User-Developer-Critic (UDC) Perspectives in AI Literacy Framework Documents

Victor R. Lee*

Stanford University, 485 Lasuen Mall, Stanford, CA, USA

Abstract

AI literacy is increasingly discussed but does not have an agreed-upon definition or operationalization, specifically for curriculum and instructional design guidance. Different groups have tried to address this by producing framework documents that articulate key ideas and activities for AI literacy. In order to help characterize the broad set of AI literacy frameworks that are emerging, Lee and Long [1] proposed the User-Developer-Critic (UDC) perspective space model as a meta-framework. UDC posits that AI literacy frameworks exist in a space with emphases on the perspectives of users, developers, and critics. To illustrate one use of this meta-framework, this paper presents a keyword analysis of five framework documents relative to the three perspectives of UDC. In doing this analysis, some differences appear between framework documents, such as more or less emphasis on developer perspectives and ideas about the mechanics of AI technology. Additionally, critic perspectives are present, but do not appear to be dominant in any of the framework documents.

Keywords

user, developer, critic, AI literacy, framework, meta-framework, perspective space

1. Introduction

While it is increasingly being discussed and recommended as a needed focal area for education, AI literacy does not have an agreed-upon definition. It is informally understood to be less technical than what one would know in order to be a software engineer who writes the code behind AI. At the same time, it is more advanced than the general public's current understanding of AI, what it can do, and what are its limits. However, beyond having those two boundaries, it is unclear what constitutes AI literacy. This is further complicated by new developments with AI that have the potential to negate the need for some parts of AI literacy. Disparate groups have been offering frameworks or other guidance documents to respond to the calls for increasing AI literacy. That work is ongoing. At the time of this writing, the European Commission and OECD (Organisation for Economic Co-operation and Development) are completing their own AI literacy framework with the support of TeachAI/Code.org. The National Academies of Science, Engineering, and Medicine in the United States is preparing a consensus report that bears on what competences students in K-12 should have that pertain to AI. CSTA (Computer Science Teachers Association) is in the process of revising K-12 computer science standards and as part of that, update the standards to include contemporary and generative AI. And in addition to those guidance documents, new policies, legislation, and other government documents are encouraging more development in AI literacy across the world.

This exploration is to be expected as new topics and terms – like AI literacy - emerge and ideas coalesce. In recognition of this, Lee and Long [1] have proposed a meta-framework for understanding the perspectives that are appearing in new AI literacy frameworks and curricula.

* Corresponding author.
vrlee@stanford.edu
0000-0001-6434-7589

They propose a User-Developer-Critic (UDC) "perspective space" model that names the three perspectives that are appearing in AI literacy definition and development efforts. The three perspectives are presented in caricature to make the contrasts clear.

User perspective orients toward using AI in service of completing tasks and activities. It would involve operating AI tools and systems, but not necessarily require understanding how they work. It is presumed to be situated in practices that have other goals in which the AI is a tool or resource. For example, user perspective can include successfully writing prompts with a chatbot to produce desired images or text. A user could produce AI-generated text, and if so desired, use an AI text detector and identify areas to modify so that it appears less like it was produced with AI. None of this requires knowing why AI text has certain characteristics and styles.

Developer perspective, with "literacy" in mind, involves foundational ideas related to the mechanisms and algorithms that one would need to know in order to build AI. These ideas are the ones that are expected to serve as a foundation when important subtleties about algorithms and machine learning should be understood for development purposes. For example, knowing that one AI architecture is a neural network and that it involves interconnected units through which calculations are made to yield an output would be developer knowledge. At the same time, for "literacy" purposes, they do not need to know the logic of specific training algorithms, subtypes and variations of neural networks, or how to perform the linear algebra and vector calculations that are used. It is hypothetically possible for a user perspective to never involve hearing the term neural network and still be capable of using AI. It is more difficult to imagine an AI developer not knowing what a neural network is and how to use it in the AI product or service they are developing.

