



# A Study on Autonomous Foreign Language Learning Based on Meta-cognitive Strategies in the Context of Information Technology

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**Abstract:** The advancement of information technology has made it more convenient for foreign language learners to study independently, so foreign language learners should fully utilize information technology such as online learning platforms, virtual reality technology, gamified learning and open educational resources to assist them in foreign language self-learning and to improve their learning efficiency. This study is to explore how to cultivate a learner's meta-cognitive strategies in autonomous foreign language learning under the background of information technology. Literature research method is used to summarize and organize relevant literature on meta-cognitive strategies and autonomous foreign language learning, etc. Through analyzing the definitions of meta-cognitive strategies by different scholars, the relationship between meta-cognitive strategies and autonomous foreign language learning, and related empirical researches, this paper discusses the effective ways of cultivating meta-cognitive strategies in autonomous foreign language learning. Various types of information technology tools that assist autonomous foreign language learning are summarized, as well as how to use meta-cognitive strategies to provide guidance and improve the efficiency of autonomous learning for foreign language learners. This study also provides some theoretical basis and practical guidance for cultivating students' meta-cognitive strategies and improving their autonomy in foreign language learning.

**Keywords:** Information Technology, Foreign Language Learners, Meta-cognitive Strategies, Autonomous Learning

## Introduction

*The New English Curriculum Standard for General High Schools* (2017 edition, revised in 2020)<sup>[1]</sup> of China states that teachers should make good use of information technology to improve the intelligence of English teaching, and at the same time, information technology should provide strong support for teachers to realize intelligent teaching. In terms of teachers' "teaching", *the New Standard* gives English teachers certain strategic guidance, such as the diversified use of English teaching materials, the use of micro-classes and the assistance of multimedia resources. However, with the continuous development and popularization of information technology, the integration of information technology and autonomous learning of foreign language learners is also being optimized, especially in the post-epidemic era, online and offline blended learning methods are more and more widely used, so how to effectively use information technology in learning is worthy of in-depth discussion.

With the continuous optimization of Artificial Intelligence Technology, autonomous foreign language learning has also entered a brand-new stage, and blended learning methods have gradually become popular. Information technology has also affected learners' autonomy, flexibility and learning efficiency in many ways. Information technology enables learners to customize their learning plans according to their own interests, levels and learning needs, giving foreign language learners a personalized learning experience and providing flexible learning time and place, so the time and space for learners to learn autonomously is no longer limited. Information technology can not only provide foreign language learners with rich learning resources, but also provide foreign language learners with a virtual language practice environment, which makes it possible for foreign language learners to use the target language in a virtual environment. In addition, information technology can also provide foreign language learners with timely assessment and feedback, foreign language learners can test their own language learning effects. Therefore, information technology, as an auxiliary tool for autonomous foreign language learning, provides some help to learners in planning, monitoring and evaluating their own learning.

In the post-pandemic era, online learning can be student-centered, requiring students to use more self-regulation skills, guiding them to enhance autonomy, dynamically matching teacher-student interaction patterns with students' self-regulation abilities, and ultimately achieving maximum learning performance. As an auxiliary tool for self-directed foreign language learning, information technology provides certain assistance in learners' autonomous planning, monitoring and evaluation of their own learning. Therefore, this study mainly addresses the following issues:

1. What are ways that information technology assists foreign language learners in autonomous learning?
2. How can foreign language learners use meta-cognitive strategies to enhance the efficiency of autonomous learning in the context of information technology?

## Literature Review

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### ***Researches on the Concepts of Meta-cognitive Strategies and Autonomous Learning***

Meta-cognition refers to an individual's perception of cognition, i.e., an individual's awareness of his or her own mental states, abilities and cognitive strategies. It reflects, processes, monitors and regulates cognitive activities by stepping outside the cognitive system. The core of meta-cognition lies in the individual's self-awareness and self-regulation of the process and outcome of cognitive activities. The concept of "meta" was first introduced in 1956, later, Flavell further clarified the concept of meta-cognition, emphasizing the dynamically cognitive process and its active detection and regulation<sup>[2]</sup>. O' Malley and Chamot categorized meta-cognitive strategies into selective attention strategies, planning learning strategies, monitoring review strategies and evaluating checking strategies<sup>[3]</sup>. As the research progressed, O'Malley and Chamot reclassified meta-cognitive strategies into planning strategies, monitoring strategies and evaluating strategies<sup>[4]</sup>. Oxford classified meta-cognitive strategies as attention strategies, planning strategies and evaluation strategies<sup>[5]</sup>.

