Research of Blended Teaching Strategies Based on Heutagogy, Cybergogy and Peeragogy: A Systematic Literature Review

Li Rui, Nurfaradilla Mohamad Nasri and Li Zhen

Abstract – **The concepts of Heutagogy, Cybergogy and Peeragogy are products of the digital age in the 21st century. New concepts have brought new opportunities and challenges to education and teaching. Cultivating students' abilities of independent learning, peer learning, cooperative learning and self-development in the digital age, so that learners can become high-quality talents with lifelong learning capabilities, has become the main goal of today's education. With its flexibility and personalization, the blended teaching strategy can better integrate new educational concepts into the classroom and better realize the needs for talent training. However, there are currently relatively few studies on hybrid teaching strategies based on the concepts of Heutagogy, Cybergogy and Peeragogy, and the characteristics and implementation principles of hybrid teaching strategies are not yet clear. This study uses a systematic literature review and meta-analysis method to explore the requirements and characteristics of hybrid teaching strategies based on the principles of Heutagogy, Cybergogy and Peeragogy based on an in-depth analysis of the concepts of Heutagogy, Cybergogy and Peeragogy. The study proposed 23 detailed rules that present the three elements of the hybrid teaching strategy (organizational strategy, delivery strategy, and management strategy) in three dimensions, and proposed three principles for the implementation of the hybrid teaching strategy design. It provides a reference for teachers to design and implement hybrid teaching strategies based on the principles of Heutagogy, Cybergogy and Peeragogy, in order to optimize the teaching and learning experience and improve the effectiveness of education and teaching.**

Keywords – **Heutagogy, Cybergogy, Peeragogy, Blended Teaching Strategies**

I. INTRODUCTION

In the era of information technology in the 21st century, the rapid development of science and technology has provided huge opportunities and challenges for education and teaching, and has also promoted the continuous rethinking of traditional teaching models (Asad & Malik, 2023). Due to the dominant position of teachers, the traditional class teaching system fails to stimulate students' learning initiative, and it also fails to make full use of the advantages of information technology resources (Hase, & Kenyon, 2000, 2007). In response to this problem, experts and scholars have discussed new teaching theories and models in the current context to meet the needs for talent

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training in today's information technology era. In this context, the introduction of concepts such as Heutagogy, Cybergogy and Peeragog undoubtedly marks a major progress in the field of education (Blaschke, 2021).

In order to fully apply the Heutagogy, Cybergogy and Peeragog theories and let them serve education and teaching, the hybrid teaching model gradually comes into people's vision (Cheng (2022)). The hybrid teaching model weakens time and space constraints, allowing students to use the Internet anytime, anywhere Engage in learning (Gao, 2020). In addition, the application of the hybrid teaching model allows educators to use various interactive tools, multimedia resources and virtual experiments, increasing opportunities for students to participate in learning, enriching teaching methods, making teaching more diverse, and getting rid of the traditional teaching model's limitation (Lee, Lim & Kim, 2017). This model allows educators to provide customized learning experiences based on students' learning styles, levels and interests, and provides students with personalized learning paths and resources through online learning platforms, further promoting the personalized development of education.

However, in the specific implementation of the hybrid teaching model, the formulation of hybrid teaching strategies is particularly important. How to fully integrate current information technology resources to provide students with a personalized learning experience? What are the specific requirements and characteristics of hybrid teaching strategies? Still needs further in-depth research and discussion. The goal of this article is to deeply analyze the concepts, characteristics and advantages of Heutagogy, Cybergogy and Peeragog, combine their applications in hybrid teaching, summarize the characteristics and requirements of hybrid teaching strategy design, and propose principles for implementing hybrid teaching strategies. It is hoped that this research will provide feasible guidelines for the design and implementation of blended teaching, assist teachers in better designing blended teaching, and improve educational and teaching effects.

II. PROBLEM STATEMENT

T The introduction of the concepts of Heutagogy, Cybergogy and Peeragog means changes in the field of education. These teaching concepts emphasize cultivating students' abilities in independent learning, online learning and peer learning in the digital age (Wang & Kang, 2006). The ultimate goal is to cultivate learners into high-quality talents with lifelong learning abilities (Blaschke, 2012). With the application of these concepts in education, it is necessary to explore the needs and characteristics of hybrid teaching strategies based on Heutagogy, Cybergogy, and Peeragog.

There have been many articles studying Heutagogy, Cybergogy and Peeragog, but there are still obvious deficiencies in the research involving their comprehensive application in hybrid teaching strategies. Existing literature tends to focus on each instructional approach in isolation, lacking comprehensive insights into how these principles work together to guide hybrid instructional design. There is a lack of a systematic framework outlining the specific requirements, principles, and methods for integrating Heutagogy, Cybergogy, and Peeragog into hybrid teaching.

This study aims to explore what are the key requirements and characteristics of hybrid teaching strategies based on Heutagogy, Cybergogy and Peeragog? What are the principles for implementing hybrid teaching strategies based on Heutagogy, Cybergogy and Peeragog?

III. LITERATURE REVIEW

Heutagogy

The core concept of Heutagogy is self-paced learning and autonomous learning. This theory emphasizes the autonomy and self-direction of learners and regards learning as an active, purposeful, and self-driven process. Different from traditional educational theory, it not only focuses on the acquisition of knowledge, but also emphasizes on cultivating learners' learning ability, problem-solving ability and critical thinking (Hase& Kenyon, 2000, 2007; Blaschke & Hase (2016)).

Heutagogy plays a powerful function and role in hybrid teaching. First of all, Heutagogy emphasizes the autonomy of students' learning and encourages students to set their own goals. The rich and diverse online learning resources in hybrid teaching can better stimulate students' active pursuit of knowledge, and students have more opportunities to participate in learning (Bandura, 2001; Blaschke, 2021; Blaschke & Hase, 2019). Blended teaching provides students with a flexible learning environment where students can choose online resources according to their own learning styles, interests and ability levels, thereby creating a learning experience that is more in line with individual needs (Hase, S. & Kenyon, K. 2003) . Heutagogy encourages cross-learning between disciplines. Blended teaching provides a richer and more diverse subject experience through online resources and practical projects in different subjects, prompting students to apply interdisciplinary knowledge when solving practical problems (Hase, S., & Kenyon, C. 2007). In hybrid teaching, the concept of Heutagogy can be realized by integrating various technological tools. Technical tools such as online platforms, virtual experiments, and multimedia resources help provide more interactive and visual learning experiences and enhance students' learning engagement. Heutagog emphasizes reflection in the learning process, and blended teaching can prompt students to have a deeper understanding of their own learning process by providing online discussions, feedback, and regular learning summaries (Gregory et al., 2018).

By applying the Heutagogy principle in hybrid teaching, students' learning autonomy and initiative can be better utilized. A personalized, flexible and inspiring learning environment can better promote students' learning participation and cultivate students' independent learning and problem-solving abilities.

Cybergogy

Cybergogy is technology-based learning, a network-based learning model (Satria, D. (2022, December)). Cybergogy emphasizes the use of technology to make student learning easier, and it focuses on how to use information technology, the Internet, and digital tools to promote educational teaching (Suhaimi, N. A., Adnan, M., & Puteh, M. (2020)).

The concept of Cybergogy is in line with the needs of learners in the digital age. Through online platforms and digital tools, it can better meet students' expectations for a flexible, interactive, and digital learning environment (Rahma, R. A., Affriyenni, Y., & Widyaswari, M. (2021)). In hybrid teaching, Cybergogy can increase student participation and stimulate students' interest and enthusiasm for learning through interactive and personalized learning design, thereby improving learning effects (Torres Martín (2021)). The application of Cybergogy enriches learning resources and expands students' learning experience through multimedia, virtual experiments, etc., making hybrid teaching more diverse and innovative (Rahma and Widyaswari, (2021)). Cybergogy emphasizes learners' initiative and autonomy, which is consistent with the concept of encouraging students to learn independently in hybrid teaching. Through online platforms, students are more able to direct their own learning process and develop the ability to learn independently. In hybrid teaching, Cybergogy's global features can help students better adapt to the cross-cultural learning environment and cultivate their international vision and cross-cultural communication skills.