Finally, the critic perspective is one that expresses awareness, concern, and skepticism with respect to how AI is used by individuals and in society. Already, there are documented cases where AI has been deployed that are recognized as harmful, whether it is a social media bot that starts to spout toxic content or a facial recognition system that does not recognize common faces of certain complexions. This also encompasses knowledge about AI's weaknesses, such as the production of inaccurate text or that current systems are built off of documents that the original authors did not expect to be used for AI training and receive no compensation for the use of their work. For example, a critic perspective might observe that the development teams and training sets used to build AI are such that they will be prone to misrepresent groups of people who have been historically marginalized and thus unable to benefit from the use of the AI. It raises awareness of our ethical commitments.

It is unlikely that exclusively one perspective of UDC is represented in a given AI literacy framework or curriculum. Likely, there are some amounts of understanding the way in which AI is built or how it can cause harm is helpful for operating AI. Still, *how much* of each perspective is emphasized in service of AI literacy remains unresolved. Represented as a triangle, the UDC model is presented as a way to talk about different frameworks and curriculum efforts in relation to what they emphasize and how they compare to one another. Important with this model is the depiction of *relative* emphasis. Where a given framework or curriculum is positioned within the triangle speaks to how much it is emphasized in relation to other perspectives. While it may seem attractive to assume that an equal balance between all three perspectives – a framework that is exactly in the middle of the triangle – it remains to be seen whether that is true and under what circumstances. The UDC triangle does not state preference for what should be emphasized, but rather is a means of talking about perspectives and differences so that we can better distinguish between multiple frameworks that are now being produced.

2. Mapping Frameworks on UDC

One indicator that a framework, or in the case of UDC, a meta-framework, is useful is that it helps users attend to a set of relevant components and that there is interesting variation when looking at those components. Therefore, as an exploration, I share a relatively simple computational analysis of framework documents as they relate to UDC.

Five frameworks were selected for this exploratory analysis. They include: AI4K12's "Big Ideas" guidance documents, which names five ideas important to understanding AI [2]; UNESCO's AI Competency Framework for Students [3], which specifies aspects of AI and grade level progressions for those aspects; an EDUCAUSE Review-published framework for higher education for AI literacy as developed by staff at Barnard college [4]; Digital Education Council's AI Literacy Framework for higher education and workforce across multiple countries [5]; and Digital Promise's AI Literacy Framework [6] for education leaders which emphasizes the verbs use, understand, and evaluate. For the most part, these are documents with combinations of prose and tables that include key principles or competences that are part of AI literacy. For AI4K12, the copies of pdfs for each of the big ideas in AI were used and merged into a single document. These were primarily tables with a substantive amount of supportive example text in the table cells.

2.1. A computational approach using keywords

For this analysis, ChatGPT 4o was used to assist, with oversight as described. First, I asked for a set of keywords associated with a copy of Lee and Long [1] for the User, Developer, and Critic perspective, which it generated. For this analysis, each word – designated by a character space – was the token. I reviewed the words suggested by ChatGPT and removed or replaced multi-word tokens with a single word. Then I added related words evoked by the list that was generated, as well as added some different conjugations and tenses of words that were provided. The list of words and how they were grouped are shown in Table 1.

Table 1.
User-Designer-Critic perspectives and selected keywords.

Perspective	Keywords
User	"use", "interact", "recommendation", "app", "tool", "tools", "assistant", "decision-making", "consumer", "useful", "utilize", "AI-generated", "usage", "prompt", "assistant", "automated", "student", "awareness", "work", "works", "help", "aid", "efficient", "efficiency", "behavior", "results", "understanding", "online", "chatbot", "media", "job", "operate", "image", "career", "people", "create", "creative", "creativity", "understand", "apply"
Developer	"develop", "program", "code", "training", "train", "algorithm", "machine", "neural", "network", "architecture", "data", "framework", "frameworks", "GPU", "server", "Scratch", "Snap!", "Cognimates", "inventor", "Python", "API", "technical", "classifier", "classification", "tree", "trees", "dataset", "testing", "model", "develop", "architecture", "parameter", "pipeline", "test", "arrays", "vectors", "abstraction", "symbolic", "transformer", "tokenizer", "large", "diffusion"
Critic	"bias", "ethics", "inequality", "unequal", "diversity", "diverse", "marginalized", "discrimination", "unfairly", "unfair", "justice", "equity", "fairness", "power", "injustice", "citizenship", "surveillance", "privacy", "accountability", "responsible", "inclusion", "social", "society", "representative", "race", "gender", "exclude", "exclusion", "incorrect", "sustainability", "critical", "critic", "harm", "harmful", "civic", "participation", "ethic", "ethical", "ethically", "environmental," "impact", "decolonial", "cultural", "misinformation", "hallucination", "evaluate

