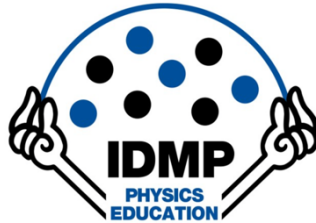




Institute of Science Education



09.03.2023 – 10.03.2023

# Social Media and Climate Change from the Perspective of Science Education

*Symposium at Leibniz University Hannover*



The symposium is funded by the Lower Saxony Ministry for Science and Culture (Niedersächsisches Ministerium für Wissenschaft und Kultur, MWK) and the Volkswagen Foundation in the funding line "zukunft.niedersachsen".



**Niedersächsisches Ministerium  
für Wissenschaft und Kultur**



**VolkswagenStiftung**

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## Programm overview

### Donnerstag, 09.03.2023

Leibnizhaus Hannover  
Holzmarkt 5, 30159 Hannover

### Freitag, 10.03.2023

Königlicher Pferdestall  
Appelstraße 7, 30167 Hannover

From 16:00 Registration

**16:30 Internal opening**  
*Dr. Alexander Büssing*  
*Institute of Science Education,*  
*Leibniz University Hannover*

**17:00 Official opening**  
*Prof. Dr. Sascha Schanze*  
*Director Leibniz School of*  
*Education (LSE), Leibniz*  
*University Hannover*

**17:15 Climate change in social media: Investigating usage, literacies, and interventions in SoMeCLiCS**  
*Dr. Alexander Büssing*  
*Institute of Science Education,*  
*Leibniz University Hannover*

**17:30 Informed trust decisions as key to competently Informing oneself in digital contexts**  
*Dr. Friederike Hendriks*  
*Technische Universität*  
*Braunschweig*

**18:00 Climate Change in Social Media: A Perspective for Science Education**  
*Nadja Belova (Moderation),*  
*University of Bremen, Germany*  
*Thomas Schubatzky, University of*  
*Innsbruck, Austria*  
*Kerstin Kremer, Justus-Liebig-*  
*University Gießen, Germany*  
*Hannes Balk, Fridays for Future*  
*Hannover, Germany*  
*Shakked Dabran, Technion –*  
*Israel Institute of Technology,*  
*Israel*  
*Jonas Wagner, Lutherschule*  
*Hannover, Germany*

**19:10 Informal get-Together**

**09:00 Opening and overview**

**09:30 A1) Kresin et al.: Credibility criteria**  
**A2) Dabran et al.: Conspiracy theories about climate change**

**C5) Grothaus et al.: Labs4Future**

**10:30 Coffee break**

**11:00 D1) Upadhyaya et al.: Students or AI?**

**D2) Taibi & Fulantelli.: Information Distortion**

**B3) Bortolluzzi: Plant representation in social media**

**12:00 Poster session and discussions**

**12:30 Lunch**

**13:30 B1) Pfeiffer et al.: Review of relevant literacies**

**B2) Zilz & Höttecke.: Science Media Literacy**

**B4) Dorsch: Digitality for Fut.**

**14:40 Coffee break**

**15:00 C1) Siegmann et al.: Prerequisites for Intervention**

**C2) Schubatzky et al.: Inoculation Theory**

**C3) Belova: Overview on Literacy Interventions**

**C4) Schlamelcher & Fögele: Social digital participation**

**16:20 Wrap up and outlook**

**17:00 End of symposium**

*For each speaker, 10 minutes of input and 10 minutes of discussion are planned!*

## Abstracts of talks

### A) Usage

#### A1) Credibility Criteria of Activist and Non-activist Students Concerning Climate Change Information on Social Media

**Soraya Kresin**

*Institute of Science Education, Leibniz University Hannover, Germany*

**Kerstin Kremer**

*Justus-Liebig-University Gießen, Germany*

**Alexander Büssing**

*Institute of Science Education, Leibniz University Hannover, Germany*

As a basis for adequate educational concepts, we need to gain a general understanding of students' usage of social media in connection to climate change content. In doing so, differing accesses to the topic need to be considered. In the following study we conducted a focus group study with 21 students, thereof 10 climate activist students and 11 non-activist students. We showed them three social media posts on climate change and asked them what they pay attention to when evaluating the credibility of the post. The data were analyzed through a qualitative content analysis according to Rädiker and Kuckartz (2019). Interestingly, the results showed that there are conflicting criteria between the groups that students take into account. Some of these conflicting criteria are the manner in which likes, academic titles and diagrams are involved in the evaluation process. The results help drawing conclusions about how receptive they might be for misinformation and can be basis for educational concepts.

