Challenges of Technological Subservience among Preschool Teachers in Personalized AI Teaching: A Phenomenological Study

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Abstract
With the gradual deepening of artificial intelligence (AI) in preschool education, Personalized AI Teaching has gradually become an important path for the digital transformation of education. However, with the increasing involvement of technology, preschool teachers are gradually facing pressure to restructure their teaching authority and professional roles. This study focuses on the challenges brought about by Technological Subservience in Personalized AI Teaching for preschool teachers, aiming to reveal the real teaching experience of teachers under high technological intervention.This study uses a phenomenological approach to conduct semi-structured in-depth interviews with 20 preschool teachers who have actual experience in personalized AI teaching, and systematically sorts out the typical dilemmas they face in their teaching practice from a subjective perspective. The study found that teachers generally experienced three core dilemmas: Diminished Instructional Authority, mainly manifested as reduced instructional autonomy and reduced classroom control; Intensified Instructional Load, mainly manifested as increased teaching complexity and attention displacement; Intensified Role Identity Conflict, mainly manifested in diminished professional identity and role ambiguity. Based on the above findings, this study emphasizes that only by promoting the return of personalized AI teaching to a people-oriented collaborative logic and strengthening teachers' discretionary power and professional legitimacy can the sustainable reconstruction of the role of teachers in the digital transformation of education be achieved.The research results provide theoretical support for understanding the role evolution and psychological coping mechanisms of teachers in personalized AI teaching in the preschool education stage, and also provide practical guidance for the formulation of relevant educational technology policies and the construction of teacher support systems.
Keywords: Technological Subservience, Personalized AI Teaching, Preschool Teacher, Self-determination Theory

Introduction
In a global educational ecosystem characterized by rapid digital intelligence development, AI has not only reshaped teaching paradigms, but also triggered profound reflections on the nature of education. The advent of Education 4.0, with data-driven and algorithm-regulated features at its core, embeds concepts such as personalized learning,

intelligent feedback, and adaptive teaching into classroom structures and interactive logic (Castro et al., 2024).In the field of preschool education in particular, AI systems are gradually being embedded in daily teaching as "intelligent intermediaries," marking a structural reconstruction of the relationship between technology and humans (Prunkl, 2024; Zhou et al., 2024).

Despite these broad developments, the impact of AI-driven educational transformation is not uniform across educational stages. Early childhood education represents a particularly sensitive and underexamined context, as its pedagogical foundations rely heavily on embodied interaction, emotional attunement, and situational responsiveness. Therefore, the introduction of algorithmic systems into preschool settings raises distinct pedagogical and professional concerns that differ fundamentally from those in primary or higher education.

The preschool education stage is characterized by strong physicality, emotionality, and context dependency, and its educational practices are highly dependent on real-time interaction between teachers and young children, nonverbal communication, and the construction of social contexts (Devjak et al., 2020).However, the current intervention of AI systems at this stage is transforming teaching activities into behavior scripts guided by algorithmic predictions, whose logic is standardized, predictive, and automated. This trend poses profound challenges to the cognitive and practical forms of the teacher role (Tyson & Zysman, 2022).

Personalized AI Teaching, as a core application of educational intelligence, is designed based on cross-technologies such as machine learning, emotion recognition, and data analysis, emphasizing dynamic teaching control based on students' cognitive styles and learning trajectories (Lokare & Jadhav, 2023).Although this model has been recognized for improving learning efficiency and individual adaptability, existing research has shown that this technological configuration is often accompanied by a redistribution of authority, whereby teachers are forced to follow AI-generated teaching paths and feedback strategies, leading to a transfer of teaching sovereignty and the marginalization of professional judgment (Alzakwani et al., 2025).

This "de-empowerment" of the teacher's role is not an isolated phenomenon, but is reflected in an institutional configuration, namely the structural state of Technological Subservience. This concept refers to teachers being forced to submit to technological presets and operational logic under the dominance of algorithmic systems (la Velle, 2023).In this context, teachers' professional autonomy, emotional investment, and educational ethics are at risk of being undermined (Nguyen et al., 2022).

