THE DEVELOPMENT OF AN INSTRUCTIONAL MODEL FOR SELF-DISCOVERY LEARNING FOR ONLINE TEACHING: FOUNDATION OF EDUCATION COURSE

BY

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Abstract

This study aimed to 1) develop an online Self-Discovery Learning (SDL) model, 2) evaluate its impact on student academic performance, and 3) assess student satisfaction. A sample of 30 students was selected through stratified random sampling. Paired t-tests were conducted to compare pre-test and post-test scores. Additionally, descriptive statistics were used to analyze levels of student satisfaction.

The results indicated the following key findings: 1) the development of an online instructional model grounded in constructivist principles, which emphasizes learning through creation, collaboration, and the construction of knowledge., emphasizing learning through creation, collaboration, and the construction of knowledge; 2) Significant improvements in academic achievement were observed, with students demonstrating a notable increase in post-test scores across multiple lessons, indicating that the SDL model effectively enhanced both knowledge acquisition and comprehension. Paired t-test analysis revealed statistically significant differences confirming the model's positive impact on academic performance; and 3) the learners expressed a high level of satisfaction with the SDL model. These included the diversity of learning processes, the effective integration of digital tools, and the clarity of learning objectives. The overall satisfaction rating was exceptionally high, indicating that the SDL model not only enhanced academic outcomes but also fostered an enjoyable and motivating educational environment.

(Total 200 pages)

Keywords: Self-Discovery Learning, Online Teaching, Instructional Model

Student's Signature…… Dissertation Advisor's Signature……...……

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND STATEMENT OF THE PROBLEM

In the continuously changing environment of education, particularly in sectors such as digital learning and online learning, the necessity for creative instructional methodologies is of the utmost importance. As a result of the growth of online learning platforms and the growing demand for education that can be completed remotely, educators are faced with the difficulty of modifying traditional teaching approaches to properly suit the digital world. Self-Discovery Learning (SDL) is one of these approaches that has garnered a lot of attention since it is effective in cultivating both profound comprehension and the ability to think critically. SDL, which has its origins in constructivist ideas of education, places an emphasis on inquiry-based learning and student-centered exploration. There is a great deal of potential for the implementation of SDL principles in the field of online teaching education, which is characterized by the intersection of intricate ideas and practical applications. The application of SDL to online contexts, particularly in artificial intelligence classes, is still relatively unexplored, even though it has been extensively researched and implemented in traditional classroom settings (Zhou, 2022).

The necessity for creative instructional methodologies is paramount in the continuously changing education environment, particularly in sectors such as AI. As a result of the growth of online learning platforms and the growing demand for education that can be completed remotely, educators face the difficulty of modifying traditional teaching approaches to suit the digital world properly. Online Teaching is revolutionizing teaching and learning in the educational field worldwide. This special issue showcases innovative advances in educational applications and services powered by big data, machine learning, and deep learning (García-Peñalvo, Casado-Lumbreras,

Colomo-Palacios, & Yadav, 2020). Online Teaching is revolutionizing teaching and learning in education, enhancing students' experience and knowledge, leading to improved learning outcomes (Lin & Lai, 2021).

Designing a Discovery Learning paradigm for online AI courses. This method combines Discovery Learning with innovative online teaching methods to boost student engagement, active learning, and artificial intelligence understanding and skills. This instructional model is multidisciplinary, drawing on educational psychology. Support Vector Machine (80%) and Decision Tree (75%) classification methods are less accurate than the Artificial Neural Network (85%). Based on this information, the intelligent predictive system gives students feedback and alerts instructors when engagement dips. If instructors see students struggling, they can motivate them via email, course messaging, or online meetups (Ayouni, Hajjej, Maddeh, & Al-Otaibi, 2021). Discovery Learning is one of these approaches that has garnered much attention since it effectively cultivates profound comprehension and the ability to think critically. Discovery Learning (DL) originates from constructivist education ideas and emphasizes inquiry-based learning and student-centered exploration. The intersection of complex ideas and useful applications offers great potential for implementing discovery learning principles in Online Teaching education. The application of DL to online contexts, particularly in Online Teaching classes, is still relatively unexplored, even though it has been extensively researched and implemented in traditional classroom settings (Zhou, 2022). A Discovery Learning paradigm for online AI courses to meet this need. Online students' learning activity has improved with Discovery Learning. The study found that a collaborative classroom action research strategy can improve online learning. The model demonstrated potential in online learning as learning activity increased from 37.5% in the first cycle to 84.3% in the second (Ningrum, Pujiastuti, & Izhar, 2022).

Online learning is a multidisciplinary approach that combines Discovery Learning with theoretical knowledge to enhance practical abilities in Artificial Intelligence. This method promotes active learning, active engagement, and active problem-solving, utilizing scaffolding and Project-Based Learning (PBL) to actively

involve students in problem-solving activities. Furthermore, they emphasize the crucial role of emotional scaffolding in promoting engagement in remote learning (Zhong & Lyu, 2022). Teachers organize complex Artificial Intelligence topics and activities for students. Interactive simulations, virtual labs, and collaborative platforms can help instructors build immersive learning experiences that encourage research and experimentation. The teaching approach also stresses creating a friendly online learning community where students may collaborate, share perspectives, and have meaningful interactions. Using social learning methods and peer engagement in curriculum activities can provide a dynamic learning environment for discovery and knowledge creation. Deep learning for instructor assessment review sentiment categorization uses multiple layers of nonlinear information processing to improve prediction accuracy. A major empirical study found 98.29% classification accuracy for deep learning-based machine learning classifiers in teacher review sentiment classification (Onan, 2020). Discovery Learning is a teaching approach that utilizes artificial intelligence and technology to enhance learning experiences. This approach involves scaffolding complex topics, creating immersive experiences through interactive simulations, virtual labs, and collaborative platforms, and fostering a friendly online learning community. Social learning methods and peer engagement enhance the dynamic learning environment (Paredes-Baan, 2021).

Learning Online Teaching is crucial for understanding its complex ecology and enhancing practical skills. Traditional teaching methods are insufficient, and online platforms require new methodologies. Discovery Learning can boost critical thinking, but challenges remain in abstract theory and practical implementation. Understanding drug representations, DL models, and benchmark datasets is essential for successful Online Teaching education (Kim,J., Park, Min, & Kim, W., 2021). Online Teaching is revolutionizing learning by promoting active learning through discovery learning. This approach encourages curiosity, investigation, and inquiry, fostering critical thinking, problem-solving, and analytical skills. However, resource constraints and instructor expertise may hinder its implementation. An instructional model for Online Teaching courses (Paul et al., 2020). Online Teaching is rapidly expanding, requiring skilled professionals to manage its complex ecology. Deep learning technologies, such as

machine learning, are essential for Online Teaching education. Combining Discovery Learning with innovative instructional methods enhances student engagement and Online Teaching skills. Online Teaching technologies have significantly benefited supply chain integration and environmental performance, enabling logistics managers to mobilize green supply processes (Benzidia, Makaoui, & Bentahar, 2021).

The Foundation of Education is implementing an instructional model for self-discovery learning in online education, aiming to foster active engagement and autonomy among learners, thereby enhancing the learning experience in this rapidly evolving educational landscape. Online education offers a comprehensive understanding of the Foundation of Education course, transforming traditional face-to-face instruction into a virtual learning environment, requiring educators to adapt their instructional strategies for effective virtual learning. The Foundation of Education faces challenges in online teaching due to the loss of physical interaction, lack of immediate feedback, and the need for innovative approaches to maintain student motivation and community. Self-discovery learning empowers learners to construct knowledge through exploration, inquiry, and reflection, fostering critical thinking skills and self-efficacy, unlike traditional instructional models that prioritize information transmission from teacher to student. Self-directed learning is a crucial aspect of instructional strategies in the digital age, enabling learners to learn independently and independently. This approach integrates technology and instructional strategies, allowing instructors to create suitable learning environments and resources. By incorporating Era 4.0 principles and teaching innovations, this approach fosters self-directed learning experiences, enabling learners to develop strategies and assess their own learning independently. (Chatwattana, 2021).

Considering the historical context and significance of the aforementioned issues, consequently, the researcher conducted a study on an instructional model for self-discovery learning for online teaching in Foundation of Education course. Essentially, the creation of a teaching framework for self-discovery learning in the Foundation of Education course is a direct reaction to the changing nature of online instruction. This model aims to promote active participation, profound understanding,

and significant interactions among students in virtual learning settings by adopting the concepts of constructivism and utilizing the advantages of online platforms. Amidst the difficulties of online teaching, it is crucial for educators to adopt creative instructional models that stress student-centered methods. These models are necessary to promote effective learning outcomes and adequately prepare future educators for success in the digital age. Discovery learning is a student-centered approach that fosters lifelong learning and innovation in online platforms. This approach caters to learners' needs and interests, creating a supportive and inclusive learning environment. By adopting this approach, future AI experts develop confidence, creativity, and ethical reasoning skills. Students can explore key concepts, experiment with algorithms, and participate in interactive simulations, preparing them for real-world challenges and contributing to AI research.

The statement of the problem for this issue could be concluded that in light of the historical context and the growing significance of Artificial Intelligence (AI) education, there is a need to develop effective instructional models that leverage online teaching methods, specifically focusing on the implementation of Discovery Learning. This study aims to address this gap by investigating the development and application of an instructional model for Discovery Learning in online Foundation of Education course. The primary objective is to assess how such an approach can enhance student engagement, foster critical thinking and problem-solving skills, and ultimately prepare learners for the challenges of the rapidly evolving field of Online Teaching. Additionally, the research seeks to explore the potential benefits of this model for teachers and educational institutions, including its impact on the comprehensiveness of understanding Online Teaching concepts and its ability to facilitate personalized learning experiences.

1.2 RESEARCH OBJECTIVES

1.2.1 To develop an instructional model for self-discovery learning for online teaching in the Foundation of Education course.

1.2.2 To compare achievement between pre- and post-tests on an instructional model for self-discovery learning for online teaching in the Foundation of Education course.

1.2.3 To assess the student's satisfaction with an instructional model for self-discovery learning for online teaching in the Foundation of Education course.

1.3RESEARCH QUESTIONS AND HYPOTHESES

1.3.1 Research Questions

1) What is an instructional model for self-discovery learning model for online teaching in the Foundation of Education course?

2) What is the achievement comparing between pre- and post-tests on an instructional model for self-discovery learning for online teaching in the Foundation of Education course?

3) What is the student's satisfaction level with an instructional model for self-discovery learning for online teaching in the Foundation of Education course?

1.3.2 Research Hypothesis

The hypothesis that could be formulated as follows:

Students studying with an instructional model for self-discovery learning for online teaching in the Foundation of Education course have higher achievement after studying than before studying statistically significant difference .05.

1.4 CONCEPTUAL FRAMEWORK

The research analyzes and synthesizes all relevant documents to develop policies for an instructional model for self-discovery learning for online teaching in the Foundation of Education course. The conceptual framework of policies to develop an instructional model for self-discovery learning for online teaching in Foundation of Education course has been illustrated in Figure 1.1.

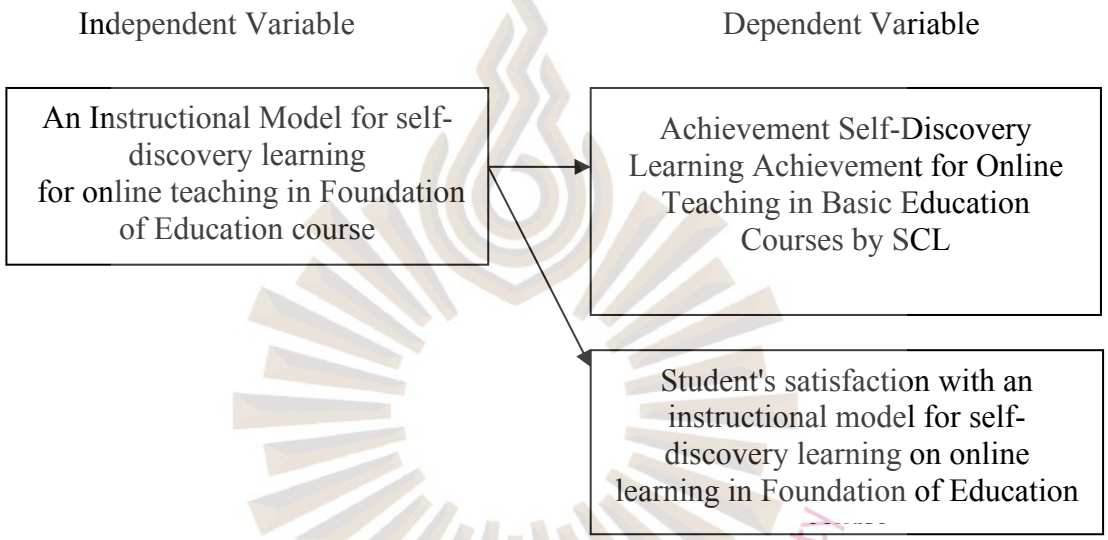

Figure 1.1 Conceptual Framework for an Instructional Model for Self-discovery Learning for Online teaching in Foundation of Education Course

1.5 SIGNIFICANCE OF THE STUDY

The results of this research benefit to the followings:

1.5.1 For Students

The students can acquire a proficient understanding of a self-regulated instructional paradigm for discovery learning in online artificial intelligence courses.

1.5.2 For Teachers

The Teachers in Kunming, Yunnan Province, China, have implemented an efficient instructional paradigm for discovery learning in their Online Teaching course.

1.5.3 For Self-Governed Online Teaching

A self-governed instructional model serves as a prototype for discovery learning in online courses with other universities in provinces of China.

1.5.4 For Student-Centered Program

The student-centered program encourages students to develop critical thinking skills through Online Teaching exploration, fostering curiosity and intrinsic drive. This personalized learning approach deepens understanding of machine learning techniques and neural network topologies, preparing students for real-world challenges.

1.6 RESEARCH METHODOLOGY

Research Design

This research on "The development of an instructional model for self-discovery learning for online teaching: foundation of education course" uses the Quasi Experimental Research format, the One Group Pretest – Posttest Design as a research methodology.

Population

There are two groups as follows:

1) Expert Group. The researcher has assigned a variety of experts to check the accuracy of the content of the pre- and post-tests, as well as to oversee the learning management process. This expert group consists of 3 experts in curriculum

development, 3 experts in learning management through online teaching, and 3 experts in learning evaluation, totaling 9 experts.

2) Student Group. Approximately 120 undergraduate students are currently enrolled in the Foundations of Education course across four classes.

Sample

The researcher uses a stratified random selection method to ensure diversity across demographics, past educational backgrounds, and technological aptitude. The sample size consists of one class of 30 students from the Foundations of Education course.

Research Instruments

The followings are three sets of research instruments and related instructional tool (Lesson Plan) of Foundation of Education course used in this data collection process.

1) Lesson Plan of Self-Discovery Learning in the Foundations of Education Course. The course consists of eight components as follows:

Lesson 1: Definition and Objectives of Education

Lesson 2: Emphasize eternal truths.

Lesson 3: Ancient and medieval education

Lesson 4: Sociological Foundations

Lesson 5: Features Cognitive, Constructivism, and Behaviorism learning theories.

Lesson 6: Education Policy and Governance

Lesson 7: Cultural Foundations

Lesson 8: The Role of Digital Tools and Online Learning in Education

This experimental research focused on four lesson plans, which are significant and align well with online teaching and self-discovery learning. These are Lesson 2, Lesson 3, Lesson 5, and Lesson 7."

2) Learning Achievement Evaluation Form: Pre-test and Post-test for Self-Discovery Learning in the Foundations of Education Course for Online Teaching.

3) Assessment of Satisfaction in Learning through the Self-Discovery Learning Curriculum includes the following topics:

Part 1: General information of the respondents, such as gender, grade level.

Part 2: Satisfaction regarding the content of the course, a total of 8 lessons.

Part 3: Satisfaction regarding online learning consists of the difficulty of using the system in various parts such as learning, evaluation, tests between chapters, etc.

Data Collection

Developing a self-discovery learning approach for the online Foundation of Education course involved contributions from 5 experts across 3 aspects. These experts reviewed the curriculum, evaluated the pre- and post-test questions, and assessed the student satisfaction survey related to online and self-discovery learning. A total of 30 students enrolled in the Foundation Studies course were assessed to evaluate their academic achievement.

Data Analysis

1) The evaluation, using descriptive statistics, includes percentage, mean, and standard deviation. In interpreting the results, the score range (Pimentel,

2010) derived from quartile determination is divided into the following opinion level ranges.

