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Review Article

Construction of Autonomous Learning Strategies in Secondary School English under the Framework of Macroscopic Vision

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Abstract *- The macroscopic teaching method is an instructional approach that integrates unit content to guide students in autonomous exploration. The macroscopic teaching approach, driven by core competencies, emphasizes the shift from surface-level to deep-level essential learning with transferable and enduring features. It also emphasizes the shift from memorizing knowledge points to learning and applying content, methods, and strategies and the shift from fragmented learning to structured disciplinary perspectives. The article further discusses the cultivation path of autonomous learning ability from three levels: "consciousness-action-ability", which involves cultivating awareness of autonomous learning, creating opportunities for practical action, and providing platforms for demonstrating abilities. Lastly, the author reviews traditional measurement techniques and several major scales for autonomous learning and emphasizes innovative measurement techniques.*

Keywords *- Macroscopic unit, Secondary school English, Autonomous learning, Metacognitive strategies.*

1. Introduction

In recent years, there has been increasing recognition in China of the importance of cultivating students' self-learning abilities. While the traditional emphasis of secondary education has been on knowledge transmission, the limited development of students' foreign language proficiency has primarily focused on "basic skills" training[1]. This not only limits students' further development but also weakens their ability to adapt to social changes and pursue lifelong learning. Fortunately, in the "National Medium and Long-Term Education Reform and Development Plan (2010-2020)" released as early as 2010, competence development was identified as one of the strategic themes of educational reform and development in China. The plan advocates prioritizing competence, optimizing knowledge structure, enriching social practice, and strengthening competence cultivation. Efforts are made to improve students' learning, practical, and innovative abilities, enabling them to actively adapt to society and create a brighter future[2].

Self-directed learning ability is one of the important competences that middle school students should possess, as proposed in the "New Curriculum Standard" in China. On the one hand, in the era of information, students are faced with abundant knowledge and information sources, and they need to be able to judge and choose independently. On the other hand, the prevalence of the Internet and the rapid development of information technology have accelerated the pace of knowledge updates. Only by having self-directed learning ability can students continue to learn autonomously and efficiently after finishing formal schooling, continuously updating and expanding their knowledge to meet the needs of social and personal development.

The importance of self-directed learning ability also lies in its role in promoting the development of other competences. According to the 2022 version of the curriculum standard: "Learning ability is the consciousness and competence of actively applying and adapting English learning strategies, expanding English learning channels, and striving to improve English learning efficiency" [3]. Therefore, this article aims to promote implementing and applying the large unit teaching method in middle school English teaching through research and teaching practices to enhance students' English core literacy through self-directed learning and provide a reference for English language education for middle school students in China[4].

2. Research Background

The "teaching without teaching" advocates for students to master autonomous learning methods. Teaching learning strategies is a necessary condition to guide students to "learn how to learn" and is an important approach to improving learning efficiency and promoting the development of individual autonomous learning abilities. This requires teachers to incorporate the teaching of learning strategies as a teaching method in daily instruction. While helping students acquire knowledge, teachers also assist them in mastering the rules and techniques of learning methods, thus achieving the true goal of autonomous learning.

Cognitive constructivism suggests that autonomous learning is essentially metacognitive monitoring, where learners actively adjust their learning strategies and efforts based on their learning abilities and the requirements of the learning tasks. Chinese scholar Chen Qi believes learning strategies are metacognitive knowledge stored in long-term memory. Effective learners should be active information processors, interpreters of confusion, and synthesizers of problems. They should be able to employ different strategies for storing and retrieving information and consciously and actively apply learning strategies both in and outside the classroom.

Compared to teaching individual articles or modules, the macroscopic unit teaching method has two prominent features. Firstly, it involves a larger scope of content and a stronger structural knowledge. Teachers alone cannot guide students to complete the exploration within a limited time; instead, students need to engage in autonomous learning. Secondly, it emphasizes the integration of knowledge. Students are not required to separate reading, writing, and oral communication modules.

