

A Study on the Influencing-Factor Model and Mechanisms of College Students' Generative AI Dependence Behavior from the Perspective of CAC Theory

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Abstract

[Purpose/Significance] University students are already extensively using generative AI in their studies; however, excessive reliance may lead to negative effects such as the degradation of autonomous learning ability, weakening of innovative thinking, and risks to academic integrity. Systematically analyzing the key factors influencing university students' reliance on generative AI can help regulate their usage behaviors. [Methods/Process] Using grounded theory, this study conducted semi-structured, in-depth interviews with 35 users who are reliant on generative AI. Through three-stage coding, it identified the influencing factors, and, based on CAC (cognition–affection–conation) theory, constructed a model of the influencing factors of university students' reliance on generative AI and explicated its underlying mechanisms. [Results/Conclusions] Technological cognition, self-cognition, task-demand cognition, and environmental cognition jointly constitute the root causes of reliance; positive emotions (such as ease and pleasure) and negative emotions (such as anxiety and disappointment) arising during use both amplify cognitive drivers and affect the depth of reliance; factors in the cognitive and emotional dimensions jointly influence the frequency, contexts, and depth of university students' use of generative AI, ultimately solidifying into sustained reliance behavior.

Full Text

Research on Influencing Factors and Mechanisms of College Students' Generative AI Dependency Behavior from the Perspective of CAC Theory

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Abstract

[Purpose/Significance] College students have widely adopted generative AI in their studies. However, excessive reliance may trigger negative effects such as degradation of autonomous learning ability, weakened innovative thinking, and academic integrity risks. Systematically analyzing the key influencing factors of college students' generative AI dependency behavior can help regulate their usage behavior. **[Method/Process]** This study employs grounded theory to conduct semi-structured in-depth interviews with 35 heavy users of generative AI. Through three-level coding, influencing factors are identified, and a model of factors affecting college students' generative AI dependency behavior is constructed based on CAC (Cognition-Affect-Conation) theory, with an interpretation of its mechanism of action. **[Result/Conclusion]** Technical cognition, self-cognition, task demand cognition, and environmental cognition collectively constitute the root of dependency; positive emotions such as ease and pleasure, as well as negative emotions like anxiety and disappointment generated during usage not only amplify cognitive drive but also influence the depth of dependency; factors in the cognitive and emotional dimensions jointly affect the frequency, scenarios, and depth of college students' use of generative AI, ultimately solidifying into continuous dependency behavior.

Keywords: generative AI, dependency behavior, influencing factors, CAC theory, college students

Classification: G252.0

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1. Introduction

1.1 Research on Generative AI Applications in Higher Education

This aspect is mainly applied to enhancing learning experience, improving research efficiency, and teaching quality. Generative AI significantly enhances students' learning experience. Text-to-text generation tools (such as ChatGPT) can provide writing feedback and inspiration[5], while text-to-image generation tools (such as DALL-E and Stable Diffusion) expand the presentation forms and interactive dimensions of educational content[6], providing students with

a comprehensive and dynamic learning environment. Through functions such as creative stimulation, information integration, and data processing, generative AI enhances research efficiency and innovation levels[7]; for instance, its application in literature review and data analysis helps researchers focus more on innovative work[8]. It can provide real-time feedback for teachers, optimize teaching plans, promote innovation in teaching methods, and meet personalized and modern teaching needs[9].

However, generative AI also faces numerous challenges. For example, generated texts often lack originality and proper citation[10], increasing the risk of academic misconduct and leading to information misuse and misleading dissemination[11]. Plagiarism, alteration, or abuse of generated content makes it difficult to assess students' genuine mastery of learning materials. It causes the educational focus to shift toward knowledge transmission while neglecting the cultivation of critical thinking, emotional experience, and comprehensive qualities[12]. Its fragmented knowledge output mode weakens students' innovative capabilities and research literacy, hindering the deep construction of knowledge systems. Biases or errors contained in training datasets can lead to inaccurate or even harmful information generation[13].