4.20 – 5.00 = Very High
3.40 – 4.19 = High
2.60 – 3.39 = Medium
1.80 – 2.59 = Low
1.00 – 1.79 = Very Low

2) To test for differences in average scores in academic achievement, a t-test is used. The sample types are not independent, so a dependent t-test is applied.

1.7 DEFINITION OF TERMS

The followings are a list of the definition of terms this study.

Self-Discovery Learning refers to a learning process where learners take responsibility for their own learning by exploring and discovering knowledge independently, rather than being directly taught by a teacher or other sources. This process helps develop critical thinking and problem-solving skills, as well as promotes a deep and sustainable understanding of the content. This type of learning is used in the Foundation of Education course environments where teachers in Yunan University serve more as guides or facilitators rather than direct instructors.

Online Teaching in this study involves delivering instruction for the Foundation of Education course at Yunnan University using internet technology. This method allows students to access content and engage in learning experiences without being physically present in a classroom. Key components include communication via video conferencing, online submission of assignments and exercises, and utilizing learning platforms to manage and monitor student progress.

Development of Instructional Model in this study refers to the process of designing, creating, and refining a framework to meet the needs and learning objectives of students. For the Foundation of Education online learning course at Yunnan University, this development begins with analyzing learners' needs, defining learning objectives, selecting appropriate teaching strategies and techniques, and evaluating learning outcomes for continuous improvement

Instructional Model refers to the structure or framework used to plan and implement instruction for students in the Foundation of Education course at Yunnan University. This model outlines the online learning methods and strategies that teachers should use to manage learning and achieve the set goals. The instructional model for this course is based on online and self-discovery learning."

1.8 LIMITATIONS OF THE STUDY

The limitations of this study are as follows.

1.8.1 Institutional constraints within the University may influence data interpretation, potentially leading to alignment with preconceived beliefs rather than objectively examining the data.

1.8.2 Lack of External Validation. External validation needs to be improved. Although study results may be biased, external validation and peer review can reduce analyst bias and ensure research transparency and accountability.

1.9 EXPECTED BENEFITS

The expected benefits of this research include:

1) Enhanced Learning Outcomes: By developing and implementing an instructional model for self-discovery learning, the research aims to improve students' engagement, motivation, and academic achievement in the Foundation of Education course.

2) Innovative Teaching Strategies: The research provides insights into effective online teaching methods that promote self-directed learning, offering new strategies and tools for educators to incorporate into their practice.

3) Personalized Learning Experience: The model supports personalized learning by allowing students to explore topics at their own pace and based on their individual interests and needs.

4) Improved Online Teaching Practices: The findings can help educators refine online teaching practices, making them more effective in fostering active and meaningful learning experiences.

5) Contribution to Educational Theory and Practice: The research contributes to the body of knowledge on self-discovery learning and online education, providing valuable data and insights that can inform future research and practice in these areas.

6) Scalable and Adaptable Framework: The instructional model developed through this research can be adapted and applied to other courses or institutions, potentially benefiting a wider range of educational settings.

CHAPTER 2

LITERATURE REVIEW

The introduction complements the goal of this chapter. This chapter will contribute further to the literature review during the study's design and present to identify and develop a discovery-based learning in an online course model for Kunming, Yunnan Province, China. This chapter is divided into the following parts:

2.1 A concept for discovery-based learning in online courses.

2.2 Interactive Learning Environments Virtual labs

2.3 Interactive Learning Environments via simulations

2.4 Online-powered adaptive platforms make learning immersive

2.5 Online Foundation of Education Courses refers to Self-Discovery Learning

2.6 Online Teaching for Online Courses Effective

2.7 Self-Discovery Learning (SDL) Theory

2.8 Self-Control Learning (SCL) Online Learning Theory

2.9 A New Online Application Created for Self-Discovery Learning

2.10 Previous Related Research

2.11 Conclusion

2.1 CONCEPT OF DISCOVERY-BASED LEARNING IN ONLINE COURSES

2.1.1 Discovery learning has become increasingly prevalent in online courses. The field of online learning education has expanded significantly due to rising demand for skilled professionals in this rapidly growing industry. As online learning platforms and technology become more widespread, it is crucial to have effective instructional models in place for online courses to ensure that learning is meaningful. To meet this requirement, this study formulates an instructional framework for facilitating discovery-based learning in online artificial intelligence courses. The domain of

artificial intelligence education has witnessed significant expansion in response to the growing need for proficient individuals in this swiftly developing sector. With the increasing prevalence of online learning platforms and technology, it is essential to provide efficient instructional models for online learning courses to guarantee relevant and engaging learning experiences for students. Multiple authors have outlined typical obstacles that cities encounter and must address, which might be extended to instructional frameworks for online education. The presence of online poses challenges in accessing intellectual resources and fostering integrity. Online learning has novel impacts on intellectual capital. Organizations employ ethical and integrity-driven branding strategies to advance social inclusivity, with a specific emphasis on managing intellectual capital and ensuring sustainability (Xue, 2022). These problems encompass the effective administration of intellectual and social resources, democratic resources, cultural and recreational resources, environmental resources, technical resources, financial resources, and vision the key to future success. Efficiently managing intellectual and social capital is of utmost importance in online AI education, as cities acknowledge the requirement to recruit and nurture persons possessing the essential skills and capacities for the knowledge-based economy. City administrations should assume the role as facilitators of change and demonstrate leadership in this regard (Odrakiewicz, Orlykovskyi, & Gaylord, 2022).

2.1.2 Constructivist discovery learning advocates for the utilization of active exploration, inquiry, and problem-solving as efficacious means of learning. Discovery learning in online AI education enables students to acquire concepts and approaches by engaging in research and self-discovery. Stabat 1 Public Middle School learners employ the discovery method of learning. The data analysis revealed that pupils with medium aptitude achieved a mastery level of 76.91% in the material, while classical learners attained a mastery level of 87.3%, and those with specialized learning objectives achieved a mastery level of 80%. This study presents the pedagogical approach employed by Stabat 1 Public Middle School for teaching arithmetic. This learning strategy can function as an alternative to mathematics. (Hendrik & Panggabean, 2022).

2.1.3 Challenges in Online AI Education on Online AI courses provide convenience and easy access, but they also pose distinct challenges, including limited opportunities for practical experimentation, the complexity of fostering collaborative learning settings, and potential difficulties with engagement and motivation. To optimize learning outcomes, online AI courses necessitate a superior instructional technique considering these limitations. Occasionally, the collaboration of technology and education facilitates the progress of online higher education. Extended Reality (XR) and AI have the potential to enhance dynamic and student-focused teaching methods. The long-term implications of the measures implemented during the COVID-19 epidemic remain uncertain. After the epidemic, an extensive examination of existing literature has effectively showcased the influence of XR and AI in the realm of online higher education. This comprehensive inquiry has uncovered the growing fascination with these rapidly developing technologies and their impact on learner autonomy and results. The integration of XR and AI in online education has enhanced its accessibility, practicality, engagement, collaboration, adaptability to different academic pathways, and self-paced learning. As a result of the epidemic, educators and universities have been increasingly embracing these technologies, surmounting novel obstacles, and reimagining online higher education (Lázaro & Duart, 2023).

2.1.4 Instructional models serve as structured frameworks for the development, execution, and assessment of educational initiatives. These models enhance the creation of engaging learning experiences by clearly defining the instructional strategies, activities, and resources needed to achieve learning goals. Teachers employ instructional design frameworks to plan, build, execute, and evaluate educational programs. Educational institutions are influenced by sociocultural and cognitive theories, as well as various learning models and teaching methodologies. Each model undergoes a rigorous process of repeated adjustments, leading to frequent and interconnected revisions.

Evaluating learning is of paramount significance. Hence, the primary focus revolves around the task of discerning or perceiving with precision. Providing prompt

and thorough feedback is essential for facilitating the learning process. Several advanced authoring applications can aid in executing this task. Instructional models offer systematic methods for educators to develop and execute engaging learning experiences by precisely outlining the instructional strategies, activities, and resources required to accomplish specified learning goals. These models are crucial for ensuring that instruction is efficiently organized, captivating, and aligned with the intended objectives. They help instructors formulate a well-organized curriculum, ensuring that teaching methodologies effectively foster student engagement, comprehension, and skill enhancement.

Moreover, instructional models promote uniformity in educational methods, as the implementation of an established framework helps educators adhere to optimal strategies and avoid impromptu approaches. Evaluating learning is an essential element of instructional models as it enables instructors to gauge the efficacy of their teaching and learning approaches.

There is less knowledge regarding the mechanisms through which feedback impacts learners and influences their academic performance. This review aims to comprehensively analyze the existing knowledge on the interaction between learners and feedback. Its objective is to gain a deeper understanding of how feedback influences learning techniques and to investigate the elements that might either enhance or hinder this process.

The pilot investigation revealed a diverse array of interpretations of feedback and study designs, leading to the adoption of a scoping approach. The inclusion criteria consisted of two components: 1) learners (including undergraduate, postgraduate, and continuing education students) who receive feedback regularly, and 2) studies that examined the relationship between feedback and learners' subsequent reactions. The screening was conducted autonomously in two identical instances. Data was extracted and synthesized using an iterative consensus process. This study's conceptual framework was Self-Regulation Learning (SRL).

Out of the 4253 abstracts examined, only 232 were deemed suitable for inclusion in the final synthesis. There is a wide range of understandings regarding feedback, but only a small number use officially recognized definitions. Learner reactions to feedback can be classified into cognitive, behavioral, affective, and environmental categories, which often interact in complex and overlapping ways. Emotional responses are common, and the mechanisms that mediate them are crucial in how learners receive information.

In conclusion, the most advantageous way for learners to benefit from feedback is by focusing on their specific requirements and engaging in a two-way dialogue. It is crucial to support learner emotions by fostering positive interactions between learners and teachers. Implementing a developmental agenda is essential for learners to effectively incorporate feedback and improve their future learning outcomes (Spooner et al., 2021).

2.1.4.1 The concept of democratic capital is crucial in AI education, as it promotes dialogue between learners and instructors. This research aims to create a customized instructional model that combines discovery learning principles with AI concepts and methodologies. The model will foster active participation, critical analysis, and problem-solving skills among students, empowering them to excel as AI professionals. The study will use both qualitative and quantitative methodologies, including literature review, expert consultation, and iterative design and evaluation cycles. The goal is to enhance AI education by providing a pragmatic framework for creating and delivering online AI courses that prioritize discovery learning (Xue, 2022). Need for Tailored Approaches While there are existing instructional models for Online Learning and AI education, few are specifically tailored for discovery learning in the context of online AI courses. Given the unique characteristics and requirements of AI education, there is a need for a specialized instructional model that integrates principles of discovery learning with AI concepts and techniques. The primary objective of this research is to develop a discovery-based learning that leverages discovery learning principles to enhance the effectiveness of online AI courses. This instructional model will promote active engagement, critical thinking, and problem-

solving skills among students, ultimately empowering them to become proficient practitioners and innovators in artificial intelligence. The research will employ qualitative and quantitative methods, including literature review, expert consultation, and iterative design and evaluation cycles. The study will leverage educational theory, AI pedagogy, and instructional design knowledge to develop and refine a discovery-based learning based on feedback from educators, AI practitioners, and students. The research will employ qualitative and quantitative methods, including literature review, expert consultation, and iterative design and evaluation cycles. The study will leverage educational theory, AI pedagogy, and instructional design knowledge to develop and refine a discovery-based learning based on feedback from educators, AI practitioners, and students. The research is expected to contribute to the advancement of AI education by providing educators with a practical framework for designing and delivering online AI courses that prioritize discovery learning. By equipping students with the knowledge, skills, and mindset needed to thrive in artificial intelligence, the instructional model aims to foster a new generation of AI professional's adept at navigating complex challenges and driving innovation in the field. The notion of democratic capital is pertinent in the context of AI education, as it necessitates fostering discussion between learners and instructors, while also seeking collaborative platforms for municipal officials, city employees, and citizens (Xue, 2022). Requirement for Customized Strategies Although there are instructional models available for Online Learning and AI education, only a limited number of them are specifically designed for discovery learning within the framework of online AI courses. Due to the distinct attributes and demands of AI education, there is a want for a customized educational framework that combines principles of discovery learning with AI concepts and techniques. The main goal of this research is to create a discovery-based learning that utilizes discovery learning principles to improve the efficacy of online AI courses. The implementation of this instructional model will encourage students to actively participate, think critically, and develop problem-solving abilities. Ultimately, this will enable them to become skilled practitioners and innovators in the field of artificial intelligence. The research will utilize both qualitative and quantitative methodologies, such as conducting a thorough literature review, seeking expert consultation, and implementing iterative design and evaluation

cycles. The study will utilize educational theory, AI pedagogy, and instructional design knowledge to create and improve a discovery-based learning through input from educators, AI practitioners, and students. The research will utilize both qualitative and quantitative methodologies, encompassing activities such as literature review, expert consultation, and iterative design and evaluation cycles. The study will utilize educational theory, AI pedagogy, and instructional design expertise to create and improve a discovery-based learning using input from educators, AI practitioners, and students. The project aims to enhance AI education by offering educators a pragmatic framework for creating and delivering online AI courses that prioritize discovery learning. The instructional approach intends to cultivate a new generation of AI professionals that possess the necessary knowledge, abilities, and mindset to excel in artificial intelligence. These individuals will be proficient in tackling intricate difficulties and spearheading innovation in the field (Xue, 2022).

2.1.4.2 The creation and provision of online AI courses that prioritize discovery-based learning for educators. The instructional approach aims to educate a new cohort of AI specialists who possess the ability to tackle intricate challenges and foster innovation. It equips students with the necessary information, abilities, and mindset to thrive in this field. (Wulandari, Suwarto, & Novaliyosi, 2021). The rapidly expanding AI education industry has developed substantial instructional frameworks to fulfill the increasing demand. Constructivist discovery learning is facilitated by engaging in active investigation, inquiry, and problem-solving, which have proven to be effective learning methods. Students acquire knowledge of AI principles and techniques through the process of conducting research and engaging in exploratory learning. Online AI courses have distinct challenges, including limited opportunities for practical experimentation, challenges in fostering collaborative learning environments, and concerns related to student participation and motivation. Teachers can create, implement, and assess educational interventions utilizing instructional models to generate engaging learning opportunities. The project aims to develop a discovery learning instructional paradigm to enhance the quality of online AI courses. This strategy will cultivate active participation, critical thinking, and problem-solving abilities in students, preparing them to succeed as AI experts and pioneers. The mixed-

methods research will involve a thorough analysis of current literature, soliciting advice from field specialists, and employing a process of iterative design and evaluation. Educators might use these discoveries to create online (AI) courses that emphasize exploration, with the goal of instructing a fresh group of AI experts who are proficient in solving intricate issues and fostering innovation. Active engagement in the learning process is a fundamental principle embraced by numerous higher education institutions in Japan. Science and technology students should prioritize learning methods that foster teamwork, self-regulation, and critical thinking in their second language. These approaches are particularly beneficial because they equip students with the necessary skills and knowledge to effectively tackle complex real-world research and professional scenarios, thereby enhancing their readiness for the demands of the AI industry. This work introduces a collaborative learning project called iLearn. The main objective of iLearn is to increase knowledge of the characteristics of effective scientific writing and presentations. This is achieved by fostering a culture of critical evaluation within real research through rigorous peer-review processes. In their study, Armstrong and McCarthy (2021) employed a systematic content analysis approach to meticulously examine peer-review exchanges in scientific posters and publications. Their analysis aimed to identify, categorize, and deeply analyze the significant interactions that occur during these reviews.

The findings underscored the importance of collaborative programs in enhancing the educational experience for science and technology learners. Such programs not only facilitate the development of essential skills for navigating international and multicultural contexts but also promote a deeper understanding of diverse perspectives and methodologies in scientific research. By engaging in these collaborative initiatives, students are better equipped to contribute meaningfully to the evolving landscape of AI and related fields, preparing them effectively for the challenges and opportunities within the global professional environment.

2.2 INTERACTIVE LEARNING ENVIRONMENTS VIRTUAL LABS

The utilization of contemporary augmented, mixed, or virtual reality technologies in immersive training and simulation is fundamentally transforming the way industries equip workers to be prepared for their jobs and gain new abilities. Virtual labs are interactive learning environments. Interactive learning environments, including virtual labs, have become prominent in educational settings due to their capacity to replicate real-world events and encourage active participation. This review critically examines the current body of literature on virtual laboratories as interactive educational settings, analyzing their effectiveness, methods of implementation, and influence on students' academic achievements.