They can practice oral communication while reading and collect writing materials during oral communication, thus clarifying the core of writing. Both of these characteristics require students to apply corresponding learning strategies. The macroscopic unit teaching method provides students with an open space for exploration, allowing them to receive comprehensive training, a positive means for student growth and development.

This article combines teaching practice and aims to promote the practical application of the macroscopic unit teaching method in secondary school English education. Through research, it seeks to enhance students' English core competencies through autonomous learning. The 2022 edition of the curriculum standards states that students should actively apply and adapt English learning strategies, explore English learning channels, and strive to improve awareness and abilities in English learning efficiency.

However, preliminary search results from the Chinese National Knowledge Infrastructure (CNKI) academic journal database indicate that current middle school students may lack the concept of a "macroscopic view", which could be attributed to the following factors:

Narrow subject-based education: Modern secondary education often focuses on teaching and evaluating subjects separately, with the curriculum divided into different disciplines. This subject-based education tends to narrow students' attention to specific subject knowledge and skills, overlooking the ability to think and comprehend interdisciplinary and comprehensive issues. As a result, students may lack the ability to connect knowledge and struggle to develop a holistic view.

Pressure from exam-oriented education: Many countries' secondary education systems tend to emphasize exam-oriented education, where students face numerous standardized tests and tight schedules. This exam-oriented approach leads students to prioritize individual subject scores and short-term utilitarian goals, overshadowing their understanding and contemplation of broader issues and concepts.

Information overload and fragmentation: Modern society's information explosion and fragmentation make it easy for students to get trapped in trivial details and short-term stimuli, hindering their ability to gain a profound understanding of the ocean of information. Students are accustomed to acquiring fragmented knowledge, making it challenging for them to grasp and comprehend complex issues holistically.

Lack of an environment that fosters a macroscopic view: The educational environment and teaching methods may also impact students' ability to cultivate a macroscopic view. Suppose schools and teachers excessively prioritize exam scores while neglecting the development of students' critical thinking, comprehensive abilities, and interdisciplinary learning experiences. In that case, it can result in students lacking the concept and ability of a macroscopic view.

The comprehensive teaching of large units provides learners with a structured framework and core concepts for self-directed learning. It organizes learning content into a series of related themes or units, helping learners clarify knowledge structures and connections. It provides learners with foundational knowledge, core concepts, and learning resources, helping them establish a foundation for self-directed learning. Teachers can understand learners' mastery of core concepts and themes through the assessment methods of comprehensive teaching of large units. At the same time, learners can assess and reflect on their own learning process and outcomes through self-directed learning strategies. In this way, problems can be identified, and improvements can be made in a timely

manner, thus enhancing the effectiveness of self-directed learning.

3. Cultivating the Ability for Autonomous Learning

Students' ability for autonomous learning is not innate or spontaneously formed but rather needs systematic cultivation. In China, teaching from primary to high school is primarily exam-oriented, with teachers at the center of everything, resulting in a lack of awareness and habits for autonomous learning. Therefore, the cultivation of autonomous learning ability among university students is a process that involves changing learning concepts, training for autonomous learning habits, and ultimately developing autonomous learning habits[5].

Students may face difficulties, confusion, and setbacks in the actual learning process. At such times, students can utilize metacognitive strategies to analyze problems and select and implement solutions, thereby overcoming difficulties and improving learning outcomes. Thus, autonomous learning can be viewed as a manifestation of students actively applying metacognitive strategies, and the application of metacognitive strategies can provide guidance and support for autonomous learning. Considering the characteristics of Chinese students, the development of autonomous learning ability also transitions from passive to proactive autonomy. Based on this, the overall cultivation of secondary school students' autonomous learning ability can follow the path of "awareness action ability."

