

How AI tools can enhance children's intrinsic motivation for foreign language learning

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Abstract. This paper investigates the potential of AI tools, particularly AI pens such as the Caterpillar pen, to enhance children's intrinsic motivation for English language learning in China. Compared to traditional exam-oriented English education in China, the AI pens offer a more engaging and natural language environment through features like audio readings with native pronunciation, graded difficulty levels for various reading abilities, and repetitive exposure to vocabulary and sentence structures. These features can significantly increase children's intrinsic motivation by making learning enjoyable and effective. However, challenges such as limited research on AI's impact on intrinsic motivation and the ongoing need for parental supervision exist. To maximize the benefits of AI tools, they should be integrated into daily learning activities and used in conjunction with traditional teaching methods as opposed to replacing these methods. In this way, AI technology can become a valuable asset in fostering a love of language learning and in turn improving children's overall language proficiency.

Keywords: AI educational tools, intrinsic motivation, foreign language learning, AI pen, children's education

1. Introduction

In China, foreign language learning is commonly exam-oriented and focused on grammar, leading to a situation where many students can achieve good exam results from Grade 1 to Grade 12. However, studies have suggested that despite these good exam results, student's actual long-term language proficiency, especially in terms of listening and speaking, is limited [1]. Frequently, by the time they reach college age, their English proficiency may not even reach the level of difficulty of English books that 12-year-old children in other native speakers can read, whether they are novels or nonfiction [1]. This prolonged emphasis on exam-oriented education fails to cultivate students' intrinsic interest in learning English; instead, compelled by others or focused on exam results, they might find themselves losing confidence and more likely to abandon learning a second language.

Consequently, many parents and teachers now aspire to alter the ineffective methods they experienced when learning English in their childhood and adopt methods that simulate a native language environment and are effective at enhancing intrinsic motivation for learning English. In this essay, I will focus on a case study of the use of AI technology – specifically focusing on what's known as AI pen tools combined with graded books – and demonstrate how these tools offer an environment that closely resembles the natural language environment.

AI driven products can significantly improve the efficiency of work and learning especially in learning and development function [2]. In this essay I focus on the case of the “little bean Caterpillar AI-Pen” (the Caterpillar AI-pen), a technology created by LittleBean (see Figure 1 below for image).



Figure 1. Image of Caterpillar pen (source – URL)

The Caterpillar-AI pen functions in a number of ways. First, it utilizes audio readings to encourage children to have conversations as native English speakers. Second, the Caterpillar AI-Pen also grades the difficulty of English books according to the actual situation. These grades cover a wide range of genres such as fiction and popular science non-fiction. The difficulty of these books is graded from easier levels to more difficult levels. Lower-level vocabulary and sentence patterns are also reiterated in different contexts to help students master them over time. By using the Caterpillar AI-Pen to immerse children in native-like pronunciation and authentic language learning environments for an extended period of time, this essay will suggest that the Caterpillar AI-Pen has the potential to enhance children’s intrinsic motivation to learn English and increase the effectiveness of their English learning.

However, there are gaps in the research on the effectiveness of AI technology in fostering intrinsic motivation and increasing the effectiveness of learning English. This essay aims to fill these gaps. This essay will not only provide educators with information about a new teaching tool but may also have a profound impact on the future use of educational technology. I will argue that understanding how to effectively implement these new tools into traditional teaching and learning can improve the quality of education and contribute to educational equity.

2. The use of AI tools in children’s education

The Caterpillar AI-pen works in the following way. It can read books and be paired with English-Chinese flashcards, which can look up 15,000 words, enabling users to create audio books themselves. In addition, by connecting to the accompanying app via a QR code, parents or teachers can download a wealth of additional reading resources. This pen also has the potential to strengthen parent-child bonds through its self-recording function. Parents can record themselves reading stories, singing nursery rhymes, or leaving personalized messages for their children to listen to anytime. For situations when parents are away, the Caterpillar AI-pen has a Micro Chat function that can facilitate parents to communicate with children. The pen also offers multiple reading modes, including singing, learning to sing, and standard reading, catering to different learning styles. Finally, the gamified learning approach can enable children to have fun while acquiring new knowledge.