The utilization of contemporary augmented, mixed, or virtual reality technologies in immersive training and simulation is fundamentally transforming the way industries equip workers to be prepared for their jobs and gain new abilities. Virtual labs are interactive learning environments. Interactive learning environments, including virtual labs, have become prominent in educational settings due to their capacity to replicate real-world events and encourage active participation. This review critically examines the current body of literature on virtual laboratories as interactive educational settings, analyzing their effectiveness, methods of implementation, and influence on students' academic achievements. The integration of modern augmented, mixed, or virtual reality technology in immersive training and simulation is fundamentally revolutionizing the way industries equip workers to be proficient in their occupations and acquire new skills. Virtual labs are immersive educational environments that facilitate interactive learning experiences. Interactive learning environments, such as virtual labs, have gained prominence in educational settings because they can accurately simulate real-world situations and promote active engagement. This study provides a thorough analysis of the existing literature on virtual laboratories as interactive educational environments, specifically focusing on

their efficacy, implementation strategies, and impact on students' academic performance (Byukusenge, Nsanganwimana, & Tarmo, 2022).

The effectiveness of virtual laboratories in the utilization of Virtual Labs has been thoroughly examined in diverse fields such as science, engineering, and healthcare education. Studies demonstrate that virtual laboratories provide numerous benefits, such as enhanced accessibility, scalability, and cost-efficiency in contrast to conventional hands-on laboratories. Research has shown that virtual and physical laboratories provide similar learning results, indicating that virtual labs can enhance or substitute traditional laboratory experiences. Modern technology can provide a virtual experience that questions the idea of a teaching laboratory for undergraduate science and engineering students. While the promise of Virtual Laboratories (V-Labs) has been praised and studied in several fields, there has been no comprehensive analysis of their application in undergraduate science and engineering education. This study conducted a comprehensive examination and consolidation of 25 scholarly research publications published between 2009 and 2019 that specifically investigated V-Labs. The findings indicate a lack of diverse theoretical and methodological approaches, with studies primarily being evaluative and narrowly concentrated on individual increases in content knowledge. Most of the research focused on the field of science and utilized a single two-dimensional (2D) experience with software obtained from several external providers. The prevailing viewpoint commonly regarded V-Labs as an instructional method that lacks any form of interpersonal communication. The positive results were ascribed to enhanced student motivation, primarily due to the novelty factor rather than the design aspect. The studies lacked an examination of individual experiences, the influence of personal traits or surroundings that facilitated social learning, such as interactions with professors or teaching assistants (Reeves & Crippen, 2020).

Engagement and immersion an important advantage of virtual labs is their capacity to fully engage learners in authentic and interactive simulations. Virtual labs offer the chance for hands-on inquiry and experimentation by recreating real laboratory environments and procedures. Studies indicate that incorporating interactive

components, such as configurable parameters, real-time feedback, and multimedia resources, can improve the learning experience. Previous studies have shown that people who play video games or use 3D virtual worlds are affected by multiple sensory stimuli when they display intense concentration and emotional involvement. This could lead to the emergence of a feeling of detachment from the physical world, which in turn may result in heightened levels of engagement and immersion. Although these discoveries have been made, it remains questionable if students can attain a same level of immersion in two-dimensional (2D) platform-based online collaborative learning environments as they do in video games and three-dimensional (3D) worlds. Moreover, if such complete involvement is achievable, it remains uncertain which characteristics might enhance engagement to the same extent. This study aims to investigate the immersion experiences of students participating in two 2D online collaborative learning platforms, one employing text-based communication and the other employing video-based communication. The analysis of data from eight students revealed that the essential elements of immersion exhibited in video games and 3D settings were also evident during online collaborative activities. Yet, the students' understanding of this complete involvement was greatly impacted by the distinct characteristics of the platform being utilized. The researchers found that when emotional engagement was included, empathy had a notable influence on the participants' immersion experiences (Garcia & Jung, 2020).

Interactive learning environments Online laboratory simulations. Interactive learning environments, including virtual labs, have become prominent in educational settings because they can replicate real-life events and encourage active participation. The objective of this study is to analyze the current body of literature on virtual labs as interactive learning environments, specifically focusing on their effectiveness, methods of implementation, and influence on student learning outcomes. The effectiveness of virtual labs has been thoroughly examined in diverse fields such as science, engineering, and healthcare education. Studies suggest that virtual laboratories provide numerous benefits, such as easy access, the ability to handle large workloads, and cost efficiency when compared to conventional hands-on laboratories. Research has shown that virtual laboratories can produce similar learning results as

physical labs, indicating that virtual labs have the potential to enhance or even substitute traditional laboratory experiences. The performance appraisal rubric serves as a tool for gathering research data. The efficacy of the virtual laboratory is determined through a comparative examination of pretest and post-test scores using the Paired Sample t-test. The findings demonstrated that the virtual laboratory was successfully utilized as a practical learning tool, yielding a significant impact. Therefore, it can be inferred that the virtual laboratory is a viable option for facilitating hands-on learning in distant education (Yanto, Kabatiah, Zaswita, Jalinus, & Refdinal, 2022).

Engagement and immersion: A significant advantage of virtual labs is their capacity to fully engage learners in authentic and engaging simulations. Virtual labs offer the chance for active inquiry and experimentation by recreating genuine laboratory environments and procedures. Studies indicate that incorporating interactive components, such as configurable parameters, real-time feedback, and multimedia materials, can increase learner engagement and motivation, resulting in more meaningful learning experiences. Enhancing accessibility and inclusivity was virtual laboratories effectively tackle the practical difficulties related to traditional laboratories, such as restricted resources, spatial limitations, and safety considerations. Additionally, virtual laboratories provide enhanced opportunities for individuals with disabilities or those residing in distant areas, thereby fostering inclusiveness and fairness in the field of education. Research has demonstrated that virtual laboratories have the capacity to accommodate a wide range of learning styles and preferences, hence meeting the needs of a more extensive student population. Virtual laboratories offer a valuable alternative to traditional, hands-on labs in science education. Utilizing computer simulations and JavaScript programming, these laboratories are integrated into an interactive learning environment on the Moodle platform. The ADDIE instructional design model is used to develop online teaching resources. This virtual laboratory was created through collaboration. The virtual learning environment has been assessed by educators and students, demonstrating its beneficial effect on learning outcomes (Kharki, Berrada, & Burgos, 2021).

Pedagogical integration and design were successful utilization of virtual labs necessitates meticulous examination of pedagogical principles and instructional design methodologies. The literature highlights the significance of ensuring that virtual lab activities are in line with learning objectives, encouraging active learning practices, and provide scaffolding support for learners. The incorporation of multimedia elements, collaborative features, and inquiry-based tasks improve the authenticity and efficacy of virtual laboratory experiences. Challenges and considerations were virtual labs, despite their potential advantages, pose difficulties in terms of technological infrastructure, software usability, and instructor training. Ensuring consistent access to technology and technical support services is essential for successful execution. Furthermore, the task of ensuring the genuineness of virtual laboratory experiences and upholding student responsibility necessitates careful planning and execution methods. The study reveals a lack of diverse theoretical and methodological approaches, primarily focusing on individual changes in content knowledge in V-Labs, a teaching approach without human-to-human interaction. The focus is on novelty and improved student motivation, lacking studies exploring individual experiences and social learning environments. The study reveals a lack of diverse theoretical and methodological approaches, primarily focusing on individual changes in content knowledge in V-Labs, a teaching approach without human-to-human interaction. The focus is on novelty and improved student motivation, lacking studies exploring individual experiences and social learning environments (Reeves & Crippen, 2020).

Future advancements in virtual laboratories will primarily concentrate on the improvement of simulation technology, the integration of artificial intelligence, and the enhancement of interactivity and customisation choices. The current advancements in the subject include collaborative virtual laboratories, immersive virtual reality environments, and flexible instructional platforms. Further investigation should continue to explore the effectiveness of these advancements and their influence on student involvement and academic achievements. Virtual labs are highly valuable instruments that facilitate the development of interactive learning environments, effectively closing the divide between theoretical knowledge and actual implementation. To summarize, they are extremely advantageous. Virtual laboratories

offer learners the chance to participate in immersive and interactive activities that are both educational and captivating.

2.3 INTERACTIVE LEARNING ENVIRONMENTS VIA AI SIMULATIONS

An examination of AI simulations in interactive learning environments was A comprehensive analysis of existing research. Interactive Learning Environments (ILEs) driven by AI simulations have emerged as cutting-edge educational technologies, providing dynamic and customized learning experiences. This study consolidates current material to clarify the function, effectiveness, and instructional implications of AI simulations in promoting interactive learning environments in various educational settings. Theoretical underpinnings of artificial intelligence simulations in intelligent learning environments were Literature explores the theoretical foundations of AI simulations, incorporating constructivist, socio-cultural, and cognitive learning ideas. AI-driven simulations promote active participation, critical thinking, and knowledge building by offering learners the chance to explore, experiment, and receive feedback. AI simulations provide an adaptable quality that allows them to provide individualized learning experiences that are specifically tuned to the unique needs and preferences of individual learners.

Simulation-based learning in higher education provides enough possibilities to practice intricate skills and employ various forms of scaffolding to enhance successful learning. This meta-analysis comprises 145 empirical studies and examines the efficacy of various scaffolding methods and technology in simulation-based learning environments for enhancing complicated abilities. The simulations yielded a significant positive impact, with a substantial effect size of 0.85 (standard error = 0.08) and confidence intervals ranging from 0.69 to 1.02. The utilization of technology and the implementation of scaffolding techniques yielded beneficial outcomes in the process of learning. Individuals possessing extensive prior information derived more advantages from engaging in reflection phases, whereas individuals with limited prior

knowledge exhibited enhanced learning outcomes when provided with illustrative instances. The findings were consistent and strong across several sectors of higher education, such as medical and teacher education, as well as management. The findings indicate that simulations are highly successful in promoting the acquisition of difficult abilities in various fields. Additionally, the researchers observed that different types of scaffolding can enhance the learning process at different stages of knowledge and skill development (Chernikova et al., 2020).

The effectiveness and influence on learning outcomes was research shows that AI simulations are effective in improving learning outcomes in different fields, such as science, mathematics, and healthcare education. Comparative research indicates that learners who are exposed to artificial intelligence simulations demonstrate superior levels of knowledge retention, problem-solving abilities, and conceptual comprehension in comparison to conventional educational approaches. Furthermore, adaptive learning pathways powered by AI optimize the paths of learning, enhancing the achievement of mastery and proficiency.

Thus, Pedagogical design principles were to successfully include AI simulations into ILEs, it is crucial to follow pedagogical design principles that are based on educational theory and supported by empirical evidence. The field of literature highlights the significance of aligning simulation activities with learning objectives, promoting active learning practices, and providing support for learner engagement. Metacognitive reflection and self-regulated learning are facilitated by dynamic feedback mechanisms, virtual mentors, and guided inquiry. The utilization and interpretation of VR simulation for educational objectives exhibits a wide range of diversity. The simulations were categorized into four primary educational goals: procedural skills training to enhance technical knowledge and expertise; emergency response training aimed at building confidence; soft skills training focused on teaching empathy; and lastly, psychomotor skills training. Diverse methodologies and simulation configurations were utilized to attain these educational results. Some of them were exceptionally inventive in offering an immersive learning experience for

hard activities, such as auscultation, or promoting empathy by simulating life with dementia (Plotzky et al., 2021).

Online AI simulations tackle the accessibility and inclusivity issues that are inherent in conventional educational environments by offering fair and equal access to interactive learning activities. Virtual environments support a wide range of learning styles, preferences, and abilities, which helps to promote universal design principles and create inclusive learning communities. Furthermore, Online-powered adaptive technologies enable customization and individualized assistance for learners with diverse levels of skill and previous understanding. Challenges and issues were AI simulations in ILEs pose difficulties concerning technical infrastructure, data protection, and ethical issues, despite their potential advantages. It is crucial to prioritize the verification, accuracy, and protection of AI algorithms and datasets to minimize biases and guarantee ethical utilization.

Furthermore, the need to investigate and implement policies on algorithmic transparency, learner autonomy, and digital literacy is essential and should be an ongoing process. The utilization of computer-based motorsports racing simulation games, their gameplay, and sim racing user interfaces as immersive interactive learning environments (ILEs). These Interactive Learning Environments (ILEs) offer a constructivist approach to learning by using 3D dynamic graphic animations. These animations are controlled by a combination of the game itself, the game user, automated bots that control simulated race cars, or other individuals participating in a multiplayer racing game competition. The user interface devices serve as affordances for player-driver control of their in-game simulated race car, facilitating an immersive and high-performance driving and learning experience. This paper examines these capabilities and evaluates their effectiveness in influencing the development of expertise, knowledge transfer, and cost functions across various system configurations (Scacchi, 2021).

Subsequent investigations in online AI simulations for Intelligent Learning Environments (ILEs) will prioritize the improvement of natural language processing,

emotional computing, and adaptive tutoring systems. The integration of multimodal interfaces, immersive virtual reality, and collaborative learning environments demonstrates significant promise for fostering innovation. Partnerships between educators, instructional designers, and AI developers are essential for progressing technology and promoting creative teaching approaches in ILEs. Online AI simulations in Interactive Learning Environments offer groundbreaking opportunities for rethinking teaching and learning methods, fostering active engagement, personalized education, and inclusive learning communities. By harnessing online-powered adaptive technology, educators can create interactive and captivating learning experiences that empower learners to actively explore, create, and excel in diverse educational settings. To effectively use the potential of online AI simulations in shaping the future of education, it is imperative to persist in doing research, promoting collaboration, and maintaining ethical stewardship.

2.4 ONLINE-POWERED ADAPTIVE PLATFORMS MAKE LEARNING IMMERSIVE

Harnessing the Immersive Power of Online-Powered Adaptive Platforms: A Literature Review. Online-powered adaptive platforms have revolutionized the educational landscape by offering immersive learning experiences that cater to individual learner needs and preferences. This review synthesizes existing literature to examine the efficacy, pedagogical implications, and transformative potential of Online-powered adaptive platforms in making learning truly immersive. Theoretical Foundations of Immersive Learning was literature explores the theoretical underpinnings of immersive learning, drawing upon cognitive, constructivist, and experiential learning theories. Immersive learning environments leverage AI algorithms to create personalized, interactive experiences that engage learners in authentic, meaningful tasks. The affordances of AI-driven adaptation, feedback, and scaffolding facilitate deep learning, knowledge construction, and skill development. Internet technology has revolutionized the field of immersive technologies, including Virtual Reality (VR). VR creates a virtual environment that combines the physical

world with digital reality, allowing users to fully engage with the virtual environment. This research focuses on incorporating immersive physiology courses using artificial intelligence and wireless network VR technology in the context of 5G. Students can view structures and physiological concepts in a realistic environment, enhancing their learning experience. A proposed CNN with AI algorithm has been found to achieve an accuracy of 99% in physiology courses (Ma, Zhang, Lv, & Li, 2022).

Efficacy and Impact on Learning Outcomes was Research demonstrates the efficacy of Online-powered adaptive platforms in enhancing learning outcomes across diverse educational contexts and disciplines. Comparative studies reveal that learners engaged with adaptive platforms exhibit higher levels of motivation, engagement, and knowledge retention compared to traditional instructional methods. Moreover, adaptive platforms optimize learning trajectories, promoting mastery and competency attainment through personalized learning pathways. Pedagogical design principles was Effective integration of Online-powered adaptive platforms necessitates adherence to pedagogical design principles grounded in educational theory and empirical evidence. Literature underscores the importance of learner-centered design, authentic tasks, and formative assessment in creating immersive learning experiences. Adaptive feedback mechanisms, interactive simulations, and gamified elements foster active engagement, metacognitive reflection, and self-regulated learning. The theory of educational theory emphasizes the importance of effective integration of design principles, based on empirical evidence, to create immersive learning experiences (Ma et al., 2022).

Customization and personalization were Online-powered adaptive platforms leverage learner data and analytics to customize learning experiences based on individual learner profiles, preferences, and performance metrics. Adaptive algorithms dynamically adjust content delivery, pacing, and challenge levels to meet learners' evolving needs and abilities. iCollab is an adaptive learning platform that uses customize learning experiences based on individual learner profiles, preferences, and performance metrics. It integrates formal and informal resources, enhancing social interaction and enhancing learning experiences in relation to context and time (Oliveira, Barba, & Corrin, 2021).