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#### A2) Conspiracy theories about climate change in three languages: Development and assessment of a tool to analyze the credibility of online sources

**Shakked Dabran**

*Technion – Israel Institute of Technology, Israel*

**Rebecca Kunze**

*Institute of Science Education, Leibniz University Hannover, Germany*

**Soraya Kresin**

*Institute of Science Education, Leibniz University Hannover, Germany*

**Ayelet Baram-Tsabari**

*Technion – Israel Institute of Technology, Israel*

Misinformation about climate change can create confusion and skepticism about the issues' reality and severity. Such misinformation reaches audiences through various online media. This

study examines the applicability of Osborne and Pimentel's (2022) theory, to develop an effective analysis tool for evaluating the credibility of online sources. Using this tool, we examine the differences, if any, in the reliability of the content available regarding conspiracy theories related to climate change. We look at three languages, English, German, and Hebrew, and analyze the first three pages of Google search results for two conspiracy theory queries related to climate change. Further, the coding tool itself is examined in-depth, to answer which criteria were more effective than others in identifying misinformation. Lastly, the difficulties that arise in evaluating sources in this way will be discussed, with an emphasis on social media sources that appeared in Google's search results in the various languages.

## B) Literacies

### B1) Climate change discourses on social media: Clarifying the potential of relevant literacies

Catharina Philine Pfeiffer

*Institute of Science Education, Leibniz University Hanover, Germany*

Stefanie Lenzer

*Institute of Science Education, Leibniz University Hannover, Germany*

Andreas Nehring

*Institute of Science Education, Leibniz University Hannover, Germany*

Today, online disinformation about socio-scientific issues like anthropogenic climate change (ACC) can be easily spread. Hence, the public uncertainty about its scientific consensus becomes challenging for effective climate education. To cope with this, literacies provide a promising construct for future climate education by defining factual knowledge, relevant competencies, specific attitudes and concrete behaviours students need to competently evaluate controversial online information about ACC.

Many literacies were defined in educational research, but it remains unclear which of these literacies are indeed relevant in the context of climate change discourses on social media and which critical components they contain. Therefore, a systematic literature review will address, which relevant literacies in this context can be found. Furthermore, the critical components within definitions of these literacies will be clarified through qualitative content analysis. Concluding, the potential of these literacies and their critical components for students' competent information gain from social media shall be presented.

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### B2) Assessment of Science Media Literacy Using Authentic Case Scenarios

Kendra Zilz

*University Hamburg, Germany*

Dietmar Höttecke

*University Hamburg, Germany*

Science Media Literacy (SML) describes a set of competencies that enable students to make informed decisions about the credibility of claims in scientific contexts. This requires adequate ideas about the Nature of Science – especially from sociological and societal perspectives – as well as specific competencies in dealing with online media. To measure this complex set of competencies, authentic performance tasks are constructed in which students are asked to make and substantiate a judgment about more or less justified scientific expertise. Climate change is a scientific context of highest relevance students face as consumers in social media. Due to contradictory representations in social media despite the overwhelming scientific consensus regarding its existence, climate change is also a highly appropriate context when measuring SML. This paper presents the development of authentic case scenarios for constructing performance

tasks to quantify SML as an ability measure. The task development and underlying design features are discussed.

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### **B3) Plant representation in social media for ecoliteracy**

**Maria Bortoluzzi**

*University of Udine, Italy*

The paper focuses on the representation of plants in social media texts with the aim of raising awareness on the anthropocentric and zoocentric characteristics of our communication in science education for young adult students at times of climate crisis.