Taken together, the application of Cybergogy in hybrid teaching not only expands teaching methods and resources, but also adapts to the diverse needs of learners, improving the effectiveness and attractiveness of teaching.

Peeragogy

The Peeragogy concept emphasizes communication, collaboration and mutual assistance with peers during the learning process. It emphasizes that students improve their learning strategies and communication skills during the peer learning process. It encourages students to actively participate in interactive learning situations and actively communicate with peers. Emphasize that learning occurs in the process of communication and discussion with peers (Rheingold, 2014).

Peeragogy emphasizes learners' mutual learning and peer learning, emphasizing that learning occurs in the process of communication and discussion, collaboration and mutual assistance with peers, which can make learners more actively participate in the learning process, and also help cultivate learners' active learning awareness and Ability (Rheingold, 2014). In blended teaching, learners can choose learning content according to their own interests and needs to achieve personalized learning. Learners acquire knowledge and achieve goals through peer cooperation, community interaction, etc., which helps develop students' social interaction skills. Peeragogy emphasizes self-organized learning communities, allowing learners to spontaneously form learning groups or communities and

jointly build a learning environment (Corneli, Keune, Lyons & Danoff, 2013). This helps learners better understand and apply subject knowledge. Peeragogy helps cultivate students' awareness of continuous learning through peer learning and community building (Rheingold, 2014). It is easier for learners to maintain their continuous pursuit and update of knowledge in such an environment.

Taken together, the application of Peeragogy in blended teaching can help improve students' learning effects, cultivate comprehensive literacy, promote the development of social skills, and make the learning process more open and interesting. The application of Peeragogy in hybrid teaching strategies can promote learners to transform from passive recipients of knowledge to active builders of knowledge, helping to cope with the complexity and diversity of modern learning environments.

Blended teaching strategies

Regarding the definition of teaching strategies, different experts and scholars have different definitions. For example: Charles M. Reigeluth believes that teaching strategies are a series of methods and means adopted to achieve teaching goals, including three types of strategies: Teaching strategies include teaching organization strategies, teaching delivery strategies and teaching management strategies (Reigeluth, 2013). Robert Marzano believes that teaching strategies are specific methods used to promote students to master knowledge and acquire skills (Marzano, Pickering & Pollock, 2001). Jerome Bruner proposed the concept of "discovery learning" and believed that teaching strategies should focus on inspiring learning. Teaching strategies should be able to stimulate students' curiosity and desire to explore, thereby promoting students' in-depth understanding of knowledge (Bruner, 1997).

This study adopts Reigeluth's point of view and divides teaching strategies into three categories: organizational strategies, delivery strategies and management strategies. Organizational strategies involve how to effectively organize and arrange teaching content, learning activities, and students' learning environment. Delivery strategies focus on how teachers effectively transfer knowledge, concepts, and skills to students. Management strategies involve how to effectively manage student behaviour, classroom order, and teaching resources. An analysis of the characteristics of organizational strategies, delivery strategies and management strategies is shown in Table I.

TABLE I: ANALYSIS OF CHARACTERISTICS OF TEACHING STRATEGIES

teaching strategy	Features
organizational strategy	1. Rigorous and flexible structure: The organizational strategy needs to ensure that the teaching content is orderly, clear, and can be presented flexibly. 2. Personalized teaching and learning: The pawn strategy needs to consider the individual differences of students, and organize teaching in a personalized manner based on factors such as students' interests, ability base, and learning styles to support students' personalized learning needs. 3. Participation and inspiration: Organizational strategies need to mobilize students' enthusiasm for learning and stimulate students' interest in learning through participatory and inspiring learning tasks.
delivery strategy	1. Interactivity: The delivery strategy encourages teacher-student interaction, student-student interaction, and interaction between technical resources and students in the learning process, and encourages students to explore independently and experience the problem-solving process. 2. Diversification: The delivery strategy emphasizes the use of a variety of teaching media and methods to meet the learning styles of different students. 3. Task and practice orientation: combine theoretical knowledge with practical applications, and transfer knowledge through practical cases, task activities, etc., so that students can better apply the knowledge they have learned into practice.
management strategy	1. Flexibility: Teaching management needs to be adjusted and improved based on students' classroom feedback and actual conditions. This includes flexible management of class progress and learning resources. 2. Evaluation and feedback mechanism: Teaching management needs to provide an effective evaluation and feedback mechanism to understand students' learning status in a timely manner, help them solve problems, and also provide a basis for the improvement of the teaching process. 3. Incentive: Stimulate students' learning motivation and improve their enthusiasm for learning through incentive and reward mechanisms. This can include recognition, scholarships, academic competitions, etc.

The development of hybrid teaching strategies is the product of the application of digital technology in the field of education. It emphasizes combining the advantages of traditional teaching and online teaching, maximizing the use of educational resources, and providing students with a more flexible and personalized learning experience. At present, many studies have proposed examples and models of the application of hybrid teaching strategies in different subjects. For example, Ma et al. (2022) proposed a hybrid teaching model under the "Healthy China" strategic framework. This model covers the fields of biochemistry and molecular biology education and is committed to promoting students' comprehensive development in the health field by integrating traditional teaching and online learning resources. Gao (2020) focused on hybrid teaching strategies for art and design majors, emphasizing the promotion of practicality and creativity in art and design disciplines by integrating online learning and face-to-face teaching. Cheng's (2022) research focuses on hybrid teaching strategies based on computer corpora, providing a solution for integrating online and traditional teaching in college English translation courses. What these studies have in common is a focus on the effective integration of online and face-to-face learning.

With the introduction of innovative teaching methods and their application in hybrid teaching, hybrid teaching strategies have a new development direction. For example, Ma et al. (2022) emphasized the importance of student-led learning in the hybrid teaching model, and supported students to learn according to their interests and needs through the creation of autonomous learning paths and autonomous learning support systems. Anthony et al. (2021) developed a model based on Heutagogy theory to predict teachers' adoption and actual use of blended learning. The study emphasized teacher leadership and students' personalized learning. Capone (2022) combined Cybergogy

theory and created a flexible, interactive and personalized blended learning experience by designing a digital learning environment. Cook et al. (2023) studied the application of Cybergogy theory in distance teaching and improved the interactivity and adaptability of teaching through the use of digital tools. Skliarova et al. (2023) discussed the application of Peeragogy in hybrid education and emphasized the importance of collaboration, sharing, and support in hybrid education. Kannan et al. (2020) explored a peer collaboration strategy that enhanced the participation and learning effects of hybrid courses through collaborative learning among classmates. Through the above analysis, we found that most of the current research on innovative teaching methods and hybrid teaching strategies only focus on the combination of a single innovative teaching method and hybrid teaching, and do not pay attention to the effective integration of Heutagogy, Cybergogy and Peeragogy theories. There are no specific strategies for how to effectively apply the Heutagogy, Cybergogy and Peeragogy theories in hybrid teaching, which results in teachers being unable to take advantage of the Heutagogy, Cybergogy and Peeragogy theories in actual teaching. Based on the above shortcomings, the research aims to explore the basis of Heutagogy, Cybergogy and Peeragogy. Characteristics and requirements of hybrid teaching strategies based on Cybergogy and Peeragogy theories, and specific design principles are proposed to make up for the shortcomings of current research.