In additional, personalized recommendations, remediation, and enrichment activities could optimize learner engagement and success rates. Accessibility and Inclusivity was Adaptive platforms address accessibility and inclusivity challenges by providing equitable access to immersive learning experiences for learners with diverse backgrounds, abilities, and learning styles. Multimodal interfaces, assistive technologies, and universal design principles accommodate diverse learner needs and preferences. Moreover, adaptive technologies facilitate differentiation and personalized support, promoting inclusive learning communities. Performance metrics are crucial in evaluating the effectiveness of adaptive technologies in learning. These technologies enable learners to customize their experiences based on their individual needs and abilities, thereby enhancing their learning experience, and promoting inclusivity and accessibility. Challenges and Considerations was Despite their potential benefits, Online-powered adaptive platforms present challenges related to data privacy, algorithmic bias, and ethical considerations. Ensuring the transparency, fairness, and accountability of this algorithms is paramount to mitigate biases and uphold ethical standards.

Additionally, addressing concerns regarding learner autonomy, agency, and digital literacy warrants ongoing research, policy development, and stakeholder engagement. Future directions and innovations were future research directions in Online-powered adaptive platforms encompass advancing natural language processing, affective computing, and collaborative learning environments. Integration of immersive technologies, such as virtual reality, augmented reality, and mixed reality, represents promising avenues for innovation. Interdisciplinary collaborations between educators, instructional designers, and developers are essential for driving technological advancements and pedagogical innovation in immersive learning.

Online-powered adaptive platforms have the potential to transform education by creating immersive learning experiences that empower learners to explore, create, and excel in diverse educational contexts. By leveraging Online-driven adaptation, customization, and personalization, educators can foster active engagement, deep learning, and inclusive learning communities. Continued research, collaboration, and

ethical stewardship are essential to maximize the potential of Online-powered adaptive platforms in shaping the future of immersive learning.

2.5 ONLINE FOUNDATION OF EDUCATION COURSES REFERS TO SELF-DISCOVERY LEARNING

Online courses in the fundamentals of education and self-exploration learning. Online Foundations of Education courses change the online learning experience by implementing self-discovery learning, which is a constructivist approach based on the theories of Piaget and Vygotsky. This strategy improves participation, motivation, and critical thinking abilities in online education. Nevertheless, obstacles such as limited face-to-face communication, difficulties in self-control, and technological limitations can impede the successful execution of the task. Key tactics for achieving successful implementation encompass the utilization of organized autonomy, interactive tools, consistent feedback, and comprehensive professional development for instructors.

2.5.1 Online Foundations of Education courses revolutionize traditional teaching methods, offering opportunities for self-discovery learning. Constructivism is an educational approach that focuses on students' experiences and aims to develop new academic conceptions. The Constructive Teaching Approach (CAT) and the PQRST method (Preview, Question, Read, Summarize, and Test) effectively improve students' comprehension of English subjects. This study used a quasi-experimental pre-test-posttest research design to investigate the effect of PQRST on 9th-graders' academic achievement in English. The results showed a significant positive statistical difference in scores after 12 weeks of PQRST instruction. The research recommends that a constructivist teaching approach and PQRST can enhance students' reading and comprehension skills, ultimately enhancing their overall achievement in English (Hashmi, Wishal, & Kiyani, 2021).

2.5.2 Self-discovery learning emphasizes learner autonomy, critical thinking, and personal engagement. Educational autonomy, a pedagogical concept, promotes

autonomy, critical thinking, and metacognition, fostering student-teacher interactions, self-evaluation, and self-training, fostering personal development and autonomy in education. Educational autonomy is a pedagogical concept that emphasizes involvement, freedom of choice, responsibility, critical thinking, and metacognition. It involves strategies like meta-knowledge acquisition, reflection, self-evaluation, and cooperative work activities. Students contribute responsibly to their own training, managing new knowledge, setting goals, and designing strategies for self-monitoring and self-evaluation. Self-training involves conscious, voluntary actions aimed at qualitative transformations, leading to the development of personal personality and self-instruction (Anca, 2023).

2.5.3 Benefits include enhanced engagement, motivation, development of critical thinking skills, and personalized learning experiences. This study investigates the progression of critical thinking skills in undergraduate English language students by including them in research activities. The methodical process of investigation, which involves workshops, individual and collaborative analysis, group consultation, presentations, and criticizing, improves students' critical thinking abilities and attitudes. The students actively apply the critical thinking skills they learned in the project to their own academic fields, enhancing their professional development as future language instructors (Yuan, Yang, & Stapleton, 2020).

2.5.4 Challenges include lack of direct interaction, self-regulation issues, and technical and accessibility barriers. The digital semester at RheinMain University of Applied Sciences has highlighted the significant challenge of digital inclusion, highlighting the need for flexible learning designs and the cultivation of digital skills to support students' educational journeys (Ulzheimer et al., 2021). Psychological personality traits significantly influence students' assessment of digital teaching methods. Matching teaching methods to students' psychological needs can lead to higher inclusion levels and reduced exclusion risks in digital learning scenarios (Malschützky, Reher, & Schröder, 2021). Personality traits are a strong predictor of academic performance, but limitations exist. A new method relying on physiological signals was developed, involving 30 participants. The results showed correlations

between personality traits and physiological signal changes during video learning, including extraversion, agreeableness, conscientiousness, and openness to experiences (Tseng, Lin, Chen, Lin, & Huang, 2022).

2.5.5 Implementation strategies for effective teaching include structured autonomy, interactive tools, regular feedback, and professional development for instructors. The importance of autonomous learning in preparing future philologists for their professional endeavors. It identifies four primary elements of autonomous learning: motivational, cognitive, operational, and reflective. The effectiveness of teaching autonomous learning depends on the quality of educational resources, methodological guidance, and instructions provided. To enhance the cognitive aspect of autonomous learning, a modification of the training program for translation students in the "Practical course of the main foreign language (German)" discipline should be made. An inventory of effective tactics for autonomous learning is established, including reading, writing, speaking, grammar, and vocabulary. The study emphasizes the need to organize the educational process considering individual learning styles and incorporating practical-oriented methodologies in foreign language education. The interactive technology "Learning by stations" is considered the most effective method for developing autonomous learning skills. Future research should focus on investigating individual traits and autonomous learning styles of philologists, enhancing pedagogical interaction between teachers and students (Izhko, 2023).

2.5.6 Instructors should offer a structured framework, utilize interactive tools, provide timely feedback, and be well-versed in online teaching methodologies. Online teaching and learning require a well-designed online classroom that fosters student engagement. Chickering and Ehrmann's research highlights the importance of faculty-student communication, activities actions and appreciation of students' learning goals, time management time frames, progress indicators, and short learning units, resource and support management flexible learning resources, peer assessments, and accessibilities, and navigation. Its ramifications for scholars and practitioners are discussed. (Zhu, 2021).

2.5.7 Online courses and tutorials on AI topics are abundant; therefore, self-directed learners must be able to evaluate them. They should look for courses from credible instructors or institutions with defined learning objectives, well-structured content, interactive activities, and excellent student feedback. Learners can maximize their AI knowledge by carefully assessing online courses and tutorials. Modern learners are embracing digital innovations to enhance their learning experience. The researchers developed open online courses, combining technology and teaching methods to create self-Discovery Learning experiences. This approach fosters self-learning, skill development, and social networking, promoting a learning society that adapts to current learning situations (Wattana, 2021).

2.5.8 Self-Directed Learners can benefit from peer review and mentorship on AI-related projects, assignments, and learning progress. Peer review gives students constructive criticism, different viewpoints, and suggestions for improvement, which can improve their AI comprehension and work. Peer review helps learners improve their learning and contributes to the learning community by giving peers essential views. Participating in peer-review feedback activities may improve academic skills and student engagement in higher education. Such events help students become active learners, socialize, and improve employability skills. This study examined student satisfaction with a peer-reviewed assessment method in an undergraduate Health Science subject at Edith Cowan University in Western Australia. Before peer-reviewing, a sample assignment taught students how to give constructive criticism. They then drafted their assignment for peer evaluation and assessed another student's work. Pre-Post-surveys assessed students' perceptions of peer-review's usefulness. According to the pre-survey, 94% (n=30) of 32 students said peer-review coaching helped them prepare their assignments, and 85% (n=27) said it taught them how to give constructive written comments. Twenty-one students completed the post-survey, and 76% (n=16) said peer review changed their assignment. Many respondents noted improvements in critical thinking (76%; n=16) and writing communication (62%; n=13). Overall unit satisfaction skyrocketed (Wallace et al., 2020).

2.5.9 SDL for AI learning requires reflection on learning events. Self-directed learners should periodically assess their learning experiences, including what worked or did not, what they learned, and how they may apply it to real-world issues. Reflection helps students solidify their knowledge, discover areas for development, and adjust their learning practices. This study examines how reflective practices as instructional tactics affect second-language university students' SDL competencies. An explanatory mixed-methods technique extended quantitative and qualitative research to address research concerns. A survey of Japanese students in "Advanced Listening & Speaking" and "Public Speaking" classes used the 28-item SDL Competency Scale. The survey included 25 students. For in-depth student impressions of reflective activities, 11 students were interviewed and analyzed using theme analysis. The survey found that reflective practices predicted SDL competencies. Cooperation best predicted SDL competencies among self-reflection, peer feedback, and cooperation. Based on the interviews, the researchers created a thematic map of reflective practices and SDL competencies. This study has important implications for reflective practices to help second-language university students become self-directed learners (Lee & Mori, 2020).

2.5.10 Self-Directed Learners must stay abreast of AI breakthroughs, trends, and research due to the rapid pace of AI technology and application advancements. They can do this by reading AI news, following respected AI researchers and organizations on social media, participating in AI forums and communities, and attending conferences and workshops. Staying informed lets learners update their knowledge and adjust their learning goals and tactics to AI trends and possibilities. The rapid pace of AI technology and application advancements is being rapidly accelerated through social media platforms, requiring self-directed learners to stay updated on these advancements and their potential applications. Fast-growing social media networks and associated apps have transformed how billions interact online. This expansion of social media has led to several end-user, or user-centered, applications that require innovative and efficient data processing. Recent advancements in data science and AI in pattern recognition, information fusion, knowledge discovery, and data visualization have made this possible. This special

issue features 12 papers from 65 submissions that showcase the latest accomplishments in these fields (Camacho, Luzón, & Cambria, 2021).

In conclusion, self-directed AI learners must review literacy to evaluate resources critically, assess educational quality, engage in peer review and feedback, reflect on learning experiences, and stay current on AI developments. SDL learners may navigate the vast geography of AI knowledge, make educated learning decisions, and attain learning goals in this dynamic and quickly growing field by establishing excellent review literacy abilities. AI education requires students to evaluate and establish well-informed opinions on content, resources, and materials through SDL. Artificial intelligence, where new technology, methods, and research findings emerge constantly, requires this skill. Many AI MOOCs, online courses, and tutorials exist, and self-directed learners must evaluate them to learn more. SDL need peer review and feedback for constructive criticism, various perspectives, and improvement recommendations. Higher education students can become active learners, socialize, and develop employability skills by participating in peer-review feedback activities. Coordination is best predicted by self-reflection, peer feedback, and cooperation in second-language university students' SDL abilities. Due to the quick pace of AI technology and application improvements, self-directed learners must follow AI breakthroughs, trends, and research. Staying informed lets learners adapt their learning goals and strategies to AI trends and potential. The growth of social media has led to end-user apps that require innovative and fast data processing. This is achievable thanks to data science and AI advances in pattern recognition, information fusion, knowledge discovery, and data visualization. In conclusion, self-directed AI education involves reviewing literacy abilities, including resource evaluation, peer review, and AI progression and application awareness.

2.6 ONLINE TEACHING FOR ARTIFICIAL INTELLIGENCE COURESE EFFECTIVE

Currently, online is widely used in various industries to enhance and improve processes and create new, engaging experiences. Using online teaching as an educational tool offers numerous benefits, including automating routine tasks and accessing valuable insights that teachers and administrators can use to refine curricula or inform more personalized learning experiences for students. In education, students who engage in online learning can conveniently use online systems and study anytime. In today's era, online systems come with mechanisms that enhance and promote educational skills for students effectively. Incorporating online and AI systems as an aid in education, research, or various experiments has proven beneficial. Research has shown that using online AI in teaching can improve administrative tasks, such as reviewing and grading assignments, more efficiently. Online learning capability allows it to tailor curricula and content to each student's level, enhancing their skills effectively. Online systems demonstrate outstanding learning efficiency and can be adapted to optimize teaching quality for students. The benefits of using online in education include:

Assisting in Lesson Planning

AI in education facilitates the creation of more effective lesson plans. AI-driven tools can help design high-quality curricula and lesson plans that align with students' needs and understanding, making the process faster, accurate, and less complicated. Examples include Copilot AI Lesson Planner, Lesson plans AI, Top Hat, or ChatGPT.

Developing and Designing Differentiated Learning.

Differentiated learning is crucial in education, allowing teachers to customize learning paths for students based on their strengths, weaknesses, and learning preferences. AI tools can analyze student data, such as assessment scores and

attendance records, to design personalized learning experiences. Examples include Dreambox, Smart Sparrow, or Knewton.

Simplifying Learning Assessment.

Automated grading systems, another AI application, reduce teachers' workload, making the grading process more efficient. AI in education can streamline this time-consuming task, making it easier. An example is Gradescope.

Providing Virtual Learning Experiences.

AI transforms digital learning into a more enjoyable experience by integrating learning with gamification to create virtual learning environments. These tools track progress and adjust tasks for convenience. Examples include MATHia or Duolingo.

Preparing for Exams.

AI in education helps prepare students for exams by using technology to analyze their data and create targeted exercises to improve test-taking skills. Examples include ExamSoft, R.Test, or Quizgecko.

Assisting with Tutoring.

AI revolutionizes tutoring by using algorithms to provide personalized support, allowing students to work independently while receiving real-time guidance. This helps students gain confidence and motivation to continue learning. An example is Squirrel AI.

Providing Learning Feedback.

One crucial aspect of education is giving students detailed feedback, not just on correct or incorrect answers but with comprehensive explanations. This process can be time-consuming, especially for subjective assessments. AI can offer more efficient and impartial feedback methods. An example is Turnitin Feedback Studio.

Creating Equal Opportunities for Learners.

Equal access to educational opportunities is essential in modern education. AI helps bridge gaps in learning abilities and backgrounds using technology, providing equal educational opportunities for all students, including those with hearing impairments or multilingual students. AI can automatically transcribe speech, making lessons accessible regardless of the teacher's accent or pronunciation. An example is Braina.

AI in education has significantly improved effectiveness, from personalized learning to automated administration and virtual learning. The potential applications in education are virtually limitless, driven by AI tools integrated into teaching, enabling teachers to offer the most effective learning experiences to students (Dynamic Intelligence Asia, 2024).

2.7 SELF-DISCOVERY LEARNING (SDL) THEORY

2.7.1 Self-Discovery Learning (SDL) theories hold that people can tailor their learning to meet their interests, needs, and goals. These ideas emphasize learners' autonomy, initiative, and responsibility in learning. The researchers discussed critical SDL theories as follows.

2.7.1.1 Autonomy: SDL theories center on autonomy. Active learners can choose what, how, when, and where to learn. Learning autonomy requires self-regulation, decision-making, and motivation. Learners steer the learning process to suit their requirements rather than passively receive knowledge from an instructor. Educational psychological wellness is significantly influenced by intrinsic motivation and autonomous extrinsic motivation. These factors contribute to positive outcomes across various educational contexts. Supporting students' psychological needs for autonomy, competence, and relatedness enhances motivation. However, traditional motivational models often fail to support students and teachers, highlighting a knowledge gap in educational policies (Ryan & Deci, 2020).

2.7.1.2 Self-Regulated Learning (SRL) and Self-Discovery Learning (SDL) allows learners to take charge of their education. Establish objectives, devise strategies, keep track of progress, and scrutinize the outcomes. SRL includes metacognitive processes, such as planning and monitoring, and motivational processes, such as self-efficacy planning and goal orientation.

Learners can take care of their education and enhance their performance with SRL. SRL and SDL allow learners to take charge of their education. Establish objectives, devise strategies, keep track of progress, and scrutinize the outcomes. SRL includes metacognitive processes, such as planning and monitoring, and motivational processes, such as self-efficacy planning and goal orientation.

