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Review

How science education research journals address (and neglect) trust in science

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Science education is pivotal in enhancing scientific literacy and potentially contributing to trust in science. The paper examines how trust in science has been addressed in science education by investigating the content of 5 leading research journals. Of the 116 articles published between January 2024 and June 2025 that mentioned "trust" and "mistrust", only 17 directly engaged with trust in science. Analysis revealed an emphasis on the epistemic aspects of science, with limited attention to affective or political dimensions, and a disproportionate focus on global issues such as COVID-19 and climate change rather than local issues. There was a marked lack of an explicit definition or conceptualisation of 'trust' in the papers. We argue that science education research would benefit from interdisciplinary perspectives on trust, including frameworks on the emotional, relational, and ideological characterisations of trust. Such multiplicity of perspectives is relevant to science education given educational contexts inherently embody not only epistemic but also social, political and affective dimensions. Suggestions are made for future directions in science education research for a critical yet balanced account so that trust in science can be appropriated.

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Trust in science and science education

Trust in science is essential for a functioning society. From public health [1] to climate change [2], from new technologies [3] to everyday medical decisions [4], people rely on scientific research and expert knowledge to make informed choices. However, trust in science is not automatic. It must be earned and sometimes repaired. Recent debates over vaccines, climate policy, and the credibility of scientific institutions have highlighted the importance of understanding what trust in science means [5,6], how it relates to scepticism about science [7] and what can be done to mitigate mistrust in science [8,9].

At its core, trust in science involves confidence that scientific methods produce reliable knowledge [10], that researchers act with integrity [11], and that institutions communicate findings honestly [12]. However, given the complexity of the nature of science [13,14], understanding how science works is a challenge for adults and youth alike [15]. Furthermore, the public needs to believe that the scientific enterprise is fair, transparent, and driven by evidence—not politics or profit [4]. This form of trust is what allows science to guide public behaviour and policy. Historically, science has earned trust through its methods, not only through rigorous testing but also peer review and open debate [14]. When functioning properly, science is self-correcting. Errors are exposed, fraud is punished, and understanding evolves over time [13].

Several factors have recently undermined public trust in science. One major issue is the miscommunication of scientific uncertainty [16]. For example, during the COVID-19 pandemic, changing guidelines were sometimes perceived as incompetence or contradiction, rather than as evidence of science adapting responsibly [17]. Another factor is misinformation, which spreads quickly online and often presents scientific debates as political disagreements [18]. When people see scientific findings used to support specific agendas, they may grow sceptical of the science itself [7]. At the same time, scientists and institutions have a responsibility to communicate more clearly, admit uncertainty, and engage with the public in open and respectful ways.

Science education plays a crucial role in developing future scientists' and citizens' understanding of how science works. Science education has the potential to instil a sense of trust in science. When students learn not just scientific facts, but also how science works—its

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values, norms and limitations—they can potentially become more capable of evaluating claims and understanding why scientific claims change over time, for example. A population that understands how scientific knowledge is constructed is more likely to trust it, even when conclusions of scientific investigations are complex or inconvenient. However, understanding the nature of science does not necessarily guarantee that there will be trust in science as other factors such as cultural and religious identities may influence beliefs about phenomena [6].

The importance of trust in science has been recognised in the science education research community as exemplified by dedicated volumes of a particular journal on this theme in recent years [19,20]. Yet there have not been any recent investigations of the content of major science education research journals to examine what and how they cover the issue of trust in science. In line with the aim of the special issue focusing on research published within the past 2 years, we focused on investigating the content of some major journals in science education research. The rest of this paper thus reports an empirical study that focused on the following questions: (a) *How do top journals in science education research cover trust in science?* (b) *What are some potential future directions of research in science education in relation to trust in science?*