IV.   THEORETICAL FRAMEWORK

The theoretical framework of this study is constructivism theory, social cognitive theory and technology integration framework TPACK model. These three together build a comprehensive and organic learning support system.

In the constructivist theory, Swiss psychologist Jean Piaget (Piaget, J. (2013)) proposed the famous stage theory of cognitive development, which regards learning as a process in which learners actively construct their understanding of the world. This theoretical basis emphasizes the adaptive process of learning, including cognitive assimilation and adaptation, and provides theoretical support for subsequent teaching design. As an extension of constructivist theory, Heutagogy emphasizes the autonomy and self-direction of learning. Under this concept, learning is regarded as an active, purposeful, and self-driven construction process of knowledge meaning. This echoes the learning concept of Peeragogy, which emphasizes students' mutual communication and communication in the peer learning process, jointly constructing the meaning of knowledge, and emphasizing the self-construction of students' learning process. The two complement each other and provide students with a more diversified and autonomous learning path.

In social cognitive theory, Albert Bandura (1977) argued that individuals develop skills by engaging in autonomous learning and problem solving, emphasizing that learning occurs through observing and imitating the behaviour of others. Bandera points out that learning effects are more significant when imitative behaviour is accompanied by positive consequences. In Cybergogy learning, the application of technology is seen as key to optimizing students' cognitive, emotional and social communication experiences. Technology provides students with opportunities for personalized learning and encourages students to actively explore and solve problems in a digital environment. This is consistent with the perspective of social cognitive theory, which emphasizes that learning occurs through observing and imitating the behaviour of others. Under this framework, students develop skills by participating in independent learning and problem solving, and are able to imitate and learn from the excellent learning behaviours of others to achieve a deeper understanding of knowledge.

The TPACK model provides guidance for technology integration for the entire theoretical framework. This model considers the interaction between technology, pedagogy, and subject content knowledge (Mishra, P., & Koehler, M. J. (2006)), providing educators with a good framework for integrating technology into teaching. In Heutagogy learning, the TPACK model helps educators identify and integrate appropriate technologies to enhance students' learning motivation and optimize the learning experience in independent learning. In Peeragogy learning, the TPACK model helps educators integrate technology to design attractive project tasks or game tasks to promote student engagement in learning. In Cybergogy learning, the TPACK model helps educators integrate technology to design online learning environments, build learning communities, and promote students' online learning and online participation. The three integrate with each other to provide a more systematic and comprehensive support framework for teaching.

Taken together, constructivist theory emphasizes students' initiative in the learning process and the self-construction of knowledge. Social cognitive theory emphasizes the social nature of student learning and proposes the positive impact of observation and imitation on student learning. The TPACK model emphasizes the interplay of technology, instruction, and subject content knowledge. These three theories complement each other and together provide theoretical support and practical guidance for the research on hybrid teaching strategies based on Heutagogy, Cybergogy and Peeragogy.

V.   METHOD

This study uses a systematic literature review and meta-analysis to analyze the application of Heutagogy, Cybergogy and Peeragogy theories in hybrid teaching strategies.

Under the theoretical guidance of constructivism theory, social cognitive theory and TPACK model, hybrid teaching strategies are analyzed in depth. Using the classification of teaching strategies based on Charles M Reigeluth, teaching strategies are divided into teaching organization strategies, teaching delivery strategies and teaching management strategies, and the requirements of these strategies in the three theoretical dimensions of Heutagogy, Cybergogy and Peeragogy are determined.

Collect research literature on hybrid teaching strategies involving Heutagogy, Cybergogy, and Peeragogy, as well as

literature on detailed descriptions and analyzes of teaching strategies.

An in-depth analysis of selected literature is conducted, focusing on the application, characteristics, and advantages of each theory in blended teaching strategies. According to the classification and theoretical framework of Charles M Reigeluth, the literature on each teaching strategy was classified and refined. After systematic analysis, 23 characteristics of the hybrid teaching strategy in the theoretical dimensions of Heutagogy, Cybergogy and Peeragogy were obtained. The requirements for designing hybrid teaching strategies are summarized, and three principles for implementing hybrid teaching strategies are proposed.

Sample acquisition

In order to effectively obtain the target literature of this study, the research was conducted in 5 literature databases: EBSCO ERIC, ScienceDirect, Springer Link, Web of Science, and Wiley Online Library, using "Heutagogy", "Cybergogy", "Peeragogy", "Blended Teaching Strategies" and "Teaching Strategies". ” conducted a precise title search for keywords, and the document time was limited to January 1, 2010 - June 30, 2023, and a total of 2486 documents were obtained (Heutagogy n=962, Cybergogy n=115, Peeragogy n=75, Blended Teaching Strategies and Teaching Strategies n=1334).

Literature screening criteria

In order to ensure the accuracy and reliability of the literature analysis results, and to accurately present the research on Heutagogy, Cybergogy and Peeragogy theories and hybrid teaching strategies, based on the research questions, this study developed a method as shown in Table 1 based on the 2486 documents initially retrieved. Literature inclusion/exclusion criteria. As shown in Table II, the first six items are systematic literature reviews and commonly used criteria for screening literature. The seventh item limits the quality of literature and eliminates literature that lacks research questions, rigorous experimental processes, and clear research methods; the eighth item aims to The research topics of the literature focus on the research on Heutagogy, Cybergogy and Peeragogy theories and hybrid teaching strategies, and research literature that does not match the research focus is eliminated.

TABLE II: LITERATURE EXCLUSION/INCLUSION CRITERIA

Number	Inclusion Criteria	Exclusion Criteria
1	English Essay	Non-English Paper
2	Empirical Research	Non-empirical research
3	Full text available	Full text is not available
4	The article is a journal article	Reviews, conference papers, reports, etc
5	Article must contain at least three pages	Posters, short papers or introductions of less than three pages, etc.
6	Article title appears only once	Repetitive title
7	Research includes clear research questions, research methods, and research conclusions	The study did not present clear research questions, research methods or research conclusions.
8	Research topics focus on Heutagogy, Cybergogy and Peeragogy theories	Research Topics Non-Heutagogy, Cybergogy and Peeragogy Theory and

and hybrid teaching strategies		Hybrid Teaching Strategies

Literature screening process

This study followed the research ideas of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). This method needs to clearly present the process and reasons for document identification, screening, inclusion or exclusion, in order to improve the accuracy of systematic literature reviews and meta-analysis reports. Based on this research idea, this study finally obtained 30 eligible papers to answer the research questions of this study. The PRISMA flow chart is shown in Figure 1, the number of included documents is shown in Table III.
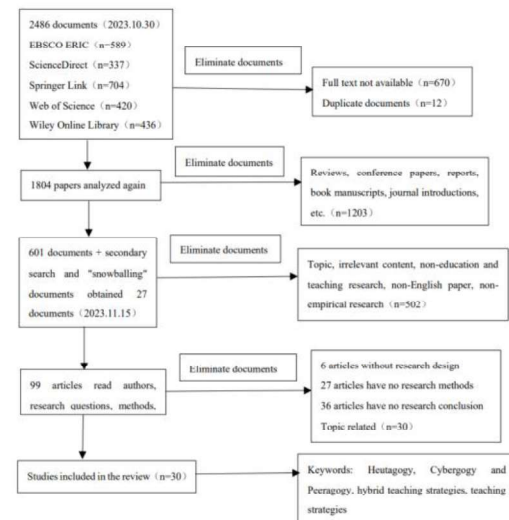
Figure 1. PRISMA FLOW CHART

TABLE III: NUMBER OF STUDIES INCLUDED ACCORDING TO PRISMA GUIDELINES

theme	quantity
Heutagogy	8
Cybergogy	6
Peeragogy	6
Blended teaching strategies	10

Data analysis

First, the inclusion criteria documents were classified according to the dimensions of Heutagogy, Cybergogy and Peeragogy, a literature data set was established, and Heutagogy-related documents were defined as Category A, Cybergogy-related documents were Category B, and Peeragogy-related documents were Category C. The document numbering table is shown in Table IV. Extract the summary and key ideas, teaching strategies, theoretical points, etc. of each document, and establish a document information table. The literature information table is shown in Table V in the appendix.