In addition, learners can take care of their education and enhance their performance with self-regulation. One of the most critical aspects of learning across tasks, domains, and contexts is self-regulated learning, often known as SRL. Research demonstrates that not all students are equally adept at precisely and dynamically monitoring and regulating their SRL processes. This is even though it is essential. Consequently, learning technologies such as intelligent tutoring systems (ITSs) have been developed to assess and foster SRL. This article summarizes research conducted over ten years on SRL using an Information Technology System (ITS) called Meta Tutor. The ITS is built on hypermedia and is designed to assist college students in their SRL while learning about the human circulatory system. The instructional features and architecture of the Meta Tutor are designed using empirical evidence on principles of multimedia learning, as well as in educational systems for SRL. The study team has conducted extensive research on models of SRL, and the researchers have also incorporated research from other researchers both within and outside of the field of SRL. When it comes to learning outcomes, the researchers first provide Meta Tutor. Then, the researchers proceed to synthesize the most crucial study data about the effectiveness of different system versions, for example, adaptive scaffolding versus no scaffolding of self-regulatory behavior.

In the first place, the researchers concentrate on the discoveries that emerge from self-reports, learning outcomes, and multimodal data such as log files, eye tracking, facial expressions of emotion, and screen recordings, as well as the contributions that these findings make to comprehension of SRL with an ITS.

In the second part of this article, the researcher will elaborate on the function that embedded pedagogical agents (PAs) play as external regulators developed to scaffold the application of SRL strategies by cognitive and metacognitive learners.

The third part of this article focuses on the contributions of multimodal data in measuring and comprehending the involvement of cognitive, affective, metacognitive, and motivational (CAMM) processes. The researchers elaborate on these contributions and underline their significance. In addition, the researchers discuss some of the difficulties that these data present when developing real-time educational interventions that scaffold SRL techniques. In the fourth section, the researchers explore the existing theoretical, methodological, and analytical issues and briefly discuss the lessons gained and the open challenges associated with these challenges (Azevedo et al., 2022).

2.7.1.3 Self-Regulated Learning (SRL) allows learners to take charge of their education. Establish objectives, devise strategies, keep track of progress, and scrutinize the outcomes, including metacognitive processes, such as planning and monitoring, and motivational processes, such as self-efficacy planning and goal orientation. Learners can take care of their education and enhance their performance with self-regulated and SDL that lets students manage their education. SRL is using specific tactics to achieve goals through SRL. This entails mastering one's learning processes by skill, will, and self-regulation behaviors. SRL is associated with more excellent grades and scholastic progress. The Learning and Study Strategies Inventory (LASSI) assesses SRL in higher education (Weinstein et al., 2016). The 60-item questionnaire assesses 10 subscales: motivation, anxiety, test tactics, time management, and concept selection (Fojas, 2022). Set goals, create tactics, track

progress, and evaluate results. SRL metacognitive and motivational activities include planning, monitoring, self-efficacy planning, and goal orientation. Self-regulation helps students improve their Studies. Learning theories emphasize intrinsic motivation. Extrinsic motivation originates from outside rewards or demands, while intrinsic motivation comes from curiosity, interest, and personal development. SRL enjoy learning and find fulfillment rather than external rewards or expectations.

2.7.1.4 SDL theories emphasize self-reflection. Students routinely assess their strengths, weaknesses, and improvement areas. Students assess their learning, uncover effective solutions, and adjust through reflection. It boosts comprehension and lifetime learning. SDL is a teaching method that helps learners identify their learning requirements, set goals, and develop strategies. It improves learning autonomy, motivation, lifelong learning skills, self-control, self-confidence, and self-management. In the department of anatomy, 126 first semester MBBS students participated in SDL sessions, with most scoring above the mean and fourfold more scoring over 80% in two SDL assessments. The department can apply SDL to engage students in becoming lifelong learners (Sachdeva & Mahajan, 2022).

2.7.1.5 Resourceful Self-Directed Learners (SDL) find learning opportunities independently. They take ownership of their learning by using books, online courses, mentors, and peer networks. This creativity helps pupils adapt to varied learning contexts and overcome challenges. SDL requires learners to assess learning gaps, set goals and resources, implement learning strategies, and evaluate learning outcomes. Promote SDL by developing tasks enabling students to work solo or cooperatively with flexibility and creativity. The latest National Medical Commission competency-based curriculum document must define or implement SDL, leaving it up to interpretation. The researchers discuss SDL, answer common misconceptions, and explain how medical students can learn SDL skills using curriculum opportunities. Flipped classrooms, reciprocal teaching, technology-enhanced approaches, problem-based learning, and group projects promote SDL. SDL demands teacher and institutional efforts and policies to help Indian medical graduates become lifelong learners (Anshu, Gupta, & Singh, 2022).

2.7.1.6 Lifelong Learning: SDL models emphasize dynamic lifelong learning beyond education. Self-directed learners adopt a growth mindset and regard learning as a lifelong pursuit of new knowledge, skills, and experiences to fit changing circumstances and attain personal and professional goals. SDL is when adult learners motivate themselves to study from resources and evaluate learning outcomes. Organizations create, share, use, and manage their information and resources through knowledge management (KM). They learn with KM. Digital Literacy Abilities are required to access these resources. The researcher created an SDL-KM paradigm to improve DLA: Five domain specialists verified the model using related works. Focus group discussion yielded a five-level Likert scale evaluating model appropriateness and expert comments and recommendations. Analyzed data included mean ($\bar{x}$) and Standard Deviation (SD). Experts advised on model adjustments after discussion. It has SDL, KM, and DLA circles from inner to outer. SDL involved preparedness triggers, goal setting and planning, learning activities, and evaluation. The five steps of KM were knowledge discovery, capture and storage, application and distribution, assessment, and creation. DLA included operation, analysis and evaluation, value and creation, and social-culture-organization collaboration literacy. Generally, experts' ratings of model adequacy were high ($\bar{x}$ = 4.4, SD. = 0.6). Adult learning will continue using this model. (Silamut & Petsangsri, 2020). Self-Discovery Learning (SDL) is a concept that empowers learners to customize their education to their interests, needs, and goals. It promotes autonomy, self-regulation, intrinsic motivation, introspection, resourcefulness, and lifelong learning. Meta Tutor, a hypermedia-based information technology system, has been developed to improve DLA by incorporating SDL, KM, and DLA circles from the inside out. This approach empowers learners to manage their education, set goals, create tactics, track progress, and evaluate results, fostering personal growth and promoting dynamic lifelong learning beyond education.

2.7.2 In the context of Self-Discovery Learning (SDL) for an artificial intelligence learning course, the term "review literacy" refers to the capacity of students to effectively evaluate and generate well-informed opinions regarding the content, resources and materials they come across throughout their education. For self-directed learners, having strong review literacy skills is essential in the rapidly

evolving field of AI, where new technologies, techniques, and research findings emerge frequently. This is because they must be able to navigate the vast amount of available information and determine what is relevant, credible, and valuable for their learning goals. Review literacy in SDL for artificial intelligence learning includes the following critical aspects:

2.7.2.1 Evaluation of resources: Individuals who are self-directed learners are required to evaluate the resources they come across, including online articles, research papers, tutorials, and videos, to determine the trustworthiness, relevance, and correctness of these resources. Several aspects, including the author's level of knowledge, the publication source, the timeliness of the material, and the proof that backs up the assertions that were made, should be evaluated by them. Using this critical evaluation, students can determine whether a resource is reliable and appropriate for their educational requirements. MOOC students must handle self-Discovery Learning. It examined MOOC instructors' methods for teaching SDL self-management. An online survey of 198 MOOC instructors, semi-structured interviews with 22 participants as the primary data source, and document reviews of 22 MOOCs were employed. Qualitative data were evaluated using content analysis, and quantitative data using descriptive statistics. The study found that MOOC instructors enabled learners' self-management skills in four areas: enactment of learning goals explanations and appreciation of students' learning goals, time management time frames, progress indicators, and short learning units, resource and support management flexible learning resources, peer assessments, and accessibilities, and navigation. Its ramifications for scholars and practitioners are discussed. (Zhu, 2021).

2.7.2.2 Online courses and tutorials on AI topics are abundant; therefore, self-directed learners must be able to evaluate them. They should look for courses from credible instructors or institutions with defined learning objectives, well-structured content, interactive activities, and excellent student feedback. Learners can maximize their AI knowledge by carefully assessing online courses and tutorials. Modern learners are embracing digital innovations to enhance their learning experience. The researchers developed open online courses, combining technology and

teaching methods to create self-discovery Learning experiences. This approach fosters self-learning, skill development, and social networking, promoting a learning society that adapts to current learning situations (Wattana, 2021).

2.7.2.4 Peer review and feedback: Self-Directed Learners can benefit from peer review and mentorship on AI-related projects, assignments, and learning progress. Peer review gives students constructive criticism, different viewpoints, and suggestions for improvement, which can improve their AI comprehension and work. Peer review helps learners improve their learning and contributes to the learning community by giving peers essential views. Participating in peer-review feedback activities may improve academic skills and student engagement in higher education. Such events help students become active learners, socialize, and improve employability skills. This study examined student satisfaction with a peer-reviewed assessment method in an undergraduate Health Science subject at Edith Cowan University in Western Australia. Before peer-reviewing, a sample assignment taught students how to give constructive criticism. They then drafted their assignment for peer evaluation and assessed another student's work. Pre-Post-surveys assessed students' perceptions of peer-review's usefulness. According to the pre-survey, 94% (n=30) of 32 students said peer-review coaching helped them prepare their assignments, and 85% (n=27) said it taught them how to give constructive written comments. Twenty-one students completed the post-survey, and 76% (n=16) said peer review changed their assignment. Many respondents noted improvements in critical thinking (76%; n=16) and writing communication (62%; n=13). Overall unit satisfaction skyrocketed (Wallace et al., 2020).

2.7.2.5 Review literacy in SDL for AI learning requires reflection on learning events. Self-directed learners should periodically assess their learning experiences, including what worked or did not, what they learned, and how they may apply it to real-world issues. Reflection helps students solidify their knowledge, discover areas for development, and adjust their learning practices. This study examines how reflective practices as instructional tactics affect second-language university students' SDL competencies. An explanatory mixed-methods technique

extended quantitative and qualitative research to address research concerns. A survey of Japanese students in "Advanced Listening & Speaking" and "Public Speaking" classes used the 28-item SDL Competency Scale. The survey included 25 students. For in-depth student impressions of reflective activities, 11 students were interviewed and analyzed using theme analysis. The survey found that reflective practices predicted SDL competencies. Cooperation best predicted SDL competencies among self-reflection, peer feedback, and cooperation. Based on the interviews, the researcher created a thematic map of reflective practices and SDL competencies. This study has important implications for reflective practices to help second-language university students become self-directed learners (Lee & Mori, 2020).

2.7.2.6 Self-Directed Learners must stay abreast of AI breakthroughs, trends, and research due to the rapid pace of AI technology and application advancements. They can do this by reading AI news, following respected AI researchers and organizations on social media, participating in AI forums and communities, and attending conferences and workshops. Staying informed lets learners update their knowledge and adjust their learning goals and tactics to AI trends and possibilities. The rapid pace of AI technology and application advancements is being rapidly accelerated through social media platforms, requiring self-directed learners to stay updated on these advancements and their potential applications. Fast-growing social media networks and associated apps have transformed how billions interact online. This expansion of social media has led to several end-user, or user-centered, applications that require innovative and efficient data processing. Recent advancements in data science and AI in pattern recognition, information fusion, knowledge discovery, and data visualization have made this possible. This special issue features 12 papers from 65 submissions that showcase the latest accomplishments in these fields (Camacho et al., 2021).

In conclusion, self-directed or self-discovery learners must review literacy to evaluate resources critically, assess educational quality, engage in peer review and feedback, reflect on learning experiences, and stay current on technology developments. SDL learners may navigate the vast geography of online knowledge,

make educated learning decisions, and attain learning goals in this dynamic and quickly growing field by establishing excellent review literacy abilities. Online AI education requires students to evaluate and establish well-informed opinions on content, resources, and materials through SDL. Artificial intelligence, where new technology, methods, and research findings emerge constantly, requires this skill. Many online MOOCs, online courses, and tutorials exist, and self-directed learners must evaluate them to learn more. SDL need peer review and feedback for constructive criticism, various perspectives, and improvement recommendations. Higher education students can become active learners, socialize, and develop employability skills by participating in peer-review feedback activities. Coordination is best predicted by self-reflection, peer feedback, and cooperation in second-language university students' SDL abilities.

Due to the quick pace of online AI technology and application improvements, self-directed learners must follow AI breakthroughs, trends, and research. Staying informed lets learners adapt their learning goals and strategies to trends and potential. The growth of social media has led to end-user apps that require innovative and fast data processing. This is achievable thanks to data science and advances in pattern recognition, information fusion, knowledge discovery, and data visualization. In conclusion, self-discovery education involves reviewing literacy abilities, including resource evaluation, peer review, and progression and application awareness.

2.8 SELF-CONTROL LEARNING (SCL) ONLINE LEARNING THEORY

Self-Control Learning (SCL) Theory applied to online learning defines review literacy as the ability of learners to critically analyze, discern, and manage resources, materials, and information. SCL Theory promotes self-regulation, discipline, and purposeful practice for learning. Review literacy in SCL Theory of online learning includes several fundamental elements:

2. 8.1 Evaluation of select resources self-control learners must evaluate materials' relevancy, credibility, and quality. Examine content creator expertise, accuracy, currency, and learning objectives. Learning experience is significantly enhanced through effective resource management, where learners actively select, evaluate, and adapt resources to enhance their learning experience. This self-reflective approach to resource management, involving conscious exploration, exploitation, and pruning, significantly predicts academic success, highlighting the importance of effective resource management (Chen, Chen, & Lin, 2021).

2. 8.2 Effective time management is part of SCL theory review literacy. Self-control learners must prioritize learning activities based on time commitment. They should prioritize critical concepts and abilities and study efficiently to maximize learning. Time management helps learners focus on AI learning goals and avoid distractions. Student self-management in learning is the ability to organize, manage time, and prioritize work to obtain maximum and effective target results. This study examines how tutoring in problem-solving improves student self-management. This quasi-experimental study used nonequivalent pretest-posttest control groups. Three-semester guidance and counseling study program students at STKIP Muhammadiyah Pringsewu Lampung comprise research sample 22. This study found that problem-solving tutoring improved student problem-solving, self-management, and guidance learning (Rosidah et al., 2020).

2.8.3 Evaluation of Learning Progress: Self-control learners often review their Learning progress and performance. They evaluate their online and AI knowledge, problem-solving skills, and strengths and limitations. Objectively assessing their development helps self-control learners create new goals, refine their study strategies, and improve their performance. Self-assessment in education encourages students to evaluate their performance. The definition is "the evaluation or judgment of 'the worth' of one's performance and identifying one's strengths and weaknesses to improve learning outcomes. This study examines how self-assessment affects math problem-solving ability. The study compares students' self-evaluations to external ones and examines whether (and how) self-assessment accuracy altered along the problem-

solving process. In 2020/2021, 182 grade 11 students used an Advanced Computing Environment to solve 8 real-world mathematical problems. For each problem, a tutor assessed the work of the students.

Additionally, the students assessed their work using a shared rubric with five indicators. These were the key indicators: comprehension of the problem, identification of a solving strategy, development of the solving process, justification of the chosen strategy, and effective use of the ACE. A quantitative analysis compared students' self-evaluation and tutors' assessment, cross-checking with questionnaire responses. The results demonstrate a link between tutor and self-assessment, with students underestimating their performance. In addition, pupils self-assessed indications more accurately, Improving the solution process and ACE utilization, but severe issues with indicator self-assessment: Problem understanding and reasoning (Barana, Boetti, & Marchisio, 2022).

2.8.4 Self-control learners maximize online learning efficiency and retention using spaced repetition, active recall, and interleaved practice. They critically assess learning tactics and adjust their approach depending on empirical evidence and learning experiences. Student control over practice increases motor learning. Learning deepens when offered choices during practice, explaining the self-control effect. Online learning found that self-control learners maximize efficiency and retention through active recall and interleaved practice. (Couvillion et al., 2020).

2.8.5 Feedback on oneself to develop self-control, learners seek input from peers, mentors, and experts. They welcome feedback, alternative perspectives, and concept and application advice. Feedback helps self-control learners improve, correct, and master the impact of real-time feedback on group and individual behavior. A lack of instantaneous feedback and infrastructure has limited the use of feedback interventions to modify behavior for years. The methodology of this study uses the Meeting Mediator (MM), an online intervention tool that reveals participants' conversational balance and provides rapid feedback to team members with minimal researchers' interaction. The MM-exposed experimental and control groups completed

two moral reasoning tasks requiring them to make complex decisions together. The MM increased self-assessed dominance over the control group by twice as much as once. This effect increases with repeated exposures. Participants' performance improved when exposed to the MM in the first or second task but not when exposed many times. This experiment shows that enabled tools can improve collaboration and growth in business and online education settings, which demands critical thinking and self-reflection (Porter & Grippa, 2020).