The overarching question is how plants and their action are represented in relation with ecosystems, and, more specifically, human and non-human animals in texts promoting the protection of the environment. The study shows how the discursal representation of plants in social media text can be made relevant for promoting science ecoliteracy in young adults and raising critical awareness on our relation with the environment that sustains us.

The theoretical framework draws on ecolinguistics which investigates how we construe the environment in discourse and how discourse influences our relation with and action on the ecosystems, and ecoliteracy which aims at identifying education practices to strengthen and extend our capacity to live sustainably.

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### **B4) Digitality for Future? – The potential of digital practices for climate education**

**Christian Dorsch**

*Institute of Humangeography, Goethe-University Frankfurt, Germany*

The "Fridays for Future" movement brought the issue of climate crisis an enormous boost in public awareness and generated a great interest in climate-related topics among students. The particular way in which issues of climate protection or climate adaptation are negotiated in communities in social media ensures their appeal in this context.

Three questions arise from this for the paper: How do practices of digitality affect informal learning processes in the knowledge domain of climate & climate change? How can this informal learning be made fruitful for climate change education? Which meta-competencies also with regard to a maturity-oriented education are promoted?

Initial results obtained with a qualitative content analysis of posts that have been created in digital communities of the "Fridays for Future Germany" movement show that processes of identity formation take place in the communities. If these knowledge practices are taken up and reflected upon in school, they can be transferred into formal educational processes.

## C) Interventions

### C1) A study on perceptions, attitudes and media literacy as a prerequisite for an intervention study on learning about climate change

**Sophia Siegmann**

*Institute for Didactics of Mathematics and Physics, Leibniz University Hannover, Germany*

**Alexander Büssing**

*Institute of Science Education, Leibniz University Hannover, Germany*

**Gunnar Friege**

*Institute for Didactics of Mathematics and Physics, Leibniz University Hannover, Germany*

Digitalization and the use of social media require new competencies among learners. Problems such as fake news on climate change are amplified by social media. To prepare learners to deal with these problems, interventions in schools are becoming increasingly important. This chapter focuses on the assumptions with which learners enter intervention classes. We asked about learners' own assessments of their media literacy know their self-reported competencies before entering interventions and media training. Besides further the media training we also discuss issues surrounding the role of student support in intervention studies and the role of learners' prior knowledge of climate change. We also propose a possible intervention design to examine the effectiveness of the intervention. Besides this cognitive measure, this chapter also takes a closer look at learners' attitudinal prerequisites about climate change through the Rosenberg and Hovland (1960) three-component model. Learners' behavior, feelings, and expertise are part of the measurements.

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### C2) Potentials and Limits of Inoculation Theory for Climate Change Education Research

**Thomas Schubatzky**

*University of Innsbruck, Austria*

**John Cook**

*Monash University, Australia*

**Susanne Rafolt**

*University of Innsbruck, Austria*

**Bärbel Winkler**

*Skeptical Science, Germany*

Teaching climate change is a challenging task, since there are deliberate efforts to distort the scientific facts around climate change via the distribution of misinformation, especially on social media. It is therefore of importance that we develop strategies on how to address the influence of climate change misinformation. In recent years, a growing body of research has focused on



how to reduce the impact of misinformation. Many of these studies utilize inoculation theory to build resilience against possible misinformation. A recent study even demonstrates its scalability for use on social media. Despite these findings, ideas of inoculation theory for education have not been explored extensively. In this article, we will explore ideas of inoculation theory in climate change education. We will describe examples and follow this with a discussion revolving around the potentials and limits of inoculation theory for climate change education research, concluding with research required in the future.