Secondly, a coding system is designed to classify and label different types of teaching strategies and theoretical dimensions, and an information table of teaching strategy dimensions and theoretical dimensions is obtained, as shown in Table VI in the appendix. By analyzing and summarizing the data in the coding system, key information on teaching strategies and theoretical dimensions in each document was

extracted, and a coding table of characteristics of teaching strategies and theoretical dimensions was formed, as shown in Table VII in the appendix.

Finally, a qualitative analysis was conducted on the characteristics of each teaching strategy and theoretical dimension, and the results of the qualitative analysis were sorted out to summarize the characteristics of organizational strategies, delivery strategies and management strategies under the theoretical dimensions of Cybergogy, Peeragogy and Heutagogy, as shown in Table VIII in the appendix.

TABLE IV: DOCUMENT NUMBER LIST

Document Title	Document number
Hase, S., & Kenyon, C. (2000). From andragogy to heutagogy. UltiBASE In-Site.	A1
Hase, S., & Kenyon, C. (2007). Heutagogy: A child of complexity theory. Complicity: An international journal of complexity and education, 4(1).	A2
Blaschke, L. M., & Hase, S. (2016). Heutagogy: A holistic framework for creating twenty-first-century self-determined learners. The future of ubiquitous learning: Learning designs for emerging pedagogies, 25-40.	A3
Hase, S., & Kenyon, C. (2003). Heutagogy and developing capable people and capable workplaces: strategies for dealing with complexity. In Proceedings of the changing face of work and learning conference. University of Alberta.	A4
Bhoyrub, J., Hurley, J., Neilson, G. R., Ramsay, M., & Smith, M. (2010). Heutagogy: An alternative practice-based learning approach. Nurse education in practice, 10(6), 322-326.	A5
Blaschke, L. M., & Hase, S. (2019). Heutagogy and digital media networks. Pacific Journal of Technology Enhanced Learning, 1(1), 1-14.	A6
Blaschke, L. M. (2021). The dynamic mix of heutagogy and technology: Preparing learners for lifelong learning. British Journal of Educational Technology, 52(4), 1629-1645.	A7
Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. The International Review of Research in Open and Distributed Learning, 13(1), 56-71.	A8
Scopes, L. J. (2009). Learning archetypes as tools of Cybergogy for a 3D educational landscape: a structure for eTeaching in Second Life (Doctoral dissertation, University of Southampton).	B1
Muresan, M. (2014). Using cybergogy and andragogy paradigms in lifelong learning. Procedia-Social and Behavioural Sciences, 116, 4722-4726.	B2
Satria, D. (2022, December). Cybergogy: Towards a New Paradigm of Language Learning. In 5th International Conference on Language, Literature, and Education (ICLLE-5 2022) (pp. 207-215). Atlantis Press.	B3
Asad, M. M., & Malik, A. (2023). Cybergogy paradigms for technology-infused learning in higher education 4.0: a critical analysis from global perspective. Education+ Training.	B4
Wang, M., & Kang, M. (2006). Cybergogy for engaged learning: A framework for creating learner engagement through information and communication technology. Engaged learning with emerging technologies, 225-253.	B5
Rahma, R. A., Affriyenni, Y., & Widyaswari, M. (2021). Cybergogy as a Digital Media to Facilitate the Learning Style of Millennial College Students. World Journal on Educational Technology: Current Issues, 13(2), 223-235.	B6
Prasetya, E. P., Nuraeni, N., & Shabir, M. (2022). TEACHERS'PERCEPTION OF PEERAGOGY IN ONLINE LEARNING DURING THE COVID-19 PANDEMIC. Journal of English Educational Study (JEES), 5(2), 141-151.	C1
Corneli, J., Keune, A., Lyons, A., & Danoff, C. J. (2013).	C2
Peeragogy in Action. The Open Book, 3, 162.	
Suhaimi, N. A., Adnan, M., & Puteh, M. (2020). Promoting Transformative Mathematical Learning Through Heutagogy, Paragogy and Cybergogy Approaches. PalArch's Journal of Archaeology of Egypt/Egyptology, 17(10), 481-497.	C3
Rheingold, H. (Ed.). (2014). The Peeragogy handbook. Jointly published by Pierce Press and PubDomEd.	C4
Antipuesto, J. L., & Tan, D. A. (2020). Enhancing Student Performance and Engagement in Mathematics Via Peeragogy. Science International (Lahore), 32(2), 159-164.	C5
Ouhrir, S., Lotfi, S., & Talbi, M. (2019). Online Peeragogy: Effects of videos developed by students on peer learning and their impact on academic results. International Journal of Emerging Trends in Engineering Research, 7(11), 576-583.	C6

VI. RESULTS AND DISCUSSION

In this section, the characteristics and requirements of hybrid teaching strategies based on Heutagogy, Cybergogy and Peeragogy will be discussed, as well as the specific principles for implementing hybrid teaching strategies. The study adopts Charles M Reigeluth's classification of teaching strategies to explore the characteristics and requirements of three aspects of teaching strategies: teaching organization strategies, teaching delivery strategies and teaching management strategies in the three theoretical dimensions of Heutagogy, Cybergogy and Peeragogy. After analysis and summary, it was refined into 23 detailed rules. As shown in Table IX: A detailed table of characteristics and requirements of hybrid teaching strategies.

Characteristics and requirements of hybrid teaching strategies based on Heutagogy, Cybergogy and Peeragogy Organizational Strategy - Heutagogy Dimension

The design of organizational strategies has three significant characteristics in the Heutagogy theoretical dimension, namely student-centered, self-determined goals and problem-oriented.

Student-centeredness reflects students' self-construction of knowledge. In the design of teaching strategies, individual differences of students should be considered and the subjectivity of student learning should be emphasized. In organizing teaching content, teachers need to fully consider the basic differences in students' learning styles, interests and abilities to ensure that the learning process is closer to the individual needs of students. (Hase & Kenyon, 2000, Blaschke & Hase, 2016)

Self-set goals allow students to set their own pace, set long-term and short-term goals, and develop goal-oriented learning habits according to their interests and learning styles (Blaschke & Hase, 2016, Blaschke, 2012). Instructional design should support students to set their own pace according to their interests, hobbies and learning styles, encourage them to set clear learning goals and develop goal-oriented learning habits.

Problem orientation guides students to think, explore and solve problems by asking open questions, stimulating students' interest and curiosity (Bhoyrub et al., 2010, Blaschke, 2019). When designing teaching strategies, problem settings should be related to actual problems so that

students can gain knowledge through problem solving.

Organizational Strategy - Cybergogy Dimension

Organizational strategy design has two characteristics in the Cybergogy dimension, namely the presentation of teaching materials in the form of digital resource media and the design of virtual learning environments.

Teaching materials are presented in the form of digital resource media, emphasizing the use of digital technology to organize diverse digital resources, providing interactive media teaching materials, and supporting students' personalized learning (Wang & Kang, 2006, Rahma et al., 2021). Specific design requirements are that teachers should use a variety of digital resources, integrate interactive media teaching materials, and consider adding real-time collaboration tools to support students' personalized learning.

Virtual learning environment design can provide rich multimedia learning resources to help students achieve personalized learning and independent learning. The design of specific teaching strategies needs to consider the needs of learners and the functions of media resources to give full play to the advantages of the virtual learning environment. (Muresan, 2014, Satria, 2022).

