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Generation Process and Early Warning Methods of Academic Misconduct A Grounded Theory Analysis Based on Academic Misconduct Cases

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Abstract: Academic misconduct erodes the foundation of academic integrity and seriously threatens the sound operation of the academic ecosystem. Existing studies mostly focus on phenomenon description and governance countermeasures, while lacking in-depth logical explanations for the generation mechanism of academic misconduct based on practical data. Taking publicly available research-integrity investigation reports, official notices of investigated academic-misconduct cases and typical cases as data sources, this paper adopts grounded theory to systematically reveal the generation logic of academic misconduct among researchers, and constructs a generation-mechanism model of "situational pressure -individual cognition -behavioral choice -consequence feedback". The study finds that the mutual coupling of imbalanced institutional incentives, regulatory gaps, weakened organizational awareness on the one hand, and individual utilitarian motives and fluke mentality on the other hand constitutes the deep-seated inducement of academic misconduct. From the three links of ex-ante prevention, in-process monitoring and ex-post accountability, combined with artificial intelligence and knowledge-graph technologies, this paper puts forward an early-warning framework covering the whole life cycle of scientific research, so as to provide theoretical support and technical paths for research-integrity governance.

1. Introduction

Academic misconduct not only damages individual academic reputation and harms the collective academic ecosystem, but also erodes national research investment and output efficiency[1]. In-depth analysis of the generation mechanism of academic misconduct and exploration of scientific and effective early-warning methods have become major practical propositions to be addressed urgently in the field of research-integrity governance.

In terms of research status, foreign studies paid early attention to the definition, typology and cause analysis of academic misconduct, forming multi-dimensional interpretive frameworks covering organizational pressure, individual morality and peer supervision[2]. Domestic studies, by contrast, have focused more on specific manifestations of academic misconduct, journal governance strategies

and institutional norm construction[3]. Nevertheless, reviewing existing literature, most studies adopt speculative argumentation or questionnaire-based quantitative approaches, with few qualitative explorations that generate theories bottom-up through systematic coding based on empirical data. Academic misconduct involves complex individual psychological activities and situational interactions; its real generation logic can hardly be grasped merely through theoretical deduction[4].

Proposed by Glaser and Strauss in 1967, Grounded Theory is a qualitative research methodology whose core proposition is that concepts and theories "naturally emerge" from empirical data[5]. It emphasizes iterative cycles between data collection and analysis to ultimately generate substantive theories with explanatory power. The principle of "letting data speak" of grounded theory fits the narrative characteristics of academic-misconduct research intertwined with human factors, environment and psychology, and provides a theoretical methodology for digging deep into psychological motivations and situational factors behind behaviors.

Accordingly, this study collects 60 pieces of publicly available research-integrity survey data, official notices on academic-misconduct investigations and typical cases as empirical materials, and conducts three-level coding analysis via grounded theory. It attempts to answer two core questions: first, how does academic misconduct among researchers arise and evolve, and what is its underlying generation mechanism? Second, based on the above mechanism, how can we construct scientific early-warning methods covering the whole life cycle of scientific research? Theoretically, this research expands the qualitative interpretive path for academic-misconduct studies; practically, it offers a feasible framework for the technical upgrading of the research-integrity governance system.

2. Literature Review and Theoretical Perspective

2.1. Concept Definition and Typology of Academic Misconduct

Academic misconduct refers to deceptive behaviors violating generally-accepted norms within the scientific community in the course of scientific research and achievement publication. In China, Rules for the Investigation and Handling of Research-Integrity Cases (Trial) defines research-integrity violations as fabrication, falsification, plagiarism and other research-dishonest behaviors, and extends its scope to inappropriate authorship, duplicate submission, ghostwriting and commissioned writing, etc. In typology, academic circles generally recognize fabrication, falsification and plagiarism as the three core types of academic misconduct. With the wide application of Generative AI, new forms of academic misconduct such as ethical problems caused by AI-generated content, machine ghostwriting and deepfakes have emerged, posing new challenges to traditional detection and governance systems[6].