3.1. Cultivating Awareness for Autonomous Learning

Awareness of learning refers to the thoughts and attitudes aimed at improving learning efficiency to achieve learning goals. Awareness differs from strategies: strategies are observable behaviors, while awareness exists in mind. It is through awareness that actions are guided. Cultivating students' awareness of autonomous learning is a precondition for developing autonomous learning abilities[6,7]. However, many students are accustomed to teacher-directed tasks and lack a strong awareness of autonomous learning. They are also unaware of how to apply relevant learning strategies through the concept of the macroscopic unit to handle vast knowledge systems. When assisting secondary school students in understanding the macroscopic view of units, teachers can apply metacognitive strategies and cognitive strategies to help them comprehend and apply these concepts, thereby cultivating awareness for autonomous learning. Here are some specific suggestions.

3.1.1. Metacognitive Strategies

Goal Setting

Clearly define the learning objectives for the macroscopic unit to students and help them identify specific learning tasks and expected outcomes. This provides students with a clear direction during the learning process and helps them focus on studying relevant materials and concepts.

Self-Monitorin

Teach students to monitor their own understanding and progress during the learning process and reflect on their learning strategies. Students can monitor their understanding of the macroscopic view through self-questioning, summarizing notes, concept mapping, and other methods and make timely adjustments to their learning approach.

Self-Evaluation

Encourage students to periodically assess their understanding of the macroscopic view and provide themselves with positive feedback. Students can write self-reflections or engage in student-teacher feedback exchanges to encourage them to think critically and understand different aspects and applications of the macroscopic view.

Self-Organization

Each textbook chapter has a set of key questions at the beginning and systematic questions at the end regarding what has been learned. Students can combine their own understanding with these questions, creating concept maps.

This arrangement in the textbook is beneficial for cultivating students' independent review abilities. To improve student's overall quality, after completing a chapter, students should be required to comprehensively organize and review the textbook content, understanding the intrinsic connections between knowledge points and gaining a deeper comprehension.

3.1.2. Cognitive Strategies

Concept Mapping

Students can use concept mapping to visualize and organize the macroscopic view and its related sub-concepts. By identifying key concepts, organizing them into hierarchical structures or networks, and indicating their relationships, students can gain a clearer understanding of the structure and content of the macroscopic view.

Questioning and Inquiry

Encourage students to ask questions and actively investigate relevant materials and resources. Students can engage in questioning, seeking answers, and discussions with others to delve deeper into the macroscopic view and understand the meaning and significance of concepts from multiple perspectives.

Case Analysis

Guide students in conducting case analysis to explore and apply the macroscopic view through studying examples in real-life contexts. Students can analyze cases

and consider the cause-and-effect relationships, common features, and solutions present, thereby enhancing their understanding of the application and practicality of the macroscopic view.

The new curriculum standards emphasize the focus on learning processes and methods, advocating for a "self-directed, cooperative, and inquiry-based" learning approach. This has greatly promoted classroom transformation, departing from the traditional teacher-centered approach to a more engaging and interactive learning environment. It marks a milestone in progress in education. However, from the perspective of nurturing students, this is only a phase of progress. Taking self-directed learning as an example, although self-directed behaviors are prevalent in the classroom, there is also a common issue of "superficial" or "false" self-directed learning. The so-called "superficial self-directed learning" refers to self-directed behaviors that lack substance or are not goal-oriented. This manifests as engaging in self-directed activities for the sake of self-direction itself, unrelated to the intended learning objectives.

In the context of promoting core competence as the goal, the teaching of large-scale units requires a shift from a superficial understanding to a deeper, essential learning with transferable and enduring characteristics. It involves a shift from memorizing isolated knowledge points to learning and applying content, methods, and strategies. Furthermore, it entails a shift from fragmented learning to a structured understanding of disciplinary macroscopic views. To illustrate these points, this article will provide examples.

3.1.3. Clearly define the Inquiry Topic and Maintain the Inquiry Direction

Combining metacognitive strategies can help students engage in effective inquiry-based learning when the inquiry topic is clearly defined, and the inquiry direction is maintained. Here is an example:

Inquiry Topic: Environmental Conservation and Sustainable Development

Metacognitive Strategies: Goal Setting, Self-Monitoring, Metacognitive Strategies (Questioning, Self-Evaluation)

In this inquiry-based learning topic, students aim to understand the importance of environmental conservation and sustainable development and explore related solutions. They can apply metacognitive strategies using the following steps:

Goal Setting

Students set learning goals, such as understanding the significance of environmental conservation, mastering practical, sustainable development methods, and recognizing their responsibilities and roles in protecting the environment.

