Supplementary material

# A detailed account of the three lenses

The following provides a more detailed account of the part of the framework dedicated to the technology. Thus, the table below breaks down the three lenses – technological properties, users experience, and content presentation – providing additional information regarding related aspects and concepts presented in the paper.

### (1) Technological properties

| *Dimension* | *Criteria* | *Description* |
|---|---|---|
| Basic properties | Main objective (OECD, 2022) | What is the primary or leading purpose of the technology? For example, retrieving information, generating text, transforming text into visual or audio-visual, reinforcing learning, etc. |
| | Knowledge base (see Barzilai et al., 2020, 2023; Forzani, 2020; Polman et al., 2014) | What type of sources does it draw from (e.g., scientific, journalistic, wiki, user-generated content, etc.)? |
| | | How recent is the data on which the technology relies? |
| | | Does the technology prioritize certain type/s of sources, and if so, which? |
| | Capabilities in science and math (OECD, 2023; Zhai et al., 2024) | What can the AI do, in terms of fundamental and science literacies, compared to humans? If unknown, this could be measured by testing the technology according to math and science literacy tests for humans. |
| Output's qualities | Media richness (Daft et al., 1987; Ishii et al., 2019; Sun & Cheng, 2007) | How many and what kind of modalities does the technology offer the user when answering queries or prompts, and in which combination (see also Hendriks et al., 2020)? |
| | | How many, which, and to what degree does the technology support different languages?<br>Does the technology mitigate low levels of foundational literacies (Sharon & Baram-Tsabari, 2020) and language divide (Dabran-Zivan et al., 2023)? |
| | Multitasking (Bang et al., 2023) | How many and which tasks can the technology perform, and to what degree? For example, summarization, question answering, misinformation detection, task-oriented dialogue, and more. |

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| | Accuracy, relevance, and clarity (Ghassemi et al., 2023) | How frequently and how well does the technology succeed in retrieving/ generating relevant information (see also Hendriks et al., 2020; Polman et al., 2014; Schäfer, 2023)? |
| | | Is the technology susceptible to hallucinations? Does using detailed misinformed prompts or queries lead to inaccurate or false information (see also Bang et al., 2023; Zuccon & Koopman, 2023)? |

## (2) Users experience

| *Dimension* | *Criteria* | *Description* |
|---|---|---|
| Interactivity (Sohn, 2011; Sundar, 2015, 2020) | Anthropomorphism (Chong et al., 2021; Gambino et al., 2020; Kim & Sundar, 2012; Sundar, 2020; Wang et al., 2022) | Does the technology have visible, audible, or otherwise humanlike features, e.g., eyes, a voice, gender, human name, etc.? |
| | | Whether and to what degree is the technology conversational, e.g., using first person singular pronouns, facial cues, emojis, providing responsive message exchange, etc.? |
| | | Is the interaction style more task-oriented or social-oriented? Is it more formal or casual? Is it more purposeful or social-emotional and affective (see also Chattaraman et al., 2019; Keeling et al., 2010)? |
| | Guidance (Long & Magerko, 2020; see also Nielsen, 1993, 2020) | Whether, how, and to what degree does the technology guide the users on how to use it best, e.g., advanced search on Google Search, 'How to search' instructions on Consensus, etc.? |
| | | Does the AI support or encourage social interaction around science, and if so, how (see also Hendriks et al., 2020)? |
| | | Does the technology encourage users to learn more about science-related issues, e.g., suggesting further inquiries, related topics, etc.? |
| Users' agency (Coyle et al., 2012; Kang & Lou, 2022; Sundar, 2020; Sundar & Lee, 2022) | Previous sessions (see Kang & Sundar, 2016; Nielsen, 2020) | To what degree and how far back can users see and restore their previous sessions? |
| | | To what degree and how can users continue or regenerate previous sessions, partially or in whole? |
| | | Whether users can delete previous sessions, in whole or partially, and how? |

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|---|---|---|
| | Personalization (Sundar, 2020; see also Hendriks et al., 2020) | What kinds of feedback can the user give the technology? |
| | | To what degree can users actively train, program, or set the AI system to meet their personal and particular needs or preferences? For example, can users train or set the AI to prioritize scientific information sources over personal blogs? |
| | Suitability (see Long & Magerko, 2020) | To what degree is the technology compatible with different audiences, e.g., children, people with special needs, laypeople, scientists, etc? |
| | | To what degree does the technology allow legal guardians to supervise, support, or track young or otherwise less-capable audiences' use of the system? |
| Transparency (Sundar, 2020) | AI thickness (Sundar & Lee, 2022) | Is the AI's presence and involvement apparent in the interface (i.e., thick), like in the case of robots, or rather unapparent in the interface (i.e., thin)? |
| | AI's boundaries (Nielsen, 2020; see also Sundar & Lee, 2022) | Are the AI's capabilities (overtly) described? |
| | | Are the AI's limitations (overtly) described? |
| | Explainability (Doran et al., 2017; Forbus, 2021; Long & Magerko, 2020; Miller et al., 2022) | To what degree and how does the technology reveal and explain the 'rationale for decisions that the system makes' (Forbus, 2021, p. 36)? |
| Costs and benefits (Sundar, 2020; Roloff, 1981) | Engagement complexity (Forbus, 2021) | How many "digital steps" (e.g., prompting, querying, opening additional tabs, reading different webpages, etc.) are users required to perform in order to complete their task? |
| | Mitigating information literacy (see Aguileraa & Pandya, 2021; Hendriks et al., 2020; Jones-Jang et al., 2021; Yamamoto et al., 2018) | Does users' engagement with science through the technology involve evaluating and selecting information sources? |
| | | Does users' engagement with science through the technology involve integrating information from multiple sources? |

## (3) Content presentation

| *Dimension* | *Criteria* | *Description* |
|---|---|---|
| Source (Barzilai et al., 2020, 2023; Bromme et al., 2010; Bromme & Goldman, 2014; Forzani, 2020; McGrew & Breakstone, 2023; Osborne & Pimentel, 2022; Stadtler & Bromme, 2014) | Identification | Does the technology identify relevant information sources (irrespectively whether the information is accurate)? |
| | Information about the source | When identifying the sources, does the technology provide enough details that allow users to check the source directly (e.g., providing a valid URL, publication name, date, etc.)? |
| Reasoning (Barzilai et al., 2020, 2023; Forzani, 2020; Halpern, 2014; OECD, 2019b; Retzbach et al., 2016; Tseng et al., 2021) | Evidence | To what degree does the information retrieved/ generated tend to include evidence as part of the explanation or argumentation? |
| | | To what degree does the information retrieved/ generated include facts that can easily be cross-checked? For example, statistical facts, historical facts, factual spatial information, etc. (see also Bang et al., 2023; Zuccon & Koopman, 2023) |
| | | Does the retrieved/generated information enable users to learn about the nature of the evidence (e.g., authority-based, anecdotal evidence, scientific evidence, etc.) used for explanation or argumentation? |
| | Comprehensiveness | Can the technology provide a conclusion or a recommendation? If it does, does it detail the information that leads to that conclusion or recommendation (see also OECD, 2019a)? |
| | | To what degree does the technology allow users to learn about alternative theories or perspectives? More specifically, does the technology frequently present alternative perspectives, does it do so only when prompted, and does it contextualize said alternative (see also Facione & Facione, 2014) |
| Consensus (Osborne & Pimentel, 2022) | The agreement | Does the technology facilitate easy understanding of whether there is a scientific consensus about the issue at hand and the nature of said consensus? |
| | The disagreement | Does the technology allow users to learn about the specifics of the (scientific) disagreement when asked about its nature? |

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