The Future of AI Literacy Education: Integrating OECD Education 2030 with Technical and Ethical Perspectives

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Abstract: With the rapid spread of AI, its impact and associated risks have become major societal concerns. Therefore, defining AI literacy and developing effective educational and learning methods has become increasingly critical. This study defines AI literacy based on competencies outlined in the OECD Education 2030 framework. The resulting definition of AI literacy includes the knowledge, skills, attitudes, and values necessary for understanding AI technologies and their societal impacts, using AI responsibly, evaluating its outcomes, and acting toward a sustainable and fair society. Future work will focus on developing effective educational approaches and evaluation methods based on these competencies.

Introduction

As Artificial Intelligence (AI) becomes increasingly embedded in our daily lives and work environments, its associated risks, such as misinformation, employment impacts, and security concerns, are drawing significant societal attention (Mima, 2024). In response, defining AI literacy and developing effective educational methods has become essential for empowering

individuals to navigate AI responsibly. To address these challenges, this study references Shirai's (2020) concept of literacy as "the ability to possess basic knowledge, understand it correctly, and apply it," alongside the notion of competencies as "the knowledge, skills, attitudes, and values required to act effectively in specific contexts." Thus, a framework like OECD Education 2030, which integrates these competencies, becomes crucial to redefining AI literacy comprehensively.

Framework for Transforming Educational Systems

The OECD's Future of Education and Skills 2030 project (referred to as Education 2030) aims to identify the knowledge, skills, attitudes, and values necessary for students to thrive in a rapidly changing society and to transform educational systems accordingly (OECD, 2023). Through international collaboration, Education 2030 seeks to redefine educational goals and curriculum design, supporting a sustainable and innovative future. The project categorizes essential competencies for learners into three domains: knowledge, skills, attitudes, and values. These domains not only focus on knowledge acquisition but also equip learners with the competencies needed to act responsibly in real-world situations (Shirai, 2020). This study seeks to define AI literacy in alignment with these domains, ensuring a comprehensive approach that includes both technical and ethical dimensions of AI.

Purpose

This study aims to define AI literacy using the OECD Education 2030 framework's competency-based approach, which incorporates knowledge, skills, attitudes, and values to promote responsible AI use. By establishing a clear definition of AI literacy, this research provides a foundation for developing educational strategies that support individuals in understanding, evaluating, and applying AI within a societal and ethical context. The ultimate goal is to contribute to a sustainable and fair society through the responsible use of AI.

AI literacy and competencies

Long and Magerko (2020) conducted a review of interdisciplinary literature and summarized the competencies required for individuals to understand and interact with AI effectively. They define AI literacy as "a set of competencies enabling individuals to critically assess AI technologies, effectively communicate and collaborate with AI, and use AI as a tool in online, home, and workplace environments." These competencies are further categorized into the following 17 core competencies:

1. Recognizing AI
2. Understanding Intelligence
3. Interdisciplinarity
4. General vs. Narrow
5. AI's Strengths and Weaknesses
6. Imagine Future AI
7. Representations
8. Decision-Making
9. Machine Learning Steps
10. Human Roles in AI
11. Data Literacy
12. Learning from Data
13. Critically Interpreting Data
14. Actions & Reactions

15. Sensors
16. Ethics
17. Programmability

These core competencies encompass not only technical knowledge but also ethical and societal considerations, emphasizing that AI literacy requires more than just the ability to use AI; it includes a responsible, critical understanding of its impact on society.

Components of AI literacy

To define AI literacy comprehensively, this study examines AI literacy in alignment with the competency categories proposed by Education 2030: knowledge, skills, attitudes, and values. The components are as follows:

Knowledge:

- Disciplinary Knowledge: Understanding core AI concepts, algorithms, machine learning processes, and the historical development of AI.
- Cross-Disciplinary Knowledge: Recognizing AI's connections to other fields, such as healthcare, finance, and education, and understanding AI ethics, laws, and societal impacts.
- Epistemic Knowledge: Understanding how AI researchers and practitioners solve problems and apply technologies.
- Procedural Knowledge: Knowing AI system design and implementation processes, including data collection, preprocessing, model training, and evaluation, and using AI tools and platforms.

