Extended Abstract for the
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DATA AND AI READINESS: COMPETENCIES FOR SCHOOL STUDENTS TO BECOME INFORMED CITIZENS

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Focus Topic: AI and Data Science Competencies

Motivation

The demand for *Data and AI Literacy* is currently very high: in Germany and Switzerland, Data Literacy charters call for the initiation, promotion, and implementation of measures to foster data competencies (Akademien der Wissenschaften Schweiz, 2024; Schüller et al., 2021), an increasing number of publications on AI literacy show the relevance of artificial intelligence for the educational context (Almatrafi et al., 2024), and the inclusion of AI Literacy in the EU AI Act (European Union, 2024, Article 4) now also anchors the demand for AI literacy from a political perspective. However, what competencies do Data and AI Literacy encompass?

A standardization of Data and AI Literacy

The literature offers numerous frameworks focusing exclusively on Data Literacy competencies (e.g., Schüller et al., 2019) or AI Literacy competencies (e.g., Long & Magerko, 2020). However, (1) the proposed AI Literacy competencies vary significantly between different frameworks (Laupichler et al., 2020), and (2) a comprehensive framework combining both Data and AI Literacy does not yet exist (Olari & Romeike, 2021). Therefore, we are developing a holistic and comprehensive framework for Data and AI Literacy, which will be realized as an IEEE standard titled "Standard for Data and Artificial Intelligence (AI) Literacy, Skills, and Readiness" (IEEE Standards Association, n.d.).

The framework is being developed by an international and interdisciplinary group of data and AI researchers and practitioners, including educators, developers, and engineers worldwide. This approach ensures the applicability of the framework across different contexts and countries. The framework provides a detailed description of the competencies that individuals need to be aware of data and AI, enabling them to be ready to make data-based decisions in a critical, informed, and responsible way. These identified competencies are based on more than 25 existing frameworks for Data Literacy and AI Literacy, which have been consolidated and integrated. Thus, the new framework creates a common understanding of the knowledge, skills, attitudes, and values individuals need to cope with upcoming societal challenges.

Unlike many of the frameworks reviewed, the new framework emphasizes not only knowledge and skills but also an understanding of the ethical implications of data and AI, including questions such as: How reliable and trustworthy are the results generated by these systems? How can one maintain autonomy in decision-making when AI systems offer persuasive recommendations? How far should one integrate data and AI applications into one's life? By incorporating these considerations into the framework, we are cultivating a society capable of thoughtfully evaluating the benefits and risks associated with digital technologies.

In addition, the framework also considers that different target groups need competencies at different levels (e.g., an AI developer should have a deep understanding of the underlying algorithms, while AI applicants should be more aware of where AI systems are integrated). However, every informed citizen in the 21st century consumes and provides data and AI (partly unconsciously) on different occasions. The framework takes these aspects into account through different hierarchical competency levels, which are theoretically based on established educational principles.

Applicability of the standard in the context of school students

The framework is designed to be universally applicable and is not restricted to a specific target group, unlike many existing frameworks. This ensures its relevance both in professional contexts and school settings. The framework follows the idea that students should already be equipped in school with the necessary competencies to be ready to consciously identify and address diverse situations related to

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data and AI. The standard is not limited to a single subject but is designed to be applied across the entire spectrum of school subjects, acknowledging the broad impact of data and AI on all disciplines. Consequently, the competencies defined for K-12 students represent fundamental, minimum standards necessary for them to become informed citizens. These competencies are essential for acquiring further knowledge and participating responsibly in modern everyday life.

Further applications of the standard in the educational context

By providing a complete catalog of knowledge, skills, attitudes, and values, the proposed competence framework for Data and AI Literacy can also be used to develop school curricula (and likewise curricula for teacher education programs), evaluate educational programs, and consider competence development.

Value

The proposed contribution thus offers a new perspective on conceptualizing AI and Data Science Competencies. It underlines the goal to embed Data and AI literacy as a fundamental component of education—from early schooling to higher education and professional training—to enable individuals to make informed decisions in a data-driven, AI-integrated world.

The symposium highlighted that many initiatives lack a theoretical foundation based on standardized Data and AI competencies. Establishing such a standard can therefore be valuable for educators, lesson designers, researchers, and curriculum developers worldwide, enabling them to foster Data and AI competencies in a systematic and coherent manner.

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