Organizational Strategy – Peeragogy Dimension

Organizational strategy design has three characteristics in the Peeragogy dimension, namely autonomy and comprehensive development, collaborative tasks, and community building.

Autonomy and comprehensive development advocate learners' active participation and comprehensive development in the learning process (Blaschke & Hase, 2016). Teaching design should encourage students to think independently and learn independently, and cultivate their ability to develop in an all-round way.

Collaborative tasks promote cooperation, sharing, and mutual assistance among team members. The design of teaching strategies should clarify task goals, support diverse task types, encourage inter-disciplinary cooperation and interdisciplinary tasks, and provide a periodic feedback mechanism (Antipuesto & Tan, 2020, Ouhrir et al., 2019).

Learning communities create a more flexible and interactive learning environment. The design of teaching strategies needs to clarify common learning goals, provide diverse learning activities, support communication between students through social platforms, and provide timely feedback and improvement mechanisms (Muresan, 2014).

Delivery Strategy – Heutagogy Dimension

Delivery strategy design has two characteristics in the Heutagogy theoretical dimension, namely: creation of personalized learning paths and independent learning support systems.

The customization, flexibility and diversified learning resources of personalized learning paths can improve learners' learning experience. When designing a personalized learning path, it is required to provide learners with diverse learning resources, visualize students' learning progress, and provide timely feedback and adjustment mechanisms (Blaschke, 2012).

The autonomous learning support system can provide the necessary resources and tools according to students' needs, helping students better plan and evaluate their own learning process. The design of autonomous learning support systems includes the management of autonomous learning tasks, learner-oriented design, and provides real-time feedback mechanisms to support students' autonomous learning (Hase & Kenyon, 2003).

Delivery Strategy – Cybergogy Dimension

Delivery strategy design includes three characteristics in the Cybergogy dimension, namely: online learning platform design, digital media resource design, and intelligent push of learning resources.

The design of online learning platforms should provide diversified learning resources, support real-time interaction and communication, and personalized learning paths, while also being able to conduct learning analysis and feedback, and track student participation (Asad & Malik, 2023, Rahma et al., 2021).

The design of digital media resources needs to support real-time interaction, provide multimedia support, be able to track students' tasks and progress, support personalized customization, and provide learning analysis and feedback (Satria, 2022, Wang & Kang, 2006).

Intelligent push of learning resources needs to provide personalized recommendations based on students' interests, learning goals and other factors to ensure that the pushed resources match the learning goals and are diversified, immediate and accessible (Blaschke, 2019Muresan, 2014).

Delivery Strategy – Peeragogy Dimension

The delivery strategy has two characteristics in the Peeragogy dimension, namely: learning community construction and social learning network construction.

The construction of a learning community requires clarifying common rules and values, promoting the sharing of learning resources, and providing feedback and evaluation mechanisms to maintain a positive atmosphere in the learning community (Rheingold, 2014, Corneli et al., 2013).

The construction of social learning networks needs to provide multimedia support, be able to conduct learning analysis and feedback, support open resource sharing, and promote the formation of personalized learning paths (Ouhrir et al., 2019, Antipuesto & Tan, 2020).

Management Strategies – Heutagogy Dimension

Management strategy design has two characteristics in the Heutagogy dimension, namely: self-management and lifelong learning orientation

Self-management reflects the self-determination characteristics of student learning, and learners can choose personalized learning paths, resources and goals. Management strategies need to provide training and support, conduct assessment and feedback, support students in

developing personalized learning plans, and provide corresponding personalized learning resources (Hase & Kenyon, 2007, Bhoyrub et al., 2010).

A lifelong learning orientation encourages learners to continue learning and develop their learning abilities. Management strategies need to encourage students to continue learning and provide support systems to encourage students to continuously develop their learning abilities (Blaschke, 2012, Hase & Kenyon, 2003).

Management Strategies - Cybergogy Dimension

The management strategy design includes three characteristics in the Cybergogy dimension, namely flexible learning environment management, student support service management and intelligent learning system management.

Flexible learning environment management refers to the management and organization of learning resources and learning activities to adapt to the different needs, backgrounds and learning styles of learners. The design of flexible learning environment management needs to be customizable to adapt to the needs of different students, and must be managed in a data-driven and participatory manner (Satria, 2022, Wang & Kang, 2006).

Student Support Services Management aims to provide comprehensive support for student learning. This function needs to provide personalized care, ensure the sustainability of services, and implement effective management with the help of data-driven (Rahma et al., 2021 , Satria, 2022).

Intelligent learning system management aims to organize, optimize and manage the operation of intelligent learning systems, requiring user-centered design, making data-driven decisions, and maintaining system maintainability (Asad & Malik, 2023, Muresan, 2014).

Management Strategies – Peeragogy Dimension

The management strategy has three characteristics in the Peeragogy dimension, namely peer cooperation and social platform management, project (task) management and subject coordination management.

Peer collaboration and social platform management need to be user-driven, maintain openness and transparency, and provide continuous learning support (Rheingold, 2014, Corneli et al., 2013).

Project (task) management needs to emphasize feedback and evaluation mechanisms, encourage students to participate in decision-making, and cultivate students' teamwork skills (Ouhrir et al., 2019, Antipuesto & Tan, 2020).

Coordinated management of disciplines requires setting interdisciplinary evaluation standards, encouraging sharing of resources between disciplines, and providing guidance from subject tutors.

In general, Heutagogy, Cybergogy and Peeragogy theories all focus on the use of technology and media, and emphasize the autonomy of learners themselves. Cybergogy focuses more on digital media and global perspectives. Peeragogy focuses on peer learning and developing professional skills in practice. Heutagogy theory values students' ability to manage their own learning and handle complex situations.

Implementation principles of hybrid teaching strategies based on Heutagogy, Cybergogy and Peeragogy

The implementation of hybrid teaching strategies based on Heutagogy, Cybergogy and Peeragogy needs to comprehensively consider various factors and coordinate the support of information technology, teaching objectives and learning environment. This study proposes three principles for implementing hybrid teaching strategies to ensure the effective implementation of hybrid teaching strategies. First: based on goal achievement; second: centered on task realization; third: based on technical support.

Based on goal achievement, the design of mixed teaching strategies must have a deep understanding of the Heutagogy principle and focus on giving full play to students' subjectivity. The design of teaching activities should be able to stimulate students' interest in learning and initiative. The design of teaching resources should be able to meet students' personalized learning needs, provide students with personalized scaffolding, and provide learning adjustments, learning guidance, and decision-making intervention according to learners' ability levels to adapt to their learning needs and learning styles. The formulation of teaching goals should encourage teachers and students to participate together, and encourage students to formulate personalized learning goals, including long-term goals and short-term goals.

Centering on task realization requires the design of mixed teaching strategies to fully implement the Peeragogy concept and place task realization at the core. The design of teaching activities and tasks needs to focus on promoting collaboration, mutual learning and knowledge sharing among peers. Task design must be collaborative and can stimulate learners' interest in learning. It can be project learning, problem learning, inquiry learning, etc. Interdisciplinary tasks should be introduced into task activities to achieve interdisciplinary integration and improve students' comprehensive abilities.

Relying on technology requires teaching strategy design to be combined with the Cybergogy concept, selecting appropriate tools and media based on specific learning tasks and goals, and designing digital content and resources that support students' personalized learning and peer learning. It is required to make full use of multiple media resources, virtual learning environments, online collaboration platforms and learning aids to provide students with a richer learning experience.

VII.   CONCLUSION

Through a systematic literature review, this study conducted a statistical analysis of papers on Heutagogy, Cybergogy and Peeragogy theories. Under the guidance of the theoretical framework, 23 characteristics of hybrid teaching strategy design under the dimensions of Heutagogy, Cybergogy and Peeragogy were extracted, and The design requirements corresponding to the characteristics are put forward. Provide reference for teachers to design hybrid teaching strategies based on Heutagogy, Cybergogy and

Peeragogy theories. The paper finally puts forward three principles for implementing hybrid teaching strategies, namely, based on goal achievement, centered on task realization, and relying on technical support. Provide specific practical ideas for teachers to implement hybrid teaching strategies.