2.2. Multi-dimensional Interpretations of the Causes of Academic Misconduct

Regarding the generation mechanism of academic misconduct, domestic and foreign research has formed several representative interpretive approaches. First, the organizational-and-institutional perspective highlights structural inducements. It holds that the "publish or perish" pressure under quantitative assessment orientation, utilitarian incentives for resource allocation and imbalanced research-evaluation mechanisms form the institutional soil for academic misconduct[7]. Second, the individual-psychological perspective focuses on subjects' motives and cognition. It argues that utilitarian orientations, fluke mentality and weak awareness of academic norms drive individual academic anomie[8]. Third, the social-interaction perspective regards academic misconduct as a product of the interaction between individuals and environments. It points out defects in governance such as peer-review fraud and weakened self-purification functions of the academic community, which lower the expected cost of misconduct[9]. Fourth, the collaborative-governance perspective

advocates reconstructing governance frameworks from the dimensions of diverse subjects, goal identification and systematic collaboration[10]. Overall, existing interpretations provide rich perspectives for understanding academic misconduct, yet systematic explanations for the coupling mechanism of multiple factors remain insufficient.

2.3. Applicability of Grounded Theory in Academic-Misconduct Research

Through constant comparison and theoretical sampling, grounded theory realizes conceptualization and theory generation. It is especially suitable for fields with complex research objects, unclear variable relations, and requiring internal-perspective understanding of behavior construction[5]. Essentially, academic misconduct is a decision-making process of researchers under given institutional contexts and psychological states. Its real mechanism is embedded in subjects' experiential world and can hardly be captured by pre-set questionnaire dimensions. Introducing grounded theory into academic-misconduct research helps break through top-down theoretical presuppositions, generate localized behavioral-interpretation models bottom-up from empirical data, and realize methodological innovation in research perspectives. Existing studies have successfully applied grounded theory to topics such as scientific-technological cooperation, educational evaluation and teaching-quality assurance, verifying its applicability in researching complex social phenomena[10].

3. Research Design and Data Sources

3.1. Research Methodology

This study adopts classic grounded theory, following the research procedure of "open coding - axial coding -selective coding -theoretical saturation test"[5]. The research emphasizes constant comparison between data and analysis, revising conceptual categories continuously until theoretical saturation is reached, and finally generating substantive theories reflecting the generation mechanism of academic misconduct.

3.2. Data Sources and Samples

Data of this study come from three types of public materials: (1) notices of investigation and disciplinary decisions for academic-misconduct cases released by national, provincial and ministerial research-integrity authorities; (2) research-integrity investigation reports issued by authoritative domestic and international institutions; (3) typical academic-misconduct cases disclosed by authoritative media and officially confirmed. Following the principle of theoretical sampling and taking into account cases from different disciplines, behavior types and institutional levels, 30 case texts are included, yielding 60 conceptual-coding entries. All materials are obtained from public channels without involving personal privacy information.

3.3. Coding Procedures

In open coding, initial concepts are extracted sentence-by-sentence and paragraph-by-paragraph from original materials, and similar concepts are clustered to form initial categories. In axial coding, causal, situational, action-strategy and outcome relations among categories are analyzed via the paradigm model, and initial categories are aggregated into main categories. In selective coding, the "story line" is sorted out centering on the core category to construct an integrated theoretical model. Memo writing and theoretical-saturation testing are conducted simultaneously in coding to ensure

adequate coverage of data by the conceptual system.

4. Results of Grounded-Theory Coding Analysis

4.1. Open Coding

Statements highly relevant to "the generation of academic misconduct" are extracted from official public research-integrity cases and institutional documents. Concept coding is carried out from seven dimensions: behavior type, individual traits, environmental factors, behavioral motivation, governance mechanism, governance measures and impacts/hazards, producing 60 initial concepts for category extraction.

Major conceptual coding is shown as table 1:

Table 1 Conceptual coding

No.	Concept	Corresponding Original Material Sentence
1	plagiarism	"Academic misconduct includes plagiarizing, copying and appropriating others' academic achievements."
2	data fabrication	"Fabricating research data, materials, literature and notes constitutes an important type of academic misconduct."
3	data falsification	"Falsifying others' research results is an important type of academic misconduct."
4	research competence	"Internal conditions include individual cognition, academic pressure, personal competence, academic morality, etc."
5	moral deficiency	"Lack of personal academic honesty and morality serves as a vital individual factor for academic misconduct."
6	instant-success pursuit	"Seeking shortcuts to achieve research goals out of eagerness for quick success."
7	fluke mentality	"Some scholars regard academia merely as a tool for fame and fortune and lack rigorous scientific spirit."
8	colleague behavioral demonstration	"Demonstration effects of colleagues' misconduct, personal-relation concerns and human-favor manuscripts affect academic ethos."
9	promotion-related pressure	"Interest-driven factors make academic misconduct recurrent."
10	undesirable academic atmosphere	"Intra-organizational academic-moral ethos exerts influences on academic misconduct."
11	unitary evaluation mechanism	"Imperfect research-evaluation systems and inadequate supervision-punishment systems represent key institutional factors."
12	quantity-over-quality orientation	"The 'quantity-over-quality' orientation in academic evaluation inevitably leads to low-level repetitive academic outputs."
13	supervision vacuum	"Defective academic laws and regulations as well as flawed supervision-punishment systems contribute to repeated academic misconduct."
14	institutional imperfections	"Institutional policies, review services and academic environments constitute external situational factors affecting academic misconduct."
15	moving prevention	"The governance of academic misconduct is undergoing a

	forward	fundamental shift from ex-post punishment to ex-ante prevention."
16	risk grading	"Multi-dimensional data collection and intelligent analysis shall be adopted for dynamic identification and graded early warning of academic-misconduct risks."
17	ex-ante early warning	"The academic-misconduct risk early-warning system aims to fundamentally prevent the occurrence of academic misconduct."
18	multi-subject collaboration	"Eradicate the breeding ground for misconduct by reforming administrative mechanisms, strengthening supervision and establishing impartial institutions."
19	undermined academic credibility	"Academic misconduct not only undermines scientific credibility but also impairs academic-administrative mechanisms."
20	damaged education quality	"Academic misconduct harms academic integrity and impedes educational quality and research development."
21	polluted research ecosystem	"Academic misconduct seriously infringes research integrity and hinders the sound development of science and technology."
22	collapsed integrity system	"Academic fraud severely endangers social integrity, research resources and academic environments."
23	resource waste	"Academic misconduct gravely corrupts academic ethos."

4.2. Axial Coding: Extraction of Main Categories

In axial coding, initial categories are integrated into four main categories according to the paradigm model of "causal conditions -phenomena -contexts -intervening conditions -action strategies -consequences" (table 2).

Table 2 Initial categories of axial coding

Main Category	No.	Initial Category	Category Connotation
Behavioral Choice	A1	Behavior Implementation Patterns	Specific manifestations and typology of academic misconduct
	A2	Technical Availability	Technical tools and approaches for committing academic misconduct
Individual Cognition	A3	Individual Deficiencies in Literacy	Individual inadequacies in academic-integrity awareness, research capabilities and moral literacy
	A4	Individual Behavioral Motivations	Internal driving forces and interest appeals motivating individuals to engage in academic misconduct
Situational Pressure	A5	Academic Ecosystem	External environmental factors within the academic community and society that shape academic behaviors
	A6	Academic Evaluation Mechanism	Behavior-orienting effects of quantitative-indicator-dominated academic-evaluation systems on researchers
	A7	Supervision-and-Punishment Mechanism	Institutional arrangements and enforcement intensity for supervising, investigating and penalizing academic misconduct

	A8	Research-related Pressure	External pressures stemming from academic assessments, paper publication and professional-title evaluation
Collaborative Mechanism	A9	Technical Supervision Instruments	Technical supports for detecting and issuing early warnings against academic misconduct via information technologies
	A10	Governance-subject Collaboration	Linked and collaborative prevention-and-control systems for academic misconduct among diverse governance subjects
	A11	Early-warning and Prevention Mechanism	Risk-prevention-oriented mechanisms for early identification and risk control of academic misconduct

First, the situational-pressure dimension covers categories including academic ecosystem, academic-evaluation mechanism, supervision-and-punishment mechanism and research-related pressure. This dimension reveals the structural breeding ground for academic misconduct, reflecting the squeeze exerted by “publication pressure” and “evaluation baton” on researchers[11].

Second, the individual-cognition dimension includes individual literacy and behavioral motivation. It encompasses insufficient awareness of academic norms, weak moral consciousness, utilitarian values, fluke mentality and biased risk perceptions. Focusing on subjects’ internal psychological mechanisms, this dimension indicates that individuals’ subjective perceptions regarding the nature, consequences and probability of being penalized for misconduct profoundly influence their behavioral decisions[12].