Autonomous learning refers to learners' active, conscious and independent learning, opposed to passive and mechanically receptive learning. It consists of three aspects: firstly, the prior planning and organization of learning activities; secondly, the monitoring, evaluation and feedback of actual learning activities; and lastly, the regulation, modification and control of learning activities. Wenden points out that autonomous learning of a foreign language refers to the ability of the learner to acquire learning strategies and relevant learning knowledge, and the attitude to being able to apply them correctly, effectively and autonomously<sup>[6]</sup>. Furthermore, Wenden emphasizes that one of the main purposes of studying foreign language learning strategies is to promote autonomy in learning. Learning strategies are an important part of autonomous learning, acquiring and using them effectively is a key step in developing autonomous learning skills<sup>[7]</sup>. Researchers also have proposed some classical models of autonomous learning based on this, such as Zimmerman's model of self-regulation strategies, including planning, execution and self-reflection<sup>[8]</sup>; Pintrich's general model of autonomous learning, including planning activation, monitoring, control and reflective response<sup>[9]</sup>; and Winne's COPES model, including conditions, operations, products, evaluations, and standards<sup>[10]</sup>.

### ***Researches on the Relationship of Meta-cognitive Strategies and Language Learning***

Wenden points out that the main role of meta-cognitive strategies lies in instruction and management, while developing students' meta-cognitive awareness of the nature of learning is also an important part of meta-cognitive strategy research<sup>[11]</sup>. Nunan trained 60 university students in the University of Hong Kong in 15 types of learning strategies including meta-cognitive strategies, the results of the study showed that there were significant differences among students in motivation and learning strategies, which further validated the feasibility of meta-cognitive strategies and the effectiveness of strategy training<sup>[12]</sup>.

Domestic researchers in China start late in the study of meta-cognition in foreign language learning. It was not until the 1990s that researches on the relationship between meta-cognitive strategies and language learning were gradually deepened. Wen Qiufang first points out that learning strategies are conscious behaviors adopted for effective learning, emphasizes how learners handle and process information in the learning process, including cognitive and meta-cognitive strategies, and stresses the important role of meta-cognitive strategies in learning<sup>[13]</sup>. Liu Peihua and Zhou Rong further link meta-cognitive strategies to language learning, arguing that the processing of various linguistic information is regulated by meta-cognition<sup>[14]</sup>. Liu Shaolong and Xiao Shanxiang, on the other hand, focus on the functional as well as practical value of meta-cognitive strategies in the learning process<sup>[15]</sup>. Zhang Congzheng, Zhang Hongsheng et al. (2020) and Zhang Yi explore the strategy of using meta-cognitive strategies in English listening and its effects from the theoretical and practical levels, and put forward the ways to cultivate students' meta-cognitive strategies<sup>[16][17][18]</sup>. There is a close relationship between meta-cognitive strategies and autonomous learning, Li Zijian and Qiu Defeng theoretically analyze the roles of formulating learning plans, monitor the learning process and assess learning outcomes in learners' mastery of the initiative of learning, so as to make them gradually become independent learners<sup>[19]</sup>. Yanling, Zhang Ronggen and Yan Hua, on the other hand, show that through experiments low or inappropriate use of learning strategies would hinder the development of learners' autonomous learning ability, and that through the use of meta-cognitive strategies it could also improve the learners' meta-cognitive awareness, so that they would have a more in-depth understanding of their own learning process, and thus promote autonomous learning<sup>[20]</sup>.

Information technology, as an assistive tool, provides more opportunities for learners to utilize meta-cognitive strategies. Through information technology, language learners can more easily make learning plans, track learning progress and assess learning outcomes. According to Qiu Xuyan<sup>[21]</sup>, information technology helps to enhance learners' autonomy and enables them to better control the pace and direction of learning. Therefore, the theory of meta-cognitive strategies provides guidance for autonomous learning of foreign languages, while information technology provides practical tools and environments for learners to apply meta-cognitive strategies.

