Ethical Principles in Artificial Intelligence for Children: A Protocol for a Scoping Review

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Abstract. Artificial intelligence (AI) is leading a new era of technological progress with significant ethical implications. Furthermore, AI is playing an increasingly important role in the lives of children. Nonetheless, it is noteworthy that most national and international ethical guidelines on AI only superficially address children and their needs. This article proposes a protocol for reviewing ethical guidelines on AI with children as users. The objective was to map the guidelines, ethical principles, and literature recommendations for using AI with children as primary users. We employed a methodological approach based on the discovery and eligibility protocol, adapted from the Joanna Briggs Institute's PRISMA extension for scoping reviews. Our research involved a multi-stage screening process using various sources, including online collections and search engines. We applied specific inclusion and exclusion criteria to identify relevant documents defining ethical principles for AI use, particularly concerning children. We analyzed the data using linguistic analysis software and qualitative content analysis to identify and summarize emerging ethical principles and their frequency. In this way, we established a comprehensive and specific framework of ethical principles that should guide AI in this context.

Keywords: Artificial Intelligence · Ethics · Children · Ethical Guidelines · Ethical Principles · Scoping Review Protocol

1 Introduction

1.1 Ethics of Artificial Intelligence

The emergence of Artificial Intelligence (AI) has marked the beginning of a new era of technological progress, with significant implications not only in scientific and social domains [1–3] but also in ethical considerations [4, 5].

The increasing complexity of AI systems [6–9] has prompted fundamental inquiries, such as understanding how humans can coexist with AI, its impact across diverse contexts, and the ethical principles that should govern its development and implementation [10, 11]. Concurrently with AI's technological advancement, AI ethics has evolved,

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delineating guidelines and principles to steer the design and use of intelligent systems [12].

Various national and international organizations have convened expert committees dedicated to AI [13–15]. These organizations, spanning both the public and private sectors [16, 17], have produced reports and guidance documents on AI that fall within the realm of soft law. Soft law establishes standards or principles that guide AI's ethical and responsible management [18].

Despite a burgeoning international focus on AI ethics for adults, the escalating integration of AI into children's daily lives gives rise to additional ethical issues [19]. AI is taking a significant role in children's lives through various applications, including personalized educational tools [20, 21], interactive games [22], and monitoring devices [23]. Nonetheless, most national AI strategies superficially touch upon children and their specific needs [24]. In contrast, several documents emphasize the imperative of affording exceptional protection to children, given their potential vulnerability to the impacts of technology [25, 26].

These considerations highlight the need to ascertain what ethical principles should govern when children are the primary users of AI technology and their prioritization [27]. Addressing ethical challenges associated with using AI with children as users demands a comprehensive and unified perspective on the ethical principles involved.

To this end, we have reviewed ethical guidelines for AI with children as users.

1.2 Limits and Resources of Gray Literature

One of the challenges in achieving a unified vision of AI ethics for children pertains to the nature of AI guidance documents. Usually, these documents are classified as soft laws [18]. Soft laws encompass documents such as reports and guidelines issued by public and private entities without legal constraints. They may be considered part of the broad range of grey literature materials [28]. This literature presents numerous advantages, including encompassing a wide variety of documents, providing a fundamental contribution to literature reviews, expanding the scope of scientific syntheses, helping to reduce publication bias, and ensuring greater completeness and representativeness of the evidence considered [29, 30].

Although valuable, grey literature presents various challenges in its retrieval, such as rapid online publication, difficulty finding documents outside conventional editorial channels, and diversifying formats and target audiences [31–33]. Furthermore, grey literature lacks legal constraints, originates from various sources, and is less accessible than traditional literature [34]. These factors make searching for such materials more complex and may result in lower documentation and archiving than official documents [35]. Despite these challenges, the benefits of studying grey literature outweigh the efforts required to retrieve it.

A well-planned research strategy can be an aid in overcoming these difficulties and exploiting this source of information [33].

