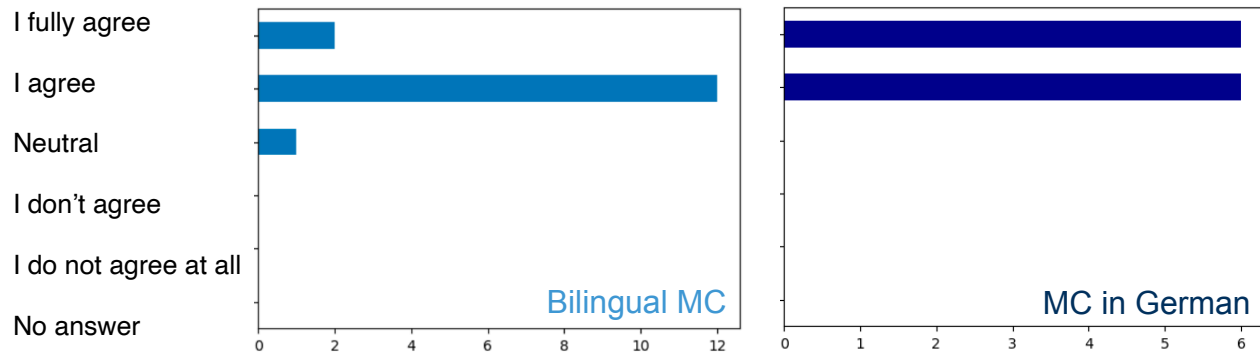
- Short survey (3-5 Min)
- Simple questions
- Easily accessible (QR-Code)
- Mail to bonn@teilchenwelt.de → get raw data table or a pdf with plots
- Data from all MCs (bilingual, English or German) will help us



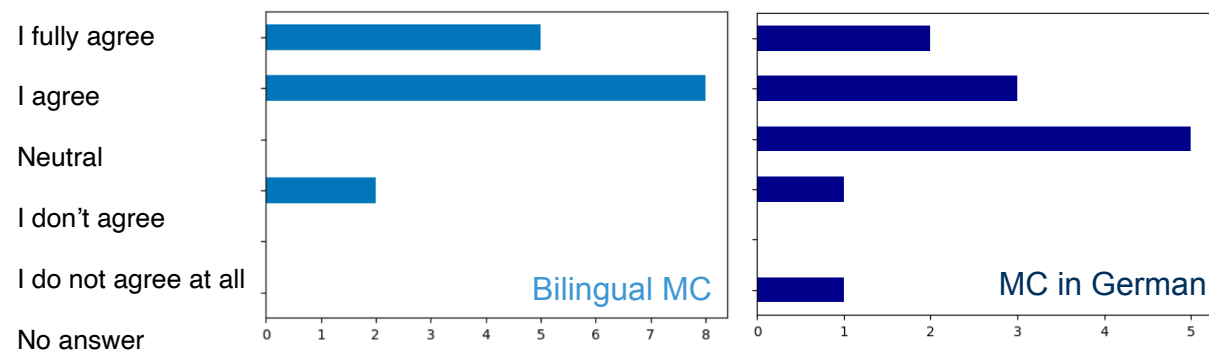
https://forms.zohopublic.eu/netzwerkteilchenweltbonn1/form/MiniumfragezurMasterclass/formperma/wgpGeXU_4CQDa_r1P-4GNQahXRkWS7O0OOkR7qR1Q-g

First Results from Bilingual Masterclasses in Bonn

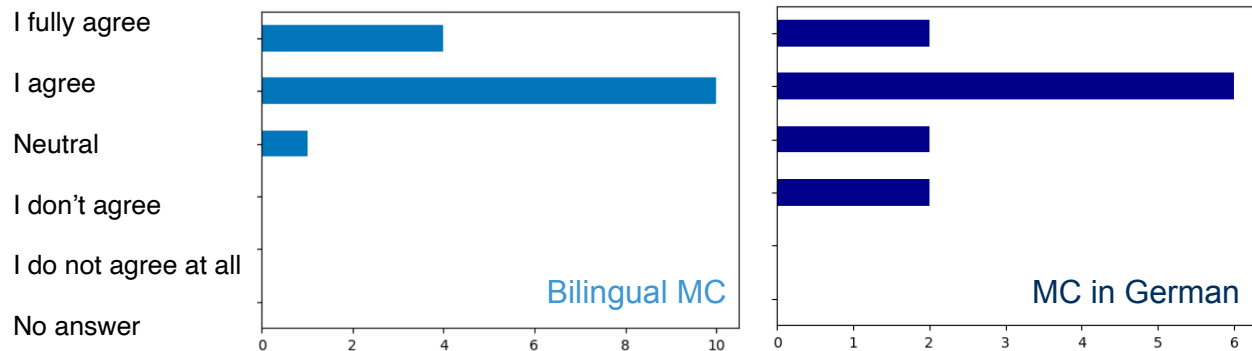
The MC has strengthened my interest in the topics presented



