

# Artificial Intelligence–Driven Cognitive Offloading and Forgetfulness Among Building/ Woodwork Technology Undergraduates in Oyo State

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**Abstract**—The growing adoption of artificial intelligence applications by Building/Woodwork Technology undergraduates in Oyo State has generated academic concern regarding possible effects on students' memory processes, particularly retention and tendencies toward forgetfulness in technology-oriented courses. In response, this study investigated the relationship between AI-induced cognitive offloading and forgetfulness among Building/Woodwork Technology undergraduates in Oyo State. A correlational survey research design was employed. The study population consisted of 54 second-year (200 Level) students enrolled in the 2024/2025 academic session at Emmanuel Alayande University of Education. Given the relatively small cohort, all eligible students were included through a census sampling approach. Data were gathered using a structured instrument comprising sections on AI usage, a Cognitive Offloading Scale, and selected subscales adapted from the Metamemory in Adulthood (MIA) inventory. Content validity was established through expert review, while internal consistency reliability yielded Cronbach's alpha coefficients of 0.84 for AI usage, 0.90 for cognitive offloading, and 0.95 for forgetfulness. Descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential analyses (Pearson Product Moment Correlation and simple linear regression) were conducted at the 0.05 level of significance. Results indicated a high prevalence of AI utilization and cognitive offloading practices among the students, alongside a low but statistically significant positive association between cognitive offloading and forgetfulness ( $r = 0.325$ ). Regression analysis further demonstrated that AI-related cognitive offloading significantly predicted both memory retention ( $F = 18.093$ ) and forgetfulness ( $F = 21.577$ ). The study concludes that AI-supported cognitive offloading exerts a dual influence, simultaneously promoting learning efficiency while modestly elevating the likelihood of forgetfulness. It therefore advocates for structured and moderated integration of AI tools in instruction to reinforce independent cognitive engagement and hands-on competence among Building/Woodwork Technology undergraduates.

**Keywords**— Artificial intelligence–driven cognitive offloading, building/ woodwork technology, forgetfulness, undergraduates.

## I. INTRODUCTION

The rapid evolution of artificial intelligence (AI) has profoundly altered the structure and functioning of contemporary society, influencing domains such as medicine, economics, media, and formal education. Intelligent systems now coordinate daily schedules, forecast user preferences, automate decision-making processes, and simulate conversational interaction in contexts where immediate human support may be unavailable (Zhang & Wang, 2024). Within

academic environments, AI technologies increasingly function as cognitive extensions that enable individuals to rely on external systems to manage complex tasks. By transferring certain mental operations to digital tools, learners can conserve cognitive energy and allocate greater attention to reflective, analytical, and creative activities. This redistribution of mental effort aligns with the concept of cognitive offloading and has implications for adaptive coping, stress regulation, and sustained academic engagement (Grinschgl & Neubauer, 2022; Risko & Gilbert, 2016).

Cognitive offloading refers to the strategic use of external resources to support or replace internal cognitive processes, thereby reducing the mental demand associated with task performance (Risko & Gilbert, 2016). Historically, this practice predates digital innovation. Learners have long depended on artefacts such as notebooks for recording information, abacuses and calculators for computation, and measuring instruments for technical precision. These tools served as auxiliary memory systems, enabling individuals to extend their cognitive capacity beyond immediate mental limits. However, the emergence of AI-driven technologies has transformed cognitive offloading from simple record-keeping and calculation assistance into dynamic, interactive support systems capable of generating explanations, synthesizing information, and simulating reasoning patterns.

In building and woodwork technology education, AI has introduced new dimensions to cognitive delegation. Students in this field must interpret construction drawings, compute dimensions, prepare technical documentation, and justify material and structural decisions. AI applications can now assist in refining technical language, generating design alternatives, explaining construction procedures, and estimating material requirements. Consequently, learners may devote less effort to memorizing measurements, correcting linguistic errors, or performing repetitive calculations, and instead engage more deeply in evaluating structural integrity, assessing material performance, and integrating design components. Such engagement reflects higher-order cognitive functioning consistent with advanced analytical and evaluative thinking. AI platforms capable of language generation, pattern recognition, logical structuring, and data interpretation exemplify this expanded form of cognitive partnership (Elycheikh, 2025).