1.3 Scoping Review as a Literature Synthesis Methodology

Choosing how to synthesize the retrieved documents presents an additional challenge. Literature syntheses aim to summarize all relevant studies on a specific research question, improve understanding of discrepancies among various pieces of evidence obtained, and identify literature gaps to guide future research projects [36]. In recent years, many works have proposed different methods of knowledge synthesis in the literature, each aimed at addressing various types of questions in heterogeneous disciplines [37].

To understand ethical principles with children as the primary users of AI technology, we have opted for the scoping review method as the mode of literature synthesis. The scoping review represents a valuable research tool for systematically and comprehensively exploring the extensive reference literature [38], including grey literature documents, guidelines, and government reports [39]. The scoping review is a legitimate and rigorous methodology for providing an overview of the state of evidence on broader research questions and emerging, less-known, interdisciplinary, complex, or multi-methodology topics [40–43].

The ethics of AI for children is broad and still needs to be widely explored. It is a new and complex multidisciplinary research topic. Therefore, we opted for a scoping review focusing on ethical guidelines for AI with children as primary users. To our knowledge, no published scoping studies exist on ethical guidelines for AI with children as users. Our proposed review aimed to address this research gap.

Although the scoping review is an excellent method of literature synthesis, it presents several limitations that researchers must consider. Scoping review exhibits variations in its approaches and methodologies, which may increase the potential for bias [44]. It does not include a critical appraisal or an analysis of the risk of bias, which could affect the confidence and validity of the review results, and only a few reviews include a priori protocols [45, 46].

Therefore, a priori review protocol becomes essential as it provides clear guidance on the direction and execution of the review itself. A protocol can be likened to a recipe for the review, outlining inclusion criteria, search methods, and data management in advance [47]. This procedure can help reviewers avoid bias and reduce the risk of arbitrary decisions and duplications of previous reviews.

An optimal scoping review should be characterized by procedural and methodological rigor. A lack of clarity or transparency regarding the methodology can make it difficult to distinguish between errors in result synthesis or research design [48]. Therefore, authors of scoping reviews must account for processes, procedures, and any limitations of their approach to provide reviewers with the necessary information to evaluate the work [49].

To overcome the limitations of scoping reviews and gray literature searches [50, 51], this paper describes our protocol inspired by the PRISMA extension for scoping reviews (PRISMA-ScR) [39, 47].

2 Methodology

2.1 Eligibility Criteria

The concept of AI has evolved, leading to various definitions that reflect the rapid development of the technology [52]. For instance, in 2019, the European Union defined AI as a collection of software or hardware systems designed by humans capable of operating in physical and digital environments through data acquisition. These systems have complex objectives, interpret data, make decisions, and act based on predetermined goals [53]. This definition was also endorsed by the OECD [54]. To accommodate the rapid changes in this field, we included all documents containing the term *AI* rather than selecting only those adhering to a specific definition of AI.

We adopted the definition proposed by Fjeld et al. (2020) [55] for ethical principles. According to these authors, *principles* refer to statements on how AI should be developed, utilized, and disseminated to influence the behavior of specific recipients. Consequently, we included documents conforming to this definition, even if they used different terminology, such as requirements, recommendations, or guidelines. If a document contained only one or more, but not all, sections of guidelines, principles, or recommendations aligning with this definition, we included only that section (not the entire document).

Considering our objective of constructing a comprehensive and consistent framework for the ethical principles guiding the development and implementation of AI used by children, we included documents that exclusively refer to children as the primary recipients. This decision led to the exclusion of documents that treat children as use cases [56] or that consider children only when dealing with specific ethical principles (for example, Morgan's treatment of the privacy principle for children [57]).

We also included documents that addressed AI for children within specific application domains, such as guidelines for educational contexts. These documents comprehensively described the principles involved in children's use of AI, including the roles of children, teachers, and families. On the contrary, we excluded documents that did not refer to AI, such as general guidelines to protect children's rights in digital environments [58]. Furthermore, we excluded documents focusing on a particular type of technology, such as robotics [59] or facial recognition [60], as the application of ethical principles depended strictly on the type of technology.