Self-Monitoring

Students monitor their progress and understanding during the inquiry process. They can record key information and raise questions or challenges they encounter to understand better and address them.

Questioning as a Metacognitive Strategy

Students use questioning as a metacognitive strategy to delve deeper into the topic. For example, they may ask questions like, "What is sustainable development? Why is it crucial to protect the environment? What are some environmental pollution issues? What are some methods of sustainable development?"

Self-Evaluation

Students engage in self-evaluation during the inquiry process, reflecting on their understanding and the effectiveness of their learning approaches. They can ask themselves questions such as, "Have I achieved my learning goals? Do I understand the concepts and significance of environmental conservation and sustainable development? What areas are still unclear or require further exploration?"

By applying these metacognitive strategies, students can enhance their inquiry-based learning experience, deepen their understanding of the topic, and develop critical thinking skills in the process.

3.1.4. Integrating Unit Content and Organizing Knowledge Structure

Incorporating metacognitive strategies can help students better understand and consolidate their learning when integrating unit content and organizing knowledge structure. Here is an example:

Inquiry Topic: Global Warming and Climate Change

Metacognitive Strategies: Goal Setting, Self-Monitoring, Metacognitive Strategies (Summarization, Problem-solving)

In this unit, students aim to understand the causes, impacts, and solutions related to global warming and climate change and establish a structured knowledge framework. They can apply metacognitive strategies using the following steps:

Goal Setting

Students set learning goals, including understanding the concepts of global warming and climate change, grasping the main causes and factors influencing them, understanding solutions, and being able to summarize the relevant knowledge.

Self-Monitoring

Students engage in self-monitoring during the learning process, paying attention to their understanding and level of knowledge mastery. They can record key information and frequently review, revise, and reinforce their understanding.

Summarization

Students utilize summarization as a metacognitive strategy to integrate and organize their learned knowledge. Throughout the learning process, they can summarize the main causes of global warming (such as greenhouse gas emissions), major impacts (such as rising sea levels and increased occurrences of extreme weather events), and solutions (such as reducing carbon emissions and promoting renewable energy usage).

Problem-Solving

Students deepen their understanding and apply their knowledge by posing and solving problems. For example, they can generate their own questions, such as, "What are the environmental and human impacts of global warming?" or participate in group discussions to solve problems like, "How can we reduce carbon emissions at home?" Engaging in problem-solving processes allows students to apply and consolidate their learned knowledge effectively.

By employing metacognitive strategies, students can set targeted learning goals, self-monitor their progress, and use summarization and problem-solving to deepen understanding and apply knowledge. This learning process will enhance their knowledge structure and problem-solving abilities while fostering deeper-level thinking skills.

3.1.5. Creating Teaching Scenarios to Facilitate Inquiry

Incorporating metacognitive strategies can provide students with meaningful and practical learning experiences when creating teaching scenarios to facilitate inquiry. Here is an example:

Inquiry Topic: Human Exploration of Space
Metacognitive Strategies: Goal Setting, Self-Monitoring, Metacognitive Strategies (Situation Simulation, Self-Evaluation)

In this inquiry-based learning, students aim to understand the history, purpose, and development of human exploration of space and the application of related science and technology. They can apply metacognitive strategies using the following steps:

Goal Setting

Students set learning goals such as understanding the significant milestones in human space exploration, the purpose and significance of exploration, and the application of related science and technology.

Self-Monitoring

Students engage in self-monitoring during the inquiry process, observing their learning progress and understanding. For example, they can record key information, document their discoveries and thoughts, and compare them with their predetermined goals.

