Special Issue Paper

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Factors influencing exposure to and consumption of scientific content on social media: insights from a collaborative world café discussion with school students

https://doi.org/10.1515/cti-2025-0057
Received June 13, 2025; accepted September 22, 2025; published online October 2, 2025

Abstract: Social media is increasingly recognised as having the potential to assist with science learning. However, despite the abundance of science-related content online, many students do not actively engage with such content during their leisure time, which limits its potential as an educational tool. This paper explores factors that influence young people's exposure to and consumption of scientific content on social media. We used the World Café method to engage students in collaborative discussion to identify these factors. Key factors influencing exposure to content include social networks, algorithmic filtering, and individual behaviours. Many students reported not following scientific accounts, which limits their exposure to scientific content. Furthermore, algorithmic filtering often leads to a decrease in scientific content in their feeds, as students intentionally avoid such material. Furthermore, students indicated that the complexity and repetitive nature of scientific content led to feelings of overwhelm, boredom and disengagement, which in turn heightened fatigue with regard to science communication. Possible implications for teachers and school settings are discussed at the end of the article.

Keywords: ECRICE 2024; science communication; social media; exposure and consumption of scientific content

1 Introduction

For Generations Z and Alpha, smartphones are an essential part of daily life. These generations spend a large amount of time on the internet, especially on social media platforms,[1] and this has opened up new opportunities for the dissemination of scientific information. Research has demonstrated the effectiveness of online resources in knowledge acquisition and the enhancement of scientific understanding,[2–4] and a positive correlation between the use of such online resources and increased trust in science.[5]

Given these developments, social media have also become increasingly relevant as an educational tool. They have already been integrated into some educational settings, where they are primarily used as platforms for collecting and sharing content on specific topics. Content is either provided and created by educators in the form of supplementary material for students,[6,7] or is created by students to explore or consolidate their knowledge on a specific topic.[8–10]

Beyond these applications, social media could also be used for other educational purposes, as a large amount of scientific content is already available online.[11–13] Many of these formats and projects are specifically designed for young people[12] and could serve as valuable educational tools.

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However, social media have unique principles and dynamics that have to be taken into account.[14] Unlike traditional mass media, individual users play a central role in shaping the content they are exposed to: their iterative interactions with content, platforms and communities create personalized feeds that are tailored to individual users.[14–16] This shift has also transformed consumption behaviors. Most young users no longer actively search for specific content; instead, they passively consume what platforms curate and expose them to.[17] As a result, if scientific content appears in their feeds at all, it typically does so by chance rather than through deliberate effort.[18,19]

Existing research has primarily focused on students' judgments about credibility and their strategies for evaluating scientific content on social media, in studies that often use predesigned content.[20–22] Other research has examined students' awareness and understanding of communication mechanisms such as algorithms, filter bubbles, and echo chambers.[23]

To the best of our knowledge, a gap remains with regard to understanding whether young people encounter scientific content on social media, and if so, the extent to which they actually engage with it. Our research project, "We Talk About Science", therefore aimed to explore how young people interact with existing scientific content on social media, and to shed light on their consumption of science communication on social media. Based on these findings, the potential educational value of science communication in these digital spaces can be further considered.

2 Project and motivation

Initial findings and insights relating to the consumption of science communication on social media[24,25] led to the formulation of the research questions addressed in this article, which are briefly summarised below. Figure 1 provides an overview of the project.

We encouraged school students in Austria to focus on scientific content on social media by involving them in a contest offering winners prize money and the opportunity to attend a science conference. Over four months, participants logged the scientific content they encountered on digital sheets, rating its easiness to understand, attractiveness, interestingness, and trustworthiness.[25]

The classes that placed first and second were asked to collaborate further. To gain deeper insights into their experiences and consumption habits with regard to science communication, we conducted eight group interviews with 24 students. Participants reported limited or no prior exposure to scientific content on social media, indicating that the contest had motivated them to search for it actively.[25] They described the content as interesting, informative and easy to understand, with some stating that the contest had increased their consumption of science communication both at school and during their leisure time. One student noted,