1.2 Research on Generative AI Dependency Behavior

(1) Generative AI Dependency Behavior

Currently, research on generative AI dependency behavior is growing both domestically and internationally, covering multi-level analyses of technology, psychology, negative effects, and countermeasures. From the perspective of technical dependency, college students' dependency on AI technology is positively correlated with their usage frequency. While this dependency enhances learning efficiency to some extent, it may lead to weakened independent thinking ability[14]. Dependency on AI may undermine students' cognitive abilities and reduce their learning initiative[15]. Social psychology research on AI dependency shows that individual differences play an important role in technology acceptance and dependency. Personal personality traits, confidence levels, and technical experience all influence their dependence on AI[16]. Among college students, traits such as neuroticism, perfectionism, and impulsivity can deepen their dependence on AI[17]; depression and anxiety also prompt users to turn to AI tools, thereby increasing dependency risk[18]. Generative AI dependency may trigger negative effects on multiple levels. At the cognitive level, long-term dependency can easily lead to weakened critical thinking and cognitive inertia, reducing the willingness for autonomous deep thinking[19]; simultaneously, errors or biases in AI output may also spread through the dependency chain, affecting knowledge accuracy[20]. At the social and ethical level, excessive dependency may trigger ambiguous responsibility attribution and academic integrity risks[21]. Existing literature proposes strategies to alleviate technical dependency, such as improving college students' digital literacy through education and training to promote rational use[22]; planning usage strategies based on

task attributes to seek a balance between efficiency improvement and cognitive autonomy[23].

(2) Influencing Factors of Generative AI Dependency Behavior

Regarding the influencing factors of generative AI dependency behavior, relevant research primarily analyzes the impacts from individual, environmental, and technical dimensions. Individual level. Students with neurotic and perfectionist tendencies are more likely to depend on generative AI, while reward-sensitive individuals may avoid its use due to concerns about affecting their grades[24]; students with low academic self-efficacy are more dependent on AI; users with higher technical proficiency increase their dependence on AI[25].

Environmental level. When academic pressure is high and time is tight, students are more inclined to use generative AI to reduce burden and improve efficiency[26]; teachers' attitudes toward technology influence students' dependency behavior[27]; peer and organizational use of generative AI may trigger herd mentality, thereby exacerbating dependency[28]; the formulation and implementation of relevant policies directly affect public trust in AI technology.

Technical level. Characteristics such as intuitive interfaces, personalized interaction, and adaptive natural language processing significantly lower the usage threshold and strengthen users' sense of dependency[29]; the demonstrated high accuracy enhances user trust and promotes dependency formation; the provision of instant feedback and efficient solutions makes users tend to rely on it rather than think independently[30].

1.3 Literature Review

Existing research has clarified the application value and risks of generative AI in education, and conducted multi-level discussions on the manifestations, influencing factors, and consequences of dependency behavior, laying a foundation for this study. However, research on influencing factors of generative AI dependency behavior is primarily based on single dimensions, lacking multi-dimensional comprehensive analysis, and seldom explores the pathways of influencing factors, having not yet formed a mature theoretical model. Therefore, this paper employs grounded theory combined with CAC theory, focusing on the college student population, to explore the deep influencing factors and mechanisms of action of their generative AI dependency behavior.

2. Research Design

2.1 CAC Theoretical Model and Its Application

Rosenberg et al. divided human behavior into three components: Cognition, Affect, and Conation[31], abbreviated as the CAC Cognitive-Affective-Conative Theory (CAC for short), which analyzes behavior from three main dimensions: cognition, affect, and conation[32]. Cognition, as an individual's beliefs and opinions about specific matters, directly influences their interpretation and evaluation of information and objects, and is regarded as a prerequisite for the

generation of behavioral intention. Affect refers to the emotional experiences and value tendencies formed by individuals on the basis of cognition. Conation, meanwhile, is the tendency and actual behavior itself that individuals generate toward specific behaviors by integrating information based on cognitive and affective attitudes, establishing a transformation path from cognition-affect to explicit behavior. The CAC framework has been widely applied in empirical research on attitude or behavior change, such as using this model to study social media burnout among youth groups, analyzing its causes and subsequent impacts[33]. This study places college students' generative AI dependency behavior within the 'Cognition→Affect→Conation' perspective, distilling the key factors influencing the formation of this behavior and constructing a theoretical model.