Situation Simulation as a Metacognitive Strategy

Students use situation simulation as a metacognitive strategy to experience and simulate the context of space exploration. For instance, they can engage in virtual reality experiences, watch documentaries on space exploration, or participate in role-playing activities simulating space missions to enhance their perceptual and conceptual understanding of space exploration.

Self-Evaluation

Students conduct self-evaluation during the inquiry process, reflecting on their learning outcomes and the effectiveness of their learning approaches. They can assess their understanding of space exploration by answering questions, engaging in group discussions, and raising their own questions and thoughts.

By creating teaching scenarios and utilizing metacognitive strategies, students can experience and simulate the context of space exploration more authentically, leading to a deeper understanding and learning of the related knowledge. This learning process will cultivate their deeper-level thinking skills and problem-solving abilities through exploration and practice while enhancing their interest and engagement in the topic of space exploration.

3.2. Creating Opportunities for Action and Practice

Once students have developed a sense of self-directed learning, teachers should provide opportunities for students to explore and practice through action. Motivation is an intrinsic force and determining factor that induces, propels, and sustains individual learning activities[8]. Teachers can start by understanding students' learning characteristics, observing their preferences, and consciously integrating them into classroom activities. By designing authentic and relevant learning tasks, teachers can stimulate students' intrinsic motivation. Driven by learning motivation, students will not only make full use of the autonomy provided by teachers but also create opportunities for themselves to apply various learning strategies. Through a cycle of "practice-reflection-repractice-rerelection," they gradually master learning strategies that suit themselves[8]. Teachers can also encourage students to develop the habit of writing learning journals, focusing on summarizing and reflecting on the use of effective learning strategies. This helps students improve their self-efficacy and satisfaction, enhancing their learning motivation. Cultivating self-emotional management skills also relies on students' firsthand experiences and practices. Teachers can assign

challenging tasks to students and guide them on how to avoid anxiety and transform pressure into motivation. By leveraging positive emotions, students can achieve better learning outcomes. Teachers can also create simulated challenging scenarios for students to experience, cultivating their courage, willpower, and other positive qualities in dealing with difficulties. This promotes the formation of favorable learning psychological or behavioral patterns.

Acquiring self-directed learning ability means that students can adapt to different learning environments [9], and the ability to adapt to the environment is also formed through students' actions and practices. For example, self-access centers and online or virtual learning environments are significantly different from traditional face-to-face classroom environments, and the interaction between teachers and students and peer-to-peer interaction differs from online or human-computer interaction. Only by actively engaging in learning or interaction in various environments can students develop the ability to flexibly switch learning or interaction methods based on the context, namely, the ability for multi-modal interactive learning. In summary, students need to continuously enhance their self-directed learning ability through practical activities and firsthand experiences under the guidance of teachers.

Incorporating inquiry-based learning activities into macro teaching units encourages students to actively engage in information gathering, cooperative discussions, and problem-solving processes. Students can independently generate questions, set topics, and choose appropriate research methods and resources based on their interests and needs. Providing a resource-rich learning environment, including extracurricular reading materials, online learning platforms, multimedia resources, etc., encourages students to explore independently and apply their learned knowledge actively. At the same time, teachers can grant students the autonomy to choose tasks, allowing them to choose learning topics or engage in role-playing activities that interest them.

3.3. Providing Platforms for Demonstrating Abilities

Developing self-directed learning abilities is a gradual, dynamic, and long-term process. In addition to strengthening students' awareness and encouraging their self-directed learning behaviors, teachers need to provide platforms for demonstrating abilities to enhance students' confidence and motivation and promote peer learning and skill improvement. The demonstration of self-directed learning abilities can be reflected in two main aspects.

Firstly, showcasing the outcomes of autonomously completed tasks. According to Gardner's [10] "multiple intelligences" theory, each student has different intelligences and strengths. When assigning learning tasks, teachers should give students the freedom to choose different types of tasks, and the evaluation of learning outcomes should also reflect personalized differences. This enables each student to maximize their potential and fully demonstrate the outcomes of their self-directed learning abilities.