This study aims to explore the challenges of technological subservience experienced by preschool teachers in a personalized AI teaching environment through a phenomenological approach. Although this study attempts to maximize the revelation of the deep structure of individual experiences, it inevitably faces the following limitations:The sample area and institutional cultural context limit the breadth of the study's extrapolation; teachers' reflections tend to be meta-constructive, and some experiences may be subjectively processed; and functional heterogeneity caused by differences between manufacturers of

technological systems may cause uncontrollable interference with perceptions of subservience.

Literature Review

Self-determination theory (SDT) argues that individuals' intrinsic motivation and behavior regulation mechanisms are rooted in the continuous satisfaction of three basic psychological needs: autonomy, competence, and relatedness (Guay, 2021).In the context of teacher education and educational technology integration, this theory provides a solid theoretical foundation for revealing the psychological dynamics of teachers' adaptation to emerging technology systems.

Specifically, autonomy can be understood as the choice and decision-making power that teachers have in teaching arrangements and technology integration. Once this sense of control is weakened by external technological forces, their teaching motivation and professional effectiveness are easily suppressed.Research also shows that teachers' perceived autonomy support significantly predicts their teaching commitment and satisfaction in cross-cultural contexts (Zhou et al., 2022; Jeno et al., 2021).

At the same time, competence constitutes a key dimension for teachers to establish efficacy beliefs and psychological stability when facing new technological challenges.If the complexity of the technology system exceeds the existing competence structure of teachers, it is likely to trigger self-doubt and withdrawal from participation (Vasconcellos et al., 2020). Related meta-research also reveals that the strength of teachers' competence in technology use contexts directly affects their intrinsic motivation levels and teaching quality evaluations (Wang et al., 2024).

Relatedness refers to the social connections and emotional embeddedness between teachers and students and among peers. In a context where immersive technologies are increasingly replacing traditional interaction structures, teachers who lack the necessary supportive interactions are prone to professional isolation and identity dissolution (Hensley et al., 2020).Especially in the context of immersive technologies that may disrupt traditional patterns of human interaction, structured collaborative environments and well-designed training programs play a central role in meeting teachers' needs for relatedness (Lan, 2024). Therefore, SDT not only provides a theoretical framework for understanding the process of teachers' technological adaptation, but also lays a solid theoretical foundation for this study.

Methodology

This study adopts a phenomenological qualitative research design to explore the challenges of Technological Subservience in personalized AI teaching among preschool teachers.Phenomenological methodology emphasized the detailed description of embodied experiences in the subject's stream of consciousness and the reduction of phenomena to their meanings (Meihami & Rashidi, 2022). It is particularly suitable for exploring teachers' perceptual understanding and emotional connotations of their professional roles, teaching authority, and cognitive control under highly algorithmic intervention.

The research sample consisted of 20 preschool teachers from central, eastern, and southern China, including 11 female and 9 male. Given the low proportion of male teachers

in the Chinese preschool education industry, the selection intentionally covered diverse gender perspectives. All participants had a bachelor's degree or above and at least 2 years of direct experience in operating and implementing AI-based personalized teaching.Prior to the study, all participants signed informed consent forms, and the project proposal was approved by an ethics review committee, strictly adhering to ethical norms such as voluntary participation, data confidentiality, and protection of interviewee rights.

Data collection employed a semi-structured in-depth interview strategy, with two authoritative scholars in the field of preschool education jointly reviewing and revising the interview outline to ensure that the questions were theory-oriented and practice-oriented.The interview structure incorporated the three core psychological constructs emphasized by SDT: autonomy, competence, and relatedness, thereby deepening the structural analysis of teachers' experiences from the dimensions of intrinsic motivation and identity. Each interview was conducted one-on-one in a quiet, independent space, lasting 40 to 60 minutes, for a total of 1,170 minutes of raw data.All dialogue content was digitally recorded and transcribed verbatim by the research team, then reviewed by the interviewees to verify the accuracy of semantic representation and contextual integrity. To protect participant privacy, all data was managed using a de-identified numbering system (T1 to T20).The analysis process utilized NVivo 15 software as an auxiliary tool to systematically process the textual data. The Colaizzi seven-stage phenomenological interpretation framework was applied to sequentially complete the 7 steps.