Many strategies and features are mentioned in the research, but concrete empirical support or case studies are lacking. Future research will add actual cases to provide more evidence and make the research more meaningful for practical application. This study did not address specific challenges regarding the implementation of hybrid teaching strategies, teacher training needs, and student feedback. While further improving these aspects, this study provides useful guidance for the design of hybrid teaching strategies in the Heutagogy, Cybergogy, and Peeragogy dimensions, providing a valuable reference for educational practice and future research.

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VIII.   APPENDIX

TABLE V: LITERATURE DATA SET

Document number	Abstract Information	Key Ideas	Research Scope	Theoretical Points	Topic Classification
A1	This literature explores the transition from andragogy to heutagogy	It emphasizes the importance of learner autonomy and independent decision-making, and advocates the establishment of a learning environment dominated by learners.	Explore the theoretical transformation process between andragogy and heutagogy.	The theory and practice of autonomous learning.	Educational Theory Transformation: Theoretical Evolution from Andragogy to Heutagogy
A2	Based on complexity theory, the concept of heutagogy is explored.	Combining heutagogy with complexity theory emphasizes the uncertainty and variability of the learning environment.	Discuss the relationship between heutagogy and complexity theory, and study the development of heutagog.	The relationship between complexity theory and autonomous learning	The relationship between heutagog and complexity theory
A3	Proposes heutagogy as a comprehensive framework for creating autonomous learners in the 21st century.	Place autonomous learning within the overall educational framework to promote students' lifelong learning capabilities.	Heutagog is proposed as an overall framework for creating autonomous learners, and the application of heutagog in new educational design is studied.	A comprehensive framework for heutagogy.	heutagog frame
A4	The heutagogy approach to coping strategies in complex environments is explored.	Emphasis on developing individual and organizational capabilities in complex work environments.	Explore the application strategies of heutagogy in developing capable individuals and complex workplaces.	Application of heutagogy in workplace learning	heutagogy application
A5	Alternative practices using heutagogy in nursing education are explored.	Encourage students to lead their own learning process in practice.	Study the practical application of practice-based heutagogy learning methods in nursing education.	Heutagogy practice in nursing education.	heutagogy practice
A6	Discussed the practice of heutagogy in the digital media network environm	Use digital media networks as tools to promote self-directed learning	Explore how digital media networks influence and interact with heutagog	Application of heutagogy in digital media network environment.	Digital media networks and heutagogy

	ent.		y.	
A7	Explores the dynamic integration of heutagogy and technology to prepare learners for lifelong learning.	Emphasis on the role of technology in promoting self-directed learning.	Examine how heutagogy and technology can be dynamically combined to support learners' readiness for lifelong learning.	A dynamic combination of technology and heutagogy.	heutagogy combined with technology
A8	Reviews the literature on heutagogy practice and self-directed learning.	A comprehensive review of heutagogy practice and independent learning.	Review the relationship between heutagogy and lifelong learning, and analyze the practice and independent learning of heutagogy.	A literature review on heutagogy.	A review of heutagogy and autonomous learning in lifelong learning.
B1	Research on the use of learning prototypes as Cybergogy tools in virtual 3D educational environments is explored.	Emphasis is placed on using learning prototypes in virtual environments such as Second Life as tools for Cybergogy to provide structure for eTeaching.	Research how to use the structure of Cybergogy (network teaching theory) in virtual environments such as Second Life to support eTeaching.	Learn the application of prototypes in Cybergogy.	Cybergogy and the 3D Educational Landscape
B2	Research on the application of Cybergogy and Andragogy theoretical paradigms in lifelong learning is discussed.	Combining Cybergogy and Andragogy theoretical paradigms to enhance the effectiveness of lifelong learning	Explore how to combine Cybergogy and Andragogy theoretical paradigms in lifelong learning.	Application of Cybergogy and Andragogy theoretical paradigms in lifelong learning.	Cybergogy and Andragogy Paradigms in Lifelong Learning
B3	Explores the new paradigm of Cybergogy in language learning.	Propose Cybergogy as a new paradigm for language learning.	Research the application of Cybergogy in language learning and propose new teaching paradigms.	Cybergogy is a new paradigm in language learning.	Cybergogy and the new paradigm of language learning
B4	Cybergogy Paradigms research that critically analyzes technology-infused learning in higher education 4.0.	A critical analysis of technology-infused learning in higher education and proposed cybergogy paradigms.	A critical analysis from a global perspective to study Cybergogy's technology-infused learning in Higher Education 4.0.	Cybergogy applications and analysis in Higher Education 4.0.	Technology-Integrated Learning in Higher Education 4.0
B5	A Cybergogy framework for creating learner engagement through information and communication technology is proposed.	Emphasis on promoting learner engagement through technology.	Proposes research on using the Cybergogy framework in information and communication technology to create learner engagement.	Application of the Cybergogy Framework to Promote Learner Engagement	Participate in Learning Cybergogy
B6	The application of Cybergogy as a digital media in promoting the learning styles of Millennial college students is explored.	Highlighting the role of digital media in promoting the learning styles of Millennial college students.	Research how Cybergogy can be used as a digital medium to promote the learning styles of Millennial college students.	Cybergogy as an application of digital media in promoting learning styles.	Cybergogy as digital media
C1	Surveyed teachers' perceptions of Peeragogy in online learning during the COVID-19 pandemic.	Examined how teachers view teaching through Peeragogy in an online learning environment.	Surveying faculty on their perceptions of Peeragogy in online learning environments, especially during the COVID-19 pandemic.	Pedagogical applications of Peeragogy in online learning during the COVID-19 pandemic.	What teachers say about Peeragogy in online learning
C2	Demonstrates the practical application of Peeragogy.	Demonstrate the application of Peeragogy in action through practical cases.	Describe the application and practical experience of Peeragogy in practical education	Demonstration of the operation of Peeragogy.	Peeragogy Practice

Document number					
C3	Research on promoting mathematics learning through Heutagogy, Paragogy and Cybergogy methods is discussed.	Emphasize the use of diversified teaching methods to promote the transformation of mathematics learning.	. Research the application of Heutagogy, Paragogy and Cybergogy in promoting mathematics learning.	The application of multiple teaching methods in mathematics learning.	Transforming math learning with Heutagogy, Paragogy and Cybergogy
C4	The Peeragogy Manual is written to provide detailed guidance on Peeragogy.	Comprehensive guides and resources for Peeragogy are provided.	Provides a manual for Peeragogy practice to guide practical application.	Preparation of the Peeragogy manual.	Peeragogy Practice Handbook
C5	Research focuses on innovative teaching methods that enable students to share knowledge and experiences with each other through peer learning.	Research focuses on the effects of implementing peer teaching in mathematics to improve student academic performance and engagement.	Improve student performance and engagement.	Emphasis on peer teaching as an innovative teaching method helps improve students' academic performance and engagement.	Improving student performance and engagement in mathematics with Peeragogy
C6	Research on online Peeragogy is explored, focusing on the impact of student-produced videos on peer learning and academic performance.	The effects of student-produced videos on peer learning and academic performance were studied.	Study the impact of students' video production on learning among classmates and the impact on academic performance.	The impact of online Peeragogy on peer learning.	OnlinePeeragogy