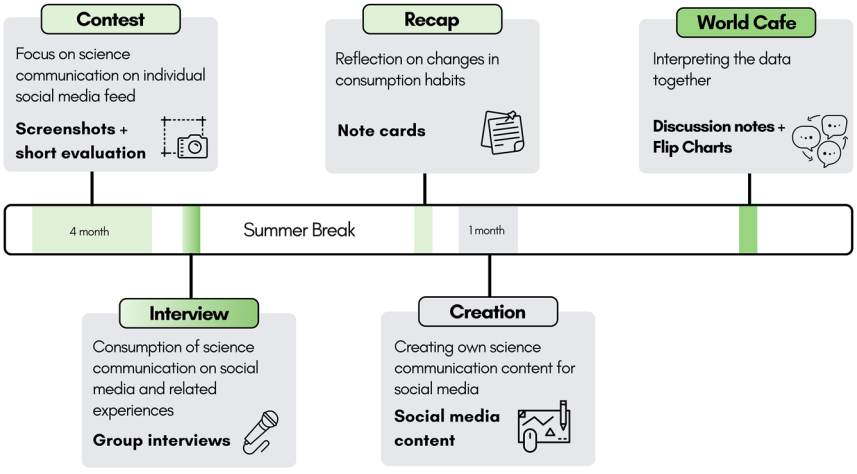

Figure 1: Project overview. The results from the light green sections led to the formulation of the questions addressed in this article, which were then primarily considered through world café discussions and supplemented with selected interview data.

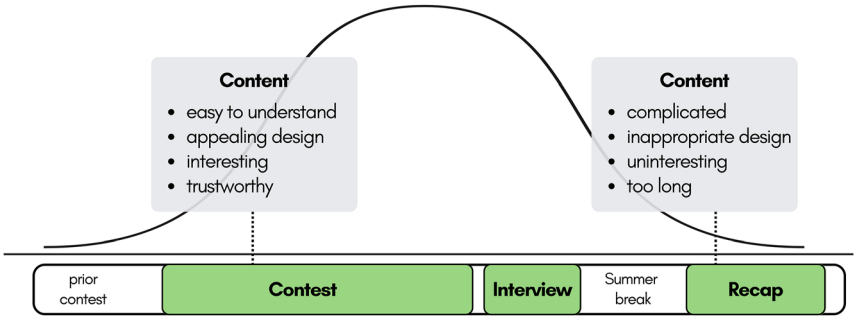

Figure 2: Consumption of science communication on social media based on interviews and recap session.

> "I spent a lot of time scrolling through TikTok to see if I could find something interesting to contribute [to the contest], and I also started watching similar content that I personally found interesting, in my free time." (BHS2, 4; translated from German)

To assess the medium-term impact of science communication, a recap session was held after the summer break, during which the students reflected once more on their consumption habits. They reported that they were now consuming little or no scientific content.[25] They then discussed the reasons for the decline in their consumption, and identified four main issues with content, perceiving it as too complicated, too lengthy, uninteresting, and inadequately presented, both visually and substantively. Figure 2 is based on student responses in the interviews and the recap session, and illustrates their consumption of scientific content on social media during the project, and their evaluation of such content.

The marked decline in consumption during the summer break, along with the stark contrast in evaluations of scientific content in the recap as compared to the contest, raises questions about the shifts in students' consumption that this study seeks to address.

3 Theoretical perspectives

As already mentioned, a substantial amount of science communication content is already available on social media platforms. Nevertheless, this does not guarantee that students are actually exposed to it or consume it. Unlike traditional mass media such as television, radio, and magazines, exposure to content in digital environments, especially on social media, is largely influenced by factors beyond the control of the producers of such content. Instead, it is determined by other factors such as social contacts and algorithms, and by individual users themselves, as illustrated in Figure 3.[15,18,26] These factors are what underpin our framework, which is based on the model proposed by Kitchens, Johnson & Gray.[17] The following section will provide a more thorough description of the three key factors and their effects.