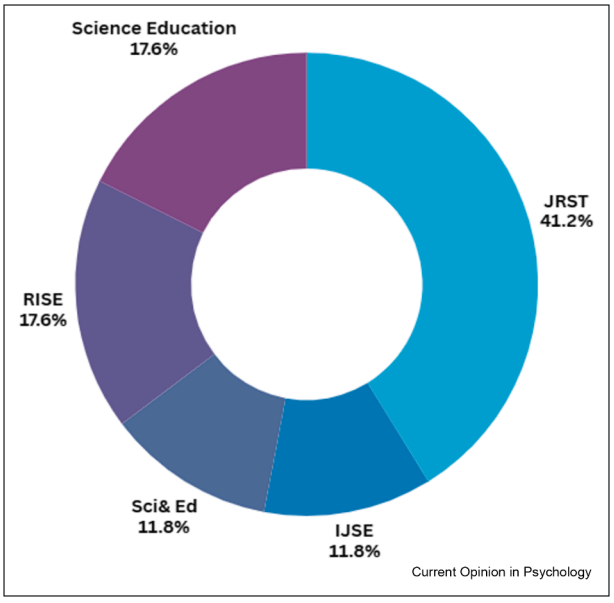
Trust in science: coverage by science education research journals

Data sources were 5 leading journals in science education research which are classified as Quartile 1 journals in the field. These were *Journal of Research in Science Teaching* (JRST), *International Journal of Science Education* (IJSE), *Research in Science Education* (RISE), *Science & Education* (S&E) and *Science Education* (SE). The websites of each journal were searched with the key words 'trust' and 'mistrust' covering the period of 01/01/2024 to 30/06/2025. The word 'mistrust' was also used as it can potentially also capture any negative aspects of lack of trust in science. 'Mistrust' and 'distrust' are often used interchangeably although 'mistrust' typically refers to a general sense of unease and suspicion whereas 'distrust' is more specific. In our search, we used 'mistrust' as it is a term that is broader in scope than 'distrust'. The search for 'trust' captured the variations of 'mistrust' and 'distrust'. For convenience, we refer to 'mistrust' only in this article. The abstracts of all the papers were examined closely and those that pertain to the theme of "trust in science" were selected, while those that had any other use of the words 'trust' and 'mistrust' were excluded. For example, if an article referred to teachers' mistrust of school systems, the article would not qualify given the focus of our study is on trust/mistrust in *science* related issues.

Across the 5 journals, there was a total of 116 articles whose abstracts contained the words 'trust' and 'mistrust'. Of these, 17 relevant papers were identified as follows: JRST 7(16), IJSE 2(13), Sci&Ed 2(4), RISE 3(14) and SE 3(116). (The numbers in parentheses indicate the total number of articles that returned the words 'trust' and 'mistrust' in that particular journal.) All 17 articles are highlighted at the end of this paper in an annotated reference list. In terms of first authorship of the articles, the distribution was 9 from USA, 2 from Germany, 2 from Israel, 1 from Hong Kong (China), 1 from Italy, 1 from Singapore and 1 from Spain. The results indicate that JRST contained the most number of articles published on trust and mistrust in science (Figure 1). Although *Science Education* had a significant number of articles that referred to trust/mistrust (116) only a few were related to the content of trust in science. 5 articles focus on K-12 education; 2 articles focus on post-secondary education; 10 articles focus on public engagement with science. A notable omission in the papers is a focus on teaching and teacher education. In other words, the selected sample of papers did not explore either the teaching of trust in science or supporting teachers in learning to teach trust in science.

