Learning how to debunk climate change myths during teacher education

Abstract.
In the "post-truth" era, where misinformation and fake news are increasingly present and young people rely on social media as information sources, teaching students strategies to identify such online misinformation becomes pivotal. However, in order to support students, teachers need to be professionalized to teach such strategies. Hence, we developed a learning environment for physics pre-service teachers where they are supported to learn how to spot and debunk misinformation and myths about climate change. There, they are practicing a specific technique called prebunking in order to pre-emptively inoculate their future students against online misinformation regarding socially controversial topics.

1 Theoretical Background

Online misinformation are increasingly widespread in our "post-truth" era. Post-truth relates to the notion that the public is increasingly confronted with and tolerates inaccurate allegations or the outright denial of facts. This is especially alarming when policymakers claim disbelief in response to scientific consensus on issues such as climate change [1]. Moreover, young people increasingly rely on social media as their primary source of scientific information. In this context, it is of importance how students discern scientifically justified claims amongst misinformation [2]. Therefore, teachers need to teach strategies that allow students to safely navigate in social media. A technique known as "prebunking" seems to be a fruitful approach to neutralize the effects of misinformation [3]. Prebunking is based on inoculation theory. The main idea of this theory is that individuals can be inoculated against misinformation attacks on their attitudes, similarly to the way individuals can be immunized against a virus [4]. In our study, we developed a learning environment, which aims to improve physics pre-service teachers' (PSTs') skills to debunk climate change misinformation and to apply prebunking techniques for their future teaching.

2 Design

Our learning environment consists of two main parts. At the beginning, the PSTs are provided with information regarding climate change, but also science denial techniques which are typically used in the internet. The second part consists of an active inoculation against climate change misinformation. The participating pre-service teachers' task is to slip into the role of a climate change denier and forge a misinformation document based on science denial strategies. Thereby, the PSTs work in pairs. Previous studies have shown that inoculation theory can be successful to support people to better spot misinformation-posts on social media [5].

Next, the students exchange their documents. Their task then is to spot the climate denial strategies used by their peers and to write a text where they debunk the addressed climate change myths. To do so, the PSTs need to incorporate their scientific knowledge regarding climate change in combination with their knowledge about science denial strategies. In the next step, the PSTs discuss with each other whether they successfully spotted the climate change denial strategies. The

next and last step is put into practice in form of small group discussions including lesson planning about how this learning environment could be transferred into school settings.

Following a DBR-Approach [6], we are currently in a first evaluation-cycle with N = 20 students enrolled in a secondary teacher training program for physics. We apply a Pre-Post-Setup, using a Mixed-Methods Design . The goal of this cycle has two dimensions: First, we analyze whether students improve their ability to identify climate change denial strategies based on our intervention. To do so, participants are confronted with sections of blog entries before and after the intervention. There, they need to a) identify whether the sections contain science denial strategies, b) which strategies are being used and c) how the identified climate change myth can be debunked. These written documents are analyzed using a rubric.
Second, we are interested whether PSTs are motivated during the learning environment. To do so, participants fill in a feedback sheet after the intervention, consisting of a few demographic questions, the intrinsic motivation inventory [7] and a few open questions.

3 Results

In the presentation, all results of this evaluation-cycle will be presented. To investigate the development of the PSTs climate change myth debunking self-efficacy, we developed a scale using 5-point Likert-scale items showing an excellent reliability of Cronbach's α = .93. Our results show that the PSTs did not only significantly increase their debunking self-efficacy ($t(19) = 4.19$, $p<.01$, $d = .94$), but also their debunking score in general (counting for the number and quality of debunks) ($V = 34$, $p<.05$,$r = .50$) as well as their debunking quality ($V = 21.5$, $p<.01$,$r = .58$), each with a large effect size. The PSTs furthermore showed a very high intrinsic motivation (ranging from 1 = low intrinsic motivation to 4 = high intrinsic motivation) with an average value of 3.5 ± 0.52. Hence, we conclude that the developed learning environment is able to support the PSTs in developing skills to effectively debunk climate change myths. In the presentation, we also give an outlook to next steps, where we want to transfer this idea to other topics such as Covid-19.

4 References

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