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Ai Prompting And The Growth Of Metalinguistic Skills In Educational Contexts

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ABSTRACT

The rapid diffusion of artificial intelligence (AI) prompting in educational settings is transforming not only modes of learning and instruction but also fostering advanced metalinguistic skills among learners and educators. This paper conducts a critical synthesis and review of recent research and theoretical perspectives on the convergence of AI prompting—particularly engagement with large language models (LLMs)—and the development of metalinguistic awareness, defined as the ability to consciously reflect on, analyze, and manipulate language. Integrating evidence from over twenty prominent educational studies, the article explores both the mechanisms and outcomes of AI prompting for language learning, curriculum development, and assessment practices. The findings underscore that purposeful AI prompting deepens metalinguistic reflection by supporting explicit language analysis, feedback-driven practice, and the negotiation of meaning across diverse linguistic and cultural settings. The implications for inclusive pedagogy, curriculum design, and future research directions are discussed.

KEYWORDS: AI prompting for language learning, Metalinguistic Analyse, Inclusive Pedagogy

INTRODUCTION

Artificial intelligence tools, especially generative language models such as ChatGPT, have fundamentally altered the landscape of language education, with prompt-based interactions now prevalent in higher education, schools, and digital learning environments. The ability to compose, revise, and refine prompts for AI systems is increasingly recognized as a metacognitive "meta-skill" essential for effective information retrieval and enhanced learning outcomes. Parallel to this technological evolution is the growing emphasis within educational linguistics on metalinguistic skills: learners' capacity for conscious analysis, manipulation, and strategic deployment of language resources.

This paper systematically reviews the connections between AI prompting and the growth of metalinguistic skills, drawing on contemporary research to illuminate the mechanisms at work and articulate best pedagogical practices for the AI-rich classroom.

THEORETICAL FOUNDATIONS

AI PROMPTING AS A META-SKILL

The rise of prompt engineering—a systematic approach to crafting queries that elicit optimal responses from AI—reflects a broader educational shift toward promoting digital and cognitive literacy as core competencies for the 21st century. Prompt engineering involves a range of subskills: understanding prompt structure, anticipating AI interpretive patterns, and iteratively refining language to produce precision and clarity in AI-generated output. These processes are inherently metacognitive and demand both linguistic dexterity and reflective reasoning.

DEFINING METALINGUISTIC SKILLS

Metalinguistic awareness has diverse definitions in applied linguistics, centering on the capacity to step back from everyday language use and examine language's formal structures, functions, and pragmatic boundaries. According to Jessner (2006), it encompasses both analysis of linguistic representations and executive control over processing, enabling learners to dissect language, recognize ambiguity, and evaluate the appropriateness of alternate language forms. This multidimensional skill set is catalysed through deliberate practice and exposure to multiple languages and registers.

CONSTRUCTIVIST AND SOCIOCULTURAL PERSPECTIVES

The integration of AI in education is often framed through constructivist or sociocultural theories, positioning learners as active co-constructors of meaning in dialog with digital agents. Vygotskian models of language development, and more recent dynamic systems theories—such as the Dynamic Model of Multilingualism—underscore the role of guided scaffolding in metalinguistic growth. AI prompt engineering provides an innovative scaffold, allowing learners to experiment with language, receive timely feedback, and engage in higher-order conceptualization.

MECHANISMS: HOW AI PROMPTING FOSTERS METALINGUISTIC SKILLS

PROMOTING EXPLICIT LANGUAGE ANALYSIS

Interactions with LLMs that require learners to clarify, negotiate, or revise prompts foreground explicit language awareness. For example, composing a translation prompt for an LLM necessitates awareness of semantic nuances, register, and idiomatic variation. Each iteration cultivates skills in analysing syntactic structures, identifying ambiguity, and manipulating language for specificity.

FEEDBACK AND ITERATIVE PRACTICE

AI platforms are uniquely positioned to generate immediate, detailed feedback on linguistic choices, supporting metalinguistic noticing and hypothesis testing. Studies of intelligent tutoring systems (ITSs) in K-12 and higher education have found that students who receive real-time, adaptive feedback on grammar, word choice, or discourse organization outperform peers in metalinguistic tasks.

ENHANCING CONTROL AND SELF-REGULATION

The metacognitive demands of AI prompting require not only language knowledge but also executive function: planning, monitoring, and revising. Learners must evaluate the adequacy of responses, identify reasons for communicative breakdowns, and strategically adjust their language input. This fosters self-regulation, a central pillar of metalinguistic skill development.