Result

This study included 20 preschool teachers as interview subjects, with a relatively balanced gender ratio: 11 female and 9 male. In terms of actual experience with personalized AI teaching, 12 teachers had 2 years of teaching experience, 5 had 3 years of experience, and 3 had 5 years of experience.Through systematic analysis and horizontal comparison of the interview texts from T1 to T20, it can be clearly observed that the key themes expressed by teachers in the personalized AI teaching environment exhibit high consistency across different genders and experience backgrounds.The codes and sub-codes of Challenges of technological subservience among preschool teachers in personalized AI teaching based on interviews obtained from NVivo 15 can be found in Figure 1.
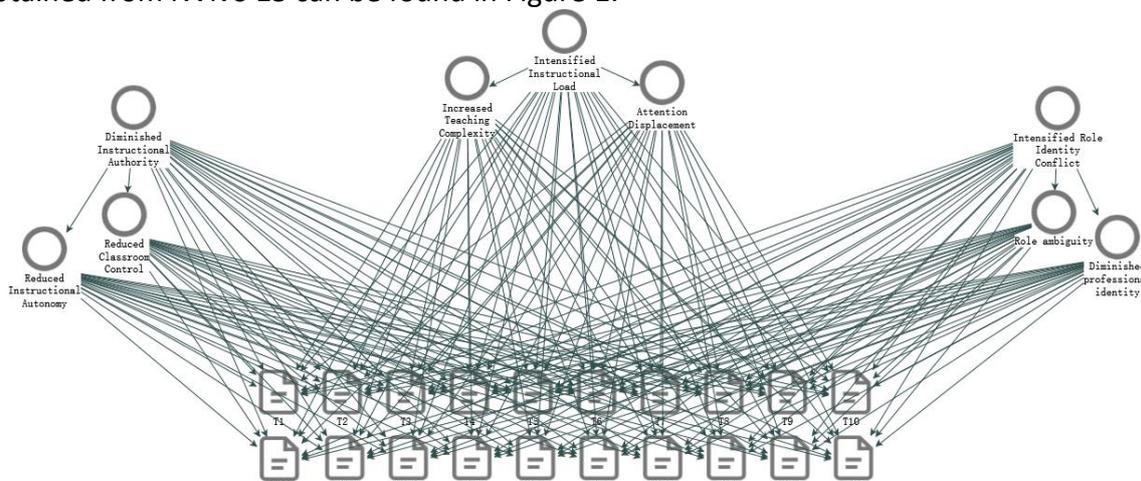

Figure 1 - Codes and sub-codes of Challenges of technological subservience among preschool teachers in personalized AI teaching based on interviews.

Diminished Instructional Authority

T1-T20 generally showed a structural experience of erosion of their teaching authority. The mother proposition, Diminished Instructional Authority, is mainly reflected in two sub-propositions: Reduced Instructional Autonomy and Reduced Classroom Control. This dual phenomenon can be seen as a direct manifestation of the systematic suppression of the basic psychological need for autonomy in SDT.

In terms of reduced instructional autonomy, the pre-set mechanisms of the systematic algorithmic structure substantially reduce teachers' agency and discretion in teaching situations.Teachers are gradually transforming from active builders of educational paths to passive executors of technical instructions. T5 believes that the system usually provides a number of pre-set templates containing basically fixed materials, contexts, and interaction methods. Although teachers can combine them within the framework, they lack the possibility of designing courses from scratch. T6 pointed out that the setting of functional modules and teaching scripts in AI platforms does indeed limit their teaching flexibility during implementation,and that the high degree of dependence on technology often interferes with their ability to make immediate teaching decisions.T20 clearly pointed out:"This technology-based operating mechanism does bring a certain degree of operational pressure... Teachers have almost no buffer space."

In terms of reduced classroom control, the shift in teachers' professional identity from teaching leaders to executors is becoming increasingly prominent. The role of teachers has been reconfigured as order maintainers, process regulators, and data feedback coordinators, with their involvement in teaching rhythm and cognitive construction gradually decreasing. T5 believes that their responsibilities are more like rhythm coordinators or task issuers, rather than guides for knowledge construction. T8 pointed out thatteachers play more of a monitoring and coordination role, mainly responsible for maintaining order and responding to emergencies, rather than being knowledge-centered leaders. T10 believes that in a context where the system logic is predetermined and the teaching path cannot be changed, their teaching creativity is significantly limited.

