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The Impact of Generative AI-Driven Personalized German Listening and Reading Tasks on College Students' Self-Directed Learning Engagement

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Abstract

It is widely recognized that listening and reading instruction are crucial components of foreign language teaching, and German is no exception. Leveraging its technological advantages, generative artificial intelligence (AI) can support students' learning of German listening and reading. This study adopts self-determination theory as the analytical framework, focusing on personalized German listening and reading tasks completed by students in the "2+3" program at Zhejiang University of Science and Technology under AI-driven instruction, to explore the impact of AI on students' autonomous engagement in German listening and reading. The study aims to clarify the intrinsic relationships among AI technology, students' learning motivation, and their autonomous involvement in German listening and reading, to identify both the strengths and limitations of AI-enhanced German instruction, and thus provide theoretical foundations and practical insights for optimizing AI-driven personalized German listening and reading teaching models, stimulating students' motivation, and improving the quality of autonomous learning in these areas.

Keywords

German Listening and Reading; AI; Independent Learning; Self-Determination Theory.

1. Introduction

Since 2000, Zhejiang University of Science and Technology has successively launched undergraduate joint training programs with nine public universities in Germany (hereinafter referred to as the "2+3" program). During the two-year study period, selected students are granted the opportunity to pursue three years of further studies at their partner institutions in Germany. Upon graduation, students receive both bachelor's degree certificates from the Chinese and German universities involved. German language instruction serves as a fundamental guarantee for the smooth operation of the "2+3" program, and its effectiveness directly affects whether students can pass the German language proficiency exam required for studying abroad.

In recent years, generative AI technologies, represented by large language models, have advanced rapidly. Generative AI excels in real-time content generation, multidimensional adaptation, and contextual simulation, enabling it to dynamically create highly personalized listening and reading materials as well as interactive tasks tailored to learners' interests, language proficiency, academic backgrounds, and even emotional states. This technological potential not only revolutionizes content production methods but may also fundamentally reshape learners' autonomous learning experiences [1].

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2. Research Background

In the "2+3" German language teaching approach, listening and reading skills have consistently been both a key focus and a major challenge in instruction. For a long time, the listening and reading tasks in the "2+3" program have relied solely on specific listening and reading passages and exercises from designated textbooks, largely ignoring students' actual German proficiency levels and interests. This approach leaves many learners without clear motivation or initiative when completing tasks that are neither suitable nor appealing to them, ultimately undermining their German language learning outcomes at the institutional level.

Generative AI demonstrates outstanding capabilities such as real-time generation, multi-dimensional adaptation, and context simulation, enabling it to create personalized listening and reading materials and tasks tailored to learners' language proficiency and interests. When listening tasks align with students' interests and match their actual German proficiency level, their learning motivation significantly increases along with greater engagement in learning. However, current academic research on AI applications in foreign language listening and reading tasks remains limited, with particularly scarce studies specifically focused on German language teaching.

Generative AI tools such as DeepSeek and DouBao, leveraging their capabilities in natural language generation, real-time feedback, and multi-round interaction, open up new possibilities for creating personalized learning tasks. The AI can automatically generate tailored learning materials based on learners 'needs, such as listening comprehension and reading comprehension passages aligned with students' interests. Additionally, it can produce articles in various language levels on the same topic.

Learning engagement serves as a key indicator of learning quality, encompassing multiple dimensions such as behavioral engagement, cognitive engagement, and emotional engagement. In the context of self-directed learning, students are freed from classroom constraints, and their level of engagement depends primarily on their personal learning motivation. The Theory of Self-Determination posits that when the learning environment meets learners' three fundamental psychological needs—autonomy, competence, and belonging—it more effectively fosters their motivation to learn and promotes deep engagement in the learning process. The personalized listening and reading tasks developed by generative AI enable students to independently select learning materials, control their study pace, and monitor tangible improvements in their German proficiency through real-time, specific feedback—fully addressing students' needs for autonomy, skill development, and a sense of belonging.