To keep pace with the rapid evolution of AI ethics, we have selected only documents published since 2018.

Finally, to facilitate the comparison of documents through linguistic analysis with the software, we excluded documents that were not in English or lacked translation options.

2.2 Information Sources and Search Strategy

Without a specific database of ethical guidelines for AI, we drew inspiration from the search strategy used by Jobin et al. (2019) [50]. The authors used a multistage screening strategy to map and analyze the principles and guidelines on ethical AI.

Our search strategy involved four sequential screening processes to retrieve relevant documents:

1. We manually searched the AI Ethics Guidelines Global Inventory by Algorithm Watch, a comprehensive list of ethics guidelines [61]. Subsequently, we manually searched Linking Artificial Intelligence Principles (LAIP) [62], an initiative and platform dedicated to integrating, synthesizing, analyzing, and promoting global AI principles from various research institutions and organizations. To determine if the documents explicitly referenced children, we utilized keywords such as "Children," "Child," "Minor," "Youth," "Adolescent," and "Young."
2. After logging out of personal accounts, we conducted a keyword-based web search using the Google.com search engine in incognito mode. Keywords such as "AI principles for children," "Artificial Intelligence principles for children," "AI guidelines for children," "Artificial Intelligence guidelines for children," "Ethical AI for children," and "Ethical Artificial Intelligence for children" were utilized to search for relevant documents. Each link within the first fifty search results underwent analysis for the title, abstract (if available), document summary, and table of contents. Subsequently, the remaining Google results up to the 200th listing for each search were screened only for the title and the table of contents based on a pre-determined selection [50].
3. Finally, we searched the Scopus database using search terms tailored to the research topic (AI), target population (children, youth, minors, and pediatric populations), and document type (guidelines).

An example search string used for the database included terms such as (TITLE-ABS-KEY (((AI AND principles) OR ("Artificial Intelligence" AND principles) OR (AI AND guidelines) OR ("Artificial Intelligence" AND guidelines) OR (AI AND guidelines AND ethic*) OR ("Artificial Intelligence" AND guidelines AND ethic*)) AND (Child OR Adolescent OR child* OR boy* OR girl* OR toddler* OR kid* OR minor* OR preschooler* OR schooler* OR schoolchild* OR preadolescent* OR adolescent* OR "young people" OR "youth*"O "giovane*" OR teen* OR juvenile* OR student* OR underage OR under-age OR schoolage* OR "pre-puberty" OR prepuberty OR "pre-pubescent*" OR prepubescent*))) AND (LIMIT-TO(LANGUAGE, "English")) AND (LIMIT-TO(PUBYEAR > 2017))).

4. Once the relevant documents were identified, we employed the citation chaining technique to manually examine the full texts and identify further pertinent documents [63].

All citations were imported into Excel, and duplicate citations (including those found later in the process) were manually removed.

2.3 Data Management and Selection Process

The lead author assumed an active role in conducting the screening, eligibility assessment, and inclusion operations of the identified documents under the supervision of the co-authors. Any uncertainties regarding inclusion/exclusion were resolved through discussions among all authors until a consensus was reached. This approach was designed to ensure a precise and comprehensive analysis of the documents included in the review and a balanced evaluation of inclusion and exclusion criteria.

For each relevant document identified, we systematically extracted and compiled the following information into an Excel spreadsheet:

(a) Document title
(b) Year of publication
(c) Organizations that commissioned or produced the document
(d) Geographical locations referenced in the document
(e) Specific paragraphs or chapters of the documents included in the content analysis.

We employed two sequential strategies to extract principles, requirements, and ethical recommendations. Initially, we conducted a content analysis of the documents using SketchEngine software [64]. Subsequently, we performed a qualitative content analysis (QCA) [65] to verify the following:

(a) Correspondence with principles identified through software analysis
(b) Identification of any additional principles not captured by the software.