Intensified Instructional Load

Intensified Instructional Load consists of two structural sub-dimensions: Increased Teaching Complexity and Attention Displacement. In the context of the deep integration of personalized AI teaching into preschool education practice, the responsibilities of teachers have shifted from traditional knowledge transfer and child guidance to multidimensional operations that take into account system execution, platform debugging, and multi-task interaction coordination.Although this shift has increased the diversity of teaching forms and technological richness, it has also significantly increased the teaching load faced by teachers, posing a challenge to their competence, i.e., their self-efficacy and psychological support in coping with complex teaching tasks.

In terms of increased teaching complexity, teachers generally reported that their tasks had clearly gone beyond the boundaries of traditional teaching, with pre-class preparation,process control, and on-site technical coordination constitute a highly complex cognitive and operational load. T5 believes that the most energy-consuming parts are mainly concentrated in the preliminary equipment testing and technical support during the

classroom implementation stage. T6 pointed out that most of his teaching energy is consumed in technical preparation before teaching and continuous control during system operation. T8 said, "Repeated testing of system stability before teaching and technical maintenance during on-site operation… easily lead to distractions."T15 also admitted, "Debugging, parameter setting, updating, and maintenance require precise coordination at every step. This complexity made me wonder if I could still focus on the teaching content itself."

Under the sub-proposition of Attention Displacement, most teachers pointed out that the frequent switching of attention between teaching itself and system operations weakened their focus on teaching. T6 believed that this additional burden of technical execution diluted their attention to teaching content. T8 also admitted, "Sometimes it really distracts me and makes it difficult to fully devote myself to teaching."T9 pointed out that frequent system scheduling and student operation guidance tasks frequently interrupted the rhythm of their teaching, disrupting the original teaching path arrangement. T18 said that teachers must monitor student status and adjust feedback strategies in real time during the classroom implementation process, and this kind of multitasking significantly increases the cognitive load. T17 further pointed out: "This kind of multitasking often distracts teachers and reduces their focus on in-depth teaching of course content."T20 summarized: "Although behind-the-scenes preparation is not directly reflected in teaching outcomes, it is the foundation for ensuring an immersive teaching experience… It may indeed distract teachers from focusing on the teaching content itself to a certain extent."

Intensified Role Identity Conflict

Intensified Role Identity Conflict can be broken down into two structural sub-propositions: Diminished Professional Identity and Role Ambiguity.According to SDT, relatedness is a basic psychological need, emphasizing the importance of individuals establishing a sense of belonging and gaining recognition in social situations. However, many of the teachers interviewed expressed that their professional identity and role positioning are facing unprecedented challenges in a teaching ecosystem deeply involved with AI.

In terms of diminished professional identity, teachers generally feel that AI-led teaching logic is weakening their sense of existence as the main subject of education. T6 believes that the interactive logic of AI systems often dominates the teaching process, passively embedding the role of teachers in the system settings and presenting a clear trend of marginalization. T8 further pointed out, "Sometimes I am confused myself. Am I teaching or providing technical support?"T7 pointed out that in technology-driven immersive teaching environments, teachers tend to be positioned as organizers and task coordinators of the teaching process, rather than education leaders in the traditional sense. T10 believes thattheir role is more like that of a system operator and teaching organizer, constantly switching between knowledge transfer and technology management. T11 pointed out that the timing of system operations and technical failures often cause them to lose their teaching leadership and even feel alienated from their profession. T18 believes that teachers' passive response mechanism to system commands weakens their initiative and emotional stability in teaching.

In terms of role ambiguity, teachers need to play multiple functional roles at the same time, and there are no clear boundaries between the division of responsibilities and the

execution of behaviors, which leads to a deep-rooted dilemma in role positioning. T6 pointed out that he often finds himself caught between the dual tasks of technical control and student observation in the classroom,which causes them to vacillate between the roles of assistant and guide. T7 believes that the current identity dilemma is no longer a weakening of traditional roles, but rather a transformation to a composite structure. T17 described: "Teachers need to transform into hybrid facilitators, that is, simultaneously managing cognitive guidance and system logic."T19 believes that the diversity of responsibilities under AI teaching platforms often leads to frequent task switching and confusion in role positioning, significantly increasing their professional stress.