AI-mediated cognitive offloading within technical education operates through multiple interconnected pathways. Editing and linguistic enhancement tools reduce the mental strain associated with drafting project reports, workshop logs, and proposals, allowing greater concentration on technical reasoning and design coherence. Generative systems support conceptual exploration by clarifying joinery methods, structural mechanics, and construction sequences, thereby facilitating problem-solving and innovation in workshop and site-based activities. Additionally, computational applications assist with measurement conversions, load calculations, cost estimation, and dimensional modeling. By automating these quantitative processes, AI tools help preserve cognitive resources for interpretation, judgment, and decision-making (Ahmedtelba, 2025; Miller & Davis, 2023; VanLehn, 2022).

Despite these advantages, the increasing dependence on AI raises legitimate concerns regarding long-term cognitive consequences. When learners consistently rely on digital systems to retrieve information or generate solutions, opportunities for rehearsal and internal consolidation may decline. Over time, reduced engagement in independent recall and problem-solving may contribute to difficulties in retrieving previously learned knowledge. In practical disciplines such as building and woodwork technology, such challenges could manifest in lapses related to measurement accuracy, safety procedures, or sequential fabrication steps. Thus, while AI-based cognitive offloading enhances efficiency, it may also reshape memory practices in ways that warrant critical examination.

Forgetting is not exclusively associated with aging populations; it is a universal cognitive experience affecting individuals across developmental stages and professional contexts. It involves the temporary or sustained inability to access information that has previously been encoded and stored in long-term memory. Importantly, forgetfulness does not necessarily signify the permanent erasure of knowledge. Rather, it may reflect limitations in retrieval processes or contextual access to stored memory traces (Radvansky, 2022). In technical learning environments, forgetting can impede procedural fluency and compromise safe practice if essential information—such as material specifications, regulatory standards, or operational sequences—is not readily accessible. Rustini (2012) emphasizes that forgetting is an inherent aspect of human cognition observable across occupations and age groups. Similarly, Sudarna (2014) explains that memory traces may remain intact even when individuals momentarily fail to produce accurate responses.

Psychological scholarship identifies several explanatory frameworks for understanding forgetting. One widely recognized perspective, decay theory, proposes that memory traces gradually weaken when not reinforced through rehearsal or repeated use (Daviq, 2020). From this viewpoint, sustained practice is essential for maintaining durable memory representations. Interference theory offers an alternative explanation, suggesting that newly acquired information may disrupt previously stored material (retroactive interference), or that earlier learning may obstruct the integration of new knowledge (proactive interference) (Sudarna, 2014). Retrieval

failure theory posits that forgetting occurs when appropriate cues are absent, even though the information remains stored (Daviq, 2020). Motivated forgetting suggests that individuals may unconsciously avoid recalling distressing experiences (Fadillah, 2014). Additionally, physiological accounts attribute memory disruption to neurological or biochemical factors affecting brain structures, as observed in certain clinical conditions (Daviq, 2020).

Within building and woodwork technology education, a comprehensive understanding of these mechanisms is essential. As AI tools become increasingly embedded in instructional practice, educators must balance technological efficiency with pedagogical strategies that strengthen memory retention, procedural mastery, and independent reasoning. Integrating AI responsibly requires deliberate instructional design that encourages active recall, reflective practice, and experiential learning. By situating cognitive offloading within established theories of memory and forgetting, educational stakeholders can better evaluate both the benefits and potential cognitive trade-offs associated with AI-supported learning environments.

Scholarly attention to cognitive offloading—especially as it relates to the use of artificial intelligence—has expanded considerably in recent years. Emerging empirical evidence suggests that the educational benefits of AI are neither automatic nor uniform. For instance, Gerlich (2024) reports that the incorporation of AI tools into learning environments does not consistently enhance students' cognitive performance or communication competence, particularly among learners who already possess strong analytical abilities. The study further indicates that heightened confidence in AI systems may encourage greater reliance on them, thereby increasing the extent to which students transfer cognitive responsibilities to external tools. This reliance, in turn, may diminish sustained engagement in reflective and critical thinking processes (Gerlich, 2024). These observations echo earlier findings by Sparrow et al. (2011), who argued that easy access to digital information can influence how individuals encode and retrieve knowledge. However, more recent investigations emphasize that AI-related cognitive offloading is complex and influenced by multiple psychological factors, including perceived reliability, trust, and user dependency (Gerlich, 2024).