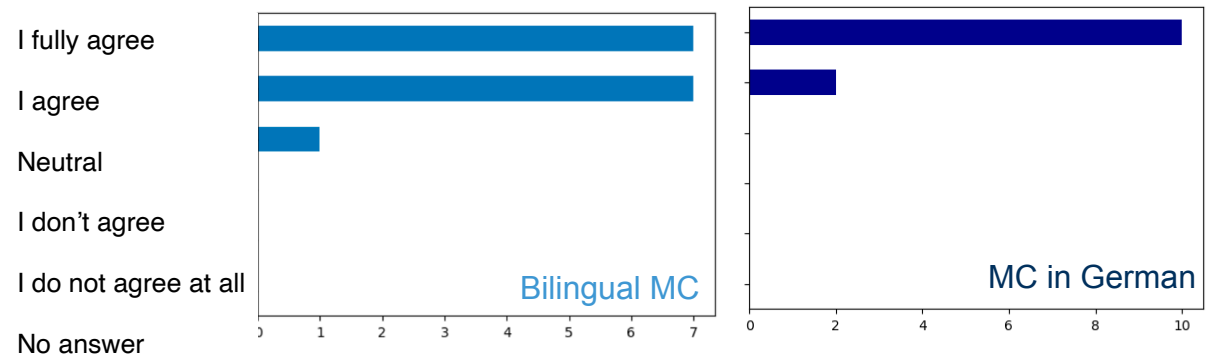
I was able to clarify all the questions that came up during the MC



I was able to understand the content of the lectures

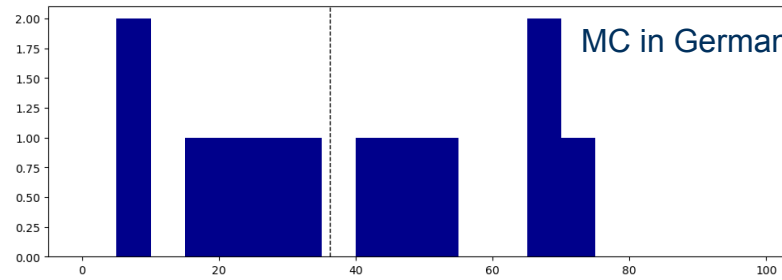
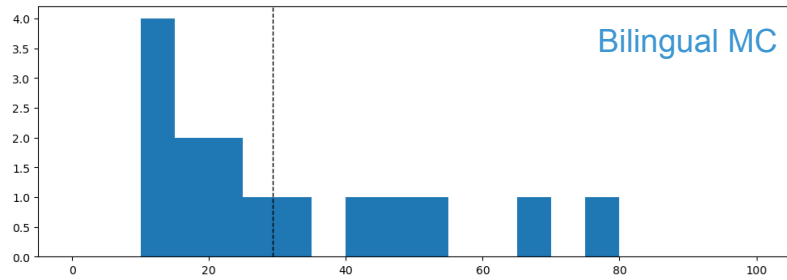


I found the contact with the facilitators to be uncomplicated

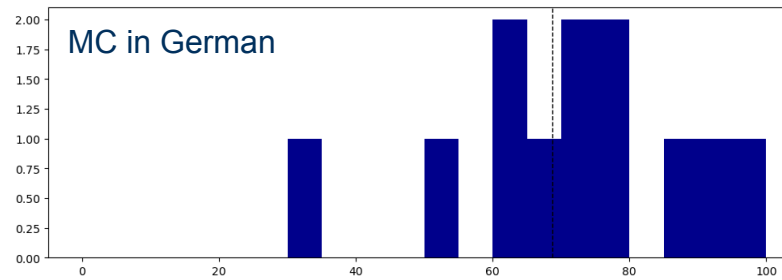
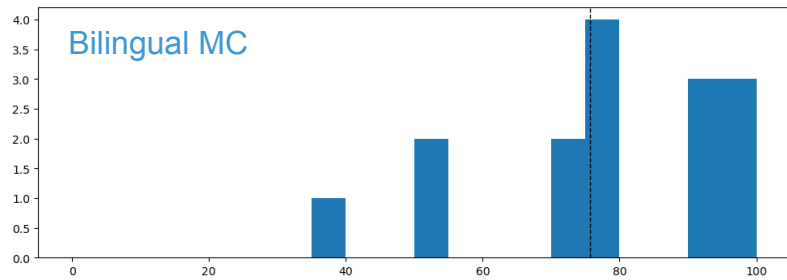


First Results from Bilingual Masterclasses in Bonn

How much of the content presented today did you already know?