Discussion

This study analyzes the structural dilemmas faced by preschool teachers in real teaching situations in the context of personalized AI teaching from the core perspective of technological subservience. First, preschool teachers face the challenge of diminished instructional authority. The main proposition of diminished instructional authority is manifested in two sub-propositions: reduced instructional autonomy and reduced classroom control. The reduction of decision-making space and content discretion is not an isolated phenomenon, but a systemic logic embedded in the platform architecture.Although some teachers have achieved a certain degree of content restructuring and path customization thanks to their high technical literacy, such autonomy is still limited by the openness of the platform and the flexibility of the interface, and cannot form a universal operating experience. This theme closely corresponds to the systematic compression of autonomy in SDT, revealing the deep mechanism of the restructuring of teachers' discretionary space.

Second, preschool teachers face the challenge of Intensified Instructional Load.The main proposition of Intensified Instructional Load can be broken down into two sub-propositions: Increased Teaching Complexity and Attention Displacement. The focus of teaching has shifted from the original content of children's cognitive and emotional support to system operation and platform stability maintenance, forming a structural dispersion of cognitive focus.This asymmetry in the allocation of teaching resources and the fragmentation of operational tasks have gradually evolved into the core manifestation of the "hidden burden" of the teacher's role, substantially weakening their sense of competence and control. This phenomenon is closely related to the limited dimension of competence in SDT, manifesting itself in the weakening of teachers' self-efficacy and the overuse of their psychological capacity in a technology-driven environment.

Finally, preschool teachers face the challenge of Intensified Role Identity Conflict. The main proposition, Intensified Role Identity Conflict, is broken down into two sub-propositions: Diminished Professional Identity and Role Ambiguity.In the field of personalized AI teaching, the identity of teachers has transformed from traditional knowledge transmitters and class leaders to teaching process coordinators, platform technology operators, and data execution coordinators, forming a complex structure in which multiple roles coexist. This decentralization trend has weakened the professional connection between teachers and the educational community, constituting a key challenge to the reconstruction of their professional identity system, which clearly corresponds to the continued weakening of the relatedness need in SDT.

Conclusion and Implication

Through a phenomenological approach, this study focuses on the issue of technological subservience faced by preschool teachers in personalized AI teaching environments, revealing the deep-rooted mechanisms of disruption caused by this technological context on teachers' teaching dominance, task load, and professional identity.The study clearly identifies three types of structural core dilemmas: diminished instructional authority, intensified instructional load, and intensified role identity conflict. These three tensions not only constitute the challenging experiential structure of teachers' actual teaching practices, but also reflect the profound tension between textual power relations and educational professionalism in the process of human-machine collaboration.

Based on this, future research should be deepened from the following dimensions:

A theoretical model centered on "teacher technical control rights" should be further constructed to analyze the compression mechanism and recovery path of teacher autonomy in a personalized AI environment and expand the understanding of individual agency under Technological Subservience. Cross-level comparison methods can be used to focus on the heterogeneous manifestations of AI intervention in teacher role reconstruction in different educational stages and institutional contexts, and to construct more targeted technical governance and teacher support strategies.Intervention mechanisms for regulating teachers' cognitive load should be developed, combining AI visualization feedback, task flow redesign, and emotion regulation tools to alleviate the deep fatigue caused by cognitive fragmentation and attention dissipation. Future research should be encouraged to introduce diverse perspectives from students and families to explore the role of AI teaching systems in reshaping the teacher-student-parent triangle and promote the formation of a human-machine collaborative community with teachers as the core node.

This study contributes to the social sciences by introducing technological subservience as an analytical lens for understanding teacher–technology relations in personalized AI teaching contexts. By focusing on preschool teachers, it extends existing discussions of educational digitalization into an underexplored professional group characterized by strong emotional labor and embodied pedagogy. The identification of three structural dilemmas— diminished instructional authority, intensified instructional load, and role identity conflict— offers a conceptual framework for examining how AI systems reshape professional agency in human–machine collaboration. This contribution enriches sociological and educational research on technology, labor, and professional identity in contemporary digital societies.

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