As of August 2024, the Caterpillar AI pen retails for \$50 (<http://m.tb.cn/h.g9JeGbCoJK171ss?tk=xyEd3WOKvrR>). In contrast, a private English tutor costs approximately \$100/hour, so the pen is much more affordable than private tutoring [3]. This means that children from a wider range of socioeconomic backgrounds can access the same learning tool and the same quality of educational content. For example, in China, children living in first-tier cities such as Beijing have easier access to opportunities for learning foreign languages, studying English with native English-speaking teachers, or encountering more English original books compared to children in less developed cities. Nevertheless, by utilizing the Caterpillar AI-pen, children from any socioeconomic background can have equal access to this educational resource for learning. This encourages more children to participate. The core functionality of the Caterpillar AI-pen is graded reading. By offering a spectrum of reading storybooks from simple to complex, it can accommodate children with different English proficiency levels, mitigating the sense of difficulty in learning English. Moreover, through engaging English stories, it stimulates children’s intrinsic motivation to learn, boosting their overall learning experience. This aspect can significantly impact children’s learning journeys.

However, there are valid concerns regarding the use of this technology, and parental or teacher supervision remains necessary. Firstly, with some AI pens, children can encounter various unexpected issues when they start using them, such as being unfamiliar with the functions of the AI pen, accidentally selecting the wrong line while reading, or inadvertently skipping the reading and just looking at the pictures. Secondly, students may be tempted to exceed the recommended usage time, strain their eyes, and occasionally get distracted by searching or browsing unrelated content while ostensibly using it for learning purposes. In addition, during a child’s development journey, interaction with peers is crucial as it enhances their social and expressive skills, contributing

significantly to their overall growth[4]. However, excessive use of electronic devices may hinder these interactions, negatively impacting a child's social development. Consequently, parents and teachers must be vigilant of how to assist children in managing electronic device usage and allocating time for social activities.

In this essay, I will leverage my years of experience as an educational technology blogger and parent in China to examine the AI pen and suggest methods to overcome these challenges and use it effectively to improve children's literacy. In 2019 while assisting my children with their English homework, I noticed the potential of technology like AI pens to improve foreign language learning. I started using the pen with my own children and then developed a network of parents and teachers. I currently have three WeChat groups, each consisting of around 300 parents. Three years ago, I shared on social media and within these three groups methods for using the Caterpillar AI-pen to help children learn English, and I received a lot of engagement and adoption from parents. Through communication with parents, I found that firstly, many children, compared to the previous dull English grammar classes, were more inclined to spend time listening to English stories with the Caterpillar AI-pen, which increased their interest in learning English. Secondly, because they were immersed in the pronunciation of native speakers through the Caterpillar AI-pen for a long time, their listening skills improved compared to before. This is because traditional English learning skills only focused on independent reading and paper tests. Finally, some children would try to express themselves in English, and their pronunciation sounds more like that of native speakers, which is a significant advantage compared to learning English from Chinese teachers' pronunciation in the classroom.

3. Intrinsic Motivation

According to psychologists Ryan and Deci [5], intrinsic motivation is defined as the doing of an activity for its inherent satisfaction rather than for some other consequence. When intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of external products, pressures or reward.

For example, when children learn a foreign language, they can become fully immersed in the content by reading stories. This immersion increases their curiosity as the story develops, making the activity engaging. They may feel a sense of pleasure when exploring new knowledge and language, perceiving it as fun, almost like a game. In this scenario, their behavior is driven by intrinsic motivation. Curiosity is a form of intrinsic motivation that is key in fostering active learning and spontaneous exploration [6]. Recognizing the crucial role of curiosity in learning, educational systems increasingly emphasize fostering intrinsic motivation to achieve more engaging and effective educational outcomes [6]. Thus, it is highly important to develop a fundamental understanding of intrinsic motivation, including curiosity's mechanisms, especially in addressing the educational challenges of the 21st century.