Self-Control Learning Theory emphasizes the importance of reviewing literacy abilities in online learning to help learners effectively manage resources, time, and learning methodologies. This theory aims to foster discipline, efficiency, and self-regulation in learners. Self-control learners must assess resources' relevance, credibility, and quality and use high-quality materials to enhance learning. Effective time management is crucial for self-control learners, as they must prioritize time-consuming learning activities and critical concepts and skills. Problem-solving tutoring can enhance student self-management, and self-assessment can help improve learning outcomes. Students use spaced repetition, active recall, and integrated practice to improve learning. They critically evaluate learning methods and adapt based on empirical facts and learning experiences. Self-control learners consult peers, mentors, and experts to grow, learn, correct, and master using feedback. Online-enabled real-time feedback can boost business and online education collaboration and growth, requiring critical thinking and self-reflection. In conclusion, self-control learners can significantly improve their performance in online learning by enhancing their review literacy abilities, resource management, and self-regulation. By utilizing online-enabled solutions, learners can enhance their learning experience and overall performance. Online-enabled feedback interventions to improve group dynamics and individual behavior. The results showed that participants exposed to it experienced a significant increase in self-assessed dominance over the control group, even after repeated exposures. This highlights the potential of AI-enabled tools to promote collaboration and sustainable growth in corporate settings and online education environments.

2.9 A NEW ONLINE APPLICATION CREATED FOR SELF-DISCOVERY LEARNING

In today's digital era, the integration of technology into education is transforming the way we learn and develop as individuals. Self-discovery learning, a process that encourages learners to explore their strengths, passions, and potential through reflective practices and personalized assessments, can be significantly enhanced with digital tools. This paper introduces a new approach to self-discovery learning by utilizing two widely-used communication platforms, DingTalk and WeChat, as a foundation for an online learning application. By leveraging the familiar interfaces and communication features of these applications, this new self-discovery tool offers a user-friendly and accessible platform that supports interactive learning, self-assessment, goal-setting, and continuous personal development.

DingTalk, originally designed as a professional collaboration tool, provides an ideal environment for structured learning activities, allowing for the integration of quizzes, assignments, and progress tracking. WeChat, a versatile social messaging platform, enhances the experience by facilitating community engagement, peer feedback, and real-time communication. Together, these platforms create a comprehensive digital ecosystem that encourages learners to reflect on their personal journeys, engage in meaningful discussions, and receive tailored feedback to enhance their self-awareness and growth.

The introduction of DingTalk and WeChat in self-discovery learning not only provides a familiar and accessible interface for learners but also fosters a collaborative and interactive learning environment. This application promotes active participation, personalized insights, and community-driven support, helping users embark on a transformative journey of self-awareness and personal growth.

This new online application highlights the unique advantages of using DingTalk and WeChat as a foundation for an online self-discovery learning

application while positioning the platform as innovative and beneficial for learners. The followings details of both applications are described.

2.9.1 DingTalk

DingTalk is an enterprise communication and collaboration platform developed by Alibaba Group. It was founded in 2014 and headquartered in Hangzhou (Fu, 2020). By 2018, it was one of the world's largest professional communication and management mobile apps in China with over 100 million users. International market intentions were announced in 2018. DingTalk provides iOS and Android apps as well as Mac and Windows clients. A version of the app for HarmonyOS was in development as of 2023 and is a Chinese software application developed by Alibaba Group. It is primarily used as a professional communication and collaboration platform for businesses, offering features such as:

Instant Messaging: Text, voice, and video messaging for individuals or groups.

Video Conferencing: High-quality video meetings for remote collaboration.

Task Management: Tools for assigning and tracking tasks within teams.

Attendance and Work Reporting: Functions to manage employee attendance, schedule meetings, and report work progress.

File Sharing and Storage: Secure cloud-based storage for sharing documents and files within teams.

DingTalk is widely used in corporate and educational environments for remote work, project management, and communication.

On January 16, 2015, DingTalk launched the testing version 1.1.0. On May 26, 2015, V2.0 was released, adding Ding Mail, Smart OA and shared storage. On September 19, 2016, V3.0 was released, focusing on B2B communication and collaboration. On January 15, 2018, DingTalk launched the English version of its application in Malaysia, its first market outside of China (although it can be downloaded and used in other markets such as Bangladesh, US, etc.). At the same time, DingTalk noted that in November 2017 it had launched hardware devices such as

the “smart receptionist” that enables employee check-in by fingerprint or facial recognition.

During the COVID-19 pandemic in Wuhan, the app was the target of review bomb after it was used to send homework to quarantined school children. On April 8, 2020, DingTalk Lite was released on various app stores across key Asian markets, including Japan, Indonesia, Malaysia, and other countries and regions. DingTalk Lite comes with necessary features such as messaging, file sharing, and video conferencing. It supports video-conferencing for over 300 people simultaneously and a live-broadcast function for more than 1000 participants. The app offers AI-enabled translation of messages in 14 languages including Chinese, Japanese, and English. All messaging types features include text messages, voice messages, pictures, files, DingMails. The Unique Read/Unread Mode is to improve communication efficiency.

2.9.2 WeChat

WeChat or Weixin in Chinese is a Chinese instant messaging, social media, and mobile payment app developed by Tencent. First released in 2011, it became the world's largest standalone mobile app in 2018 with over 1 billion monthly active users (Yang, Chen, & Li, 2016). WeChat has been described as China's "app for everything" and a super-app because of its wide range of functions. WeChat provides text messaging, hold-to-talk voice messaging, broadcast (one-to-many) messaging, video conferencing, video games, mobile payment, sharing of photographs and videos and location sharing.

Accounts registered using Chinese phone numbers are managed under the Weixin brand, and their data is stored in mainland China and subject to Weixin's terms of service and privacy policy, which forbids content which "endanger[s] national security, divulge[s] state secrets, subvert[s] state power and undermine[s] national unity". Non-Chinese numbers are registered under WeChat, and WeChat users are subject to a different, less strict terms of service and stricter privacy policy, and their data is stored in the Netherlands for users in the European Union, and in Singapore for

other users (Teng, 2021). User activity on Weixin, the Chinese version of the app, is analyzed, tracked and shared with Chinese authorities upon request as part of the mass surveillance network in China. Chinese-registered Weixin accounts censor politically sensitive topics. Any interactions between Weixin and WeChat users are subject to the terms of service and privacy policies of both services.

2.9.2.1 WeChat Mini Program

In 2017, WeChat launched a feature called "Mini Programs". A mini program is an app within an app. Business owners can create mini apps in the WeChat system, implemented using JavaScript plus a proprietary API. Users may install these inside the WeChat app. In January 2018, WeChat announced a record of 580,000 mini programs. With one Mini Program, consumers could scan the Quick Response code using their mobile phone at a supermarket counter and pay the bill through the user's WeChat mobile wallet. WeChat Games have received huge popularity, with its "Jump Jump" game attracting 400 million players in less than 3 days and attaining 100 million daily active users in just two weeks after its launch, as of January 2018. Ever since WeChat Mini Program's Launch, the daily active user count of WeChat Mini Programs are increasing dramatically. In 2017, there were only 160 million daily active users, however, the number reached 450 million in 2021.

2.9.2.2 WeChat Channels

In 2020, WeChat Channels were launched. They are a short video platform within WeChat that allows users to create and share short video clips and photos to their own WeChat Channel. Users of Channels can also discover content posted to other Channels by others via the in-built feed. Each post can include hashtags, a location tag, a short description, and a link to an WeChat official account article. In September 2021, it was reported that WeChat Channels began allowing users to upload hour-long videos, twice of the duration limit previously imposed on all WeChat Channels videos. Comparisons are often drawn between WeChat Channels and TikTok (or Douyin) for their similarity in features.

In January 2022, there were reports that WeChat is set to diversify further and place more emphasis on new products and services like WeChat Channels, amid new regulatory restrictions imposed in China. By June 2021, WeChat Channels had accumulated over 200 million users. More than 27 million people had used the platform to watch Irish boy band Westlife's online concert in 2021, and 15 million users also viewed the Shenzhou 12 spaceflight launch using the app service.

Adapting or adjusting software for online learning involves considering the specific needs of both instructors and students, such as communication, content delivery, collaboration, and assessment. If the instructors look for alternative online learning, the followings are some options:

1) Microsoft Teams

Microsoft Teams is the ultimate messaging app for your organization, a workspace for real-time collaboration and communication, meetings, file and app sharing, and even the occasional emoji! All in one place, all in the open, all accessible to everyone.

Microsoft Teams is a team collaboration application developed by Microsoft as part of the Microsoft 365 family of products (Microsoft, 2024), offering workspace chat and video conferencing, file storage, and integration of proprietary and third-party applications and services (Warren, 2016). Teams replaced other Microsoft-operated business messaging and collaboration platforms, including Skype for Business and Microsoft Classroom.

Throughout the COVID-19 pandemic, Teams, and software such as Zoom, Slack, Google Meet, among others gained much interest as many meetings moved to a virtual environment. As of January 2023, it had around 280 million monthly users (Novet, 2023).

Comparison with DingTalk: Like DingTalk, Microsoft Teams is a robust platform that integrates messaging, video conferencing, file sharing, and project

management. It's widely used in educational institutions for online classes and collaboration.

Adaptation for Learning: The program can create channels for different courses, use built-in Office 365 tools for assignments, and integrate third-party educational apps.

2) Zoom

Comparison with DingTalk: Zoom is a popular choice for virtual classrooms due to its user-friendly interface, breakout rooms, and whiteboarding features. While DingTalk also supports video conferencing, Zoom is often preferred for its stability and features tailored to educational settings.

Adaptation for Learning: Use Zoom for live lectures, group discussions, and recording sessions for later review. Integrate with Learning Management Systems (LMS) for seamless assignment submission and grading.

3) Moodle

Comparison with DingTalk: Moodle is a dedicated open-source LMS that offers more extensive features for course management, assessments, and grading compared to DingTalk, which is more focused on communication and project management.

Adaptation for Learning: Moodle can be customized with various plugins to fit the specific needs of your institution. It supports quizzes, assignments, forums, and integrates well with third-party tools.

4) Google Classroom

Comparison with DingTalk: Google Classroom is designed for educational purposes, offering a simple interface for managing coursework, assignments, and communication. While DingTalk has a broader business focus, Google Classroom is streamlined for teaching and learning.

Adaptation for Learning: Use Google Classroom to distribute assignments, facilitate discussions, and provide feedback. It integrates with Google Drive, Docs, and other Google tools.

5) Slack

Comparison with DingTalk: Slack is similar to DingTalk in terms of team communication and collaboration, but it is more widely used in educational settings outside of China. Slack's integrations with various educational tools make it a versatile platform.

Adaptation for Learning: Create channels for different courses or topics, use integrations like Google Drive or Zoom for live sessions, and employ bots for managing tasks and reminders.

In this study, the researcher adapted the DingTalk and WeChat programs for online learning. Some programs are not suitable for using in China, they are Microsoft Teams, Zoom, Moodle, Google Classroom and Slack.

In conclusion, according to the limitations for students in China, the students often face challenges using certain programs effectively due to strict government regulations and internet censorship. The Chinese government enforces a robust firewall that restricts access to many foreign platforms and services, including educational tools like Google Classroom, Slack, and Microsoft Teams. These platforms are either blocked or their features are limited, making them inaccessible or less effective for students in China. Additionally, the preference for domestically developed alternatives, like DingTalk and WeChat Work, aligns with the government's efforts to promote local technology and maintain control over data and communication within the country.

2.10 PREVIOUS RELATED RESEARCH

Online and Artificial intelligence (AI) has emerged that significantly impacts society with profound implications across various sectors, including education. The research in educational courses is essential to explore how they can improve teaching and learning outcomes. This literature review delves into current research on the significance of online courses in education, emphasizing vital themes, trends, and implications. Researching online courses is essential to understand how they can be integrated into educational settings to improve teaching and learning outcomes. This review delves into the current research on the relevance of online courses in education, highlighting key themes, trends, and implications. Online is becoming more commonly used in K-12 education, improving teaching methods and addressing educational issues. A literature review of 2075 articles and conference papers from 2011-2021 revealed that online learning has significantly impacted schooling, particularly in STEM courses and high school applications. Future research should explore online-based education systems, examining teaching methods and development tools and utilizing resources like ACM library and Google Scholar (Zafari, Bazargani, Sadeghi-Niaraki, & Choi, 2022).

Educational psychology, cognitive science, and online pedagogy inform the courses. Constructivism, cognitive load theory, and learning analytics inform Online-powered educational interventions and explain that online can help learning. Current educational ideas like Constructivism are subjective and open to interpretation, which can lead to vast variances in learning outcomes. Cognitive Load Optimization is a new quantitative Learning Science hypothesis. This method defines schemas mental knowledge patterns with quantitatively optimal lowest cognitive load, which form the basis of instructional material production. Such materials offer the most accessible learning paths. This new method taught mature students first-year undergraduate mathematics online in a proof-of-concept experiment. The pass rate, retention rate, and learning objectives were 100%. Comprehensive reviews reveal that Cognitive Load

Optimization can significantly improve STEM teaching and learning in primary, secondary, college, and university settings (Maj, 2022).

Studies examine pedagogical ways for incorporating AI into education, including personalized learning, adaptive evaluation, and intelligent tutoring. According to research, Online-powered solutions provide students with personalized help, feedback, and scaffolding that meets their learning requirements and preferences. More fields, including education, are using online learning. Online learning has many educational applications, with tutoring and assessment being two of the most commonly employed. In a recent study, the researchers conducted a systematic review to explore the use of online for student assessment. The researchers have searched through the Scopus and Web of Science databases and analyzed 454 research papers using the PRISMA statement, which led to 22 relevant papers. The research findings indicate that most online applications in education must align with the pedagogy of educational practices. The primary use of online learning in education is for formative evaluation. Automatic student grading is another online assessment function. Several studies compare online use vs non-use. The results suggest the need for teacher training and more research to comprehend online learning potential in educational assessment, particularly in non-higher education, to increase educational online research, not technological development (González-Calatayud, Prendes-Espinosa, & Roig-Vila, 2021).

Teaching practice impact online courses affect teaching methods and strategies. Online learning can help instructors design curriculum, assess students, and manage the classroom, allowing them to differentiate instruction, track student progress, and intervene quickly. Online learning revolutionizes education through big data, cloud computing, and deep learning. This technology enhances teaching and learning by tracking student improvement in knowledge, skills, and emotions. Online learning-oriented software and platforms like Waston and Knewton can increase efficiency, course design, and deep learning. This research enables teachers to understand real-time teaching situations, prepare intelligent lessons, and provide

personalized instruction for students with varied learning styles (Liu, Chen, & Yao, 2022).

Ethical and Social Implications Research in Online learning courses has ethical and societal consequences, including privacy, bias, and equity. Scholars study online learning ethics to promote transparency, accountability, and data-driven educational decision-making. Online learning in education is a field that aims to support student learning. However, more than ethical intentions are required. Fairness, accountability, transparency, bias, autonomy, agency, and inclusion must be considered. Differentiating between ethical and ethical pedagogical choices is crucial. A survey of AIED researchers revealed that most need to be trained to tackle emerging ethical questions. A well-designed framework combining a multidisciplinary approach and robust guidelines is vital (Holmes et al., 2021).

Online learning courses support teachers' professional development and training. Studies highlight the importance of preparing educators to effectively integrate AI into teaching practices, fostering digital literacy, and promoting evidence-based decision-making in educational settings. Online learning is revolutionizing education, transforming industries, and enhancing teachers' online teaching literacy. This research examines the correlations among online learning literacy dimensions, including KUAI, Applying Online learning, Evaluating Online learning Applications, and Online learning Ethics. Findings suggest that online learning positively impacts other dimensions, highlighting the need for government action to cultivate teachers' Online teaching literacy. Diverse curricula, content, methods, and resources are crucial for teachers' sustainable future development (Zhao et al., 2022).

The relevance of SCL and SDL theories in Online learning education is highlighted in a literature review, providing valuable insights for effective learning strategies.