This study adopts the Self-Determination Theory as its analytical framework—a theory developed and refined by Deci and Ryan—that profoundly elucidates the continuum of human motivation evolving from external regulation to internal identification. It highlights that fulfilling three fundamental psychological needs—autonomy, competence, and relational connection—is essential for learners to sustain and deepen their autonomous engagement in learning. In generative AI-driven personalized listening-and-reading tasks, AI technology grants students freedom of choice, adaptive difficulty levels, and context relevance—precisely aligning with their autonomous learning needs, skill requirements, and sense of belonging, thereby demonstrating strong theoretical validity.

Based on this, this study aims to address the following question: How do generative AI-driven personalized German listening and reading tasks influence college students' engagement in self-directed learning?

How do the internal experiences and levels of engagement vary among different learners under AI-driven interventions?

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3. Definition of Core Concepts

Generative AI-powered personalized German listening and reading tasks enable teachers to create materials tailored to students' proficiency levels, interests, and other needs—ensuring optimal alignment in theme, difficulty, length, and instructional objectives.

Student self-directed learning engagement refers to the sustained, positive psychological and behavioral responses demonstrated by students during their extracurricular German listening and reading self-study activities toward generative AI-driven personalized tasks. Broadly speaking, self-directed learning engagement can be categorized into three dimensions: behavioral engagement, cognitive engagement, and emotional engagement [2].

Behavioral engagement is reflected in the frequency and duration of students logging into the platform, completing tasks, and engaging in extended learning; cognitive engagement manifests in the extent to which students employ deep-processing strategies and practice self-reflection during learning; emotional engagement pertains to students' interest in listening and reading tasks as well as their emotional responses.

The Self-Determination Theory (SDT), proposed by Deci and Ryan, is a macro-level framework for explaining human motivation, emotion, and behavior regulation. It emphasizes the fulfillment of three fundamental psychological needs—innate autonomy, competence, and relationships—and serves as the core mechanism through which external environments transform into internal motivations, fostering engagement and healthy development [3][4].In this study, this theory serves as an analytical framework for examining how generative AI-driven personalized tasks influence autonomous learning engagement. Specifically, AI-driven personalized listening and reading tasks address students' autonomous needs by granting them choice; fulfill their competency needs through real-time support and interaction; and satisfy their relational needs by providing AI-generated feedback and engagement.

4. Research Design

First, teachers conduct a questionnaire survey among students to identify their interests and hobbies. Next, the teacher uses AI to generate listening and reading comprehension materials tailored to each learner's specific needs. For example, a first-year student in the first semester shows interest in German cuisine, while the instructor provides prompts such as DeepSeek and Doubao: "I am a German language teacher at Zhejiang University of Science and Technology. Please write an A1-level listening passage on German cuisine, approximately 500 words long, along with five multiple-choice questions and five reading comprehension questions." Through this process, teachers obtain a variety of reading comprehension materials covering different genres such as short news articles and everyday dialogues. Teachers categorize listening comprehension materials based on two dimensions—theme and difficulty—and then publish them on the online course platform. The teacher suggested that students could use AI to assist in understanding listening materials. Additionally, after completing the listening and reading tasks, students should use AI-generated text materials on the same topic for further learning. Using the same method, the teacher employed AI to generate several reading comprehension materials.

This study employed purposeful maximum difference sampling, selecting 10 students from Zhejiang University of Science and Technology's "2+3" program as the research subjects. The selection of this group was primarily based on three considerations: first, these students possess fundamental German language skills at levels A1 to A2 according to the Common European Framework of Reference for Languages (CEFR), enabling them to comprehend general reading materials but without developing specific autonomous learning strategies; second, they have grown up alongside rapid advancements in information technology and are