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### **C3) Scientific media literacy interventions with a focus on social media – an overview of the literature and practical examples**

**Nadja Belova**

*University of Bremen, Department of Biology and Chemistry, Chemistry Education Group*

Nowadays, everyone can spread information through social media and the number of users of social networks is increasing worldwide. The information in such media often has a scientific background but does not necessarily have to be disseminated by experts, which has fundamentally changed the way of communicating and reflecting on scientific content. Interventions for learning about science in the media slowly started to appear on the research agenda of the science education community a few years ago but are still rare. This contribution will present an overview of the interventions published so far and propose a classification of those. A special focus will be on interventions emphasizing education for sustainable development in general and climate change education in particular. In addition to an overview of existing interventions, this contribution presents further specific examples of self-developed interventions in science education and raises the question of appropriate instruments for evaluating such interventions.

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### **C4) Learning to argue for social digital participation with virtual excursions on climate change? An experimental-control-comparative study on the promotion of digitalisation-related competences in geography teaching**

**Marvin Scott Schlamelcher**  
*Stiftung Universität Hildesheim*

**Janis Fögele**  
*Stiftung Universität Hildesheim*

Climate change deniers and sceptics often use social media to spread their opinions. This is problematic in that groups of opinionated individuals can shape digital discourses and adolescents use social media to gather information. In order to proactively counteract the potential danger associated with this, Janis Fögele and Marvin Schlamelcher developed two teaching sequences on this topic for geography lessons in an experimental control design. The goal of both sequences is that students learn to develop factual arguments for climate change so that they can participate

in digital climate change discourses and refute sceptical statements. This goal is attempted in the experimental group with the help of a virtual excursion (Schlammelcher, 2022) and in the control group with analogue material. Whether and, if so, to what extent the experimental group performs better than the control group will be presented in the chapter along with the structure of the sequences.

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### **C5) Empowering the next generation to address climate change effectively – The student laboratory Labs4Future**

**Jonathan Grothaus**  
*Universität Würzburg*

**Markus Elsholz**  
*Universität Würzburg*

**Thomas Trefzger**  
*Universität Würzburg*

This chapter presents the two-day student laboratory Labs4Future that addresses 14–15-year-old high school students. This intervention is trying to link conveyed knowledge to two kinds of action: Individual behaviour and societal or political action.

Initially we give an overview of our theoretical framework for teaching about climate change and evoking effective individual and political action. Additionally, we briefly describe the connected ongoing empirical evaluation that aims to corroborate the educational framework.

The second and main part describes the student laboratory: The first day is about earth-system knowledge and how stable systems are getting out of balance (carbon cycle, greenhouse effect). The second day addresses action knowledge and effectiveness knowledge: The main sources of personal greenhouse gas emissions (housing, mobility, and consumption) are explored from an individual and political point of view. Applying the prior learnings, the students develop strategies in debunking fake news and rhetoric strategies to argue for sufficient climate action.

## D) Digital methods

### D1) Students or AI? Who is the better performer in analysing stance and sentiment of climate change Twitter data?

**Apoorva Upadhyaya**

*L3S Research Center, Leibniz University Hannover, Germany*

**Oleh Astappiev**

*L3S Research Center, Leibniz University Hannover, Germany*

**Ivana Marenzi**

*L3S Research Center, Leibniz University Hannover, Germany*

**Marco Fisichella**

*L3S Research Center, Leibniz University Hannover, Germany*

In the age of climate change, we are at a turning point. Social media provides a platform for sharing information and discussing climate change with the general public. Discussions on climate change tend to polarise beliefs and create opinion-based ideologies, leading to misinformation and fake news that influence public attitudes. Therefore, social media plays a crucial role in addressing the climate crisis. The goal of using stance detection is to identify such content and understand public attitudes towards climate change. We are investigating the role of sentiment detection as an auxiliary task to detect attitudes towards climate change in tweets. In our work, we also conducted a pilot study with underage students to understand how they view and think about climate change data on social media. We also gave them the opportunity to explain the reasons behind their choices. Our aim is to understand to what extent Artificial Intelligence can be helpful for teenagers to learn the views on climate change. As a result, we will gain a better understanding of climate change discourse in social media.