To gain a better understanding of intrinsic motivation and how to enhance it, it's helpful to understand its counterpart, which is extrinsic motivation. Extrinsic motivation is a construct that pertains whenever an activity is done in order to attain some separable outcome. Long-term reliance on extrinsic motivation can lead to decreased academic engagement and creativity, as studies have shown. Extrinsic motivation thus contrasts with intrinsic motivation, which refers to doing an activity simply for the enjoyment of the activity itself, rather than its instrumental value. [5]

Scholars have shown that traditional exam-oriented learning does not foster intrinsic learning. For example, if a child was to learn a foreign language *solely* for the purpose of passing exams, with the fear of punishment from teachers and parents if they perform poorly, this approach is clearly driven by extrinsic rather than intrinsic motivation. Rather than enjoying the process, the child's efforts here are motivated by a desire to avoid punishment from teachers and parents. If one day the teachers and parents no longer actively demand or oversee the child's learning, the child is likely to give up learning the foreign language [7]. This dependence on external incentives can undermine the development of a genuine interest in learning, which is crucial for long-term educational success. Therefore, exam-oriented learning does not enhance intrinsic motivation.

4. How AI tools can enhance intrinsic motivation

In recent years in China, many teachers and parents choose to use child-oriented AI pens as a way to introduce children to foreign languages for a number of reasons [8]. First, electronic tools with shapes resembling cute caterpillars are more readily accepted by children. Second, many teachers and parents may not have strong pronunciation in foreign languages and may be unfamiliar with many foreign nursery rhymes and stories, and the AI pens can fill this knowledge gap. Lastly, in order to continually enhance children's foreign language reading levels, the AI pens offer a vast selection of graded books, allowing children of different language proficiency levels to find suitable books and choose their preferred genres. Of course, the current functions of the AI pens are relatively simple. In the future, we can imagine features like engaging in conversations with children during story sessions to assess comprehension and language skill levels. They could also conduct regular follow-up tests to track the children's learning progress. Additionally, by analyzing the duration and frequency of each book read, the AI pens could infer children's reading preferences and recommend suitable books, thus encouraging ongoing reading engagement.

Let me offer a detailed example. Imagine a young 5-year-old child at home. Her parents are busy and don't have enough time or money to hire a private tutor. Instead, the parent buys an AI caterpillar pen. Every day, the child spends about 2 hours using the AI Pen. Starting with catchy children's songs, the child learned simple English words and can now perform them for the parents,

bringing the child joy. The child has also started to show interest in graded readers, beginning with the simplest levels. Each word and sentence in the stories is connected, helping the child to understand and even guess the meanings of some words and sentences. For example, the child may learn to use the simple sentence “I want an apple” in the context of asking for an apple. In later stages, the sentence “I want an apple” is repeated but used as a claim that another person makes or is expanded to “I want to play”. As the difficulty of the books increases, the stories also become more complex, stimulating children’s curiosity and imagination. Learning a foreign language is no longer a task forced by teachers and parents, but an immersive experience in stories. This approach enhances their language intuition and learning interest. In other words, it increases intrinsic learning. What’s more, this focus on enhancing intrinsic motivation through engaging and adaptive learning tools like the AI pen is crucial for fostering lifelong learning habits and deeper comprehension [9].

This is the kind of situation that I encounter frequently as an educational blogger interested in the use of AI tools. I run a chat with parents and many of the parents tell me how much their children seem to enjoy reading more now that they have the AI pen. I found that using AI tools not only helps some parents with poor foreign language skills teach their children English but also allows many children to learn foreign languages painlessly. By painless, I mean that children’s learning of a foreign language is not passive or forced but rather allows them to enjoy the happiness and interest that comes with learning a foreign language.

For example, three years ago, I worked with a mother who had learned Japanese rather than English, and her child had not formally studied English before starting first grade. This mother decided to use the AI pen to teach her son English on a daily basis and the son is now almost fluent in English, even though the mother still only speaks Chinese and Japanese. However, when this child was in first grade, he was the only one in the class who had not studied English before. By fourth grade, he successfully applied to a top private school in Canada and participated in the interview entirely in English. His mother said that through the long-term use of AI tools, not only did his English comprehension become excellent, but his pronunciation was also outstanding. The child successfully turned English into his strength, which also greatly enhances his self-motivation to learn the language.