Online learning enhances learning through self-regulation and active engagement, promoting learner autonomy. This approach in SDL fosters motivation,

deeper understanding, and better knowledge retention, fostering a sense of ownership and investment in learning outcomes. SRL is a crucial aspect of learning that extends across different tasks, domains, and contexts. However, not all learners are equally proficient in accurately monitoring and regulating their self-regulatory processes. To address this issue, learning technologies, such as intelligent tutoring systems (ITSs), have been developed to measure and improve SRL. This paper offers an overview of more than ten years of research on SRL using Meta Tutor, an Intelligent Tutoring System (ITS) that helps college students learn about the human circulatory system while supporting their SRL. Meta Tutor's instructional features and architecture are based on models of SRL, empirical evidence on computerized and human tutoring principles of multimedia learning, Online learning in educational systems for SRL and metacognition, and research on SRL conducted by the team and other researchers. The introduction of Meta Tutor and then summarizing the key research findings on the effectiveness of different system versions on learning outcomes, such as adaptive scaffolding and no scaffolding of self-regulatory behaviour. The focus will be on the findings from self-reports, learning outcomes, and multimodal data, such as log files, eye tracking, facial expressions of emotion, and screen recordings. The researchers will discuss how these contribute to understanding of SRL with an ITS. The researchers will then elaborate on the role of embedded pedagogical agents (PAs) as external regulators designed to scaffold learners' cognitive and metacognitive SRL strategy use.

Furthermore, the researchers highlighted and elaborated on the contributions of multimodal data in measuring and understanding the role of cognitive, affective, metacognitive, and motivational (CAMM) processes. Additionally, the researchers unpacked some of the challenges these data pose for designing real-time instructional interventions that scaffold SRL. Finally, the researchers presented existing theoretical, methodological, and analytical challenges and briefly discussed lessons learned and opened challenges. (Azevedo et al., 2022)

Promoting effective study strategies in SCL: SCL research emphasizes self-control, discipline, and strategic learning. Research has shown that time management,

goal setting, and metacognitive monitoring increase AI course learning. Effective study tactics like spaced repetition or purposeful practice help students manage cognitive resources, optimize study time, and comprehend complex concepts and algorithms. According to research, community college students need help finding time for classes and need ways to manage school and personal obligations. It examined metacognitive monitoring training in Success and Study Skills classes. The training participants used self-regulation model words to describe study skills choices. Both control and experimental groups improved learning. The control and experimental groups had similar relative and absolute calibration accuracy the difference between Learning assessments and actual performance. These findings contradict previous research suggesting that metacognitive strategy training may improve calibration (Emory et al., 2020).

Interdisciplinary Approaches Improve Learning Outcomes: SDL, SCL, and AI education research emphasize the value of interdisciplinary approaches. Cognitive psychology, educational neuroscience, and research can help educators create more effective teaching tactics and learning environments that meet students' requirements. Self-directed and self-regulated learning activities in Online learning courses can assist students acquire critical thinking, problem-solving, and a growth attitude, which are crucial for Online learning careers. IT Student-Centered Learning (SCL) challenges and solutions. Universities must equip graduates for professional jobs in today's competitive labor market. The article discusses student-centered learning theories. The authors say higher education didactics' "from teaching to learning" transition is tough. The research says digital education solutions require complex systematic work. Learning communicative competency is the focus. A competency-based approach to teaching English for specific purposes (ESP) makes instruction more personal. It values problem-solving over knowledge. A study indicated that SCL promotes student leadership, cognitive growth, and interpersonal communication. Students can customize their learning experience with this method. SICL IT students must think, examine, synthesize, criticize, and apply their real-world knowledge. In subject development, student-centered education emphasizes humanistic ideas like "subject," "freedom," "self-growth," "integrity," and "conversation." Teachers boost student

performance and engagement. The authors show Web-quest, project, problem-solving, and flipped learning. They inspire students and improve teamwork, communication, knowledge sharing, critical thinking, and creativity. Thus, 21st-century students gain practical experience, self-confidence, and lifelong Learning (Lazorenko & Krasnenko, 2021).

The popularity of online learning platforms and digital technology has led to an increasing interest in implementing the principles of self-directed and self-regulated learning in virtual learning environments. Research indicates that interactive simulations, adaptive learning algorithms, and personalized feedback can enhance self-directed and SRL in online courses focused on Online learning. These online courses can improve engagement, motivation, and learning outcomes by providing hands-on experimentation, collaborative problem-solving, and ongoing assessments. Teachers face numerous educational challenges, particularly in teaching and learning, but various solutions are available. Online students often need more support and satisfaction because they must prepare for a challenging and solitary learning environment. SDL, a traditional learning theory, can help students build a tailored strategy to manage their learning and achievement. This study examines the effectiveness of SDL in an online teaching, learning, and technological setting. These three domains focus on how learners can effectively use SDL. The study used a researchers-made questionnaire for 65 students (Reyes & Caballes, 2021).

Online learning, Education Challenges and Opportunities: SDL, SCL, and education research concludes with significant obstacles and potential for future study and application. These include creating scalable and accessible learning tools, supporting diverse learners, and promoting ethical and responsible online learning education. The researchers can develop online learning education and prepare students for the digital age by encouraging multidisciplinary collaborations between educators, academics, and industry partners to examine Estonian K-12 teachers' attitudes toward online learning as a teaching aid. Estonia fosters education and IT innovation. Estonia topped the Index of Readiness for Digital Lifelong Learning (IRDLL) among 27 European countries. The researchers intended to assess instructors' opinions on online

learning and contextualize findings regarding Fairness, Accountability, Transparency, and Ethics. The researchers questioned 140 Estonian K-12 teachers about AI in education and related concerns. The poll found that teachers know little about online learning and its benefits. They see it as a learning opportunity. The results reveal that teachers need support to be efficient and productive. Online learning may help. The researchers also found sociocultural challenges like teachers using online learning to access, adapt, and apply multilingual content. The researchers concluded with ethical online learning and its effects on FATE and participatory learning environment design (Chounta, Bardone, Raudsep, & Pearce, 2021).

In conclusion, comprehensive reviews reveal that Cognitive Load Optimization can significantly improve primary, secondary, college, and university STEM education (Maj, 2022). The research examines online-enabled personalized learning, adaptive evaluation, and intelligent tutoring. Studies show that Online-powered solutions provide students with customized coaching, feedback, and scaffolding. Online learning is increasingly used in various educational contexts, with its primary applications being in tutoring and assessment. This systematic review focuses on online learning in student assessment. Additionally, after reviewing Scopus and Web of Science, the PRISMA Statement identified 22 relevant papers out of 454.

Cognitive science, educational psychology, and online pedagogy shape online courses. Learning analytics, constructivism, and cognitive load theory explain the learning benefits of online-powered educational interventions. Contemporary educational theories like constructivism are subjective and open to interpretation, which might impact learning. Cognitive load optimization is a new quantitative learning science concept. This method defines schemas, or mental knowledge patterns, with a quantitatively optimal lowest cognitive load to provide instructional material. These materials are designed to teach in the simplest way possible. A proof-of-concept experiment taught mature students first-year college math online, achieving 100% pass, retention, and learning objective rates.

2.11 CONCLUSION

Discovery-Based Learning in online learning courses as the field of online learning education is growing significantly due to the high demand for skilled professionals. With the rise of online learning platforms Effective teaching models are therefore critical to a meaningful learning experience. This study proposes a teaching framework for discovery-based learning in online courses, helping students understand online learning concepts through self-discovery. And while online courses offer convenience, they face challenges, such as limited hands-on experimentation. and fostering a collaborative environment. Technology for Instructional Models provides a structured framework for developing, implementing, and evaluating educational programs. It outlines the strategies, activities, and resources needed to achieve the learning goals. Ensures teaching is organized and engaging. Feedback is important in these models. This affects the performance and mood of the students. This research aims to develop such a model. Encourage active participation critical thinking and problem solving skills This study uses both qualitative and quantitative methods includes literature review and expert consultation to create a framework that helps students become skilled practitioners and innovators.

Online education courses in the fundamentals of education are adopting self-discovery learning, based on Piaget's and Vygotsky's theories. This approach enhances participation, motivation, and critical thinking in online learning. However, challenges include limited face-to-face interaction, self-regulation issues, and technological barriers. Effective strategies for implementation include structured autonomy, interactive tools, regular feedback, and professional development for instructors.

1) These courses transform traditional teaching methods, emphasizing student experiences and using methods like the PQRST technique to improve comprehension and academic achievement.

2) Self-discovery learning promotes learner autonomy, critical thinking, and personal engagement through self-evaluation, reflection, and cooperative activities, leading to personal and academic development.

3) 3.Benefits include increased engagement, motivation, critical thinking skills, and personalized learning experiences.

4) Challenges involve lack of direct interaction, issues with self-regulation, and technical and accessibility barriers, which require flexible learning designs and digital skill cultivation.

5) Implementation strategies include using structured autonomy, interactive tools, timely feedback, and professional development.

6) Instructors need a structured framework, interactive tools, prompt feedback, and expertise in online teaching methodologies.

7) Self-directed learners should evaluate online courses for credibility, well-structured content, interactive activities, and positive student feedback.

8) Peer review and mentorship enhance online learning through constructive criticism and diverse perspectives.

9) Reflection on learning experiences helps solidify knowledge and identify areas for improvement.

10) Staying updated on advancements and trends is crucial for adapting learning goals and strategies.

In summary, self-directed learners need to critically evaluate resources, engage in peer review, reflect on their learning, and stay informed about online developments to navigate and succeed in the dynamic field of online education.

SDL theories focus on learners' autonomy, allowing them to choose what, how, when, and where to learn. This requires self-regulation, decision-making, and motivation, which enhance psychological well-being and educational outcomes. Involves setting objectives, planning strategies, tracking progress, and evaluating outcomes. SRL includes metacognitive processes like planning and monitoring, and motivational processes like self-efficacy and goal orientation. Research shows the importance of SRL and the development of intelligent tutoring systems (ITSs) to foster SRL. SDL emphasizes self-reflection, where students regularly assess their strengths, weaknesses, and areas for improvement. This leads to better comprehension and lifelong learning skills. SDL encourages learners to independently find learning opportunities using various resources like books, online courses, mentors, and peer networks. SDL models promote continuous, dynamic learning beyond formal education. It fosters a growth mindset, with learners continually seeking new knowledge and skills to adapt to changing circumstances.

In conclusion experiences and online learners must develop review literacy skills to critically evaluate resources, assess educational quality, engage in peer review, reflect on learning experiences, and stay current with online learning developments. These skills enable learners to navigate the vast digital knowledge landscape, make informed decisions, and achieve their learning goals in this dynamic field.

CHAPTER 3

RESEARCH METHODOLOGY

The research on "The Development of an Instructional Model for Self-Discovery Learning for Online Teaching: Foundations of Education Course" employs a Quasi-Experimental Research design, specifically the One Group Pretest-Posttest Design. The research methodology is as follows:

3.1 POPULATION AND SAMPLE GROUP

Currently, approximately 120 undergraduate students are enrolled in the Foundations of Education course across four different classes. The sampling method employed is stratified random sampling, selecting one class with diverse characteristics. This includes a mix of high-achieving and average students, a near-equal gender distribution, and students who all major in the same field of study. This approach ensures diversity in terms of demographics, educational background, and technological proficiency.

The sample consists of one class with 30 students selected from the Foundations of Education course. The students are divided into 5 groups, with 6 students in each group.

3.2 RESEARCH INSTRUMENTS

The research utilized three instruments for each purpose as follows:

1)Self-Discovery Learning Course for Online Teaching in Basic Education

Lesson 1: Definition and Objectives of Education

Lesson 2: Emphasizing Eternal Truths

Lesson 3: Ancient and Medieval Education

Lesson 4: Sociological Foundations

Lesson 5: Cognitive, Constructivism, and Behaviorism Learning Theories

Lesson 6: Education Policy and Governance

Lesson 7: Cultural Foundations

Lesson 8: The Role of Digital Tools and Online Learning in Education

The researcher selected 4 lessons to use self-directed learning. The 4 lessons included lessons 2, 3, 5 and 7 were selected and re-ordered as follows:

Lesson 1: Emphasizing Eternal Truths

Lesson 2: Ancient and Medieval Education

Lesson 3: Cognitive, Constructivism, and Behaviorism Learning Theories

Lesson 4: Cultural Foundations

2) Learning Achievement Evaluation Form

This study incorporates pre- and post-test evaluations to assess the efficacy of a self-directed learning curriculum designed for online delivery in a Foundations of Education course. These lessons provide opportunities for qualitative assessment of student learning, allowing for granular evaluation of specific learning outcomes. In this study, the course curriculum focuses on four lessons:

Lesson 1: Emphasizing Eternal Truths

Lesson 1: Ancient and Medieval Education

Lesson 2: Cognitive, Constructivism, and Behaviorism Learning

Theories

Lesson 4: Cultural Foundations.

This includes pre-test and post-test evaluations for the self-discovery learning curriculum for online teaching in the Foundations of Education course. Three experts in evaluation were invited to review the learning achievement test and provide feedback for any modifications. The Item-Objective Congruence (IOC) Index, developed by Rovinelli and Hambleton (1977), was used to evaluate each item. The IOC results range from -1 to +1:

+1: Indicates the item meets its specific objective.

0: Indicates uncertainty about whether the item meets its objective.

-1: Indicates the item does not meet its specific objective.

3) Questionnaire on Satisfaction with Learning Through Self-Discovery Learning Courses

The assessment covers satisfaction with the self-discovery learning curriculum, including the following three parts:

Part 1: General information of respondents (e.g., gender, grade level).

Part 2: Satisfaction with course content across 4 lessons (Lessons 2, 3, 5 & 7)).

Part 3: Satisfaction with online learning, including the ease of using the system in various areas such as learning, assessment, and chapter tests.

The questionnaire uses a 5-point Likert scale to measure satisfaction levels:

5 = Very High

4 = High

3 = Medium

2 = Low

1 = Very Low

3.3 VALIDITY AND RELIABILITY

3.3.1 Learning Achievement Evaluation Form

Validity

The research instruments of this study were verified by five experts. The research instrument verification was calculated according to the Index of Item-Objective Congruence (IOC) developed by Rovinelli and Hambleton (1977) to determine whether the items meet the research objectives. Based on Rovinelli and Hambleton's (1977) rating categories, the IOC experts evaluate each item in the research instruments as follows: The IOC result index ranges from -1 to +1.

1) +1: Indicates that the item meets specific objectives.
2) 0: Indicates doubtful whether the item meets the objectives or not.
3) - 1: Indicates that the item does not meet a specific objective.

The index of item-objective congruence developed by Rovinelli and Hambleton (1977) was computed using the following formula:

$$I_{ik} = \frac{(N-1)\sum_{j=1}^{n} X_{ijk} - \sum_{t=1}^{N}\sum_{j=1}^{n} X_{ijk} - \sum_{j=1}^{n} X_{ijk}}{2(N-1)n} \quad (3\text{-}1)$$

Iik is the index of item-objective congruence for item k on objective

i. N is the number of objectives (i=1, 2, … , N),

n is the number of content specialists (j=1, 2, … , n), and

Xijk is the rating (1, 0, - 1) of item k as a measure of objective i by content specialist j. (Hambleton, 1978).

Evaluated by 5 experts. From the evaluation results, the researcher made corrections according to the suggestions and cut out the items with a total score lower than 0.6 and let the experts reconsider. The overall questionnaire score was equal to 1.

Reliability

Cronbach's alpha was a measurement used to assess the reliability, or internal consistency, of a set of scale or test items. It was the most used for evaluating the reliability of the research instruments in psychological or educational research (Sharma, 2016).

Cronbach's alpha formula calculation:

$$\alpha = \left(\frac{n}{n-1}\right)\left(1-\sum S_i^2/S_t^2\right) \quad (3\text{-}2)$$

α = reliability coefficient

n =total number of the item

S_i^2 = variance of scores on each item

S_t^2 = total variance of all total scores for all items

The higher the coefficient of Cronbach's Alpha was, the higher the reliability of the instrument was. In basic research, reliability must be at least 0.70 to be acceptable, and a range between 0.8 and 0.98 was considered high reliability.

Table 3.1 Description of internal consistency using Cronbach's Alpha

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Analysis of the Cronbach's Alpha curriculum for self-discovery for online teaching in basic education overall has a Cronbach's Alpha value of 0.889. Each section of the questionnaire has a Cronbach's Alpha value as follows.

Lesson 1: Emphasizing Eternal Truthsyielded a Cronbach's Alpha value of 0.881 "Good".

