

Exploration of AI Literacy Cultivation Mechanisms in English Education in the Digital Age

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Abstract: Artificial intelligence has started to change the world in the Information Age, and as a result, the new reading literacy required of young children is also changing. The concepts and cultivation paths of AI literacy in English classes are the subjects of this paper. The three-dimensional attributes of AI literacy in the area of English education are cognition, language interaction and critical thinking; it also studies the constituent elements of task decomposition and feedback integration in human-machine collaboration. Interactive Adaptability of AI Tools, Dynamic Adjustment of Learning Strategies According to Algorithmic Feedback, and a Calibration Model for Language Trust are the subjects of this paper. Based on the above research, a progressive framework for human-machine collaboration based on language task chains has been established, a literacy advancement pathway from tool operation to pragmatic reflection has been proposed, and a cognitive transformation model integrating language acquisition with algorithmic awareness has been developed to provide a theoretical and analytical basis for the cultivation of AI literacy.

Keywords: English Education, AI Literacy, Human-Machine Collaboration, Language Cognition, Cultivation Mechanisms

Introduction

With the spread of intelligent language models in English learning, students are no longer restricted to learning fixed materials or talking with teachers; now, they can create, evaluate and correct their language output using algorithmic systems. Therefore, the old system of English education, which focused on teaching English knowledge, needs to be reformed. Learners need to be able to use intelligent tools to achieve their language goals; this is AI literacy. Most of the current research on AI literacy falls under the categories of information literacy or digital literacy, and there is no systematic theoretical framework specifically for English education. In particular, the dimensional composition, developmental path and cultivation mechanism of AI literacy in the process of human-machine collaborative language learning are not well known. Therefore, it is necessary to define the composite attributes of AI literacy in line with the disciplinary characteristics of English education, analyze its interactive logic with language cognition, learning strategies and trust relationships, and explore cultivation mechanisms for the learning process. The purpose of this paper is to add a new theoretical foundation to the study of AI literacy in English education, offer some conceptual ideas, provide a framework for applying the new knowledge, and meet the urgent need for transforming teaching methods in the era of digital intelligence.

1. Conceptual Definition and Theoretical Basis of AI Literacy in English Education in the Digital Age

1.1 Multidimensional Attributes of AI Literacy from the Perspective of English Education

In the area of English education, AI literacy is not only about one type of technical operation but also comprises three types of literacy: cognition, language interaction and critical evaluation. Cognitive ability refers to what learners know about the function of artificial intelligence language models, such as natural language processing, bias in corpus training, output probability features, etc. The subfield of Language Interaction studies how well students can use English to communicate with intelligent tutors; that is, generating questions, clarifying meanings, receiving and reacting to feedback, etc. The purpose of critical evaluation is to identify any errors or inappropriate cultural pragmatics in the English texts

produced by artificial intelligence; thus, one should not accept them blindly^[1].

Contextual awareness and adaptability are also among the many aspects of AI literacy. The different English-learning tasks, such as vocabulary expansion, writing revision and speaking simulation, have various degrees of activation for different types of AI literacy. Writing tasks need more critical thinking, and speaking practice is about conversational fluency. At the same time, with the improvement in students' English proficiency, so too has their application of AI tools, and now they are participating in higher-level pragmatic negotiation. Given that it is multi-dimensional and variable, the definition of AI literacy in English education should be based on specific situations of language use rather than being an abstract general technical ability.

1.2 Constituent Elements of AI Literacy in Human-Machine Collaborative Language Learning Contexts

The establishment of human-machine collaborative language learning is the joint achievement of language goals by learners and intelligent systems. Based on the above, the first element of AI literacy is the ability to decompose tasks and organise instructions. Learners should break down the general goal of learning English, such as writing an argumentative essay or simulating a business conversation, into several small steps that can be given to AI systems, and express these steps in clear, executable English commands. Therefore, we need to consider the function scope and limits of AI and avoid having it do too much. At the same time, learners should be able to see the AI's output in real time and, if it is inconsistent, irrelevant or impractical, promptly notice this and change their way of doing things.