Secondly, dynamic showcasing of the development of self-directed learning abilities. Teachers should be adept at recognizing students' incremental progress or successes. Furthermore, students should be encouraged to reflect on their own development and changes in various dimensions of self-directed learning abilities. Teachers should also explicitly create opportunities for students to showcase their ability development process. For example, when a student who previously heavily relied on the teacher to set learning goals is able to plan their learning objectives independently, the teacher should promptly acknowledge and encourage them. Through group or class sharing, students can introduce their experiences of progress or success, allowing them to experience the joy and satisfaction brought by sharing, enhancing their learning motivation.

These ability showcase activities not only create authentic communicative contexts for students but also provide opportunities for them to communicate in the target language. Most importantly, the showcased outcomes and experiences come from the students and their peers, enabling them to learn from each other to enhance their self-directed learning abilities effectively.

At the conclusion of macro-units of study, organize students to showcase their learning achievements. Various forms can be arranged, such as academic presentations, English speech contests, or group project exhibitions, allowing students the opportunity to demonstrate the application and outcomes of their self-directed learning strategies during the learning process. Utilizing technology tools and online platforms, students can create learning journals, produce learning reports or showcase videos to demonstrate their learning exploration and growth process. Furthermore, students can be encouraged to share their learning experiences and strategies through blogging, publishing teaching resources, and other means.

4. Measurement Techniques for Assessing Self-Directed Learning Abilities

Although it is not possible to directly measure students' self-directed learning strategies, there are indirect methods that can provide insights into students' self-directed learning behaviors and the application of strategies. By considering the results of the following assessment methods together, teachers can obtain a comprehensive assessment of students' self-directed learning abilities and strategy usage. This assessment can guide teachers' instructional decisions and provide personalized student support and guidance.

4.1. Traditional Measurement Techniques for Self-Directed Learning

The Motivated Strategies for Learning Questionnaire (MSLQ) is a widely used self-directed learning scale [10]. The questionnaire consists of 81 items and is composed of two main components: learning strategies and motivation. The learning strategies scale measures abilities related to cognition-metacognition (including rehearsal, elaboration, organization, critical thinking, and metacognitive regulation) and resource management (including time management, learning environment management, effort regulation, peer learning and help-seeking). The motivation scale includes subscales such as intrinsic and extrinsic goal orientation, task value assessment, self-regulation beliefs, learning self-efficacy, and test anxiety. Motivation, cognition-metacognition, and resource management correspond to the three components of self-directed learning as defined. The internal consistency coefficients provided in the scale manual range from 0.52 to 0.93. There are six subscales that do not meet the minimum coefficient requirement of 0.70. Test-retest stability coefficients are not provided in the scale manual. The Motivated Strategies for Learning Questionnaire can provide information about students' learning motivation and strategy usage, helping teachers understand students' needs and characteristics. In English macro-unit teaching, teachers can design personalized teaching strategies based on the questionnaire results to enhance students' motivation and engagement and promote their overall learning.

The Survey of Academic Self-Regulation (SASR) was developed by Dugan, a scholar from St. Lawrence University, New York, based on an examination and analysis of existing scales (including the ones mentioned earlier), taking into consideration their strengths and weaknesses [11]. Dugan designed the SASR questionnaire based on a structured framework of affective factors, cognition-metacognition, and self-regulation. It consists of five subscales related to affective factors: intrinsic motivation, extrinsic motivation, interest, worry/anxiety, and volition; four subscales related to the self: self-regulation, self-reward, self-assessment, and self-monitoring; and five subscales related to self-regulation abilities: cognitive strategies, help-seeking, time and environment management, metacognitive strategies, and planning. The internal consistency coefficients provided by the developer range from 0.71 to 0.86. However, test-retest stability coefficients are not provided. According to research conducted by Dugan et al., this scale has shown greater reliability and validity compared to LASSI and MSLQ, making it more suitable for measuring, diagnosing, and improving students' self-directed learning skills. The Survey of Academic Self-Regulation provides information about students' self-regulation abilities, helping teachers understand their needs and characteristics. In English macro-unit teaching, teachers can design personalized teaching strategies based on students' self-regulation abilities, foster their self-regulation skills, and promote their learning outcomes and motivation.