In another example, a mother used an AI tool every day to help her son listen to graded English stories. She emphasized the importance of consistency in language learning and ensured a daily commitment, spending two hours on English reading with her son. Three years later, when he started first grade, she enrolled him in online courses taught by an American teacher. It was astonishing to find during interactions with the teacher that the child had developed strong English listening and speaking abilities, comparable to those of native speakers. For three years, the child had consistently read English story books graded for his level, while simultaneously listening to the AI tool read them aloud. As a result, his English vocabulary for reading became exceptionally rich, enabling him to read many English storybooks independently after starting elementary school. Thus, with the aid of AI tools, this child learned a language with great interest, finding the experience enjoyable rather than dull.

5. Practical guidance on how to use AI tools effectively

There are many remaining questions regarding the practical use of AI tools for language learning. For example, how important is it that a child understands the technology behind the AI tool? What is the optimal relationship – in terms of language learning – between a child and an AI tool? Researchers have found that children do not necessarily need to fully understand the workings of AI to benefit from its educational capabilities [10]. The key lies in *how* these tools are used to aid learning. Proper usage should be guided by adults to ensure that children can gradually experience and recognize the basic functions of AI through practical operation and prolonged use [11]. The essential aspect is that children enhance their learning experiences through AI tools rather than delving into the technical details. Thus, educators and parents should focus more on effectively integrating AI tools into the learning process rather than insisting on a comprehensive understanding of the technology by the children [12]. In this way, AI tools not only improve the efficiency of learning but also subtly boost the children’s interest and motivation [13].

For instance, in a practical setting, my daughter’s first-grade teacher at a primary school in Shenyang, China used AI tools to create a language learning station within the classroom where children could interact with the AI pen on a rotational basis. This allowed each student to engage with tools under minimal supervision and explore its functions and learning at their own pace. The teacher observed that, when using the AI pen, students were more inclined to revisit language tasks and showed increased enthusiasm for learning new vocabulary, demonstrating the beneficial impact of integrating AI tools flexibly in an educational setting.

Additionally, the role of parents or teachers is crucial when children use AI tools. Children might encounter various unexpected issues when first using AI tools such as AI pens, including unfamiliarity with their functions, mistakenly selecting the wrong line during reading, or merely looking at pictures instead of reading the text [14]. Therefore, supervision by parents or teachers is indispensable. They need not only to oversee the correct use of these tools but also to guide children on how to make the most of AI for learning [15].

For example, a parent shared that during their child’s use of the AI pen at home, they regularly sat with the child to discuss the content read by the pen. This helped the child better understand the context of the stories and the pronunciation of new words, fostering deeper comprehension and interaction with the material. This approach turned passive listening into an active learning experience, which significantly enhanced the child’s language acquisition.

Furthermore, parents and teachers should also instruct children on the safe use of AI, helping them to establish correct habits and avoid over-reliance on technology. In sum, as guides and guardians, parents and teachers should ensure that AI tools play a positive role in education rather than becoming an impediment to the learning process [16]

A relevant example of ensuring the safe use of AI involves a parent who set up structured AI usage guidelines for their child at home. The parent limited AI tool usage to one hour per day, ensuring it was used primarily for educational purposes, like vocabulary building and pronunciation practice. To prevent over-reliance, they also scheduled regular intervals where the child engaged in non-digital activities, such as reading physical books and discussing what they learned with family members. This balanced approach helped the child develop a healthy relationship with technology, using AI tools to enhance learning without becoming dependent on them.

6. Conclusion

Some parents and teachers are rightly concerned about the use of AI technology in children's education. Will children become too dependent on technology? Will it help them learn? In this essay, I've argued that AI tools – like the AI caterpillar pen – can be used effectively to improve children's language learning experiences. In particular, I've argued that these tools can enhance children's intrinsic motivation for learning. Moreover, by incorporating AI into daily learning activities, these tools can provide children with consistent and immediate feedback, a crucial element in language acquisition that traditional methods may lack due to resource constraints. By drawing on the educational literature and on my experience as an educational blogger in China, I've shown how AI tools can be used to make a positive difference in children's educational experiences. The integration of AI technology in educational settings not only supports diverse learning styles but also encourages self-paced learning, allowing children to explore language learning at their own rhythm and according to their personal interests. This supports the development of a more engaging and effective educational environment, where technology complements traditional teaching methodology, ensuring a balanced approach to child education.

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