2.2 Respondent Selection

College students with obvious dependency on generative AI were selected as interviewees. Currently, there is no unified standard for defining generative AI dependency, but based on relevant research, policy directions, etc., this study formulated the following multi-dimensional screening criteria: Usage frequency criterion: Daily cumulative use of generative AI exceeds 2 hours or weekly calls exceed 10 times. High-frequency use may enhance this behavior through reinforcement loops, leading to dependency tendencies[34]. Task dependency criterion: When completing over 70% of learning or work tasks, interviewees believe it would be difficult to complete within the set time without generative AI assistance[35]. Emotional dependency criterion: When generative AI is temporarily unavailable, interviewees exhibit obvious anxiety and helplessness[36]. Capability impairment criterion: Without AI assistance, interviewees' accuracy or efficiency in completing similar tasks significantly decreases[31]. Individuals simultaneously meeting multiple criteria above can be regarded as generative AI dependent users of concern in this study. Based on the above criteria, this study directionally screened 15 eligible individuals from current college students and recruited 20 eligible individuals through social media platforms, ultimately selecting 35 valid interviewees whose basic information is shown in Table 1 .

2.3 Semi-Structured Interviews

The interviews were divided into two parts: Motivations, scenarios, experiences, and dependency manifestations, causes, and impacts of using generative AI. Factors influencing technology usage behavior, psychological characteristics and mechanisms during usage, and their impacts. A total of 35 interview records of approximately 250,000 words were obtained. Nvivo14 software was used to conduct coding analysis on 30 of these interview records, with the remaining 5 used for theoretical saturation testing.

3. Identification of Factors Affecting College Students' Dependence on Generative AI

3.1 Open Coding

Open coding requires analyzing texts with an open attitude, conceptualizing data and inducting them into basic categories through repeated comparison and in-depth analysis. Through the coding process, this study inductively generated 84 initial concepts and 23 basic categories. Partial initial concept coding content is shown in Table 2 , and open coding results are shown in Table 3 .

3.2 Axial Coding

The axial coding stage, based on open coding results, systematically clusters and integrates initial categories by sorting out logical connections among concepts, thereby inducting higher-order categories. Through comparative analysis of the 23 basic categories obtained from open coding, 7 main categories were ultimately integrated and inducted. Specific results are shown in Table 4 .

3.3 Selective Coding

The core task of this stage is to analyze the logical relationships among main categories, forming more generalized core categories through systematic sorting and refinement, while clearly explaining the mechanisms of action between each main category and the core category. The core category ultimately established in this study is “College Students’ Generative AI Dependency Behavior.” The study found that the remaining six main categories all act upon the formation process of this dependency behavior. The relationship structure is shown in Table 5 .

After coding was completed, the 5 reserved interview materials were coded again. The results remained consistent with the preliminary analysis, with no new concepts or relationships discovered, thus passing the saturation test.

4. Model of Influencing Factors on College Students' Dependence on Generative AI and Analysis of Its Functions

This study distills one core category, six main categories, and multiple sub-categories that influence college students’ generative AI dependency behavior. Based on CAC theory, these are categorized into three dimensions: cognitive dimension, affective dimension, and conative dimension. The relationships of how each influencing factor affects the formation of generative AI dependency behavior are shown in Figure 1 [Figure 1: see original paper].

4.1 Influence of Cognitive Dimension Factors on College Students' Generative AI Dependency Behavior

(1) **Technical Cognition** includes five sub-categories that can both directly drive dependency behavior and indirectly strengthen or inhibit dependency intensity through emotional experience. **Technical usage cost perception** includes three aspects: economic, time, and energy costs. When perceived benefits outweigh costs, satisfaction and pleasure are generated, thereby strengthening generative AI dependency; conversely, high costs cause anxiety and frustration, thereby inhibiting dependency. For example, "If AI responds slowly and wastes a lot of time, I'm unwilling to continue" (P6). **Technical controllability perception** includes reliability, service stability, and technical limitation perception. When technology is reliable and stable, it brings positive experiences and enhances dependency; otherwise, it weakens emotional investment and usage intention. "If AI service is unstable...I will feel anxious and disappointed" (P17). Perception of technical limitations also directly constrains dependency.

Technical risk perception covers privacy security, ethical compliance, and content homogenization risks. Concerns about personal information leakage or algorithmic bias significantly reduce trust and prompt reduced dependency; content homogenization causes student anxiety thereby inhibiting dependency. Simultaneously, high risk perception not only affects emotional evaluation but also stimulates avoidance motivation to directly weaken conative-level dependency behavior. **Technical anthropomorphism tendency** includes interactive anthropomorphism, emotional role-playing, and emotional substitutability. Anthropomorphic interaction and role-based dialogue easily generate emotional connections and strengthen dependency. "The way AI converses makes me feel like I'm chatting with a friend, which makes me very comfortable" (P9). When experiencing loneliness or emotional distress, generative AI replacing real social relationships to provide emotional comfort further enhances its dependency.