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capable of engaging with generative AI in their German learning; third, these first-year students have never visited German-speaking countries and have not previously used any AI tools systematically to support their German learning. This study was conducted over one semester, and at the end of the semester, teachers conducted semi-structured in-depth interviews with these 12 students. The interview questions are closely aligned with the Theory of Self-Determination, focusing on experiences of autonomous support, perceptions of capability changes, feelings regarding interpersonal connections, and cognitive and emotional responses to AI-driven personalized tasks, as shown in Table 1.All interview content was coded and analyzed using the thematic analysis method. The coding process begins with the core concepts of self-determination theory—autonomy, competence, and belonging—and is further refined through repeated review of interview transcripts and supplementary materials. Meanwhile, teachers gather supplementary research materials by collecting students' reflective journals and other related documents. The reflection journals require students to document their learning reflections while completing AI-driven, personalized German listening and reading tasks. Each student submits one entry per month with no word limit; ultimately, the study collected 32 valid reflection journals.

Table 1. Semi-structured interview questions

Number	Interview Questions Regarding Listening/Reading Comprehension Articles
1	Have you selected an article?
2	Why did you choose these articles?
3	Are you interested in the article's topic?
4	Is the difficulty level of this article appropriate for your language proficiency?
5	Do you use AI to help understand the content of the article?
6	How does AI assist you?
7	Are these measures effective?
8	Have you used AI to generate other articles on the same topic?
9	Do you think these articles are helpful for your German language learning?
10	How have your emotions been during this process? How was your harvest?

5. Research Process

5.1. Analysis Framework

Building on the theory of self-determination, this study aims to develop an analytical framework that explains how generative AI-driven personalized German listening and reading tasks influence students' autonomous learning engagement. The Theory of Self-Determination emphasizes that fundamental human psychological needs encompass the fulfillment of autonomy, competence, and relational connections. This is the prerequisite for stimulating human intrinsic motivation and fostering deep engagement. This study applies the theory to AI-enhanced German listening and reading learning, positioning generative AI as a dynamic "demand-support system" that fully addresses students' three key psychological needs through personalized content generation, real-time feedback, and adaptive adjustments, thereby significantly enhancing their behavioral, cognitive, and emotional engagement in German listening and reading tasks.

Specifically, the framework is structured as follows: "Generative AI creates German listening and reading materials → Students' psychological needs are met → Diversified engagement in self-directed learning emerges. "The entire process emphasizes personalization: first, content personalization—teachers create listening and reading materials with appropriate difficulty

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levels and themes tailored to learners' language proficiency and interests; second, process personalization—students gain accurate understanding of the materials through real-time AI interaction and feedback; third, pathway personalization—students independently manage their study schedules. These three elements work synergistically to achieve "self-supportive," "competency-supportive," and "contextually supportive" approaches. "Self-supportive" refers to learners perceiving their autonomy in listening and reading tasks rather than being passive executors; "competency-supportive" means learners experience a sense of control and progress when completing appropriately designed tasks generated by AI; "connection-supportive" denotes the cognitive alignment between students and AI-generated content, as well as the companionship provided by AI as a learning assistant. Generative AI can accurately address these three needs, enabling students to activate intrinsic motivation and drive their autonomous learning engagement from surface-level to deep-level engagement.

The diverse manifestations of students' engagement in self-directed learning are as follows. In terms of behavioral engagement, this is reflected in prolonged time spent on German listening and reading tasks and high task completion rates; cognitive engagement is demonstrated through proactive exploration of word meanings and grammatical rules in German listening comprehension and reading comprehension; emotional engagement is evident in positive acceptance and enjoyment of learning tasks, as well as favorable attitudes toward AI-assisted understanding. The investments across these three dimensions are not isolated but work synergistically together.

In summary, this analytical framework integrates behavioral, cognitive, and emotional engagement within a unified explanatory framework, arguing that generative AI-driven personalized listening tasks do not rely solely on AI itself to enhance engagement, but rather interact synergistically with cognitive and emotional engagement by modulating the interaction between individuals and their environment.

5.2. Data Analysis Strategy

First, the task is highly controllable. The surveyed students agreed that the listening and reading comprehension materials developed by teachers using generative AI, tailored to students' language proficiency and interests, are highly suitable—both motivating learning engagement and enabling students to feel capable of completing tasks, thus encouraging them to invest time and effort.