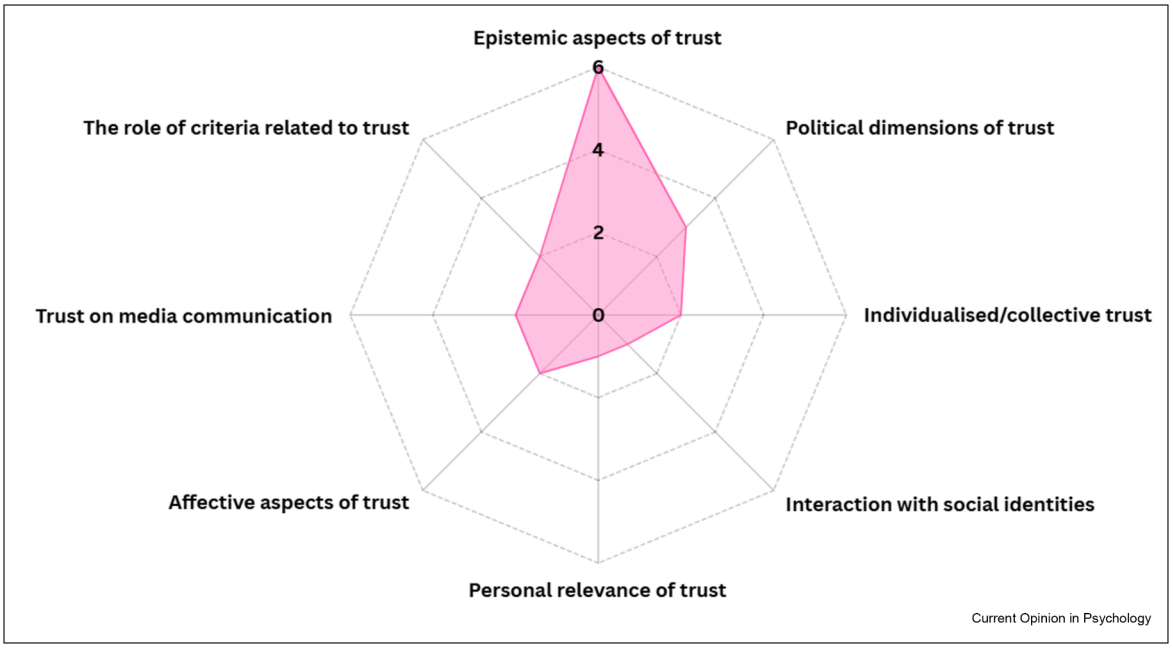
When we examined the content of the articles more closely, the results indicated that a significant majority of the articles were concerned about the epistemic aspects of trust in science ($n = 6$). For example, Osborne and Allchin (2024) defined trust in terms of social

Figure 1



Distribution of articles on 'trust' and 'mistrust' in the science education research journals.

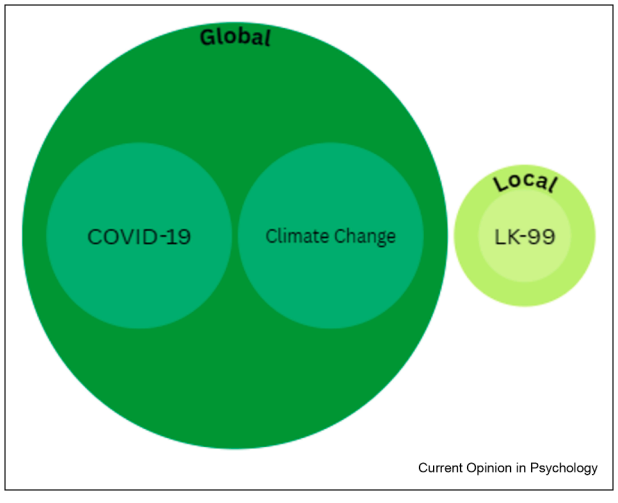
Figure 2



Aspect of 'trust' and 'mistrust' in the science education research journals.

practices that produce reliable knowledge and familiarity with theories and reasoning that guide the work of scientists [21]. The focus on knowledge production point to an epistemic emphasis as opposed to, say, a political concern about dynamics of trust among various stakeholders in scientific communities. Other aspects were affective ($n = 2$) and political ($n = 3$) dimensions emphasised to a lesser extent (Figure 2). The content articulated discrete aspects of trust, while links between different aspects of trust (e.g., relationship between political dimensions and affective aspects) were absent. Some articles were concerned about the context of media communication ($n = 2$) while others highlighted the individual and collective trust ($n = 2$). Two articles focused on criteria for evaluating scientific information. The themes associated with each paper's primary focus is indicated in the selected and annotated list of references at the end of this article.

Figure 3



Relative emphasis on global and local issues in the paper.