Third, the behavioral-choice dimension covers behavior-triggering factors, technical-tool availability and behavior-implementation patterns. It presents process characteristics of misconduct from idea germination to concrete implementation, reflecting action choices made by individuals through cost-benefit trade-offs under specific contexts[2].

Fourth, the collaborative-mechanism dimension includes technical-supervision instruments, governance-subject collaboration and early-warning-prevention mechanisms. This dimension emphasizes how discovery and disposal outcomes of misconduct reshape subsequent behavioral expectations of individuals and groups, constituting key adjusting variables for curbing or spreading academic misconduct[14].

4.3. Selective Coding: Core Category and Theoretical Model

In selective coding, the core category “generation mechanism of academic misconduct under the coupling of situational pressure and individual cognition” is extracted. Clear logical relations are formed among main categories around this core category: situational pressure serves as macro inducements and external driving forces for academic misconduct; individual cognition constitutes micro-psychological foundations and internal motivations. Their mutual coupling and mutual reinforcement jointly trigger behavioral choices. Consequences of behavioral choices feed back to contexts and cognition, forming a closed loop for the generation and evolution of academic misconduct. Accordingly, this study constructs the generation-mechanism model of “situational pressure -individual cognition -behavioral choice -consequence feedback”. It is showed as fig 1.

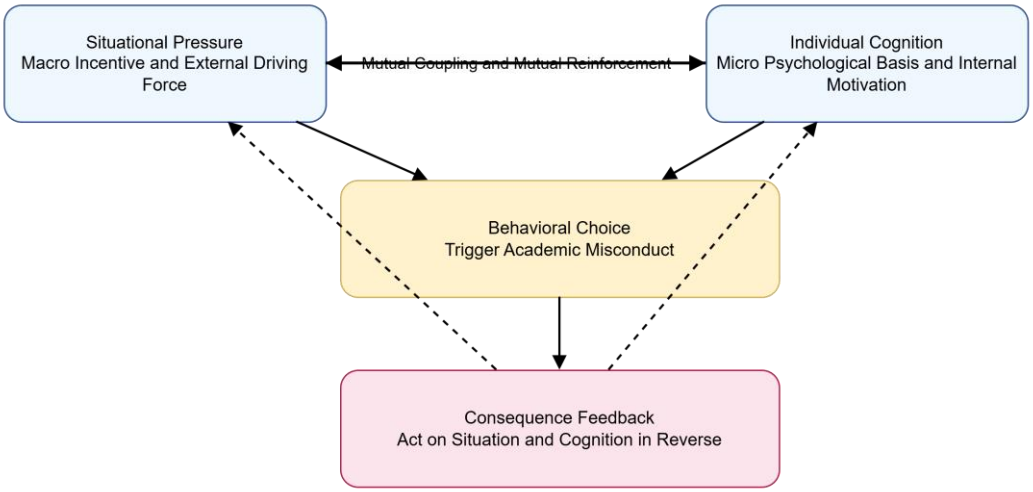


Fig.1. The generation-mechanism model

Key findings of the model are as follows. First, academic misconduct is not isolated individual moral anomie, but a product of the synergy between institutional pressure and individual psychological weaknesses. Significant coupling effects exist among factors including superimposed quantitative-evaluation orientation and regulatory gaps, weakened self-purification capacity of the academic community, and accumulated utilitarian motives plus fluke perceptions. Second, there exists a critical decision-making gateway between motivation and actual behavior. Individuals' trade-offs among "probability of punishment -expected benefits -moral costs" function as an important threshold determining whether misconduct is put into practice[14]. Third, the effectiveness of the consequence-feedback link directly determines the prevalence of academic misconduct. Environments with forceful disciplinary deterrence and sound supervision can effectively raise expected costs of misconduct and restrain its diffusion. By contrast, supervision vacuum and inadequate punishment will induce herd and imitation effects, leading to the spread of academic misconduct within specific institutions or disciplines.

5. Suggestions on Early-warning Methods Based on Mechanism Understanding

Based on the above generation-mechanism model, this paper proposes an early-warning framework for academic misconduct covering the whole life cycle of scientific research. A systematic early-warning path is constructed from the three links of "ex-ante prevention -in-process monitoring -ex-post accountability", integrating cutting-edge technologies such as knowledge graphs, machine learning and generative artificial intelligence.