Second, the task completion rate is high. The surveyed students agreed that they were permitted to use AI tools during the task completion process. As a result, students often rely on AI to learn unfamiliar words in listening and reading comprehension materials, encounter completely unfamiliar grammatical structures, or become acquainted with little knowledge of German culture and national context. Some students also use AI to analyze the reasons behind their mistakes in listening comprehension and reading comprehension questions. Students unanimously agree that AI-assisted learning plays a significant and highly effective role.

Third, there is minimal supervisory pressure. The real-time, non-judgmental feedback provided by AI offers students significant support—without any sense of pressure. This "low threat, high response" interaction model eliminates students' defensive avoidance when performing tasks incorrectly, instead stimulating their curiosity and competitive drive, thereby fostering a willingness to continue attempting the tasks.

5.3. Analysis Results

Through thematic analysis of semi-structured interview data from 12 participants, this study identified four core themes regarding how generative AI-driven personalized German listening and reading tasks influence autonomous learning engagement: the reconstruction of autonomy experiences, dynamic differentiation of competence perceptions, redefinition of interpersonal

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connections, and in-depth characterization of engagement states. These themes collectively demonstrate how personalized AI aligns with the fundamental psychological needs emphasized by self-determination theory, thereby reshaping students' engagement in German language learning.

In terms of students' independent learning experience, most learners said they gained a stronger sense of control and ownership over their study. Teachers use generative AI tools such as DeepSeek and Doubao to create customized listening and reading materials instantly. These materials match students' personal interests and current language level. Many students mentioned that this breaks the limits of fixed textbooks. One student shared that the well-matched learning content makes them feel responsible for their own German learning. Even so, this freedom does not come without limits. Some students pointed out that too many AI learning options can make decision-making difficult. They sometimes spend a long time browsing resources but end up feeling like they have learned nothing, which causes learning anxiety. This shows that AI can only support effective learning when students have clear learning plans and goals. Without clear objectives, AI-assisted learning may become an extra burden for students.

Students' sense of learning competence also varies from person to person. Most students feel capable and confident when the difficulty of AI-generated listening and reading materials is appropriate, as they can master the content with moderate effort. A student with hearing difficulties mentioned that they can understand about 70 percent of the learning content by themselves, and this feeling of being close to success greatly motivates them. Students also highly value the instant feedback and error analysis provided by AI. In their learning journals, many students wrote that AI helps them figure out why they made mistakes. Unlike teachers who cannot always reply in a timely manner and may be disturbed by repeated questions, AI allows students to ask questions and communicate repeatedly without hesitation. Therefore, students find it much more convenient to learn and solve problems through continuous dialogue with AI.

The last key change is students' new sense of connection in learning. Interacting with AI creates a unique learning bond for learners. Many students regard conversational AI as a study partner or a patient language practice friend. They say AI provides non-judgmental company, which greatly eases their social anxiety during listening and oral practice. Students can practice German with AI freely without worrying about making mistakes or facing impatience. This perfectly solves the problem of lonely and isolated language learning after class. In addition, students can work with AI to create more learning texts on the same topic, then share these resources in group study. This forms a new way of peer interaction centered on AI tools. Some students are curious about whether AI can truly understand their personal interests and language level, which makes group learning more interesting. However, AI cannot completely replace real teacher-student communication. As one student noted, they still rely on teachers' professional guidance and feel unsure about their learning without teachers' support.

The fourth theme comprehensively depicts the behavioral and emotional manifestations of learning engagement. Regarding behavioral engagement, most students reported that utilizing fragmented time has become a routine practice. Task learning strategies have become more refined: students, for instance, actively request AI assistance with providing alternative grammatical explanations, generating additional German articles related to the topic, and analyzing the reasons behind their task performance errors. Emotional investment manifests as a blend of positive and negative emotions. Positive emotions manifest as students 'strong curiosity and immersion: "I feel AI is an inexhaustible treasure trove, and I've unknowingly spent an hour learning." Negative emotions include burnout stemming from technological dependence and anxiety triggered by technical failures. A student wrote in their reflection journal: "AI seems to control my emotions—making me happy when it aligns with the task, but

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easily causing anxiety when it doesn't." Notably, nearly all students acknowledged that AI-assisted learning offers more advantages.