Second, it is the ability to accept feedback and change one's mind accordingly. AI systems for human-computer collaboration can immediately inform us about the form of language, correct grammatical errors, suggest other words, and propose different sentence structures. Learners need to learn to distinguish between feedback that can be applied directly and that should be filtered or modified according to their own language development stage. At the same time, AI can also take care of some of the lower-order cognitive load, such as spell-checking and basic grammar correction, so that students can concentrate on higher-order language processing; this includes discourse structure, rhetorical effects and cross-cultural pragmatic appropriateness. One of the reasons for the restructuring of cognitive resources is AI literacy in English classes.

1.3 Expansion Logic of Language Cognitive Competence with the Intervention of Intelligent Technology

Algos can help to change the way English learners' minds process the information in listening and reading. Traditional language cognition is a linear processing model; that is to say, it is word recognition, then syntactic analysis, and finally semantic integration. With the help of AI, learners can obtain various kinds of non-linear and multi-source feedback in the form of immediate questions, auto-completion, parallel corpus comparisons, etc., to speed up the formation and verification of semantic hypotheses. The expansion logic is an increase in cognitive flexibility; that is, the learners are no longer limited by a single language rule but can quickly compare and choose suitable linguistic forms with the help of many expression variants provided by AI^[2].

Intelligent Technology has broadened the Scope and Depth of Language Cognition. At the level of depth, AI can present implicit knowledge of language, such as the statistical distribution of lexical collocations and the frequency of syntactic structures in various registers, so that learners can go beyond explicit rules and learn about the probabilistic nature of language use. At the level of breadth, learners can use machine translation and cross-linguistic alignment functions to quickly compare the differences between their native language and the target language and thus develop metalinguistic awareness. The expansion of cognition is not to be regarded as a passive substitution for existing thinking; rather, learners should actively regulate the speed of their interaction with AI systems to create a continuous cycle of "expansion - monitoring - integration" and thus change the development path of English-language proficiency in the digital era.

2. Interactive Adaptability of AI Tools in the Process of Language Input and Output in English Education

2.1 Interactive Adaptability of AI Tools in Language Input and Output

At the beginning of the Language Input stage, AI tools have started to help adjust the difficulty and content of the English materials available to learners. Two kinds of Adaptability exist. First, there is the adjustment of the comprehensibility of the input materials; intelligent systems can dynamically filter or generate English texts at different levels of difficulty based on the current vocabulary size and syntactic ability of the learners to prevent cognitive overload caused by input that is either too difficult or too easy. The second is that the types of input can be varied; that is to say, audio, text, pictures, interactive speech, etc., can all be employed to meet different learning needs and tasks. Therefore, students should be able to recognise and modify the parameters of AI input independently; that is to say, based on their current level in language learning, they can choose different difficulties, speaking speeds and content subjects to create an individualised learning environment.

Second, the AI tool can process the students' speech in real time and provide all kinds of feedback according to the results at the output stage. When students create English sentences or paragraphs, AI can provide many kinds of feedback, such as direct correction, metalinguistic explanations and reformulations. Different kinds of feedback have different effects on language acquisition, and learners need to determine which type of feedback is more suitable for their current learning goals. For instance, if the goal of the speaking exercise is fluency, prompt correction will hinder the speaker's flow; therefore, I will provide summary feedback at a later time. AI tools can determine the purpose of a learner's output (e.g., a request, a statement, a question), and then respond to it appropriately according to the purpose in order to build an intelligent closed-loop system for language interaction. At the beginning of this adaptation, students have begun to notice how the AI responds and have been making various applications based on this information.

2.2 Dynamic Regulation Mechanism of Algorithmic Feedback on English Learning Strategies

Algorithmic feedback is the kind of evaluative information that artificial intelligence provides to learners at the level of linguistic form and content; thus, it continuously adjusts the development of English-learning strategies. The above regulation can be considered a change in strategy; that is to say, students will adjust how they learn according to the type and quantity of feedback they receive. Often, the algorithm will point out grammatical errors, and thus students' focus will shift from the content of learning to its form; they will start paying more attention to syntax. Conversely, if the feedback is about the level of semantics and pragmatics, students can improve the organisation of their expression and situational awareness. However, the fluctuation is not random; at different times in their studies, students will determine whether the algorithmic feedback can be relied upon and adjust their study methods based on what they have learned.