5.1. Ex-ante Prevention: Risk Identification and Source Governance

Ex-ante prevention focuses on situational pressure and individual cognition. It eliminates inducing conditions for misconduct by fostering sound ecosystems and improving normative literacy. Specific measures include advancing reforms of research-evaluation systems, establishing classified evaluation mechanisms oriented toward innovative value, contributions and quality, and weakening rigid constraints of quantitative indicators[10]. Research-integrity education shall be incorporated into compulsory sessions for postgraduate training and continuing education of researchers to systematically enhance awareness of academic norms. Academic-credit archives for researchers shall be built, with dishonesty records linked to resource allocation such as project application, professional-title evaluation and talent-program selection, so as to strengthen deterrent effects of

credit constraints[5].

Technically, knowledge-graph technologies can be adopted to build multi-dimensional association networks connecting researchers, institutions, projects, outputs and journals. Risk-prone contexts under high-pressure conditions can be profiled and identified to provide data support for proactive intervention[13].

5.2. In-process Monitoring: Dynamic Tracking and Intelligent Early Warning

In-process monitoring targets the behavioral-choice dimension. Dynamic tracking and anomaly identification of full-cycle research activities are realized relying on technical means. Its core lies in constructing an intelligent academic-misconduct early-warning model based on knowledge graphs, which converts “abnormal patterns” of academic misconduct into computable feature indicators[14].

In terms of data foundation, multi-source heterogeneous data including research proposals, process-management data, publication outputs and peer-review data shall be integrated to build temporal-sequence behavior graphs for research activities. In terms of technical routes, hybrid-augmented detection frameworks based on large-language models, graph neural network (GNN) anomaly detection and behavior analysis shall be combined to deliver real-time early warnings for potential fabrication, falsification, plagiarism, inappropriate authorship and citation manipulation[14]. In terms of early-warning scenarios, key nodes including project initiation, data collection, paper submission and achievement evaluation shall be covered, realizing forward-shift from “ex-post detection” to “ex-ante prevention”.

5.3. Ex-post Accountability: Collaborative Linkage and Systematic Governance

Ex-post accountability focuses on the consequence-feedback dimension. Expected costs of misconduct are raised by improving investigation-disposal mechanisms and cross-subject collaborative linkage. Specific measures include perfecting closed-loop workflows for report acceptance, investigation-verification and outcome feedback of academic-misconduct cases, ensuring unobstructed reporting channels and protection for whistle-blowers. Cross-institutional and cross-regional information-sharing and joint-punishment mechanisms for research integrity shall be established to prevent misconduct perpetrators from transferring among different institutions[14]. Journals shall strengthen their review responsibilities and retraction-response mechanisms, giving play to journals’ pivotal role in the self-purification of the academic community[12].

Based on the above analysis, governance suggestions are put forward as follows. First, the scientific research management department should deepen research-evaluation institutional reforms, break utilitarian orientations of “valuing papers, academic titles, professional titles, educational backgrounds and awards above all else”, and create a relaxed, inclusive and sound academic environment for researchers. Second, all departments work together to build a “cognition-institution-technology” collaborative prevention system for academic misconduct to realize organic integration of moral education, institutional constraints and technical monitoring. Third, Universities and administrative institutions should accelerate the construction of information-based research-integrity platforms, and improve the intelligence level of academic-misconduct monitoring with knowledge graphs, large-language models and graph neural networks. Fourth, the academic community should improve its self-governance mechanism, strengthen the responsibilities of supervisors, journals and peers in ensuring research integrity, and restore the academic community's own purification ability.

6. Conclusion

Academic misconduct constitutes a stubborn problem in research-integrity governance with complex generation mechanisms and far-reaching harms. Adopting grounded theory, this study systematically reveals the four-dimensional generation mechanism of academic misconduct among researchers: “situational pressure -individual cognition -behavioral choice -consequence feedback”, deepening theoretical understandings of the essence of academic misconduct. On this basis, an intelligent early-warning framework covering the whole life cycle of scientific research is proposed, providing a technical path for research-integrity governance to shift from “ex-post investigation and punishment” toward “ex-ante early warning”. Facing profound changes in the academic ecosystem driven by artificial intelligence, research-integrity governance must realize coordinated linkage between institutional innovation and technological innovation, so as to safeguard scientific credibility and foster a clean academic ecosystem for scientific and technological innovation.

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