### ***Auxiliary Ways of Information Technology-assisted Autonomous Learning***

The rapid development of information technology has brought opportunities and challenges to the construction of autonomous learning mode, and has also provided a brand-new platform for the research of autonomous learning theory. The elements of autonomous learning in the network environment have been reorganized, and the characteristics of students have changed, all of which have changed the connotation and extension of the concept of autonomous learning. Network-based autonomous learning is, in a narrow sense, computer network-based autonomous learning. Dr. Desmond Keegan, an internationally renowned distance learning expert, defines the broad concept of network-based autonomous learning as a learning mode in which teachers and students rely on a learning support service system in a quasi-separate

state, and in the form of individual autonomous learning, in which teachers and students benefit from the learning mode by means of bidirectional communication over the network<sup>[22]</sup>. The traditional elements of autonomous learning are students, content, technology and teachers, while the elements of web-based autonomous learning in the modern information technology environment are reorganized into learning, resources, web-based learning environment and teachers. The changes in the basic elements make the scope of the learning support service system broader, and the resources, courses, and teachers in the network environment are integrated into the new networked time and space environment through the interaction platform and the technology platform, which makes the autonomous learning in the network environment different from the autonomous learning in the sense of traditional individualized learning. Under the support of the computer network, the use of online learning resources and network interaction has brought the student's subjectivity into full play; network interactivity generated by the humanities interactive environment makes the concept of autonomous learning on the basis of the original concept "a personalized autonomous learning in the humanities interactive environment", thus the network interactive platform integrates the two processes of individual construction and social sharing.

### ***Online Courses and Learning Platforms***

White finds that foreign language distance learning students are more independent than those who learn in the classroom and employ more meta-cognitive strategies, especially self-management strategies<sup>[23]</sup>. Online courses and learning platforms combine the core concepts of meta-cognitive strategies and provide learners with the opportunity to make learning plans, monitor the learning process and evaluate the learning outcomes. Learners can use online platforms to set up their learning plans according to their own learning goals and time schedules. At the same time, the platform will record learners' learning progress and performance, help learners find their own deficiencies, correct problems in time and provide them with timely feedback, thus motivating learners to better manage the learning process and adjust their learning methods and strategies. For example, college students use online learning platforms such as "Tencent Classroom", "China University MOOC", "Learning Channel", "U Campus", etc., which allow them to select course content for learning according to the tasks issued by teachers or learners' own needs. Online learning platforms sometimes set up a reward mechanism, whereby learners can earn points if their online learning hours reach the reward standard, thus they motivate learners to complete their learning tasks and drive themselves in study.

### ***Mobile Applications and Language Learning***

Mobile application provides learners with practical applications for utilizing meta-cognitive strategies in the process of autonomous learning. According to Wen Qiu-fang and Wang Li-fei, the application of meta-cognitive strategies involves learners' selection of learning goals and setting up the application of learning strategies suitable for them to master and adjust the learning time and improve the assessment efficiency<sup>[24]</sup>. By setting learning goals and plans, learners can track their learning progress in the application. In addition, the application helps learners monitor and adjust their learning strategies through spaced repetition and personalized practice to improve the effectiveness of remembering and applying new knowledge. For example, in the autonomous learning of foreign languages, with the help of information technology, there are many full-featured mobile applications in the application market for learners to choose from, and some of them are constantly updated and iterated to provide more accurate and more personalized services for learners. For example, vocabulary learning software such as "Mo Mo Memorizes Vocabulary" will arrange the learning content according to the learning progress of the learners and arrange the frequency and time of vocabulary review according to the law of Ebbinghaus' forgetting curve, so as to ensure that the learners can achieve better vocabulary memorization.

### ***Virtual Language Environment and Social Learning***

The virtual language environment stimulates learners to actively use meta-cognitive strategies by real communication scenarios. In the virtual social platform, learners need to set their own learning goals, communicate with others, and adjust their expressions according to the real-time feedback in the conversation. This practice helps learners integrate meta-cognitive strategies into actual communication and strengthen self-monitoring and regulating abilities. For example, "Cambly", "Hello Talk", "Duolingo", "Tandem", "Zoom" and some other language learning soft-ware can provide autonomous foreign language learners with a virtual language environment or a multi-person interactive community to communicate in real time with native language learners, and through the communication opportunities provided by information technology, foreign language learners can monitor their own language learning situation and make improvements in real time. In addition, there are also some language dubbing software for autonomous foreign language learners, such as "Fun Dubbing" and "Speaking Easy", which provide learners with corresponding scenarios for simulation through dubbing, and score learners' pronunciation in real time, which promotes learners' oral learning in this way.