How and when the algorithmic feedback is provided can also affect the stability of a person's learning habits. Delayed feedback can help students recognise their own mistakes because there is more time to observe the errors in their work later and correct them; at the same time, prompt feedback is more suitable for learning automatic language patterns, such as how to use fixed word combinations or common sentences correctly. The degree of certainty in the algorithmic feedback can also influence the choice of learning methods; for example, if the corrective feedback is very deterministic, students may learn through memorisation and repetition, but probabilistic feedback is more in line with nature, such as "The acceptance level of this expression in this context is 72%", and can motivate students to learn through comparison and contextual judgement. According to the algorithmic feedback obtained in the learning process, students will gradually cultivate metacognitive regulation abilities and be able to choose various study methods in response to the characteristics of the feedback.

2.3 The Calibration Model of Language Trust Between Learners and Intelligent Systems

The relationship between the language of learners and that of intelligent systems is not fixed or unilateral; rather, it is an open system that changes constantly through interaction. Trust calibration refers to how ready learners are to use artificial intelligence to help them solve language problems, and it is based on their perception of the accuracy, consistency and comprehensibility of the results provided by the AI. At the beginning, learners may be too anxious or too relaxed because they do not know how algorithms work. After several times, learners have formed some expectations of what the

AI will answer based on other reliable sources or the guidance of teachers. Students will feel more confident learning new words in sets with the help of artificial intelligence, but they will still need to study harder for problems that require the construction of cultural metaphors or humour.

The other index of the language trust calibration model is to recognise AI errors and know how to handle them. The AI will have all kinds of deviations in the output of its English communication, such as semantic bias, stylistic inappropriateness or factual errors. Students should be able to distinguish between all kinds of errors and choose reasonable ways to correct them; local corrections can be used for random errors, but for systematic biases, one needs to change the general approach to interaction, modify other tools, or repeat a specific sentence pattern. Trust calibration also refers to emotions; that is, people are unwilling to completely ignore the language skills of AI because of some mistakes, and they are also careful not to be overly obedient automatically after repeatedly receiving correct answers. Therefore, students have learned to evaluate the reliability of language more critically and can flexibly cooperate with AI to enhance their own AI literacy in English learning^[4].

3. Construction of Cultivation Mechanisms for AI Literacy in the Context of English Language Learning

3.1 A Progressive Framework for Human-Machine Collaboration Based on Language Task Chains

A language task chain divides the activities of English learning into a series of logically connected subtasks and arranges them in an order from low-level to high-level. Therefore, the division of labour between people and machines is generally related to the difficulty of the tasks. For simple language tasks, such as word lookup or sentence pattern matching, the AI will carry out the main execution, and learners only need to start the task and see the result. As the difficulty of the tasks rises, such as paragraph writing and argumentation, the role of AI gradually changes to that of an aid; thus, students need to take the initiative to plan the tasks, evaluate the results of the intermediate steps, and integrate the final works. Therefore, students need to learn how to cooperate and manage all parts of the work independently so as not to be too reliant on AI and lose the ability to learn.

Links in the task chain are the locations of collaboration between people and machines. After finishing each subtask, the learner should evaluate the linguistic quality and informativeness of the intermediate product provided by AI, and then decide whether to move on to the next step or go back to the previous task for revision. At the same time, we will learn what the AI has created and determine if it meets our own language requirements. For example, in the task chain of writing English abstracts, learners need to complete subtasks in order, such as extracting the topic, generating a key sentence, adding logical connections, polishing sentences, etc., and receive AI assistance at each step. At the task nodes, learners need to determine whether the draft abstract produced by AI is in line with the main idea of the original text; if there are any deviations, they need to modify the prompt words or make manual corrections. The above progressive cooperation model can be used to gradually add and integrate AI literacy in the courses of language learning activities^[5].