TABLE VI: INFORMATION TABLE ON TEACHING STRATEGY DIMENSIONS AND THEORETICAL DIMENSIONS

Document number	Teaching strategies	organizational strategies	delivery strategies	management strategies,	theoretical dimensions
A1	Transition from andragogy to heutagogy.	Emphasis is placed on learner autonomy and self-direction, and organizations need to provide support and resources.	Emphasize learners' active participation and reflection in the learning process.	Learners are encouraged to take a greater role in managing their own learning process.	Heutagogy was introduced to emphasize the learner's initiative in learning.
A2	Combining autonomous learning theory with complexity theory, Heutagogy is formed.	Understand the complexity of learning and encourage creative thinking and problem-solving skills.	Emphasize that learners develop themselves by coping with complex situations.	Deal with complexity and encourage learners to develop themselves amid uncertainty.	Situating autonomous learning within a complexity theory framework.
A3	Heutagogy is proposed as a holistic framework for creating autonomous learners in the 21st century.	Emphasize the comprehensiveness of learning and encourage learners to develop in different situations.	Support learners to span multiple subject areas and form a comprehensive learning experience.	Establish an environment and culture that supports independent learning.	Think of Heutagogy as a comprehensive framework for creative learning.
A4	Deal with complexity and develop people and workplaces that can cope with complex situations.	Emphasis on building an adaptable, learning organization.	Cultivate learners' ability to quickly adapt and innovate in complex environments.	Create a workplace that can handle complexity.	Combining Heutagogy with complexity theory to provide a framework for organizational and workplace development.
A5	Heutagogy is proposed as a practice-based alternative learning method.	Emphasis on developing nursing student competencies in practice.	Learners are encouraged to construct knowledge through practical experience and reflection.	Establish an education system that supports practice-oriented learning.	Introducing Heutagogy into the realm of hands-on learning.
A6	Explore the application of Heutagogy in digital media networks.	Emphasize the impact of digital media on the learning environment and encourage innovation.	Explore how digital media promotes self-directed learning among learners.	Adapting to the learning management challenges of digital media networks.	Combine Heutagogy with the influence of digital media.
A7	Explore the	Emphasizes and	Investigate how	Adapting to	Integrating

Code					
	dynamic combination of Heutagogy and technology.	supports the full impact of technology on the learning process.	technology promotes learners' autonomous learning and access to information.	technology's transformation of learning management.	Heutagogy with technology emphasizes the importance of technology in learning.
A8	Review Heutagogy's hands-on and self-directed learning.	Pay attention to lifelong learning and cultivate learners' continuous learning capabilities.	Summarize Heutagogy practices and emphasize learner initiative.	Support the organization and management of lifelong learning.	Combining Heutagogy with lifelong learning theory, emphasizing the continuity of learning.
B1	Using learning prototypes as cybergogy tools for online teaching in 3D educational environments.	Design a structure based on learning prototypes to provide a visual learning experience for online teaching.	Use virtual environments to provide interactivity and promote students' learning experience in Second Life.	Manage the online teaching environment to ensure learners can effectively participate in learning.	Combining learning prototypes and virtual environments to build the theoretical framework of Cybergogy.
B2	Combining Cybergogy and Andragogy paradigms for lifelong learning.	Design learning environments that support the needs of adult learners.	Integrate online learning tools to increase learning flexibility and accessibility.	Manage online learning resources to ensure learners get the most out of them.	Fusion of Cybergogy and Andragogy to provide variety and flexibility for lifelong learning.
B3	Explore Cybergogy's new paradigm in language learning.	Introducing new online learning methods to provide a new language learning experience.	Use online platforms and technology to make language learning more interactive.	Manage online language learning resources to ensure students learn effectively.	Promote language learning into a new online learning paradigm and expand the boundaries of learning theory.
B4	Propose a paradigm of Cybergo	Designing higher education environments that	Integrate the latest technology to increase	Management technology-infused	Integrating Cyberogy with Higher
	gy in Higher Education 4.0, emphasizing technology-integrated learning.	support technology-infused learning.	student engagement in higher education.	learning environment to ensure effective implementation.	Education 4.0 to provide critical analysis from a global perspective.
B5	Cybergogy is proposed as a framework for promoting learners' engagement in learning through information and communication technologies.	Design technology environments that support learner engagement.	Leveraging information and communication technologies to increase learner engagement.	Manage the technology environment to ensure learners fully participate in learning activities.	Integrate Cyberogy with information and communication technology to emphasize learner engagement.
B6	Using Cyberogy as a digital medium to promote the learning styles of Millennial college students.	Designing digital media environments to meet the learning needs of Millennial students.	Use digital media to provide diverse learning experiences to accommodate different learning styles.	Effectively manage digital media resources to ensure the accessibility of learning environments.	Think of Cyberogy as digital media adapted to the learning styles of Millennial students.
C1	Research teachers' perceptions of Peeragogy in online learning.	Learn how Peeragogy is organized in an online learning environment and how teachers can get involved.	Examine how Peeragogy is delivered in online learning, including how teachers collaborate with colleagues and share resources.	Examine how Peeragogy manages online learning, including how teachers coordinate and supervise the learning process.	Explore Peeragogy's theoretical foundations and practical applications in online learning during the COVID-19 pandemic.
C2	Showcases and experiences of Peeragogy practice.	Describe the organizational structure and methods of Peeragogy in practical applications.	Share delivery strategies in Peeragogy, including how to co-construct knowledge.	Demonstrate Peeragogy's management approach, including collaborative working and	Apply Peeragogy theory to practice and reflect on the effectiveness of actual operations.

Document number					
				decision-making.	
C3	Combining heutagogy, paragogy, and cybergogy to promote transformative learning in mathematics.	Designing learning environments for mathematics subjects that support different teaching paradigms.	Integrate different teaching strategies to promote deep student learning in the subject of mathematics.	Effectively manage and integrate different teaching methods to ensure the overall learning effect of the subject.	Integrate heutagogy, paragogy and cybergogy to provide a comprehensive teaching theory for the subject of mathematics.
C4	Edit the paragogy manual to share the theory and practice of paragogy.	Build a paragogy community to promote shared learning and knowledge building.	The core concepts and operational guidelines for peer teaching are conveyed through the manual.	Manage the paragogy community to ensure effective collaboration and resource sharing.	Systematically organize paragogy theory into manual form to support practical application.
C5	Improving student performance and engagement in mathematics through peer teaching.	Designing mathematics subject environments that support peer learning.	Enable students to share knowledge and experiences with each other through peer learning.	Manage the peer learning process to ensure effective student participation.	Examining how peer teaching affects student learning and performance in mathematics.
C6	Examining the impact of student-produced videos on peer learning.	Organize an online peer learning environment to promote students to learn from each other.	Transfer knowledge and learning experiences through student-produced videos.	Manage student participation in the video production process to ensure quality learning.	Explore how student-produced videos can be an effective tool for peer learning and their impact on academic performance

TABLE VII: TEACHING STRATEGIES AND THEORETICAL DIMENSION CHARACTERISTICS

Teaching strategy dimension	Secondary dimension	Characteristics	Document number
organizational strategies	Heutagogy	Emphasis on learner autonomy and self-direction	A1
		Understand the complexity of learning and encourage creative thinking and problem-solving skills	A2
		Emphasize the comprehensiveness of learning and encourage learners to develop in different situations	A3
		Emphasis on building an adaptable, learning organization	A4
		Emphasis on cultivating the abilities of subject major students in practice	A5
		Emphasize the impact of digital media on the learning environment and encourage innovation	A6
		Emphasize the full impact of technology on the learning process and provide support	A7
		Pay attention to lifelong learning and cultivate learners' continuous learning ability	A8
	Cybergogy	Design a structure based on learning prototypes to provide a visual learning experience for online teaching	B1
		Designing learning environments that support the needs of adult learners	B2
		Introduce new online learning methods and provide a new experience of language learning	B3
		Designing higher education environments that support technology-infused learning	B4
		Design technology environments that support learner engagement	B5
		Designing digital media environments to meet the learning needs of Millennial students	B6
	paragogy	Understand how Peeragogy is organized in an online learning environment	C1
		Describe the organizational structure and methods of Peeragogy in practical applications	C2
		Designing learning environments for mathematics subjects that support different	C3