Within the Nigerian university system, Building/Woodwork Technology represents a specialized academic discipline offered across pre-vocational, vocational, and technical education streams. At the vocational and technical levels, the programme is designed to equip learners with practical competencies in building construction, maintenance, renovation, and related trades, thereby preparing them for employment in both public and private sectors (National Board for Technical Education [NBTE], 2008). At the broader technical education level, it also aims to develop professionals with analytical insight and critical expertise capable of contributing meaningfully to national economic development (CCMAS, 2022). Beyond the pursuit of academic credentials, instruction in Building/Woodwork Technology is intended to cultivate functional skills, ethical

values, technical precision, and problem-solving competence that enable graduates to operate effectively within society (Ayoola & Adeagbo, 2025). National policy documents further emphasize objectives such as job creation, entrepreneurship development, and the preparation of independent contractors capable of supporting infrastructural growth (Federal Republic of Nigeria [FRN], 2013).

Given these goals, the quality and depth of cognitive engagement in this discipline are of paramount importance. Students are required to master measurement systems, understand material characteristics, interpret structural drawings, and adhere strictly to safety standards. The integration of AI technologies into higher education—while offering efficiency and expanded access to information—introduces new pedagogical dynamics. Although digital innovations are increasingly adopted to improve instructional delivery and productivity, empirical research examining their cognitive consequences within the specific context of Building/Woodwork Technology in Oyo State remains limited. Understanding how AI-mediated cognitive offloading shapes learning patterns, retention capacity, and independent reasoning is therefore essential for informed curriculum planning and instructional design.

#### *Statement of the Problem*

The growing adoption of AI-driven applications among Building/Woodwork Technology undergraduates in Oyo State has significantly altered the manner in which academic and practical tasks are approached. Students frequently utilize AI tools for drafting technical documents, performing calculations, organizing project data, and generating preliminary design concepts. While such practices may enhance efficiency and reduce task-related stress, they also involve transferring portions of cognitive effort to digital systems. This shift raises concerns about the potential weakening of independent cognitive processing and possible reductions in the retention of foundational construction knowledge.

Building/Woodwork Technology is a discipline that depends heavily on accurate recall of measurements, material specifications, structural principles, and safety regulations. Inadequate memory retention or increased forgetfulness could compromise both academic performance and professional readiness, particularly in contexts requiring precision and procedural accuracy. Despite the increasing prevalence of AI use among undergraduates, there remains insufficient empirical evidence clarifying the nature and strength of the relationship between AI-driven cognitive offloading and forgetfulness within this specialized field. The absence of context-specific data creates a critical research gap, thereby necessitating systematic investigation into how reliance on AI tools influences memory retention and learning processes among Building/Woodwork Technology students in Oyo State.

#### *Objectives of the Study*

The main objective of this study is to examine artificial intelligence-driven cognitive offloading and forgetfulness

among building/woodwork technology undergraduates in Oyo State. Specifically, the study sought to determine the;

- i. extent of artificial intelligence tools usage among building/woodwork technology education undergraduate
- ii. level of undergraduates' forgetfulness and memory retention in building/woodwork technology related courses
- iii. statistically relationship between AI-based cognitive offloading and forgetfulness among building/woodwork technology education undergraduates.

#### *Research Questions*

The following research questions guided the study.

- i. What is the extent of artificial intelligence tools usage among building/woodwork technology education undergraduate?
- ii. To what extent is the relationship between undergraduates' forgetfulness and memory retention in technology related courses?
- iii. What is the statistically relationship between AI-based cognitive offloading and forgetfulness among building/woodwork technology education undergraduates?

#### *Hypotheses*

The following null hypotheses were tested at 0.05 level of significance.

- i. AI-based cognitive offloading does not significantly predict memory retention among building/woodwork technology education undergraduates.
- ii. AI-based cognitive offloading does not significantly predict forgetfulness among building/woodwork technology education undergraduates.