What percentage did you understand today?



Experiences & Learnings

- **Feedback** from students & teachers **extremely positive**
- **No significant differences** to German workshops (so far, evaluation still ongoing)
- Students **amazingly good in communicating in English** (talked English among each other)
- **International Masterclasses = successful examples**
 - **Video conference** always in **English**
 - **Often facilitated bilingual**
- If Bilingual:
 - **Alternate languages**
 - students are used to speak English constantly
 - feel comfortable to address all facilitators with questions
 - **All facilitators should speak English among each other**



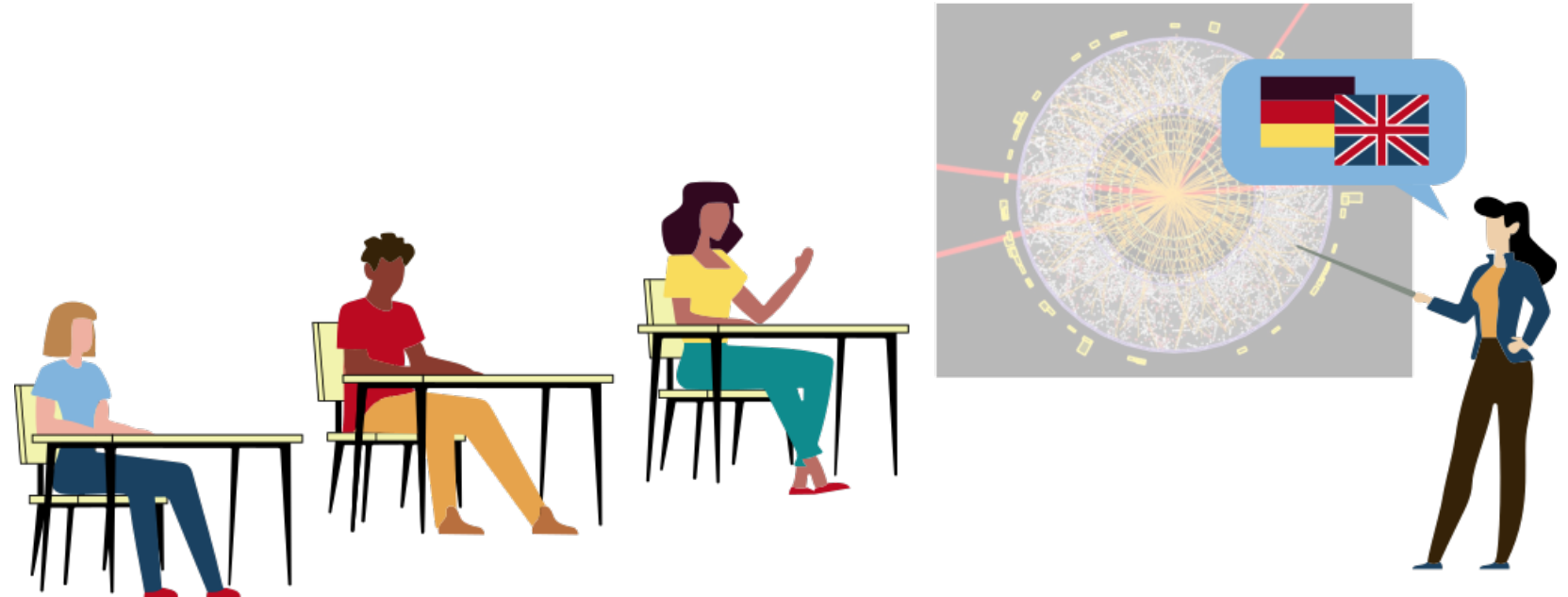
Summary & Outlook

- **Advantages for students:**
 - **Realistic insight** into research in an international environment
 - Chance to **apply English skills**
 - **Strengthens self confidence** in language skills
 - **Prepares for studying & work live**
- **Advantages for facilitators:**
 - Explain research to general public
 - Experience **high interest in everyday work**
 - **Pass on passion** for research
 - **Be role model**
- **How?**
 - **Materials, slides for talks** etc. available in English and German, **workshop on science communication, onboarding events, mailings for facilitators** in English
 - **Evaluate Masterclasses** e.g. with quick & simple tool [here](#) to see if there are any effects & differences

Try it out!

Thank you for your attention!

Questions?



E-mail: bonn@teilchenwelt.de

Website: <https://www.physik-astro.uni-bonn.de/netzwerk-teilchenwelt/>