2.4 Data Items

We chose to use SketchEngine software because of its capabilities in linguistic analysis and information extraction from extensive text corpora. This software provides users with tools for linguistic analysis, lexical information extraction, and linguistic resource generation.

A feature of the software is its *keywords* function, which allows for the extraction of single and multi-word terms. Moreover, it facilitates the comparison of two text documents by identifying unique elements present in one corpus but absent in the other. This function explicitly compares a user-uploaded focus corpus with a reference corpus to identify distinctive elements, such as multi-word terms or expressions occurring more frequently in the focus corpus than in the reference corpus.

We specifically utilized the *multi-word terms* mode within the *keyword* function because it can analyze the most significant terms in documents while providing some contextual information to aid interpretation.

Table 1 shows the output of the software's *keyword* function. The output includes the number of occurrences (F) of single and multiple salient words in the focus corpus (user-loaded document) and the reference corpus.

Table 1. SketchEngine software output example for keywords function.

KEYWORDS					
Single-Word			Multi-Word		
Word	Focus Corpus (F)	Reference Corpus (F)	Word	Focus Corpus (F)	Reference Corpus (F)
Data	326	720	Data Protection	295	189
Bias	289	543	Gender Bias	202	97

For our reference corpus, we selected the English Web 2021 (enTenTen21), a vast collection of 52 billion words from various online sources. This corpus was chosen

because it extensively covers web-based language and reflects contemporary English usage.

Subsequently, we analyzed each extracted item to identify and categorize the underlying principles represented by the terms. For example, terms like *data protection* were linked to *privacy and data protection* principles. Items with no corresponding identifiable principle were categorized as *other* (e.g., continuous assessment, designated safe space, marginalized group). Each entry in this category was further analyzed using SketchEngine's *concordance* function to understand its context within the text and determine the corresponding principle. This feature allows for exploring each item within its usage context, specifically, the sentences where it appears in the text, while extending the context forward and backward to enhance understanding.

Figure 1 provides an example of the software's output for the *concordance* function. The output shows each occurrence of the *multi-word term* in the focus corpus and the sentence in which it appears in the text.

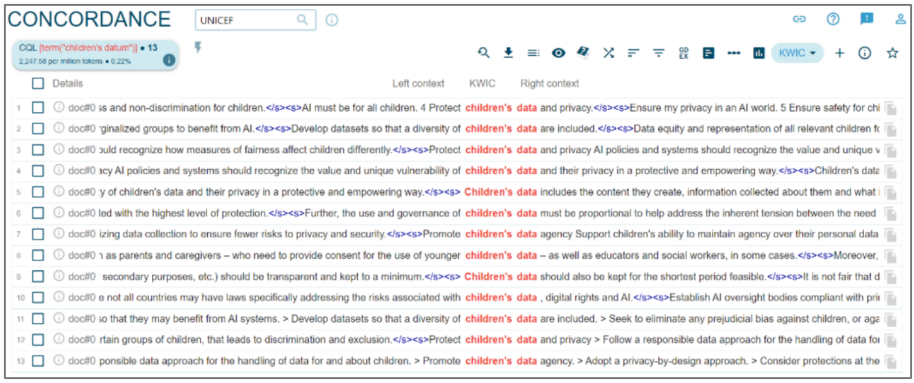

Fig. 1. SketchEngine software output example for concordance function

In the second phase of our analysis, we conducted a qualitative content analysis (QCA) on the text of the documents [65], employing an inductive approach to category formation [66]. This coding strategy enabled us to identify different classification categories based on recurring thematic areas in the documents. According to our adopted definition, the categories corresponded to ethical principles (cf. Eligibility Criteria) (e.g., Environmental Well-Being, Transparency, Non-Discrimination). As our analysis progressed, new categories were created to accommodate data that did not fit into existing ones.

2.5 Synthesis of Results

Once we identified all the ethical principles in the documents, we analyzed how they relate. This analysis allowed us to develop overarching categories to group and summarize the initial categories [67].