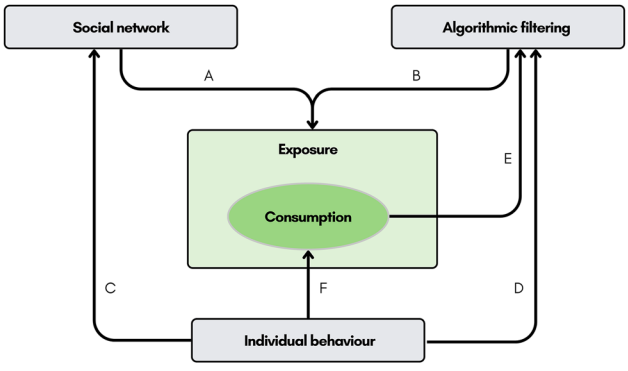

Figure 3: Factors influencing exposure to and consumption of social media content (adapted from Kitchens Johnson & Gray[17]).

3.1 Social network

The diversity of an individual's social network plays an important role in the variety of information they encounter (path A). Friends, family, colleagues, acquaintances – people with whom a person is connected – influence the content to which they are exposed.[15,27] Not only is the majority of content on social media platforms generated by the platform's users, i.e. created by social contacts;[26] those social contacts also act as micro agenda-setters.[27] Content often appears in users' feeds because their social contacts engage with it and share, comment on, or like it.[28–30] Some individuals within a person's network are particularly influential, acting as opinion leaders by actively engaging with content.[29]

3.2 Algorithmic filtering

Algorithmic filters have a particularly large impact on exposure to content on social media (path B). Algorithms not only determine what content is displayed, but also prioritize the content presented.[26] This complex technology identifies patterns in large datasets to deliver content that aligns with users' personal interests and preferences, thereby enhancing user interaction with the platform and increasing the time spent on it.[30,31] The dynamic learning capabilities of algorithms allow for content to be tailored specifically to individual users,[14,31] with AI now significantly improving prediction of user preferences and interests.[32]

3.3 Individual behavior

One unique aspect of social media is the influence of individuals whose exposure to social media content is indirectly a result of their behavior on social networks and in relation to algorithms.[16] They shape the structure of their social networks (path C) by choosing which accounts to follow. The content to which they are exposed is affected by the accounts they follow, but also by the density of their shared connections and the frequency of their interactions with certain accounts.[26,28,33]

Individuals can also influence algorithmic content suggestions (path D) through their engagement with content, for instance by liking, commenting on, and sharing content,[26,31,32,34] or by consciously not clicking on selected content to reduce the amount of it in their feed.[15,26] Algorithmic recommendations are also influenced by individual consumption habits (path E), including what content is consumed and metadata such as view counts and time spent on specific content.[28,31]

Once a social media platform exposes a user to potential content, the individual can choose what to consume (path F). This choice can be either conscious or unconscious, and is influenced by their personal preferences and expectations in terms of what they want to achieve or gain from the interactions.[35] In short, consumption is often driven by the motivations for media use, a topic extensively discussed in the context of Uses and Gratification Theory. For students, the primary gratification derived from social media use is entertainment.[1,36–40] Other motivations include relaxation and escape from everyday life,[38,39] self-expression and identity building,[37,41] and community building and social connection.[39,41,42] In addition to these gratifications, social media is increasingly a way of obtaining information[1,20,38,42,43] staying up to date with news[19,35,44] and is also used for educational purposes.[40]

Beyond motivation, content consumption and engagement are also influenced by other factors. When a user encounters content for the first time, it is often perceived as a novel, interesting and engaging stimulus, leading to more intensive interaction. However, this effect diminishes over time. Repeated exposure can lead to feelings of monotony and saturation, potentially generating negative attitudes toward the content, such as boredom.[45] Boredom can in turn trigger social media fatigue, defined as a user's tendency to withdraw from social media or to tune out or only skim certain content.[45,46] Fatigue can also result from information overload, where users feel overwhelmed by the sheer volume of information.[42,46] This can be explained by the limited capacity model, which posits that individuals have finite information processing ability. When the amount or complexity of information

exceeds this capacity, users experience information overload,[46–48] leading to feelings of overwhelm, stress or confusion,[46,47] which in turn can lead to social media fatigue in general or avoidance of specific content.[42,49]

In summary, the content to which a person is exposed on social media is significantly influenced by their social network, algorithmic filtering and individual behavior. What an individual consumes from the content on offer is in turn influenced, consciously and unconsciously, by personal motivations and their available cognitive processing capacity. All these factors will also serve as the foundation for the analyses in this study.