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### D2) Climate change education on social media: the role of digital methods to counteract information distortion

**Davide Taibi**

*Tampere University, Finland*

**Giovanni Fulantelli**

*National Research Council, Italy*

We are witnessing the transformation of social media to recommendation media, where the content to which the users are exposed to is not only the one published by the network of friends, but it is also suggested by a recommender system according to the users' profile and previous behaviour. Even though social media belong to the virtual world, their effects are clearly affecting the real world, therefore the development of digital methods and tools to study social media dynamics has been promoted to inform socio-cultural analysis. Starting from the introduction of

the state of the art concerning the most used digital methods for the analysis of social media content related to climate change, we present an innovative approach that leverages Semantic Web technologies and Knowledge Graphs to enrich the content extracted from social media and provide new visualizations aimed at facilitating the identification and the comparison of main concepts in climate change debate.

## Abstracts of posters

### E1) How students search for different perspectives on meat consumption in the social network Instagram

**Margot Bakker**

*Institute of Science Education, Leibniz University Hannover*

**Alexander Büssing**

*Institute of Science Education, Leibniz University Hannover*

Frequent use of social network Instagram is very popular among young people demonstrating (a) social media's salience in young peoples' everyday life and (b) why social media should be included into science education. Furthermore, social media posts are often expressions of opinion and shaped by emotions rather than facts. This can be exemplified by the topic of meat consumption, where many divided opinions can be found on Instagram. These multiple perspectives are often represented by hashtags (e. g. #govegan or #meatforclimate). Using those hashtags, Instagram posts about specific topics and opinions can be searched. Because little is known about how young people use search functions within social media platforms and which search terms they use, this study investigated how students searched for the topic of meat consumption in Instagram. In an interview situation, students (M=17 years) were first asked about their Instagram usage and later performed an own search, which was recorded using the record function from the tablet. This contribution shows how students intuitively search for posts using hashtags and search suggestions and that they prefer content with diagrams or meaningful text. Participants' unsystematic search approach reveals the need for enhanced searching skills as part of their research competency development, especially in relation to social media.

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### E2) How to assess sustainability disclosure quality? A content analysis of the linguistic features of Italian non-financial corporate reports

**Valentina Beretta**

*Department of Economics and Management, University of Pavia*

**Maria Chiara Demartini**

*Department of Economics and Management, University of Pavia*

Recently, the accounting literature and practitioners have pointed out the growing interest to content analysis of narrative disclosures in order to verify how firms report their performance. With this regard, narrative statements in annual reports, analyst reports and recommendations, management speech, corporate social responsibility (CSR) reports, intellectual capital statements, and environmental reports are the most analyzed types of documents. External stakeholders make relevant and strategic decisions by using information contained in these reports. Thus, the reliability and verifiability of this kind of non-financial disclosures is pivotal for increasing the accuracy of analysts' forecasts about firms' future performance. Hence, the main research question of this study is as follows: how can we assess the sustainability disclosure quality? To

do so, this study performs a comparative evaluation of Italian companies issuing non-financial disclosure, based on the coverage of sustainability matters and linguistic attributes.

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### **E3) Climate Lab – a seminar to foster Climate Agency**

**Timo Graffe**

Johannes-Gutenberg-Universität Mainz

**Klaus Wendt**

Johannes-Gutenberg-Universität Mainz

The topics of climate change and sustainability are playing an increasingly central role in university teaching. Students act as multipliers for sustainable development, as they are the leaders, experts, and teachers of tomorrow. But how can such content be integrated into the structures of university teaching in a transferable way? JGU Mainz wants to make a contribution to this and strengthen the development of such a climate agency among its students within the framework of a project seminar. In this seminar, students develop sustainability projects in interdisciplinary, small groups. The designbased research approach offers the possibility to design, implement and evaluate such a seminar based on research results from physics didactics and ESD (education for sustainable development). Through the iterative process of this research approach, an optimized prototype of such a seminar can be designed. Thereby, we from JGU will address the following challenges: How can a seminar be conceptually set up to meet both interdisciplinary demands and university curricular standards? How should the seminar be structured in terms of content so that it includes action-oriented construction phases in addition to fixed instructional phases? The poster will illustrate a possible solution to these questions and show the conceptual design process to date.