Admittedly, this has limits as an analysis of text – words were not lemmatized, and some words are going to be used in ambiguous ways or could appear across perspectives. Moreover, character spaces disadvantage two-word phrases that refer to a singular entity. For example, "neural network" would receive two counts for including the word "neural" and the word "network". In any computational analysis of text, these are common but still complex problems for which even more advanced computational linguistics techniques have been developed to address, such as training a language model or using less restrictive tokenization approaches. Whatever solution is devised would always be subject to debate, and this is a small exploratory endeavor. The conclusions from this analysis should not be treated as definitive; rather, they are the product of a simple approach and serve to demonstrate how one might use the UDC perspective space model to appraise the nature of differences in AI literacy frameworks.

Then I prompted ChatGPT 4o to help generate code to analyze the match of each document to those perspectives. Once code had been generated, I conducted a line-by-line review of the code to verify accuracy. Effectively, the code counted the number of occurrences of each keyword for each perspective, as defined above. Those counts were then scaled to represent relative emphasis among the three perspectives for the given document. Those values were then converted to x and y coordinates for placement on the UDC triangle. This code was then run through a Colab notebook.

3. Results

The keyword count yielded values shown in Table 2. The total numbers varied across documents, which makes the focus on proportions appropriate for comparison purposes. The proportion of keyword matches is shown in Table 3. Of note is that there were only two instances where there was .50 or higher for a single perspective (AI4K12 and EDUCAUSE). The positions are plotted in Figure 1.

Table 2.
Raw counts for keyword matches across documents.

Framework Document	User	Developer	Critic
ai4k12-bigideas	263	418	93
digitaleducationcouncil	234	119	139
digitalpromise	377	270	170
educause	70	42	16
unesco	589	586	519

Table 3.
Proportion of keyword representation.

Framework Document	User	Developer	Critic
ai4k12-bigideas	0.339793	0.540052	0.120155
digitaleducationcouncil	0.475610	0.241870	0.282520

Framework Document	User	Developer	Critic
digitalpromise	0.461444	0.330477	0.208078
educause	0.546875	0.328125	0.125000
unesco	0.347698	0.345927	0.306375

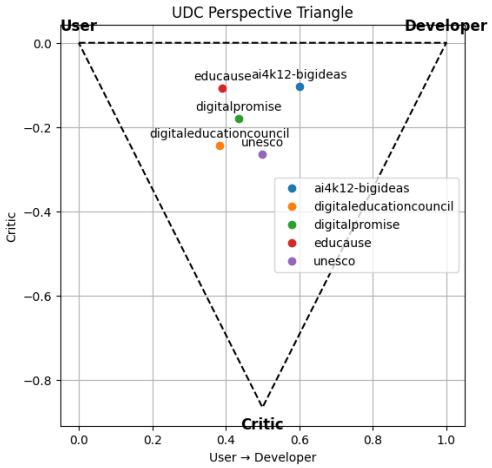

Figure 1: The five frameworks plotted on the UDC triangle based on perspective keyword match.

From this analysis, user and developer perspectives take relative precedence over critical perspectives in the analyzed documents. The AI4K12 ideas show what appears to be a stronger emphasis on developer perspective, meaning that it emphasizes more the inner workings and techniques for AI systems. UNESCO had the highest relative emphasis from the critic perspective of the five. The EDUCAUSE document had the most emphasis on user perspective compared to the other five.