In terms of the socio-scientific topics covered in the articles, there was a disproportionate emphasis on global versus local issues with an overwhelming emphasis on Covid-19 ($n = 4$) and climate change ($n = 4$) in the abstracts (Figure 3). Interestingly, one of the papers discussed public trust in a local scientific issue related to discovery of LK-99 as a superconductor in Korea. The issue of trust was thus often contextualised in relation to global issues, while locally specific issues related to trust in science was virtually absent although the local social and cultural factors were taken into account, such as specific religiosity or political orientations of participants.

Critique and ways forward

Although there has been much interest in science education research in recent years to target the issue of trust in science, there is limited conceptualisation of what the concept of 'trust' means. Among the 17 articles we have investigated, we could not find any explicit reference to a conceptual framework or even an explicit definition of 'trust'. Science education research can benefit from other

disciplinary orientations that have addressed trust directly. For example, Fage-Buttler et al. [22] conducted a systematic meta-narrative literature review that explored the narratives of trust evident in literature on public (mis)trust relating to climate science. The authors identified six narratives of trust: attitudinal trust, cognitive trust, affective trust, contingencies of trust, contextual trust and communicated trust. The paper's discussion included the importance of positionality to trust and morality to trustworthiness. Another paper in the broader literature outside of science education research articulated the interdisciplinary conceptualization of 'trust', characterising it as a pragmatic yet higher-order concept. The authors argued that such a refined concept of trust transcends the contextual boundaries of a particular discipline [23]. Indeed, there is already vast literature that spans the philosophy of trust [24,25], epistemic trust [26,27] as well as social and political trust [11] that can contribute to a more nuanced approach to trust in science in science education.

The articles reviewed in our sample used a diversity of methodological approaches including quantitative, qualitative and mixed-method approaches. There is much social scientific research dedicated to measuring and studying public trust where trust is viewed as a phenomenon that can be attributed to individuals, and that is quantitative and measurable [28]. Some authors [12] have criticised this conceptualisation of trust and argue that it fails to recognise trust as a relational phenomenon and overlooks historical and material conditions that characterise relationships between people and institutions. The implication is that studies on trust need to be situated in larger frameworks that attend to the trustworthiness of actors and to relationships between them [12]. One source of literature that has taken such a relational orientation is in organisational literature [29] where trust has been defined in organizational research, noting heterogeneity (differences) in definitions. Such research points out aspects like risk, vulnerability, expectations and relational dimensions. Other research has highlighted that people's trust in scientists rests not only on these actors' traits and qualities, but also on their behaviour and relations with other political actors [30]. Trust can be eroded when scientific decisions are characterised as being 'politicised' through deference to partisan considerations. Although such themes were raised in a few papers in our sample, future research will be enriched by methodological innovation that target more closely the relational aspects of trust in science.

In terms of some underrepresented aspects of research that emerged from our investigation, considerations on the impact of emotions in trust in science is relevant, particularly in teaching and learning contexts. Science education can include involve topics such as climate change and genetically modified foods where students may exhibit particular emotions. In other words, some topics covered in science lessons may give rise to certain emotional responses in students [31]. These emotions are students' feelings experienced in the context of the specific scientific topic [31]. For instance, students can be fearful of genetically modified foods, or they might feel sad about nuclear power plants given previously reported negative incidents. Such negative emotions may adversely affect students' perceptions of science in general and their trust in science in particular. Some authors [32] have argued that the emotional aspects of mistrust in science need to be taken seriously, highlighting that in our interactions with science, we are often vulnerable because we do not have complete control of situations, for example in health-related scenarios or climate change. Such scenarios are not emotionally neutral and overemphasis on epistemic aspects of trust may not be productive in helping learners navigate trust in science. Situations where the expertise of scientists are in doubt [33] as well as those topics that contain a moral dimension [34] all point to the need to examine the role of emotions in relation to trust in science more closely in science education. For example, some students may hold religious beliefs based on creationism that present dilemmas about evolution of humans by natural selection. They may get agitated about the scientific worldview and may argue that it is wrong of science lessons to ignore religious worldviews.