4.2. Recent Trends in Measurement Techniques for Assessing Self-Directed Learning

In recent years, some scholars have conceptualized self-directed learning as an event that unfolds from beginning to end, leading to the development of new measurement tools. For example, Zimmerman et al. have adopted a stage model of self-directed learning, dividing the process of self-regulation into several stages: forethought, performance/control, and self-reflection. Building upon this framework, event sampling methods (or real-time context measurement methods) have been developed to assess the temporal order of various responses during the learning process and make causal inferences about changes in self-regulatory behaviors as they occur in real-time. This paper will now focus on discussing several innovative measurement techniques for assessing self-directed learning.

4.2.1. Computer-based Tracking Log Technology

Computer-based tracking log technology involves tracking and recording learners' interactions and operations within a computer software system to analyze their utilization of various self-directed learning skills. One representative example is the software gStudy developed by American scholars Winne et al. This software supports learners in note-taking, creating vocabulary labels and indexes, forming concept maps, information searching, chatting, and seeking help. It allows students to upload materials and resources from almost any subject [12]. Clearly, compared to traditional instructional software, gStudy provides better support for students' self-directed learning. In addition to various features supporting self-directed learning, gStudy also provides a log analyzer to record students' learning traces. For example, it examines the frequency and patterns of highlighting key points in texts and whether students summarize and provide feedback on using instructional materials. Learning traces refer to observable external behaviors that students establish during the process of completing a task. Researchers can utilize these traces to reconstruct the entire process of students' use of learning methods. This information can assist students in understanding the effectiveness of their use of various methodological strategies. The use of gStudy enables the measurement of students' self-regulation processes and outcomes, which can be presented in the form of simple frequency charts. The ability of computer technology to save learning information without learners' awareness is unparalleled by any other method, allowing researchers to obtain detailed information about students' utilization of various learning methods during task completion. Winne and Jamierson-Noel compared computer tracking measurement technology with self-report measurement technology using gStudy software. The results

demonstrated students' difficulties in assessing their application of self-regulation strategies. For example, students' self-reports on their use of planning strategies exceeded actual records by 29%, and their self-reports on using rehearsal methods exceeded actual records by 26%. Concurrently, computer tracking logs revealed that some built-in strategy features in gStudy, such as creating instances, memory techniques, and posing questions, were rarely utilized[13]. Computer-based tracking log technology involves tracking and recording learners' interactions and operations within a computer software system to analyze their utilization of various self-directed learning skills.

4.2.2. Structured Diary Measurement Technique

The structured diary measurement technique is an innovative method used to assess the effectiveness of classroom training in enhancing students' self-directed learning abilities and other research areas. For example, Schmitz and Wiese (2006) conducted a 2-hour weekly training program on self-regulation strategies for students majoring in civil engineering at a German university. The training included goal-setting, time management, planning, self-monitoring of behavior and cognition, attention, and other aspects. Throughout the training, students kept real-time diaries. These diaries required students to answer a series of questions at different stages of the training. For instance, during the planning stage, the questions mainly focused on setting learning goals and making plans. During the feedback stage, the questions revolved around the time spent on learning, the effectiveness of that time, whether the goals were achieved, and the actual mastery of the content [14]. The researchers conducted linear analyses on the trends in self-regulation recorded in students' real-time diaries. The results indicated significant improvements in students' self-efficacy, positive emotions, understanding, and sense of achievement. The researchers also employed time-series analyses to compare and analyze performance within different time intervals. The results demonstrated notable progress in students' time management, planning, attention, and procrastination reduction. The practical application of the structured diary measurement technique has proven to be a more sensitive real-time assessment method compared to traditional questionnaires. As a measurement tool in English language teaching, students can record their learning reflections, usage of learning strategies, and learning experiences, thereby deepening their awareness of their learning processes and making timely adjustments and improvements to their learning strategies.