Figura & Jarvis helped international students in the UK learn English by utilizing computer-assisted learning materials and found that students adopted more meta-cognitive strategies along with increased autonomous learning skills<sup>[25]</sup>. Information technology provides learners with the opportunity to practically apply meta-cognitive strategies by stimulating their awareness and self-regulation of the learning process. Online platforms, mobile applications and virtual language environments all require learners to set goals and monitor the process autonomously. Learners can not only experience the effects of meta-cognitive strategies more directly, but also see the progress and results after making learning plans and adjusting learning strategies, so they can understand and experience the importance of learning

strategies more deeply. In short, Information technology can help promote the autonomous consciousness of foreign language learners' and improve their autonomy of learning.

### **Autonomous Learning Strategies Guided by Meta-cognitive Theory**

When foreign language learners use meta-cognitive strategies in the process of autonomous learning, they may also face some problems such as unclear learning goals, inappropriate strategy choices or insufficient self-monitoring. Some studies have shown that students may encounter certain difficulties in carrying out autonomous learning, and that externally moderated learning provided by information technology is significantly correlated with students' experience of autonomous learning in a foreign language<sup>[26]</sup>. With all the related problems that may arise in the process of autonomous foreign language learning, how can students' autonomous foreign language learning be guided and the efficiency of autonomous foreign language learning be improved with the help of meta-cognitive strategies and the assistance of information technology?

### ***Setting Goals and Developing Plans***

When autonomous foreign language learners do not have clear learning goals, they will lack in direction and motivation in the learning process. Online learning platforms can provide personalized learning plans and goal setting functions. Learners can set long-term and short-term goals, set daily study plans and set reminders on the platform, which enables them to better plan their learning process and apply the meta-cognitive strategies of goal setting and planning in practice. For example, foreign language learning software such as "Memrise", "Anki", "Asana", etc. can facilitate goal and study plan setting for autonomous learners of foreign languages. "Memrise" is a memory-based language learning application that allows learners to create their own study plans, set goals and learn through breakthrough games. The learning software "Anki" is a powerful memory card application that allows learners to create their own study cards, make personalized study plans and review what they have learned on a regular basis. "Asana" is a task management tool that helps learners plan, set goals, and track the completion of tasks, making it useful for organizing the learning process.

### ***Selecting and Adapting Learning Strategy***

When learners are not sure when to use learning strategy and which learning strategy to use, it can also lead to poor learning outcomes. Information technology learning platforms can provide guidance and demonstrations on different learning strategies. It helps learners to understand when and where to use different learning strategies so that they can apply meta-cognitive strategies more effectively. IT-assisted learning provides diverse learning resources and tools. Learners can choose different learning methods, such as online videos, interactive exercises, virtual practice, etc., according to their learning preferences and needs. Learners can flexibly choose different learning strategies according to the difficulty level of learning, such as breaking down tasks, associative memorization, etc., to adapt to different learning challenges. Among the widely used learning platforms and software, there are technologies that can help foreign language learners make learning strategy choices and adjustments. For example, online learning platforms such as "Coursera", "edX", and "Khan Academy" can provide guidance and modeling on different learning strategies for autonomous learners of foreign languages. These platforms offer many courses related to learning strategies and meta-cognition, covering topics such as study skills, time management, and memory skills, and are suitable for learners of all ages.

### ***Self-monitoring and Obtaining Feedback***

Learners may not effectively monitor their progress and comprehension during the learning process and are unable to adjust their learning strategies in a timely manner. Research has shown that regulation skills enable one to organize various thinking activities in the problem-solving process by using meta-cognitive strategies for planning, monitoring, and revising<sup>[27]</sup>. Information technology can provide personalized learning advice based on learners' performance, recommending knowledge areas that need to be strengthened. Tools such as online quizzes, exercises and mock exams help learners self-assess their mastery. With the help of information technology, learners can track their learning activities, completed tasks and performance on exercises. With instant feedback, learners are able to assess their learning outcomes in real time and understand which areas need more attention, so they can adjust their learning strategies based on the feedback to better support meta-cognitive strategies. For example, online learning platforms and software such as "Coursera", "Duolingo" and others provide appropriate exercises and tests to help learners assess the results of autonomous foreign language learning and language learning skills.