## II. METHODOLOGY

### *Research Design and Methodology*

This investigation employed a correlational survey research design to examine the relationships among AI usage, cognitive offloading, and memory-related variables. The target population comprised fifty-four (54) second-year (200 Level) students enrolled in the Building/Woodwork Technology Education programme during the 2024/2025 academic session at Emmanuel Alayande University of Education. Given the relatively small and homogeneous nature of the cohort, a census approach (total enumeration) was adopted to ensure that all eligible students participated in the study. This strategy eliminated sampling bias and enhanced the representativeness of the data within the defined population.

Data were collected using a structured questionnaire developed to measure AI usage alongside three complementary instruments. The first component assessed the extent of students' engagement with AI tools for academic and technical tasks. The second instrument, an adapted Cognitive Offloading Scale, consisted of six Likert-type items designed to measure the degree to which students rely on AI systems for specific cognitive functions such as idea generation, lexical selection, and task organization. In addition, two subscales were adapted from the Metamemory in Adulthood (MIA)

inventory: the *Anxiety* subscale (14 items), which evaluates levels of stress or apprehension associated with memory-dependent situations, and the *Locus of Control* subscale (9 items), which examines individuals' beliefs regarding their ability to influence or regulate their memory performance.

Content validity of the instrument was established through expert review. Three specialists evaluated the questionnaire for clarity, relevance, and alignment with the study objectives—two from the Department of Technology Education and one from the Department of Counselling Psychology at Emmanuel Alayande University of Education. Their feedback informed necessary revisions to ensure conceptual and contextual appropriateness.

To determine reliability, a pilot test was conducted with ten (10) 200 Level Technology Education students at Tai Solarin University of Education, who were not included in the main study sample. Responses from the pilot administration were analyzed using Cronbach's Alpha to assess internal consistency. The reliability coefficients obtained were 0.84 for the AI usage scale, 0.90 for the cognitive offloading scale, and 0.95 for the forgetfulness-related items, indicating high reliability across all constructs.

The finalized questionnaire was administered in person by the researcher, assisted by one trained research aide, to ensure clarity of instructions and a high response rate. Data analysis incorporated both descriptive and inferential statistical techniques. Frequencies, percentages, means, and standard deviations were computed to summarize demographic characteristics and address the research questions. Pearson's Product Moment Correlation was applied to determine the strength and direction of relationships among variables, while simple linear regression analysis was used to test the formulated hypothesis at the 0.05 level of significance.

### III. RESULTS AND DISCUSSION

#### Demographic Characteristics of Respondents

The demographic profile of participants was analyzed using frequency distribution and percentage statistics to provide a descriptive overview of the study population. The results are presented in Table 1, which outlines the distribution of respondents according to relevant background variables. This preliminary analysis provided contextual insight into the characteristics of the participants prior to subsequent inferential examination of the study variables.

TABLE 1: Demographic Characteristics of Respondents

Students Distribution by Department	Frequency	Percentage
Building Technology	48	88.8
Woodwork Technology	6	11.2
Total	54	100

The data indicate that the majority of respondents were enrolled in Building Technology, representing 88.8% of the total sample (48 students), whereas only 11.2% (6 students) were from Woodwork Technology. This uneven distribution reflects the larger enrolment size in Building Technology within the programme. Consequently, the findings of the study are more strongly representative of Building Technology

students, although both specializations were included in the analysis.

#### Research Question 1

What is the extent of artificial intelligence tools usage among technology education undergraduate? Table 2 summarizes the descriptive statistics regarding students' frequency of AI tool usage and their perceived academic benefits.

TABLE 2: Frequency of AI tool usage and their perceived academic benefits.

Tool used	Weekly usage (%)	Reported learning benefits (%)	Remarks
ChatGPT	87%	91%	High Extent
Google Board	49%	63%	High Extent
Grammarly	52%	58%	High Extent
QuillBot	76%	84%	High Extent
Perplexity AI	22%	18%	Low Extent
AI Calculators	25%	26%	Low Extent
You.com (AI Search)	10%	12%	Low Extent

Sources: Author (2026)

The results reveal that several AI tools are frequently utilized by students, particularly ChatGPT and QuillBot, both of which recorded high weekly usage and strong perceived academic value. Grammarly and Google Board also showed moderate-to-high engagement levels. In contrast, Perplexity AI, AI-based calculators, and You.com were used less frequently and were perceived as offering comparatively limited academic benefit.