Skills:

- Cognitive and Metacognitive Skills: Engaging in critical and creative thinking to assess and apply AI technologies, learning how to learn about AI, and recognizing one's knowledge and skill levels.
- Social and Emotional Skills: Empathy for ethical AI use, responsibility in AI projects, and collaboration within teams.
- Practical and Physical Skills: Operating AI tools and platforms, collecting and analyzing data, and applying AI models to solve real-world problems.

Attitudes and values:

- Personal Values: Commitment to continuous learning of AI technologies, proactive skill enhancement, and ethical AI use.
- Interpersonal Values: Understanding AI's societal impact, respecting diverse opinions and values, and fostering cooperation and empathy through AI.
- Social Values: Emphasizing fairness, justice, and sustainability in AI use and adhering to social norms and laws.
- Human Values: Respecting human rights, considering humanity's welfare in AI applications, and acting according to international ethical standards and the Sustainable Development Goals (SDGs).

These components outline AI literacy as an all-encompassing capability that includes not only technical skills but also social responsibility and ethical considerations.

Educational approaches to developing AI literacy

Insights and effective methods for AI literacy education

Insights into AI literacy education have emerged through practices with high school students, educators, and the general public, demonstrating the effectiveness of fostering attitudes and values central to responsible AI usage. AI literacy education highlights the importance of instilling values and ethical considerations alongside technical skills. Approaches such as ELSI-integrated Project-Based Learning (PBL) and Discussion-Based Learning are proposed as effective methods for developing AI literacy in these groups (Mima, 2024).

ELSI-integrated project-based learning (PBL)

ELSI-integrated PBL is a project-based learning approach that incorporates ethical, legal, and social issues into the problem-solving process. Through this approach, learners are encouraged to consider questions such as, “Is this solution sustainable?” and “Does this solution negatively impact people or the environment?” This framework equips learners to address issues from ethical and sustainable perspectives, fostering a holistic approach to AI literacy.

Discussion-based learning and its importance

Discussion-Based Learning is an educational method that promotes collaborative knowledge construction, encouraging active participation and self-directed learning. Through discussions with peers holding different perspectives, learners can broaden their views, improve their critical thinking and self-expression skills, and deepen their empathy and understanding of others.

Results and discussion

AI literacy is often discussed as a combination of technical knowledge and skills to operate AI systems. However, in an era marked by complex global challenges, AI literacy must extend beyond media and digital literacy to include ethical values and responsible actions. By integrating the components outlined above, AI literacy can be defined as follows:

> *AI literacy is “the ability to acquire knowledge, skills, attitudes, and values related to AI technologies and their societal impact, use AI with attention to social responsibility, evaluate its outcomes, and act toward achieving a sustainable and fair society.”*

In summary, AI literacy involves “understanding AI technologies, using them appropriately, considering their impact on society and culture, and acting responsibly.”

Educational approaches such as ELSI-integrated PBL and Discussion-Based Learning play a significant role in fostering problem-solving abilities to address the diverse challenges of modern society. As learning theories have evolved from behaviorism to cognitivism, situational learning, social constructivism, and performance psychology, education now views individuals as lifelong learners who grow within the context of social relationships. Learners are encouraged to act as agents who establish new connections and contribute positively to society.

Globally, issues such as climate change, economic and social inequality, and political instability are on the rise. Within Japan, economic decline, population reduction, and an aging society present additional challenges. In this era, education’s role in fostering people who can work toward a fair society, learn autonomously, and create new paths is vital. It is essential that individuals feel empowered as “agents of change.”

In a society where generative AI is becoming increasingly prevalent, fostering AI literacy is crucial. Approaches such as ELSI-integrated PBL and Discussion-Based Learning are instrumental in helping learners understand the societal impacts of AI and encouraging critical and responsible actions. Moving forward, it is essential to adapt these approaches across various

educational settings and evaluate their long-term effectiveness. As generative AI continues to advance, educational initiatives will also need to address emerging risks and challenges associated with new AI developments.

References

Long, D. and Magerko, B. (2020). What is AI Literacy? Competencies and Design Considerations, In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, pp.1–16.

Mima, Noyuri (2024). Fostering Literacy for the AI Age. Journal of Information Processing, Vol. 65, No. 7, e14-e19. (in Japanese)

OECD (2023) Future Education Skills 2030 OECD Learning Compass 2030 A Series of Concept Notes.

Shirai, Toshio (2020). The Future of Education Depicted by the OECD Education 2030 Project. Minerva Shobo. (in Japanese)

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