For example, the overarching category, *Provide Transparency, Explainability, and Accountability for Children,* could encompass principles such as *Explainability and Transparency,* which are often related [68].

Additionally, to assess the representation of each principle across different documents, we calculated the presence or absence of each category for every document as a percentage.

Finally, we analyzed the documents' application areas (e.g., social care or education), the countries in which they were developed, and whether their dissemination was national, continental, or global.

2.6 Risk of Biases

The document selection process and analysis methodology may introduce bias. The chosen documents are part of grey literature, often not indexed in academic databases. This lack of indexing could lead to non-systematic selection and the exclusion of relevant guidelines or research [30–33]. Moreover, limiting the inclusion criteria to English-language documents risks overlooking valuable information in other languages.

We adhered to a protocol for document discovery and eligibility to mitigate the risk of missing pertinent sources during the selection process [47]. We continuously monitored the literature, employed multiple screening strategies, and engaged in discussions among all authors.

Furthermore, qualitative document analysis is susceptible to arbitrary interpretations and potential information loss [69]. We incorporated linguistic analysis software alongside qualitative content analysis to address this concern.

While we cannot completely eliminate the risk of subjective interpretations influencing data analysis, this methodology can help mitigate it.

3 Discussion

Given the growing international discourse on AI ethics and its increasing presence in children's lives, reaching a consensus on the ethical principles guiding the development and use of AI for children is imperative [70]. This article proposes a protocol for a scoping review aimed at mapping the breadth, variety, and nature of documents offering guidelines, ethical principles, and recommendations for AI use by children.

Conducting this scoping review may enable the development of a comprehensive and targeted framework for understanding which ethical principles should govern AI use by children and in what order of priority. Such a framework could enhance children's comprehension of AI ethics from diverse perspectives and contribute to advancing research in this domain.

The methodology outlined herein and the ongoing review may show how different countries are represented in guidance documents on AI ethics for children. This insight could deepen our understanding of issues related to disparities in resource access across nations. Moreover, identifying countries with ethical guidelines on AI for children may help elucidate cultural and social priorities, potentially leading to a narrower focus on specific ethical concerns [71].

The scoping review may also help understand disparities in regulatory frameworks; countries with more robust regulations may produce fewer ethical documents, as ethical standards may already be embedded in existing laws [72].

Additionally, the scoping review can assist in identifying the selected documents' primary application areas. The prevalence of ethical guidelines in domains such as education or healthcare may highlight specific pressing issues, such as privacy, security, equal access to educational resources, and the impact on children's learning and development [73, 74].

Furthermore, the scoping review may underscore a widespread acknowledgment of core principles guiding AI development, implementation, and utilization in child-related contexts, irrespective of cultural, regulatory, and technological disparities. However, the analysis may also reveal the underrepresentation of certain ethical principles warranting further examination.

Deciding to focus solely on English documents or those with available translations could potentially exclude significant guidelines and constitute a limitation. This may lead to underrepresenting cultural perspectives from non-Western regions, resulting in a distorted understanding of ethical principles applicable to using AI with children globally. However, preliminary findings of the review have identified documents aimed at influencing a global audience [75, 76] and documents from countries such as India and Australia [77, 78]. This points to a geographically extensive representation of the selected guidelines.

Additionally, gray literature is not always peer-reviewed, which may lead to the inclusion of materials that do not meet the high standards associated with academic research.

However, establishing a protocol for our study aims to provide a robust framework for mapping the current research landscape, ensuring rigor in document screening and selection, improving research clarity, minimizing duplication of investigative efforts, and ultimately contributing to developing a comprehensive ethical framework [79].

Given the complexity of AI ethics for children, addressing it necessitates ongoing international dialogue, interdisciplinary collaboration, and incorporation of diverse cultural and sectoral perspectives. Integrating diverse viewpoints is essential for formulating ethical guidelines that resonate with the values of a diverse society [80].

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