### ***Cooperating and Interacting Socially***

Autonomous learning may result in learners' lack of communication and interaction with others to share experiences and solve problems. Solution sharing and decision co-creation during online discussion can reduce the risk of using poorly structured tasks and enhance cognitive learning<sup>[28]</sup>. Online learning platforms or applications can provide social interaction functions between or among learners, such as discussion forums and real-time chats. Learners can communicate with other learners and share learning experiences, doubts and solutions, thus stimulating meta-cognitive strategies. For example, some learning soft-ware can promote communication between learners by establishing learning communities, and at the same time, learners can see the learning results of others in order to motivate and model their own learning. For example, "Alpaca IELTS", "Fun Dubbing", "Hello Talk" and other soft-ware provide real-time communication and learning opportunities for autonomous foreign language learners, who can see the results of other learners of the same

language in the learning community, and they can communicate with each other and share their experiences through messages and comments.

### ***Creating Conducive Learning Environment***

Foreign language autonomous learners may experience distraction and inattention in their autonomous learning. Information technology can provide tools for focusing and concentrating, such as focus modes, reminder functions of some learning applications, and so on. These tools can help learners create learning environments that are conducive to meta-cognitive strategies. For example, "Forest", "Tomato To Do", "Focus Booster", etc. It divides the working time into short blocks of time, and each block of time is followed by a break, which makes it convenient for autonomous foreign language learners to plan their learning tasks reasonably and utilize their learning time more efficiently.

### ***Enhancing the Learning Fun***

One of the common problems of autonomous learning is that foreign language autonomous learners cannot concentrate on learning activities for a long time, and the learning effect tends to decline. In IT-assisted autonomous learning, some learning platforms and applications provide entertainment and interactivity, thus stimulating learners' learning motivation. The fun of learning can be increased through small games, competitions and reward mechanisms to make learners more actively participate in the learning process, which helps them to better utilize meta-cognitive strategies and improve learning effectiveness. However, the reform of the teaching environment alone cannot fully improve students' autonomous learning ability, so teacher intervention is also indispensable<sup>[29]</sup>. In assisting students' learning with the help of information technology, the information technology platform can act as a teacher's role to supervise the learning situation as well as the effect of autonomous foreign language learners. For example, many educators share interesting language learning content on YouTube, including grammar explanations, cultural introductions and speaking tutorials, where the IT platform acts as a teacher and gives some guidance to foreign language learners. In addition, learners can realize fun learning through IT applications, such as "Memrise" and "Duolingo", which are designed in a gamified way to help learners memorize vocabulary and grammar through the use of interesting memory cards, games and challenges .

To summarize, information technology can help foreign language learners overcome the meta-cognitive strategy problems in autonomous learning to a large extent. Through the personalized goal setting, learning strategy guidance, learning progress tracking, social interaction and other functions provided by online learning platforms, learners can make better use of meta-cognitive strategies and improve the effect of autonomous learning. At the same time, information technology can also create a more conducive learning environment to help learners focus their attention, so that they can better apply meta-cognitive strategies to improve learning outcomes. The combination of information technology and meta-cognitive strategies creates a more productive and rich learning experience for foreign language learners.

### **Conclusion**

In the context of information technology, this study explores how to assist foreign language learners' autonomous learning through information technology by using meta-cognitive strategies as the theoretical basis. In analyzing the ways in which information technology assists learning, we have found that information technology plays a key role in improving foreign language learners' meta-cognitive autonomy. Online learning platforms, mobile applications and virtual language environments all give learners more autonomy, enabling them to better utilize meta-cognitive strategies and improve their learning autonomy.

In conclusion, the combination of information technology and meta-cognitive strategies provides foreign language learners with rich learning experience and helps them to improve their ability to learn autonomously. With the assistance of information technology, learners are better able to develop learning plans, select learning strategies, monitor learning progress, obtain feedback, interact socially and create an environment conducive to learning in improving the efficiency and autonomy of learning. Therefore, the application of information technology in foreign language learning is of great significance and is expected to further promote the meta-cognitive autonomy of foreign language learners, thus learners can obtain a good autonomous learning state and effect.

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