The investigation presented in this article thus focuses on collaborating with students in a world café format to identify factors that may have led to the changes in their consumption and evaluation of science communication on social media, as described in the motivation section. It seeks to address the following research questions:

RQ1: Which factors influence young people's exposure to scientific content on social media?

RQ2: Which factors influence young people's consumption of scientific content on social media?

4 Research setting

4.1 Participants

The participants in this project were from two upper-secondary school classes. The students were of particular interest to us because, firstly, they had already engaged intensively with science communication on social media through the contest mentioned above. Given their strong commitment to that contest, we assumed they had engaged extensively with science communication on social media. Second, their school specialized in communication and media design, which provided them with basic knowledge in this field. Thirdly, the students could be described as relatively uninterested in science, as they had specifically chosen the media specialization offered their school over the science specialization. Their educational program provided only 2 h of science per week and no specific chemistry lessons. We found this particularly interesting, as the students participated in the competition with great enthusiasm despite their apparent lack of interest in science.

Prior to the summer break, there were a total of 44 students in the two classes, comprised of 42 females and two males. The latter did not participate to any great extent in the project, which meant that all active participants were female. Due to school transfers and other reasons, only 32 students remained in the participating classes after the summer break.

Participation in the contest was anonymous, with entrants only being attributed to a particular class. In the subsequent project, no personal or demographic data were collected apart from the research data. Both the students and their legal guardians gave written consent to their participation. All students participated voluntarily and had the opportunity to withdraw their consent at any time. Throughout the project, students were allowed to form small groups of their own choosing to ensure that they felt comfortable in the group and could openly communicate their needs.

4.2 Methods

An overview of the entire project with the two participating classes is provided in Figure 1 and is briefly described in the 'Motivation' section. To answer the research questions set out above, data from the first part of the interviews and the World Café discussion was analysed. The interviews have been mentioned in the motivation section above. The analysis applied to address the research questions is outlined below.

The World Café method was selected as it has proven effective in gathering the views and perceptions of a relatively large group of people in a relatively short period of time.[50,51] The method harnesses the energy of small group discussions to gain insights into a topic of interest[51] and thus enables themes or findings to be explored and

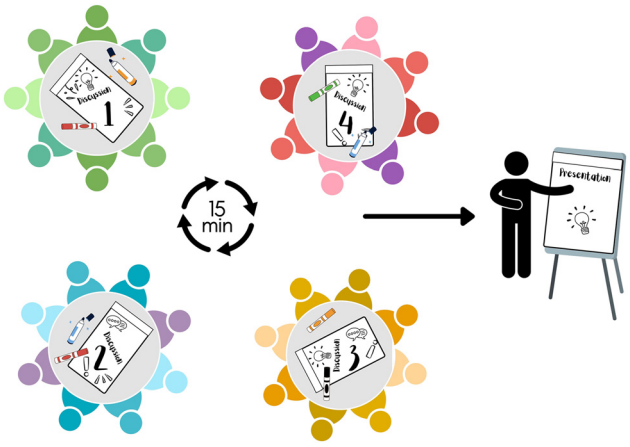

Figure 4: Overview of the world café method.

verified in the context of a large number of participants.[50] Furthermore, we sought to employ a participatory method that not only provides data for researchers but also benefits participants by facilitating dialogue and mutual learning in an equal and non-threatening manner.[50,52]

For the World Café, both classes were first presented with the results of the contest, the interviews and the recap session, especially those results that appeared to contradict each other. The students were then given a brief overview of the underlying theory, which has also been described above in the introduction. Thirdly, the students discussed the results from different perspectives in a World Café setting in line with the approach of Brown & Isaacs,[53] where participants switch between tables in several discussion rounds, building on the ideas, knowledge and discussions of others (Figure 4).