Recent trends in the journals reporting science education research point to the need to have a broad and inclusive take on conceptualisation of trust in science. Yet the future emphases on the various relational aspects of the epistemic, social, political and affective dimensions of trust in science need to be treaded carefully. Ironically, anti-science sentiments exist within the science education research community itself that can potentially breed mistrust in science. Some science educators have criticised science as being fundamentally shaped by ideology [35]. It has been argued that science suffers from a systematic bias through sexism, racism, capitalism, colonialism and other ideological interests [36]. The methodological approaches such as ethnomethodology, deconstructionism and critical theory [37] have mediated the propagation of such lines of research along with showcasing of historical case studies of misuse of and abuse by science in society [38]. Of course, scientists and science educators are not immune to mistakes and unethical behaviour, and they need to be held accountable through critical appraisal. However, lack of nuance in critiquing science and blanket dismissal of science as a racist, sexist and colonial endeavour only serves the hands of those who deliberately engineer doubt in science [39], including, for instance, in doubting the status of science expertise [40]. Breeding such mistrust in science will only serve to disempower future scientists and citizens alike. Future science education research will benefit from a critical yet balanced

account of how science works so that trust in science can be appropriated for the broader good of society.

Conclusion

The empirical analysis of the science education research journals points to a distinct lack of a clear conceptual framework regarding trust in science education. Furthermore, the emerging science education literature on trust in science seems to be limited in exploring the interplay of the epistemic and political dimensions with the collective and personal dimensions of trust. A holistic conceptual framework that integrates the various aspects of trust in science including the affective and emotional dimensions is likely to be beneficial for informing science curriculum development. The articles noted in our analysis focus primarily on students and the public. A notable shortcoming in the literature is the exploration of how teaching of trust in science can be enhanced. Our search did not yield any investigations about science teachers' views of trust in science, their pedagogical approaches to instilling trust in their students or indeed their own attitudes towards trust in science. Considering the relatively novel aspect of the theme of "trust in science" for science teachers, providing professional development opportunities for science teachers is a matter of urgency for science education. Research on science teacher education can be prioritised in future studies to ensure that effective pedagogical strategies can be identified and disseminated more widely across the teaching workforce.

Credit author statement

Sibel Erduran: Conceptualisation, methodology, data analysis, writing – original draft, reviewing, editing.

Kason Ka Ching Cheung: Methodology, data analysis, visualisation, writing - editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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1. *[Epistemic aspects of trust/Social identities]. Busch KC, Lombardi D. Effective strategies for learning and teaching in times of science denial and disinformation. J Res Sci Teach. 2025;62:1417–1424. https://doi.org/10.1002/tea.70003. This is an editorial that highlights the key contributions of papers in a special issue on misinformation and disinformation. Across the articles in this special issue, 10 pedagogical strategies to address mis- and disinformation in the classroom were synthesized. These strategies include acknowledging the social nature of knowledge and building epistemic networks, addressing mis- and disinformation directly, building nature of science knowledge and ensuring topics are socially relevant and meaningful.

2. *[Political dimensions]. Johnson V, Butterfuss R, Harsch R, Kendeou P. Patterns of belief and trust in climate change information. J Res Sci Teach. 2025;62:655–683. https://doi.org/10.1002/tea.21967. The paper reports a study that examined the extent to which individuals' belief in climate change claims and trust in the sources of these claims were influenced by the interaction between the political leaning of information sources, individuals' political ideologies, and individuals' epistemic beliefs.

3. *[Trust and media communication]. Kresin S, Kremer K, Nehring A, Büssing AG. Students' awareness and conceptions of science-related communication mechanisms on social media. J Res Sci Teach. 2025;62:756–791. https://doi.org/10.1002/tea.21973. The paper reports about 7 focus groups of 26 tenth-grade students investigating climate change content on social media. Using qualitative content analysis, the authors identified the students' awareness and conceptions of mechanisms such as filter bubbles and echo chambers on a continuum between rather simple and elaborate.