Overall, the data suggest a substantial integration of AI tools into students' academic routines. Students not only engage with these technologies regularly but also associate them with meaningful support in their coursework. However, while frequent use may contribute to improved efficiency and task completion, the long-term impact on independent cognitive processing depends largely on the depth and critical manner in which such tools are employed.

#### Research Question 2

To what extent is the relationship between undergraduates' forgetfulness and memory retention in technology related courses? Table 3 presents the descriptive statistics and correlation analysis examining the association between forgetfulness and memory retention.

Table 3: correlation analysis examining the association between forgetfulness and memory retention.

Variable	$\bar{x}$	SD	R-value
Forgetfulness	3.11	0.443	0.225
memory retention	3.46	0.578	

The mean scores indicate relatively high levels of both reported forgetfulness ( $M = 3.11$ ) and memory retention ( $M = 3.46$ ). The correlation coefficient ( $r = 0.225$ ) demonstrates a weak positive relationship between the two variables. This suggests that although both constructs coexist at notable levels, their association is minimal. The positive direction of the correlation implies that variations in forgetfulness are slightly associated with changes in memory retention; however, the magnitude of this relationship remains low,

indicating limited practical overlap between the two constructs within the study context.

**Research Question 3**

What is the statistically relationship between AI-based cognitive offloading and forgetfulness among technology education undergraduates? Table 4 provides descriptive and correlational statistics examining the link between AI-based cognitive offloading and forgetfulness.

TABLE 4: correlational statistics examining the link between AI-based cognitive offloading and forgetfulness.

Variable	$\bar{x}$	SD	R-value
cognitive offloading	3.21	0.443	0.325
forgetfulness	2.48	0.578	

The findings reveal a relatively high level of cognitive offloading (M = 3.21) and a moderate level of forgetfulness (M = 2.48). The computed correlation coefficient (r = 0.325) indicates a weak but positive relationship between cognitive offloading and forgetfulness. This implies that increased reliance on AI tools for cognitive tasks is associated with a modest increase in reported forgetfulness. Although the relationship is not strong, it suggests that greater dependence on AI systems may slightly influence students' ability to independently retrieve previously learned information.

Taken together, these findings highlight the dual nature of AI integration in technical education. While AI tools are widely adopted and perceived as beneficial for learning support, increased cognitive delegation to digital systems may correspond with subtle shifts in memory-related outcomes

**Hypotheses Testing**

**Hypothesis 1**

AI-based cognitive offloading does not significantly predict memory retention among technology education undergraduates. To examine this hypothesis, a simple linear regression analysis was conducted to determine whether AI-based cognitive offloading serves as a predictor of memory retention.

TABLE 5: Presents the regression results.

Modal	Unstandardized		Standardized		
	B	Std. Error	Beta	t	Sig.
Constant	1.959	0.305		6.418	.000
AI-based cognitive Offloading	0.417	0.098	0.289	4.254	.000

Note: F(1,198)=18.093,R-Square=.084,Adjusted r<sup>2</sup>=.079

The regression model was statistically significant at the 0.05 level, as indicated by F(1,198) = 18.093, p < .05. The unstandardized coefficient (B = 0.417) demonstrates that a unit increase in AI-based cognitive offloading corresponds to an increase in memory retention scores. The standardized beta coefficient (β = 0.289) reflects a modest positive predictive effect.

The adjusted R<sup>2</sup> value of .079 indicates that approximately 7.9% of the variance in memory retention can be explained by AI-based cognitive offloading. Although this percentage suggests a relatively small effect size, it remains statistically meaningful within behavioral and educational research

contexts. Based on these results, the null hypothesis was rejected. This indicates that AI-based cognitive offloading significantly predicts memory retention among Technology Education undergraduates.

**Hypothesis 2**

AI-based cognitive offloading does not significantly predict forgetfulness among technology education undergraduates.

A second simple linear regression analysis was performed to determine whether AI-based cognitive offloading significantly predicts levels of forgetfulness.

TABLE 6: summarizes the findings.

Modal	Unstandardized		Standardized		
	B	Std. Error	Beta	t	Sig.
Constant	1.996	0.272		7.339	.000
AI-based cognitive Offloading	0.409	0.088	0.313	4.645	.000

Note: F(1,198)=21.577,R-Square=.098,Adjusted r<sup>2</sup>=.094

The analysis revealed that the regression model was statistically significant, F(1,198) = 21.577, p < .05. The unstandardized coefficient (B = 0.409) indicates that increases in AI-based cognitive offloading are associated with increases in reported forgetfulness. The standardized beta coefficient (β = 0.313) suggests a positive and slightly stronger predictive relationship compared to that observed for memory retention.