Four discussion tables were set up to discuss the results from different perspectives. Each table was supervised by a student moderator who led the discussions. After 15 min, the students moved to the next table and were introduced to the key points of the discussion so far by the table moderator. The group then continued the discussion. All thoughts expressed during the discussion were jotted down on a flipchart. One of the tables focused on the motivations of the participants in the project and what they got out of it, and how these factors related to the results. Another table concentrated on the changing evaluations of science communication content throughout the project and discussed potential influencing factors. A third table looked at students' exposure to scientific content and the factors that could impact on that. A fourth table was designated for open discussion. Following the completion of all discussion rounds, the moderators presented their findings to the plenary session. The students were then invited to make any further comments in the plenary. The first author took notes during these presentations.

The flipcharts, and parts of the interviews, were analysed on the basis of theme analysis[54] using MaxQDA software. For this, the three deductive influencing factors – the social network, the algorithms and individual behaviour (see theoretical perspectives) – were used as the main codes. Subcodes were added inductively and are listed in Table 1, alongside their number of codings in the interviews and the World Café Data.

5 Results

The remainder of this article examines the factors potentially influencing students' exposure to science communication on social media and their consumption of it. We consider the three key factors – social networks, algorithms, and individual behavior – before discussing their interrelationship and their impact on students' consumption habits. During the interviews, students frequently referenced both their social networks and algorithms when discussing their experiences. In that context, no reports of fatigue were noted, with participants stating during interviews that they enjoyed the content. Although all three influencing factors were discussed with the students before the World Café, the conversations primarily focused on aspects relating to their individual behaviors.

Table 1: Coding system for the theme analysis and number of codings in interviews and flipcharts.

Main code	Sub-code	Number of codings (interview)	Number of codings (world café)
Social network			
	Do not follow scientific accounts	14	0
	Do follow scientific accounts	6	0
Algorithm			
	Intentionally influenced	3	5
	Changes are noticed	10	4
Individual behaviour			
	Fatigue		
	Too much the same, boring	0	11
	Too detailed and complicated	0	27
	Too many and too long	2	16
	Not interesting	0	38
	Novelty effect	0	9
	Motivation		
	Search for information according to one's interests	0	12
	Extrinsic motivation	2	56

5.1 Social network

Regarding their use of social networks, students generally indicated in the interviews that they typically follow only a few if any science accounts, and are less likely to follow accounts on TikTok than on Instagram. Of the students interviewed, 14 reported not following any scientific accounts, with three of them saying they generally only followed friends. Nonetheless, six students indicated that their participation in the competition led them to follow one or more accounts dedicated to scientific content. This tendency could be partly related to the way the young people use TikTok and Instagram; they frequently use the "Explore page" on Instagram and the "For-You-Page" on TikTok. In both cases, algorithms present students with an endless personalized selection of content based on their interests and individual behaviors. One students noted,

> "On TikTok, for example, I only follow people I actually know, but I don't really watch their content. There's the 'Following' feed and the 'For You' feed, but I never really look at the 'Following' one, so there's actually no point in following anyone" (BHS1, 61; translated from the German).

5.2 Algorithms

In the interviews and the recap session, many students demonstrated awareness of the influence of algorithms, recognizing that their feeds were primarily curated by them. Ten students described how their algorithm changed as a result of their participation in the contest, with an increase in scientific content in their feeds. One student remarked:

> "So now I'm automatically getting suggestions in my feed – especially on Instagram, because I was using it a lot towards the end. I'm automatically getting science-related images on my page. And it's actually kind of funny, because I always think, ah, it [the algorithm] has noticed that I'm viewing that kind of content." (BHS1, 41; translated from the German)

In both the interviews and the World Café discussions, students mentioned that they intentionally influenced the algorithm. Some adopted a strategy of deliberately avoiding scientific content during the summer break to prevent it from appearing in their feeds. Other students noticed that scientific content had disappeared from their feeds but did not take action to address this. Students also indicated that they did not engage with this type of content, meaning they did not like, share, comment on, or forward such content.