Perceived substitutability of traditional tools. When students perceive limitations in traditional resources and that generative AI can provide more efficient and accurate solutions, they generate negative comparative emotions and shift toward using generative AI, thereby directly promoting dependency.

(2) **Self-Cognition** is mainly reflected in four aspects: self-efficacy, psychological state, personality traits, and behavioral habits. **Self-efficacy.** If individuals perceive their own knowledge or abilities as insufficient, they often experience anxiety, unease, and self-doubt, subsequently using generative AI as an ability substitute and psychological support, gradually forming cognitive dependency. **Psychological states** such as admiration for the strong (慕强心理) easily lead students to worship AI (P12), herd mentality promotes the imitation and reinforcement of dependency behavior, and loneliness prompts students to emotionalize and rely on AI, deepening emotional dependency.

Personality traits: characteristics such as introversion, internal conflict, and lack of confidence make students more willing to seek acceptance and immediate feedback from generative AI, thereby deepening both emotional and functional

dependency on AI. **Behavioral habits.** Performance and efficiency-oriented behavioral habits lead students to view generative AI as a “shortcut” ; usage driven by laziness also often solidifies into inertial dependency. Conversely, students with self-management awareness set limits on generative AI usage, treating it as an aid rather than a dependency.

(3) **Task Demand Perception** directly influences students’ emotional experiences and behavioral intentions when using generative AI. The stronger the students’ perceived demand for AI in tasks, the more obvious their psychological dependency and usage intensity become. When tasks highly align with generative AI, satisfaction and completion confidence increase, thereby deepening dependency. Task urgency triggers time pressure and anxiety, and generative AI’s rapid response emotionally alleviates tension but also easily forms dependency on it. Clear demand and high alignment drive students to actively seek and depend on AI support; while urgency-driven motivation makes them prioritize generative AI to improve efficiency, thereby directly strengthening dependency behavior.

(4) **Environmental Cognition** mainly encompasses perceptions of policy, social, and educational environments. **Policy environment.** National-level policy support enhances students’ confidence and pride, and stimulates active learning and continuous exploration willingness, thereby increasing persistent dependency; however, regulatory absence (such as data security and academic integrity issues) also generates unease and anxiety, becoming an inhibiting factor. **Social environment.** Information overload brings anxiety, and group usage and “involution”(内卷) make “fear of falling behind” a social driving force for dependency; group usage behavior promotes the imitation and spread of dependency through herd mechanisms. **Educational environment.** Curriculum integration, teacher demonstration, and peer influence can enhance students’ trust in AI, thereby forming continuous dependency based on identification; peer competition and grading pressure also easily prompt students to depend on AI to optimize performance; while school regulations limiting usage boundaries help inhibit blind dependency.

4.2 Influence of Affective Dimension Factors on College Students’ Generative AI Dependency Behavior

Positive emotional experiences mainly include technical usage pleasure, task completion ease, and emotional support satisfaction, which can enhance continuous invocation of and dependency on generative AI. **Technical usage pleasure.** “Using generative AI to generate creativity often brings unexpected surprises” (P30). Such positive experiences continuously consolidate emotional trust in and dependency tendency toward AI. **Task completion ease.** Generative AI reduces task threat perception and cognitive burden, making it students’ psychological first choice. The ease experience gradually transforms into the dependency habit of “wanting to use AI whenever encountering problems.”

Emotional support satisfaction. “When feeling lonely or depressed, AI’s

encouraging responses give me motivation to keep going” (P9). Generative AI’s instant emotional satisfaction may replace some real interpersonal support, strengthening emotional dependency on AI[54].