4.2.3. Outloud Thinking Measurement Technique in Hypermedia Environments

Azevedo and colleagues have developed a fine-grained outloud thinking technique to assess students' self-directed learning in hypermedia environments [15]. This technique requires students to report their thinking and cognitive processes while solving tasks. Azevedo et al. argue that in hypermedia environments, students are required to employ self-regulatory methods to manipulate, organize, and integrate information. These methods include goal-setting, self-monitoring, and regulation of cognition, motivation, and behavior. In recent years, Greene and Azevedo (2007) conducted a study on middle and high school students' utilization of self-directed learning techniques while learning about the human circulatory system model. Students verbally reported all their thinking processes during the completion of learning tasks, which were then recorded, encoded, and categorized by trained observers. The coding of approximately 1800 oral segments achieved high reliability. The coding system yielded 35 categories of self-directed learning strategies across five major domains: planning, self-monitoring, strategy use, task difficulty and requirements, and motivation [10]. These major categories have received support from other research findings and gained wide recognition among scholars. The practical application of the outloud thinking technique has proven to be an effective method for measuring students' self-directed learning abilities and can be further promoted in relevant fields. By documenting and analyzing students' learning behaviors and strategies, this technique helps students improve their metacognitive and self-directed learning abilities. Additionally, it provides teachers and educational researchers with insights into students' learning processes and strategies, supporting and promoting the implementation and development of English language teaching approaches.

4.2.4. Microanalysis Measurement Technique

The microanalysis measurement technique refers to the measurement of self-regulation processes and motivation before, during, and after learning using specific questions [16]. Researchers use open-ended and closed-ended questions to inquire about learners' self-directed learning at different stages, generating qualitative and quantitative data. These questions are concise and focus on the specific characteristics of the learning tasks to minimize interference with the learning process. For instance, to measure students' self-efficacy in solving English problems, students can be asked to evaluate their confidence in completing the task on a scale from 0 to 100 during the problem-solving process. This technique allows for measuring students' immediate self-efficacy during the problem-solving process rather than overall self-assessment. Continuous use of this technique throughout the learning process can reveal student self-efficacy trends during problem-solving. Additionally, learners can self-correct their self-efficacy evaluations based on their actual problem-solving task performance. Various microanalysis techniques have been developed and applied in research on different aspects of self-directed learning, particularly in sports training (such as shooting free throws, volleyball serving, javelin throwing, etc.). Despite their apparent simplicity, these

microanalysis techniques have demonstrated their effectiveness and reliability through empirical research. By measuring students' self-regulation processes and motivation before, during, and after learning, teachers can gain a better understanding of students' learning needs and self-regulation abilities. Based on this information, teachers can adjust their teaching strategies to help students improve their learning outcomes and motivation, thereby achieving better learning outcomes in English language teaching units.

5. Conclusion

In exploring the construction and influences of self-directed learning strategies among secondary school students in learning English, this study adopted a holistic approach within the context of unit-based instruction. By identifying the influences of the concept of "big ideas" on students' lack of awareness, action, and ability, the cultivation path of self-directed learning abilities was discussed across three levels: consciousness, action, and capacity. Several innovative measurement techniques were also introduced. However, there are limitations to this study. Firstly, self-directed learning abilities are influenced by multiple factors, such as individual differences, learning environments, educational policies, etc. Future research should consider more factors to comprehensively understand secondary school students' choices of self-directed learning strategies. Secondly, this study introduced some innovative measurement techniques, but these techniques may need further refinement and validation to ensure their effectiveness and reliability. For example, the quantitative measurement of self-directed learning abilities may need to be combined with qualitative methods to assess students' abilities comprehensively. Lastly, while this study proposed a cultivation path for self-directed learning abilities, the actual effectiveness of these paths needs further research and verification. Future research can adopt longitudinal designs to track the development of students' self-directed learning abilities and explore the effects of different educational interventions on the construction of self-directed learning strategies.

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