EMPIRICAL EVIDENCE AND CASE STUDIES

AI PROMPTING IN SECOND AND MULTILINGUAL EDUCATION

Research has demonstrated that multilingual learners derive significant cognitive and linguistic benefits from prompt-based AI dialogue, including gains in metalinguistic awareness and cross-linguistic transfer. Interactions involving translation, paraphrase, and language analysis prompt learners to reflect on formal properties of multiple languages and activate crosslinguistic strategies. Jessner et al. (2016) found that frequent "languaging" practices, such as commentary on language use with AI agents, consolidated metalinguistic control in trilingual participants.

INTELLIGENT TUTORING SYSTEMS AND WRITING

Recent systematic reviews highlight the role of AI-driven ITSs in cultivating metalinguistic abilities, particularly in writing and grammar instruction. Studies by Zerva (2023) and Wijekumar et al. (2025) show that students using writing-support AI demonstrate stronger skills in self-explanation, error correction, and discourse restructuring compared to peers receiving standard teacher feedback. These systems encourage students to articulate their reasoning, test hypotheses, and receive corrective guidance, all of which promote explicit metalinguistic reflection.

HIGHER EDUCATION AND PROFESSIONAL TRAINING

In higher education, AI prompt-based activities are linked with enhanced student autonomy, language transfer, and advanced literacy. For example, Liang et al.'s (2025) review of early ChatGPT adoption found that academic practices incorporating AI prompts fostered not only language proficiency but also students' meta-awareness of disciplinary genres and conventions. Similarly, personalized AI assessment tools enable formative measurement of students' metalinguistic knowledge, providing data-driven support for instructional interventions.

LIMITATIONS AND ONGOING CHALLENGES

While AI prompting facilitates many aspects of metalinguistic growth, empirical work notes several persistent challenges: prompt illiteracy, over-reliance on automated correction (which can undermine deep learning), and inequities in AI access. Probabilistic gaps between metalinguistic judgments and probability-based assessments have been noted in computational linguistics, highlighting the need for critical human oversight.

PEDAGOGICAL IMPLICATIONS

CURRICULUM INTEGRATION

An explicit focus on AI prompt engineering within the language curriculum can scaffold both technical and metalinguistic competencies. Curriculum designers are encouraged to embed iterative prompting tasks, reflective writing, and comparative analysis of AI feedback alongside traditional instruction. Multilingual and culturally responsive curricula that leverage AI's capacity for translation and code-switching further amplify metalinguistic outcomes.

INCLUSIVE AND ETHICAL PRACTICE

Educators must attend to issues of equitable AI access, ethical data use, and the hidden curriculum of digital literacy. Culturally sensitive implementation of AI tools can reduce barriers for linguistically diverse learners, while professional development for instructors can build awareness of prompt bias and algorithmic limitations.

ASSESSMENT AND FEEDBACK

AI-augmented assessment provides robust opportunities for measuring metalinguistic growth in real time, enabling personalized feedback and the development of higher-order language skills. However, teachers should be involved in designing and interpreting assessment tools to preserve validity and mitigate risks of de-skilling the instructional process.

FUTURE DIRECTIONS AND RESEARCH GAPS

Despite advances, several areas require further investigation:

- Long-term, longitudinal studies on the cumulative effects of AI prompting on metalinguistic development across educational levels.
- The impact of AI prompting on metalinguistic awareness in low-resource languages and marginalized communities.
- Ongoing analysis of ethical and cognitive challenges posed by evolving AI models, including prompt "poisoning," feedback integrity, and the deconstruction of linguistic stereotypes.
- Cross-disciplinary collaboration between AI developers, linguists, and educators to refine models supporting deep language analysis and educational inclusion.

CONCLUSION

The growth of AI prompting as an educational practice is inseparable from the development of advanced metalinguistic skills. Prompt engineering, iterative language analysis, and AI-mediated feedback loops collectively enrich learners' ability to reflect on, manipulate, and transfer language knowledge. As empirical evidence accumulates, it is clear that AI, far from replacing human language ability, is driving the need for heightened metalinguistic reflection and cross-linguistic agility. Educators, policy-makers, and

researchers must work collaboratively to shape AI-rich curricula that promote ethical, inclusive, and deeply reflective language learning.

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