Strategy	Approach	Description	Code
		teaching paradigms	
		Build a paragogy community to promote shared learning and knowledge building	C4
		Designing mathematics subject environments that support peer learning	C5
		Organize an online peer learning environment to promote students to learn from each other	C6
delivery strategy	Heutagogy	Emphasize learners' active participation and reflection in the learning process	A1
		Emphasis on learners developing themselves by coping with complex situations	A2
		Support learners to span multiple subject areas and form a comprehensive learning experience	A3
		Encourage learners to build knowledge through practical experience and reflection	A5
		Explore how digital media promotes learners' autonomous learning	A6
		Investigate how technology promotes learners' autonomous learning and access to information	A7
	Cybergogy	Utilize virtual environments to provide interactivity and promote students' learning experience in Second Life	B1
		Leveraging online platforms and technology to make language learning more interactive	B3
		Leverage information and communications technology to increase learner engagement	B5
		Use digital media to provide diverse learning experiences to accommodate different learning styles	B6
	paragogy	Examine how Peeragogy is delivered in online learning, including how teachers collaborate with colleagues and share resources	C1
		Share delivery strategies in Peeragogy, including how to co-construct	C2
		knowledge	
		Integrate different teaching strategies to promote students' profound learning in mathematics subjects	C3
		Deliver the core concepts and operational guidelines of peer teaching through manuals	C4
		Enable students to share knowledge and experiences with each other through peer learning	C5
		Transfer knowledge and learning experiences through student-produced videos	C6
management strategy	Heutagogy	Encourage learners to take a greater role in managing their own learning process	A1
		Create a workplace that can handle complexity	A4
		Organization and management to support lifelong learning	A8
	Cybergogy	Manage the online teaching environment to ensure learners can effectively participate in learning	B1
		Manage online learning resources to ensure learners get the most out of them	B2
		Integrating Cyberogy with Higher Education 4.0 to provide critical analysis from a global perspective	B4
		Manage the technology environment to ensure learners fully participate in learning activities	B5
		Effectively manage digital media resources to ensure the accessibility of learning environments	B6
	paragogy	Examine how Peeragogy manages online learning, including how teachers coordinate and supervise the learning process	C1
		Manage the Peeragogy community to ensure effective collaboration and resource sharin	C2
		Effectively manage and integrate different teaching methods to ensure the overall learning effect of the	C3

	subject	
	Manage the paragogy community to ensure effective collaboration and resource sharing	C4
	Examining how peer learning affects student learning and performance in mathematics subjects	C5
	Explore how student-produced videos can be an effective tool for peer learning and their impact on academic performance	C6

TABLE VIII: LITERATURE DATA SET

Dimensions of teaching strategies	Theoretical dimensions	Reflection of characteristics	Document number
Organization Strategies	Heutagogy	1. Pay attention to learners' active participation and reflection in the learning process.	A1、A2、A3、A7
		2. Emphasize that learners deal with complex situations and construct knowledge through practical experience.	A2、A4
		3. Pay attention to lifelong learning and the cultivation of individual learning abilities, and emphasize independent learning.	A3、A6、A7、A8
	Cybergogy	1. Emphasize the key role of digital media and technology in learning.	B4、B5、B6
		2. Pay attention to the design of online learning structure and visual experience, and pursue innovation and technology integration.	B1、B2、B3
	Peeragogy	1. Highlight learners' autonomy, self-direction and all-round development.	A5、C2
		2. Focus on cultivating students' subject professional abilities in practice.	C5
		3. Emphasize peer learning and collaborative knowledge building, and focus on the establishment and maintenance of the community.	C2、C4
Transmission Strategies	Heutagogy	1. Emphasize students' active participation and reflection in learning.	A1、A2、A3
		2. Promote knowledge building through practical experience and active participation.	A2、A4
	Cybergogy	1. Use virtual	B1、B3

		environments and online platforms to provide interactive learning experiences.	
		2. Transfer knowledge through digital media to support different learning styles.	B5、B6
	Peeragogy	1. Build knowledge through peer learning and collaboration.	C2、C4
		2. Use multiple methods of delivery, including manuals and student-produced videos.	C2、C6
Management Strategies	Heutagogy	1. Support lifelong learning and cultivate learners' continuous learning capabilities.	A3、A6、A7、A8
		2. Encourage learners to manage themselves during the learning process.	A1、A4、A8
	Cybergogy	1. Manage the online teaching environment to ensure that learners can effectively participate in learning	B1、B2、B6
		2. Manage online learning resources to ensure learners can make full use of them	B2、B2、B6
		3. Effectively manage digital media resources to ensure the accessibility of the learning environment.	B2、B2、B6
	Peeragogy	1. Manage the Peeragogy community to ensure effective collaboration and resource sharing.	C2、C4
		2. Integrate different teaching methods to promote the overall learning effect of the subject.	C3、C4

TABLE IX: DETAILED TABLE OF CHARACTERISTIC AND REQUIREMENTS OF BLENDED TEACHING STRATEGIES

Teaching strategy dimension	Theoretical dimension	Characteristics	Requirements
Organization Strategies	Heutagogy	student-centered	Consider students' individual differences and reflect students' learning subjectivity
		Custom goals	Personalized goal setting, encouraging long-term and short-term goals
		problem oriented	Open questions, related to practical problems, arouse

Strategy	Approach	Element	Description
			students' interest
	Cybergogy	Digital resource media teaching materials	Diverse digital resources, interactive media teaching materials, real-time collaboration tools, and personalized learning support
		virtual learning environment	Personalized learning space, virtual experiments and simulations, online assessment and feedback, diverse media resources
	Peeragogy	Autonomy and comprehensive development	Reflect learners' autonomy and self-direction, and advocate learners' active participation and comprehensive development in the learning process.
		Collaborative tasks	Clarify task objectives, diverse task types, interdisciplinary tasks, and periodic feedback mechanisms
		Community Building	Clear common goals, diverse learning activities, social platform support, feedback and improvement
Transmission Strategies	Heutagogy	Create personalized learning paths	Diversified learning resources, visual learning progress, feedback and adjustment mechanisms
		Independent learning support system	Independent learning task management, learner-oriented design, real-time feedback mechanism
	Cybergogy	Online learning platform design	Diverse learning resources, real-time interaction and communication, personalized learning paths, learning analysis and feedback, tracking student engagement
		Digital media resource design	Real-time interaction, multimedia support, task and progress tracking, personalization, learning analysis and feedback
		Intelligent	Personalized
		push of learning resources	recommendations, learning goal matching, diversified resources, immediacy, accessibility
	Peeragogy	Learning community building	Common rules and values, sharing of learning resources, feedback and assessment mechanisms
		Social learning network construction	Multimedia support, learning analysis and feedback, open resource sharing, personalized learning path
Management Strategies	Heutagogy	Autonomous management	Training and support, assessment and feedback, personalized learning plans, personalized learning resources
		lifelong learning orientation	Encourage learners to continue learning and develop their learning abilities
	Cybergogy	Flexible learning environment management	Customizable, data-driven, participatory
		Student Support Services Management	Personalized care, sustainability, data-driven
		Intelligent learning system management	User-centered design, data-driven decision-making, maintainability
	Peeragogy	Peer cooperation and social platform management	User-driven, openness and transparency, continuous learning support
		Project (task) management	Feedback and evaluation, student participation in decision-making, teamwork skills development
		Subject coordination management	Interdisciplinary evaluation standards, shared resources between disciplines, and guidance from subject tutors