Negative emotional experiences are mainly manifested in anxiety, disappointment, and worry, which may trigger reflection on AI dependency and behavioral adjustment. (1) **Anxiety**: First is “dependency withdrawal anxiety,” i.e., the unease and concern about disrupted study life when unable to access AI; second is “dependency anxiety,” i.e., attempting self-restriction after realizing dependency has formed; third is “capability degradation anxiety,” worrying that long-term dependency will weaken independent thinking and innovation ability; fourth is “competitive anxiety,” i.e., worrying about falling behind others in study or social situations without using AI, a pressure that may instead prompt students to use generative AI more frequently and continuously, thereby deepening dependency passively. (2) **Disappointment**. When technical performance fails to meet expectations, it triggers cognitive dissonance and emotional avoidance. Trust drops sharply after being “deceived” by wrong answers, followed by switching to manual completion or other tools, thereby reducing dependency in the short term. (3) **Worry**. Students with “social isolation worry” fear that long-term use of generative AI will lead to social isolation and interpersonal alienation, thereby weighing usage frequency. Some students have “technical dependency negative cycle worry,” prompting them to actively reduce technical dependency. Technical dependency negative cycle refers to the self-reinforcing negative behavioral pattern formed by individuals during generative AI usage due to dependency on technical tools. This pattern causes: **Autonomous learning inhibition**. Generative AI replaces the cognitive construction process, weakening opportunities for exploration and critical thinking[55]. **Self-efficacy decline**. As autonomous learning opportunities decrease, students lack achievement experiences and confidence is damaged, conversely increasing reliance on AI. **Capability degradation**. Technical dependency leads to degradation of basic skills, which in turn forces individuals to depend more on technical tools, forming a vicious cycle of “capability atrophy → technical dependency → further capability degradation.” **Systematic dependency dilemma**. When “everyone uses AI” becomes the norm, the competitive threshold rises, and non-users are marginalized, leading to intensified collective dependency.

5. Conclusion and Discussion

5.1 Research Conclusions

This study, based on CAC theory and employing grounded theory methods, distills the influencing factors of generative AI dependency and constructs a theoretical model from the “Cognition→Affect→Conation” perspective. Research results indicate that college students’ excessive dependency behavior on generative AI is jointly affected by cognitive and affective dimensions. On one hand, college students’ cognition of technology, self, tasks, and environment triggers positive or negative emotional experiences through contact stimulation, internal

catalysis, situational inducement, and external drive, ultimately solidifying into excessive dependency behavior, forming an action chain of “cognitive drive → emotional reinforcement → behavioral solidification.” On the other hand, cognitive dimension factors directly influence the frequency, scenarios, and depth of college students’ use of generative AI, directly driving excessive dependency behavior.

5.2 Theoretical Contributions and Practical Implications

This study reveals the role of multi-dimensional influencing factors in the formation of college students’ generative AI dependency behavior and the “cognitive drive → emotional reinforcement → behavioral solidification” action chain, providing a framework reference for subsequent theoretical deepening and empirical testing across different dimensions. The influencing factors obtained in this study both validate common factors in existing technology dependency research and reveal multiple characteristic factors in the formation of college students’ generative AI dependency. Among common factors, technical risk perception and self-efficacy are key variables corroborated in technology acceptance models and technology dependency research; situational inducement factors such as task-technology fit and task urgency drive are consistent with the core viewpoints of Task-Technology Fit Theory (TTF)[56]; although social environment, educational environment, and policy environment align with the social influence and facilitating conditions in the UTAUT model[57], this study highlights the environmental orientation effects brought by the AI era and competitive pressure more prominently. Among characteristic factors, technical anthropomorphism tendency, traditional tool substitutability, and emotional support satisfaction reflect the uniqueness of the interaction between generative AI technology and college students’ emotional needs.

The multi-dimensional influencing factors and action chain of college students’ generative AI dependency provide practical references for how to inhibit AI dependency: At the cognitive level, college students should enhance information literacy and critical thinking; universities can integrate AI usage norms and academic integrity into teaching; technology platforms can strengthen result transparency and risk warnings; governments can improve policy standards to correct cognitive biases. At the affective level, universities can establish psychological support mechanisms; teachers can enhance students’ sense of achievement through positive feedback; technology platforms can optimize design to avoid excessive instant gratification, reducing emotional dependency inducements. At the conative level, college students should strengthen self-usage monitoring; universities can optimize learning scenarios through process-based assessment and originality training; technology platforms can add features such as usage time management; governments can introduce long-term supervision policies to prevent behavioral dependency solidification.

5.3 Limitations and Future Directions

The limitations of this study are mainly manifested as: The existing research has limitations in sample representativeness and coverage scope, making it difficult to fully reflect the overall characteristics of generative AI dependency behavior among college students from different levels and backgrounds, which affects the generalizability of the conclusions to some extent. The study is primarily based on qualitative methods, lacking quantitative data to verify the weights of influencing factors. Future research can expand the sample scope, compare differences among users from different educational stages and professional backgrounds, and reveal group characteristics of generative AI dependency. Combining questionnaire surveys and experimental designs for in-depth analysis can validate the theoretical model and enhance its validity and generalization value.

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