4. *[Trust and media communication]. Pimentel DR. Learning to evaluate sources of science (mis)information on the internet: assessing students' scientific online reasoning. J Res Sci Teach. 2025;62:684–720. https://doi.org/10.1002/tea.21974. The paper reports a study conducted with 43 ninth grade students who participated in 11 instructional activities. They completed pre and post constructed response tasks designed to assess three constructs: evaluating conflicts of interest, relevant scientific expertise, and alignment with scientific consensus. Findings from the study demonstrate that after the intervention students' assessment scores improved significantly on all three tasks among other outcomes.

5. *[Personal relevance of trust]. Rozenblum Y, Dalyot K, Baram-Tsabari A. People who have more science education rely less on misinformation—even if they do not necessarily follow the health recommendations. J Res Sci Teach. 2025;62:825–868. https://doi.org/10.1002/tea.21975. The paper reports a study with 500 adults who completed an online questionnaire during the second wave of COVID-19 in November 2020 and focused on two COVID-19-related dilemmas involving social distancing recommendations. The findings include the observations that personal relevance was associated with the intention to reject the recommendations but also with more complex arguments, suggesting that people did not intend to reject scientific knowledge but rather tended to contextualize it. Respondents with higher levels of science education and motivation relied less on misinformation.

6. *[Individual/collective trust]. Feinstein NW, Baram-Tsabari A. Epistemic networks and the social nature of public engagement with science. J Res Sci Teach. 2024;61:2049–2068. https://doi.org/10.1002/tea.21941. This theoretical paper focuses on the social processes of public engagement with science and their implications for science education. The core of the authors' argument is that science education should help people become better at evaluating, using, and curating their epistemic networks to make personal and civic decisions and to understand the natural world.

7. *[Epistemic aspects of trust]. Herman BC, Poor S, Clough MP, Rao A, Kidd A, De Jesús D, Varghese D. It's not just a science thing: educating future STEM professionals through mis/disinformation responsive instruction. J Res Sci Teach. 2024;61:1925–1974. https://doi.org/10.1002/tea.21934. The paper reports an empirical investigation wtih 506 post-secondary life science majors' COVID-19 related nature science (NOS) views and COVID-19 vaccine acceptance/support and conspiracy resistance changed through pandemic responsive instruction on COVID-19 science, viral biology, and vaccines with integrated focus on NOS and mis/disinformation. Using a mixed methods approach, the author find that through the pandemic responsive instruction, the students' development of NOS views significantly associated with their development of higher levels of vaccine acceptance and conspiracy resistance..

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8. *[Political dimensions]. Herman BC, Clough MP, Sobotka A. The influence of COVID-19 science views, risk perceptions, and group membership on socioscientific decisions. Int J Sci Educ. 2024;46: 1783–1810. https://doi.org/10.1080/09500693.2023.2300378. The paper reports an empirical study with 415 university biology students' COVID-19 behaviours and opinions regarding how COVID-19 mandates might be associated with their views about COVID-19 science and scientists, risk perceptions, race/ethnicity, gender, and political orientation. Political orientation appeared to mediate the relationship between views about COVID-19 science, COVID-19 actions, and mandate support.

9. *[Political dimensions]. Osborne J, Allchin D. Science literacy in the twenty-first century: informed trust and the competent outsider. Int J Sci Educ. 2024;1–22. https://doi.org/10.1080/09500693.2024.2331980. The article focuses on the epistemic dependence on the expertise of others. The authors argue that it is essential to developing such informed epistemic trust by highlighting (a) a basic understanding of the social practices that enable the production of reliable knowledge; and (b) a familiarity with the major explanatory theories and styles of reasoning that guide the work of scientists..

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10. *[Epistemic aspects of trust]. Lee G, Zhai X. Reconceptualizing epistemic dependence for future scientific literacy: a lesson from the LK-99 case. Res Sci Educ. 2025;55:1085–1107. https://doi.org/10.1007/s11165-025-10247-z. The article reports a case study about the LK-99 incident, which involved a claimed discovery in the historic room-temperature and ambient-pressure superconductor. Data were collected on internet search traffic, discourse within the scientific community, mass media articles, and social media posts from July to December 2023, utilizing various online data analytics platforms. The researchers conducted a set of studies to identify search trends as well as shifting standpoints of stakeholders.