3.2 The Hierarchical Transition Path of AI Literacy from Tool Operation to Pragmatic Reflection

The increase in AI literacy during the learning of English is a typical case of hierarchical change. The starting point is the ability at the level of tool operation; that is to say, learners can operate AI systems to enter instructions, obtain results and complete basic language tasks. At this time, the person is only familiar with the AI interface and basic operations; they can recognise some standard output formats. However, if it is only at the level of tool operation, the full potential of AI in language learning cannot be realised; we need to move to a strategic application stage, and this has been shown by the ability of students to select suitable AI functional modules according to their different English-learning goals, such as using a synonym replacement tool for writing or choosing various dialogue simulation modes for speaking practice. The main reason for this change is that learners have started to form a mental map of tasks and tools.

The high-level transition is at the level of pragmatic reflection; thus, students are no longer only learning the content produced by AI but are beginning to consider the context of use, underlying purposes and cultural norms of language. At this time, students can determine whether the English expressions produced by AI are correct, judge how suitable they are for all kinds of communication situations, and find any pragmatic biases or cultural stereotypes in the output of algorithms. AI can issue an official statement about an unofficial area, and students are allowed to add what they know

about this place to the statement. Therefore, students need to compare and integrate the linguistic forms provided by AI with their own pragmatic knowledge system to develop a sense of reflective language consciousness. High-level development of literacy does not happen automatically; rather, students need to accumulate comparative experiences in all kinds of language interaction repeatedly and actively engage in cognitive abstraction and generalisation^[6].

3.3 The Cognitive Transformation Model of Language Acquisition and Algorithmic Awareness

Integration of language acquisition and algorithmic awareness is an advanced form of cognitive AI literacy in English learning, and at the core of this is the synergistic integration by learners of the internalization process of foreign language rules and their understanding of algorithmic operating logic. The two types of changed models are: First, there is the processing of linguistic form and meaning; by interacting with artificial intelligence (AI), learners can obtain understandable input, produce understandable output, and adjust their interlanguage system according to feedback. The second is to observe how the algorithm works; that is to say, we will learn about its errors, the distribution of these errors, and the reasons for the errors. The two channels are not parallel and independent; rather, they intersect at some places and affect one another. When learners discover that AI frequently makes mistakes in a certain syntactic structure, they will pay more attention to this part of the language and learn the rules independently.

The working mode of the above cognitive transformation model is to combine the mechanisms at the metacognitive level. Learners need to develop a double-monitoring ability; on the one hand, they should be able to judge whether their own language output meets the standards of the target language, and at the same time, they should also check the accuracy of the AI's output and compare it with their own judgments of language. If there are any differences, the students will begin to think about whether they need to revise their language hypothesis or adjust the level of confidence in the AI's results. After many times, learners will establish a general rule; that is, their use of a particular language feature will also be based on what they expect the AI system to do generally with that feature. In this combined mode, students can use language somewhat independently when not connected to the AI, but they can also make good use of algorithmic support if they are connected to the AI; thus, they will be able to operate their language cognition stably in all circumstances. The model above can be used to help promote AI literacy in English classes in the digital age.

Conclusion

All the attributes and components of AI literacy in human-machine collaboration scenarios are systematically defined for English education in this paper; the extension logic of intelligent technology for language cognitive competence is revealed, the interactive adaptability of AI tools in the process of language input and output is clarified, the dynamic regulation mechanism of algorithmic feedback on learning strategies is explained, and a calibration model for language trust between learners and intelligent systems is put forward. Based on the above, this paper proposes a general framework for human-machine collaboration based on language task chains, puts forward a hierarchical transition path for AI literacy from tool operation to pragmatic reflection, and develops a cognitive transformation model that integrates language acquisition with algorithmic awareness. The theoretical system above can help organise the thinking process and guide the development of AI literacy in English classes in the digital age. Further research in the future can explore all the different patterns in the development of AI literacy for students at various levels of English proficiency, as well as how the weights of the different dimensions of literacy change in different language tasks. Some empirical studies need to be carried out to investigate the long-term effects of output deviations in intelligent systems on language trust calibration and the moderating effect of changes in algorithmic transparency in the hierarchical transition of literacy.

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