5.3 Individual behavior

In the World Café it became apparent that the primary reward for the students, especially at the outset, was their participation in the contest. The main extrinsic motivators included the chance to win the contest and the prize money, and the opportunity to take a day off school to attend a science conference. It also motivated the students to seek official permission to use social media in class.

Some content sparked their interest and a desire to learn more about the subject. However, they discussed how, over time, this need became satisfied, leading to a decline in motivation to consume such content. The students also discussed how the level of detail on their feeds increased over time, with the result that they perceived it as too complicated and difficult to understand. Consumption and comprehension thus became tiring. Participants also stated that they found much of the content to be very similar and repetitive. This led to lack of interest and boredom, and many decided to avoid consuming it further.

6 Discussion

This project revealed that students' consumption of science communication on social media in large part started as a result of their participation in the project. As illustrated in Figure 5, consumption increased during the contest. The reward of winning the contest was a decisive factor at the outset (path F). Given the students' limited prior experience of such content, the novelty effect heightened their interest and excitement. These experiences, combined with the appeal of some of the content, sparked new interests in a number of students, and increased consumption (see blue area). Increased consumption also influenced the students' algorithms (path E), which then displayed more science communication in their feeds (path B).

Following the students' victory in the contest and during the summer break, the primary reward for continued consumption of such content was no longer present (path F). Scientific content seemingly could not

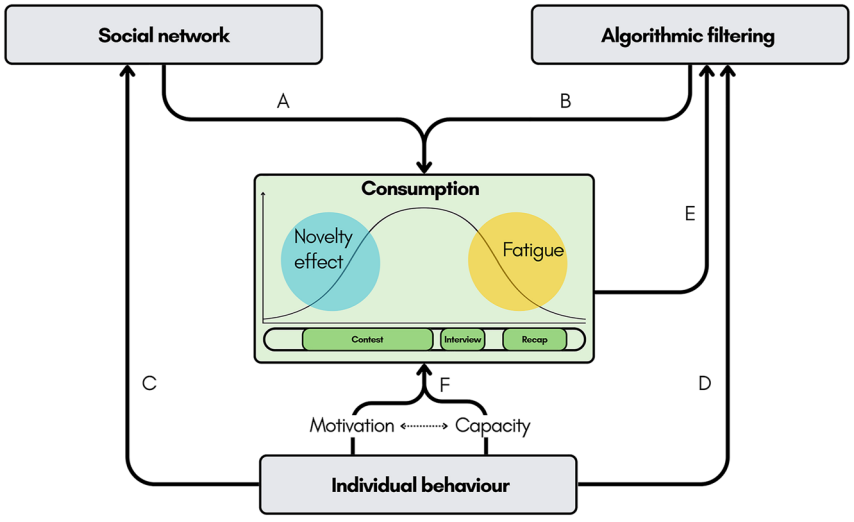

Figure 5: Potential factors in students' exposure to and consumption of scientific content on social media.

deliver other forms of gratification that are frequently provided by social media, such as entertainment.[36–40] Students also reported that the content became increasingly detailed, making it too complicated and difficult to understand, and leading to feelings of boredom and overwhelm. A similar reaction has been reported in relation to excessive social media use in general[42,46] and specifically with regard to exposure to news on such platforms.[45] It was also noted that students were exhausted by all content, a consequence of not having sufficient capacity to process it. As with social media fatigue[42,46,49] and news fatigue,[45] a phenomenon of "science communication fatigue" was observed, with students actively avoiding such content (see yellow area). This behavior aligns with findings from other studies, which indicate that students manipulate their algorithms.[17,23] There was a consequent decrease in scientific content being displayed in students' feeds (path E & path B).