11. *[Epistemic aspects of trust]. Miani L, De Zuani Cassina F, Levrini O. Raising awareness on the complexity of decision-making through climate change education. Res Sci Educ. 2025;55: 873–897. https://doi.org/10.1007/s11165-025-10266-w. Researchers conducted a study with 34 Italian secondary students who played a game involving climate change. The findings indicate that the game enhanced students' awareness of the complexities in policy negotiation, discovering how environmental, technological and scientific issues are intrinsically intertwined with social and economic aspects..

12. *[Epistemic aspects of trust]. Cheung KKC, Pun JKH, Li W. Students' holistic reading of socio-scientific texts on climate change in a ChatGPT scenario. Res Sci Educ. 2024;54:957–976. https://doi.org/10.1007/s11165-024-10177-2. The authors combined Rasch partial-credit model and qualitative analysis to investigate 117 junior secondary students (grades 8 to 9) read of texts based on two ChatGPT-generated socio-scientific texts, with one focusing on cognitive-epistemic aspects of climate science and another one focusing on social-institutional aspects of climate science. The findings indicate that the content-interpretation was the easiest while the epistemic-evaluation domains were the most difficult.. *[Epistemic aspects of trust].

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13. *[Political aspects of trust]. Poor SV, Herman BC, Janney BA. How scientists perceive NOS and its value for science communication. Sci Educ. 2025. https://doi.org/10.1007/s11191-024-00592-2. In a series of studies (total N = 2087), the authors show that increased science's epistemology literacy might have consequential population-level effects on the public's alignment with scientific results. In one exploratory study and a pre-registered national online survey, they show that understanding scientific epistemology predicts refusal of pseudoscientific beliefs and higher scores in a methodology of science test..

14. *[Epistemic aspects of trust]. Viciana H, Astobiza AM, Fasce A, et al. Scientifically together, politically apart? Sci Educ. 2024. https://doi.org/10.1007/s11191-024-00587-z. The authors report a mixed-methods investigation features analysis of surveys and interview data collected from 14 scientists to understand their perceptions and values toward communicating nature of science. Results from a semi-grounded thematic analysis of the interviews demonstrate that scientists' nature of science communication views are complex and are influenced by some factors, including their perceptions of the public, financial and institutional constraints, and the role of science in solving societal issues..

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15. *[Role of criteria and trust]. Dabran-Zivan S, Baram-Tsabari A. The importance of science education, scientific knowledge, and evaluation strategies for the successful detection of COVID-19 misinformation. Sci Educ. 2025. https://doi.org/10.1002/sce.70000. The paper reports the two studies: one investigating general population (n = 500) and the second investigating the ultra-Orthodox community (n = 800). Respondents in both studies were asked to share misinformation they heard during the COVID-19 pandemic and explain why they did not believe it. Using content analysis of participants' open-ended answers, the authors found that about half of the general population and only a third of the ultra-Orthodox sample were able to identify misinformation when confronted with such..

16. *[Affective aspects of trust]. Zummo L, Hadzic L, Gargroetzi E. Uncovering emotion in youth digital civic participation around climate change: entanglements of fear, despair, and anger in civic practice. Sci Educ. 2025;109:1422–1449. https://doi.org/10.1002/sce.21969. Using mixed-methods, the authors analyzed 82 media pieces created by youth across the US. With an analytic framework informed by prior research they found two common patterns that emerged in over half of the data set: (a) fear and/or despair around the impacts of climate change and (b) anger over inaction around mitigating climate change..

17. *[Role of criteria and trust]. Kresin S, Kremer K, Büssing AG. Students' credibility criteria for evaluating scientific information: the case of climate change on social media. Sci Educ. 2024;108: 762–791. https://doi.org/10.1002/sce.21855. The authors report results from 6 focus groups with 21 10th-grade students about their usage of different credibility criteria in the case of social media posts about climate change. The data were analyzed through qualitative content analysis. The findings suggest that students generally combine different criteria when evaluating the credibility of scientific information in social media..