6. Main Research Findings

This study, using a mixed-methods design, explored from the perspective of self-determination theory how generative AI-driven personalized German listening and reading tasks affect college students' engagement in autonomous learning, and drew the following main conclusions.

First, at the level of basic psychological needs, generative AI-supported personalized tasks significantly enhanced students' autonomy, competence, and sense of belonging. In terms of autonomy, teachers were able to use AI to generate listening and reading materials based on students' interests and language levels, while students could choose materials according to their own interests and skill levels. This sense of control effectively alleviated the passivity often experienced with traditional textbooks. In interviews, students repeatedly mentioned, "I can decide what to study myself" and "I control the pace," which confirmed the strengthening effect of autonomy support. AI tools can adjust learning difficulty in real time and give clear, instant feedback, which helps students keep getting a sense of achievement in their studies. Even when students encounter difficult German listening and reading exercises, the AI can offer targeted hints to help them out. This stops students from feeling discouraged and stressed, making German listening and reading learning much easier to handle.

As for learning engagement and a sense of connection: even though AI is not a real person, it can customize learning content to match students' personal hobbies. It can also fully understand what students want to express in interactive conversations, making students feel noticed and valued. In addition, some learning tasks designed with AI support peer sharing and group cooperation. The interesting and varied learning materials created by AI also greatly encourage students to interact and communicate with their classmates in group study.

What's more, when students' basic learning psychological needs are met, they will take the initiative to learn in many different ways. In terms of learning behavior, interviews with students show that they become more active in their studies. For example, they will take the initiative to look up relevant learning content recommended by AI on their own. When it comes to learning thinking, students no longer only do superficial learning. Instead, they adopt more in-depth learning methods: they will analyze and sort out complex sentences over and over again with the help of AI, and take the initiative to learn grammar knowledge and cultural background through AI explanations. Emotionally, students have more positive learning feelings and fewer negative ones. They are far more interested in and curious about German listening and reading, and gain more joy from learning. Meanwhile, they feel less anxious and tired in class. This positive change in learning emotion is very important for long-term language study, especially for German teaching under the "2+3" teaching mode.

Overall, personalized German listening and reading tasks work well because of the dynamic interaction between students themselves and their learning environment. The study found that even students who start at roughly the same level become more engaged in learning in completely different ways. Students who learn independently tend to use AI's open creation functions right away to explore German learning content they are interested in. In contrast, students who used to rely on external guidance need a gradual transition: they first depend on AI's organized prompts and guidance, and slowly learn to make learning decisions on their own. Ultimately, both types of students become more engaged in their studies. This proves that generative AI can fit different students' learning motivations and habits. The study also identifies a key factor called "content resonance". When listening and reading learning materials are related to students' major background, future career goals or real-life experiences, language learning is no longer just a routine learning task. Instead, it becomes a process for

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students to recognize themselves and gain meaningful learning experiences. This genuine emotional and cognitive resonance improves students' learning engagement far more effectively than simple tech-based interesting learning forms.

To sum up, this study confirms that personalized German listening and reading tasks powered by generative AI can meet students' basic psychological needs. They help students learn more independently, build stronger learning ability, and feel more connected to their studies. As a result, students show greater engagement in behavior, thinking and emotion during learning. This improvement does not come simply from using AI technology itself. It mainly depends on whether the learning tasks are well designed: offering useful learning choices, setting suitable and challenging exercises, and connecting course materials to students' personal experiences and inner thoughts. These results bring practical guidance to German listening and reading teaching in the "2+3" project at Zhejiang University of Science and Technology. They also provide real evidence for applying self-determination theory to foreign language teaching with educational technology, and offer references for designing student-oriented, smart language learning environments. This study adopts qualitative research as the main method. Future studies can carry out quantitative analysis or explore the same research topic from teachers' perspectives.

Funding Projects

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