The fact that students followed few if any science accounts (path C) and did not engage with this content (path D) may offer a further explanation of why scientific content failed to appear in their feeds, either before or after the contest. Content that students are exposed to is largely determined by social networks[15,27] and algorithms.[26,30,31] Content that is liked, shared, and commented on tends to circulate faster, reach more people and appear more frequently in feeds.[12,28–30]

7 Limitations

Our selection of two specific classes meant that the number of participants was very small. In addition, the participants were all girls who dealt intensively with science communication on social media as part of the project. The results of this study can therefore only provide insight into possible factors and cannot be generalized. Both the interviews and the World Café method were conducted in groups, with a view to creating an atmosphere that promoted dialogue and the exchange of ideas and different perspectives. However, in this setting, individual voices can dominate, which means that other students may not have had sufficient chance to express their views. Furthermore, the analysis of the flipcharts from the World Café contributed significantly to the results summarized in this article. The thoughts and discussion points jotted down there were recorded in an unsystematic manner and do not allow for quantitative conclusions to be drawn. However, we were able to identify potential influencing factors using the method described above.

8 Implications

Although there is already a lot of science communication on social media, the students in our study did not really consume this kind of content in their free time, indicating that it is not yet an effective educational tool. However, extrinsic motivation and the use of social media in the classroom can encourage students to get excited about such content, which can be used to spark their interest in science. Teachers have the opportunity to inspire students to continue their learning beyond the classroom by recommending that they watch selected content, follow scientific accounts, and engage with topics that interest them. Our study indicates that the presence of scientific information in students' feeds can be enhanced, at least in the short term, through the stimulus and influence of social networks and algorithms.

However, our findings suggest that such motivation is not long-lasting. Many students said they were not willing to devote leisure time to study in addition to their schoolwork. Integrating scientific social media content into the school environment is therefore likely to be the most effective approach. It is not always necessary for content to be created by students themselves, as this can be a very time-consuming process. A wide variety of appealing scientific content is already available online, and this could be used in multiple ways. Educators can recommend content to students, assign it as homework or use it in class. Such content can serve various purposes: it can increase motivation, introduce students to a new topic, repeat and consolidate subject matter, and illustrate different perspectives on a topic, or its relevance to everyday life.

Perhaps most importantly, social media content should also be used to expand students' science media literacy, raising students' awareness of their own influence on their consumption patterns and their underlying

motivations.[16] This includes the development of a systems-based understanding of social media mechanisms, such as the role of filtering and algorithms in social networks, and how these mechanisms systematically influence students' exposure to and perception of information.[17,23] Algorithm literacy is a key component of science media literacy, and is growing in importance.[17,55,56] Awareness of the elaborate nature of algorithms designs and social networks, and the impact of one's own behavior on the content one is exposed to, can help students navigate the vast amount of information available online.

In conclusion, integrating social media into the classroom offers a unique opportunity to transform such structures into valuable educational tools. By leveraging their potential, educators can not only enhance students' learning but also equip them with critical skills that will enable them to engage thoughtfully and responsibly with (scientific) social media content.

Acknowledgments: We would like to thank Sebastian Tassoti and Markus Obczovsky for their valuable feedback on the manuscript. We would also like to thank the participating students of classes 1C and 1D (school year 2022/2023) of the HLW FSB Weiz and their teacher Zselyke Jakubinyi for the successful cooperation.
Research ethics: The collection of data for this research took place as part of an Austria-wide Citizen Science competition, in which participation was voluntary and made with full consent of the participants and their legal guardians at every stage. No personal or demographic information was collected. As well the study does not impair physical and mental integrity of the participants or the right of privacy or other important rights and interests of the participants or their relatives. In this case, formal institutional committee approval was not required.
Informed consent: Informed consent was obtained from all individuals included in this study, or their legal guardians or wards.
Author contributions: All authors have accepted responsibility for the entire content of this manuscript and approved its submission.
Use of Large Language Models, AI and Machine Learning Tools: DeepL Translator, DeepL Write and ChatGPT-4o were used for language improvement.
Conflict of interest: Authors state no conflict of interest.
Research funding: The "We Talk About Science" project is funded by the Austrian Federal Ministry of Education and the Austrian Agency for Education and Internationalization (OeAD).
Data availability: The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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