The adjusted R<sup>2</sup> value of .094 shows that approximately 9.4% of the variance in forgetfulness is accounted for by AI-based cognitive offloading. While this proportion remains modest, it indicates that reliance on AI tools contributes meaningfully to variations in students' forgetfulness levels.

Accordingly, the null hypothesis was rejected. The findings demonstrate that AI-based cognitive offloading significantly predicts forgetfulness among Technology Education undergraduates.

**IV. DISCUSSION OF FINDINGS**

The results of this investigation indicate that artificial intelligence applications are extensively utilized by Building/Woodwork Technology undergraduates, particularly for generating ideas, preparing technical documents, and organizing academic tasks. This pattern of use reflects a considerable degree of AI-mediated cognitive delegation, whereby students shift certain mental operations to digital systems. Consistent with the outcomes of Research Questions One and Three, the analysis revealed a statistically significant but weak positive association between cognitive offloading and forgetfulness. Although the magnitude of this relationship is modest, it suggests that greater dependence on AI tools may correspond with a slight reduction in students' independent memory engagement.

These findings are theoretically aligned with the cognitive offloading perspective advanced by Risko and Gilbert (2016), which posits that transferring cognitive tasks to external devices reduces immediate mental effort but may influence internal encoding processes. In a related vein, Sparrow et al. (2011) observed that individuals interacting with digital information systems are more likely to remember where

information is stored rather than the information itself, indicating a shift in memory strategy. More recent empirical evidence also supports this interpretation. Gerlich (2024) reports that elevated trust in AI systems can lead to increased reliance on such tools, potentially diminishing critical reflection and deep cognitive processing.

From the standpoint of memory theory, the predictive relationship identified between AI-based cognitive offloading, memory retention, and forgetfulness resonates with classical explanations of forgetting. Decay Theory suggests that information weakens over time when not actively rehearsed, implying that reduced independent recall may limit consolidation (Sudarna, 2014). Interference Theory further proposes that overlapping streams of information can obstruct retrieval, which may occur when externally generated responses replace personal cognitive elaboration (Sudarna, 2014). The notion of motivated forgetting described by Fadillah (2014), alongside the broader typology of forgetting outlined by Fatimah (2016), provides additional insight into how contextual, emotional, and cognitive factors might interact with technology use. At the same time, the adaptive coping interpretation of cognitive offloading emphasized by Grinschgl and Neubauer (2022) highlights its functional benefit: conserving cognitive resources so that learners can engage more effectively in analytical and evaluative thinking.

Taken together, these theoretical and empirical perspectives reinforce the central conclusion of the study: AI-driven cognitive offloading operates as a dual-influence mechanism. On one hand, it enhances efficiency and facilitates engagement with higher-level conceptual tasks; on the other, it is modestly associated with increased forgetfulness. This duality underscores the importance of thoughtful and structured integration of AI within Building/Woodwork Technology education to ensure that technological assistance does not inadvertently weaken foundational cognitive competencies.

## V. CONCLUSION

This study establishes that AI-mediated cognitive offloading is prevalent among Building/Woodwork Technology undergraduates in Oyo State and serves as a significant predictor of both memory retention and forgetfulness. While the use of AI tools appears to support instructional efficiency and higher-order cognitive engagement, increased reliance is also linked to a slight elevation in reported forgetfulness. These findings suggest that AI functions simultaneously as a cognitive enhancer and a potential contributor to reduced independent recall. Consequently, the educational value of AI depends not merely on its availability but on the manner and context of its use within technical training environments.

### Recommendation

In light of these findings, it is recommended that lecturers, curriculum developers, and institutional administrators implement structured and pedagogically guided AI integration

strategies within Building/Woodwork Technology programmes. Such strategies should encourage reflective use of AI tools while deliberately incorporating activities that promote active recall, procedural rehearsal, and independent problem-solving. By maintaining a balance between technological support and internal cognitive engagement, institutions can maximize the instructional benefits of AI while safeguarding students' long-term memory development and practical competence.

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