4. Discussion

This analysis suggests that, at least with respect to the UDC perspective space model, AI literacy is being expressed differently across organizations. In general, the documents occupy the same general region of the UDC triangle – the documents do not represent such disparate treatments of AI literacy that they have tremendous distance from one another, and no perspective is entirely absent from a given AI literacy framework. However, this analysis would lend support to statements that AI4K12 emphasizes the ideas that are important for eventually developing AI whereas EDUCAUSE emphasizes ideas that are important for using AI. At least with the metrics used here, the critic perspective is modest in comparison to user and developer perspectives. It is still present, but not the primary perspective for any of these documents as viewed through this analysis. This may offer support to commentators who express concern that pushes for AI literacy do not prioritize risks, although risks and harms are acknowledged. The lesser representation of this perspective is not evaluated here as positive or negative. It may be that in order to be an equipped critic, some base understandings about AI, both in how it works and how it is used, are important in order to know what to critique. Indeed, it may be difficult to imagine a guidance document that would only represent critic perspectives without explaining how AI is used (potentially in dangerous ways) or developed (potentially in careless ways). A full critic perspective may end up being more about critical theory writ large than about AI specifically. Or a critic perspective is better representated by phrases and sentiments than it is by single words.

This depiction (Figure 1) did not differentiate beyond document source. It may be that for different populations being served, different perspective emphases are appropriate. What is critical for one set of countries may differ from what is critical for another given complex histories and norms. Moreover, for those framework documents that differentiate by grade level or that position themselves in relation to other guidance documents (e.g., AI4K12 has compatibility with computer science education standards), the UDC perspective emphases could look justifiably different from one another.

5. Other uses of UDC perspective space model

This was a basic demonstrative analysis of AI literacy framework documents using a simple computational approach. It is not in itself a statement of what topics or what AI literacy should be; rather, it is a characterization of the concerns that appear often in AI literacy conversations. However, it could be possible to use this approach on curriculum materials as well, as well as research articles and commentaries regarding AI literacy. Each would have specific methodological considerations, but the potential value of UDC is to direct focus to perspectives rather than specific content – which is likely to change over time. Indeed, there are some reports of UDC being a way to orient teachers for how to think about AI literacy – as an organizing structure to consider what perspectives are being represented and avoid getting hampered with specific new terminologies and specific procedures associated with a perspective.

Lee and Long [1] also have suggested that there may be other questions we could ask by using UDC as a meta-framework for thinking about AI literacy approaches. For example, they have ask whether specific design groups tend to favor some relative perspective differently than others (e.g., a group of elementary teachers supportive of educational computing might emphasize user perspectives, whereas computer scientists working in education might favor developer perspectives). For the present, the goal of this paper is to illustrate that there is some potential to use this as a means of describing and comparing frameworks. Of course, more innovations and other methodological choices could and should be made in the future.

Declaration on Generative AI

During the preparation of this work, the author used Chat GPT 4o in order to: Generate code for keyword counting and graph creation (ChatGPT 4o). Further, the author used Grammarly in order to: correct spelling and grammatical errors. After using these tools, the author reviewed and edited the content as needed and takes full responsibility for the publication's content.

References

[1] V. R. Lee, D. Long, AI literacy: Perspectives underlying an essential new digital literacy, in: J. Castek, J. Coiro, E. Forzani, C. Kiili, M. S. Hagerman, J. R. Sparks (Eds.), The International Handbook Of Research In Digital Literacies, Routledge, New York.

[2] AI4K12. URL: https://ai4k12.org.

[3] F. Miao, K. Shiohira, AI competency framework for students, UNESCO, Paris, France, 2024.

[4] M. Hibbert, E. Altman, T. Shippen, M. Wright, A Framework for AI Literacy, EDUC. Rev. (2024).

[5] Digital Education Council, DEC AI Literacy Framework, 2025.

[6] K. Mills, P. Ruiz, K.-w. Lee, M. Coenraad, J. Fusco, J. Roschelle, J. Weisgrau, AI Literacy: A Framework to Understand, Evaluate, and Use Emerging Technology, Digital Promise, Washington, DC, 2024.