Lesson 2: Ancient and Medieval Education yielded a Cronbach's Alpha value of 0.845 "Good".

Lesson 3: Cognitive, Constructivism, and Behaviorism Learning Theories yielded a Cronbach's Alpha value of 0.802 "Good".

Lesson 4: Cultural Foundations yielded a Cronbach's Alpha value of 0.898 "Good".

Upon reviewing the Cronbach's Alpha values for these four lessons, it is evident that all the lessons demonstrate good internal consistency, as indicated by the Good Cronbach's Alpha values.

3.3.2 Questionnaire on Satisfaction with Learning Through Self-Discovery Learning Courses

Validity

The research instruments of this study were verified by five experts. The research instrument verification was calculated according to the Index of Item-Objective Congruence (IOC) developed by Rovinelli and Hambleton (1977) to determine whether the items meet the research objectives. Based on Rovinelli and Hambleton's (1977) rating categories, the IOC experts evaluate each item in the research instruments as follows: The IOC result index ranges from -1 to +1.

1) +1: Indicates that the item meets specific objectives.

2) 0: Indicates doubtful whether the item meets the objectives or not.

3) -1: Indicates that the item does not meet a specific objective.

The index of item-objective congruence developed by Rovinelli and Hambleton (1977) was computed using the following formula:

$$I_{ik} = \frac{(N-1)\sum_{j=1}^{n} X_{ijk} - \sum_{t=1}^{N}\sum_{j=1}^{n} X_{ijk} - \sum_{j=1}^{n} X_{ijk}}{2(N-1)n} \quad (3\text{-}1)$$

Iik is the index of item-objective congruence for item k on objective

i. N is the number of objectives (i=1, 2, … , N),

n is the number of content specialists (j=1, 2, … , n), and

Xijk is the rating (1, 0, - 1) of item k as a measure of objective i by content specialist j. (Hambleton, 1978).

Evaluated by 5 experts. From the evaluation results, the researcher made corrections according to the suggestions and cut out the items with a total score lower than 0.6 and let the experts reconsider. The overall questionnaire score was equal to 1.

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Cronbach's alpha formula calculation:

$$\alpha = \left(\frac{n}{n-1}\right)\left(1-\sum S_i^2/S_t^2\right) \quad (3\text{-}3)$$

α = reliability coefficient

n =total number of the item

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S_t^2 = total variance of all total scores for all items

The higher the coefficient of Cronbach's Alpha was, the higher the reliability of the instrument was. In basic research, reliability must be at least 0.70 to be acceptable, and a range between 0.8 and 0.98 was considered high reliability.

Table 3.2 Description of internal consistency using Cronbach's Alpha

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

The analysis of Cronbach's Alpha for questionnaire on Satisfaction with Learning Through Self-Discovery Learning Courses. is equal to 0.924.

3.4 DATA COLLECTION

The data collection was conducted according to the research objectives in separate process as follows.

3.4.1 To develop an Instructional Model for Self-discovery Learning for Online Teaching in the Foundation of Education Course.

Developing a Self-Discovery Learning Teaching Model for Online Teaching in Basic Education Courses

1) The design of the learning process

a.Course Description

The Foundations of Education course for master's degree students provides a comprehensive and critical examination of the historical, philosophical, sociological, and psychological foundations that have influenced education systems globally. This advanced course is designed to deepen students' understanding of the complex factors shaping education, encouraging critical analysis and application of foundational theories to contemporary educational challenges. Students will engage with seminal texts, current research, and case studies to develop a nuanced perspective on the role of education in society and their professional practice.

b.Course Objectives

(1) To critically analyze the historical evolution of education and its impact on contemporary practices and policies.

(2) To explore and evaluate philosophical theories and their application to educational practice and curriculum development.

(3) To investigate sociological issues related to education, including equity, diversity, and the role of education in social change.

(4) To understand and apply psychological theories of learning and development in educational contexts.

(5) To assess the implications of current educational policies and reforms at local, national, and global levels.

(6) To develop a reflective and well-articulated professional philosophy of education informed by foundational theories and current research.

c.Learning Activities

Curriculum Design

Analyzing the Self-Discovery Learning Model, covering five key aspects, and online teaching through the integration of DingTalk and WeChat (or DingChat) for online instruction.

Self-Discovery Learning: Five Key Aspects

Learning through creativity

Working with tangible elements

Constructing knowledge connected to the context

Learning and collaborating creatively

The importance of working with tangible elements

Online Learning Platforms

DingTalk

WeChat

Curriculum Structure Design: Determining topics and lesson sequences

Instructional design using Self-Discovery Learning, covering five key aspects, including determining learning topics.

Integrating online instruction with self-directed learning, blending both approaches into learning activities that combine the two teaching methods.

Preparing content in order of appropriate priority.

Teaching method: Online learning through DingTalk and WeChat, where online organization and Self-Discovery Learning are facilitated.

2) Teaching methods

The teaching process for all 4 lessons in the self-directed learning format is as follows:

Lesson 1: Emphasizing Eternal Truths

Step 1 Set the issues and provide them to the students for learning

Students are assigned to research "Eternal Truths" (e.g., justice, beauty, goodness) from various cultures or philosophical traditions individually and present their findings in an online forum or group discussion.

Step 2 Facilitate discussion, reflection, and analysis.

Students form groups to collaboratively analyze the "Eternal Truths" they researched individually.

Students reflect on each other's ideas and provide feedback, identifying similarities or differences in their understanding.

Step 3 Students present their knowledge.

Each group presents their reflections on how the Eternal Truths relate to modern society and how these truths shape social values.

Step 4 Peer review and conclusion.

Students collectively reflect on how Eternal Truths are relevant to modern society and how they shape their personal values.

Step 5 Self-discovery learning model.

The pre-test and post-test were conducted and the differences were compared to conclude the Self-discovery learning model.

Lesson 2: Ancient and Medieval Education

Step 1 Set the issues and provide them to the students for learning

Students are tasked with exploring online resources (e.g., virtual tours of ancient or medieval educational institutions) and recording key educational philosophies and methodologies they observe.

Step 2 Facilitate discussion, reflection, and analysis.

In group discussions, students debate how ancient and medieval education influenced modern education. They then create a group presentation summarizing their findings.

Each student writes a brief essay comparing ancient, medieval, and modern educational approaches.

Step 3 Students present their knowledge.

Each student delivers a brief 5-minute presentation comparing ancient, medieval, and modern educational approaches.

Step 4 Peer review and conclusion.

Students collectively reflect on their learning about ancient and medieval education.

Step 5 Self-discovery learning model.

The pre-test and post-test were conducted and the differences were compared to conclude the Self-discovery learning model.

Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning Theories

Step 1 Set the issues and provide them to the students for learning

Each student selects a real-world learning scenario (e.g., classroom, workplace, or personal experience) and analyzes it through the lenses of cognitive theory, constructivism, and behaviorism.

Step 2 Facilitate discussion, reflection, and analysis.

Group learning involves defending a specific learning theory in a live online debate. Afterward, students vote on which theory they believe is most effective and explain why.

Students create an online learning activity or lesson plan based on one of the theories, share it with their peers, and receive feedback.

Step 3 Students present their knowledge.

Students in each group summarize their group's online learning activity and present it to the class.

Step 4 Peer review and conclusion.

Students collectively reflect on the holistic, constructivist, and behaviorist approaches to learning.

Step 5 Self-discovery learning model.

The pre-test and post-test were conducted and the differences were compared to conclude the Self-discovery learning model.

Lesson 4: Cultural Foundations

Step 1 Set the issues and provide them to the students for learning

Students are assigned to explore cultural heritage: each student selects a culture and researches its educational values, traditions, and practices, presenting their findings through an online video or blog post.

Step 2 Facilitate discussion, reflection, and analysis.

Students divide into small groups to share cultural perspectives, identifying how cultural foundations influence learning styles and classroom environments.

Each student reflects on how their own cultural background influences their learning and suggests how they can integrate new cultural insights into their learning experience in group settings.

Step 3 Students present their knowledge.

Students reflect on the analysis of their own cultural background and how it influences their learning, proposing ways to incorporate new cultural insights into their group learning experiences.

Step 4 Peer review and conclusion.

The entire class summarizes the key cultural foundations and discusses how their cultural backgrounds influence their learning experiences.

Step 5 Self-discovery learning model.

The pre-test and post-test were conducted and the differences were compared to conclude the Self-discovery learning model.

3) Assessment of Self-Discovery Learning Model: Pre- and post-tests are administered to evaluate the effectiveness of the self-discovery learning model.

Teaching through WeChat and DingTalk can effectively facilitate online education, as each platform offers a range of functions and features that can be utilized to create a comprehensive and efficient learning process. The following outlines the teaching steps for each platform:

3.4.2 Content Development

Based on the established model, the content for the four lessons was determined and delivered online through the Ding Talk and WeChat (DingChat) platforms. Practical exercises were also included to support self-discovery learning via online instruction. Assignments were designed to encourage students to independently explore concepts, reflect on the learning process, and apply their knowledge to real-world scenarios. Below are the customized tasks for each of the four lessons:

Lesson 1: Emphasizing Eternal Truths

Assignment:

Research Project: Students should individually research an "Eternal Truths" (e.g., justice, beauty, goodness) in various cultures or philosophies and present their findings in an online forum or group discussion.

Reflection Paper: Each student writes a reflection on how this “Eternal Truths” is relevant to modern society and how it shapes their personal values.

Peer Review: Students read each other’s reflections and provide feedback, identifying similarities or differences in understanding.

Lesson 2: Ancient and Medieval Education

Assignment:

Virtual Museum Tour: Assign students to explore an online resource (like a virtual tour of an ancient or medieval educational institution) and document key educational philosophies and methods they observe.

Group Discussion: In their groups, students discuss how education in the ancient and medieval periods influences modern education, then create a group presentation summarizing their findings.

Comparative Analysis: Individually, students write a short essay comparing ancient, medieval, and contemporary education practices.

Lesson 3: Cognitive, Constructivism, and Behaviorism Learning Theories

Assignment:

Learning Theory Case Study: Each student selects a real-world learning scenario (e.g., a classroom, workplace, or personal experience) and analyzes it through the lens of cognitive, constructivist, and behaviorist theories.

Group Debate: Groups are assigned a specific learning theory to defend in a live online debate. Afterward, students vote on which theory they believe is most effective and why.

Theory in Practice: Students create an online learning activity or teaching plan based on one of the theories, share it with their peers, and receive feedback.

Lesson 4: Cultural Foundations

Assignment:

Cultural Heritage Exploration: Each student selects a culture and researches its educational values, traditions, and practices, presenting their findings through an online video or blog post.

Cultural Exchange Discussion: In groups, students exchange cultural perspectives, identifying how cultural foundations influence learning styles and classroom environments.

Cross-Cultural Reflection: Students individually reflect on how their own cultural background influences their learning and propose how they can incorporate new cultural insights into their educational experience.

These assignments aim to foster independent thinking, self-discovery, and peer collaboration, while using online teaching tools to enhance the learning process.

Teaching and Learning Management

The students were organized into five learning groups, each consisting of six members, totaling 30 students, to engage in group activities. The DingTalk and WeChat programs were utilized in the teaching process. Separate chat rooms were created for each group to facilitate discussions, share documents and learning materials, collaborate on group tasks, verify information, check the accuracy of work, and present assignments via the learning platforms. The instructor could join the breakout rooms to provide feedback during the group activities. Additionally, both students and the instructor could collaboratively summarize the content and complete assessments through the DingTalk and WeChat programs.

The Use of Online Programs in Teaching and Learning

In this study, the researchers adapted DingTalk and WeChat programs for online learning. Certain programs, such as Microsoft Teams, Zoom, Moodle, and Google Classroom, were deemed unsuitable for use in China. Therefore, the researchers opted to use the DingTalk and WeChat programs, specifically focusing on self-directed learning, group work, and the realities of online education. The platforms were utilized as follows:

Ding Talk program

Ding Talk is a communication and collaboration platform, which the researchers employed in the following educational activities:

Online Learning: Ding Talk program was used for online classes through video and audio, enabling students and teachers to conduct online lessons anytime and anywhere. It functions similarly to Zoom or Microsoft Teams.

Classroom Management: The platform was used for managing instructional activities, creating learning groups, initiating discussion topics, assigning homework, and facilitating the submission and assessment of assignments through Ding Talk program.

Real-time Communication: Ding Talk program real-time chat feature allows students to ask questions and receive guidance from teachers promptly. Additionally, for group work, group chats were created to enable students to collaborate and discuss projects with their peers.

Notifications: Ding Talk program assists in sending notifications related to class schedules, assignment submissions, exams, and other activities, ensuring that students stay informed about important updates.

Document Management: Both students and teachers can share documents, slides, or instructional videos through the platform, providing easy access to learning materials.

Recording and Data Storage: DingTalk allows for the recording of meetings or classes, enabling students to review lessons at their convenience, thus facilitating continuous learning.

Application Development and Integration: The platform includes developer support, allowing the creation and customization of applications within DingTalk. This feature enabled the researchers to integrate external applications, such as educational videos or case studies, to enhance the learning experience.

WeChat program

WeChat was used for communication and online learning. It allowed teachers and students to create group chats for classroom communication and information exchange. Students could ask questions, submit assignments, or engage in academic discussions. Additionally, the platform facilitated the sharing of documents and learning materials, such as slides, audio files, videos, or images related to the lessons, including teaching slides, articles, or other instructional media. Teachers could also share lessons, teaching materials, or activities through Moments, enabling students to stay updated. Furthermore, students could share their ideas or work, fostering a participatory learning environment. The platform also supported data collection and

learning outcome analysis, such as assessing academic performance, tracking participation in activities, and analyzing student learning behavior.

Assessment Methods:

The results will be used to organize data and assess learning achievement through a control system that stores standardized data. The outcomes will be analyzed for pre-test and post-test values, and subsequently evaluated for learning achievement using a dependent samples t-test.

Prerequisites: None

Recommended for: Graduate students in education, current educators seeking advanced knowledge, and professionals aiming to deepen their understanding of the foundational aspects of education.

By the end of this course, students will possess an advanced and critical understanding of the foundational theories and issues in education, enabling them to apply this knowledge to their professional practice and further academic research.

3.4.3 Learning Platform Development

In this study, the researchers adapted DingTalk (EqualOcean News, 2024) and WeChat (Chao, 2017) for online learning. Certain programs, such as Microsoft Teams, Zoom, Moodle, and Google Classroom, were deemed unsuitable for use in China. Therefore, the researchers opted to use the DingTalk and WeChat programs, specifically focusing on self-directed learning, group work, and the realities of online education. The platforms were utilized as follows:

DingTalk is a communication and collaboration platform, which the researchers employed in the following educational activities:

1) Online Learning: DingTalk was used for online classes through video and audio, enabling students and teachers to conduct online lessons anytime and anywhere. It functions similarly to Zoom or Microsoft Teams.

2) Classroom Management: The platform was used for managing instructional activities, creating learning groups, initiating discussion topics, assigning homework, and facilitating the submission and assessment of assignments through DingTalk.

3) Real-time Communication: DingTalk's real-time chat feature allows students to ask questions and receive guidance from teachers promptly. Additionally, for group work, group chats were created to enable students to collaborate and discuss projects with their peers.

4) Notifications: DingTalk assists in sending notifications related to class schedules, assignment submissions, exams, and other activities, ensuring that students stay informed about important updates.

5) Document Management: Both students and teachers can share documents, slides, or instructional videos through the platform, providing easy access to learning materials.

6) Recording and Data Storage: DingTalk allows for the recording of meetings or classes, enabling students to review lessons at their convenience, thus facilitating continuous learning.

7) Application Development and Integration: The platform includes developer support, allowing the creation and customization of applications within DingTalk. This feature enabled the researchers to integrate external applications, such as educational videos or case studies, to enhance the learning experience.

WeChat was used for communication and online learning. It allowed teachers and students to create group chats for classroom communication and information exchange. Students could ask questions, submit assignments, or engage in academic discussions. Additionally, the platform facilitated the sharing of documents and learning materials, such as slides, audio files, videos, and images related to the lessons, including teaching slides, articles, and other instructional media. Teachers could also share lessons, teaching materials, and activities through Moments, enabling students to stay updated. Furthermore, students could share their ideas and work, fostering a participatory learning environment. The platform also supported data collection and learning outcome analysis, such as assessing academic performance, tracking participation in activities, and analyzing student learning behavior.

In this study, the researcher adapted the DingTalk and WeChat programs for online learning. Some programs are not suitable for using in China, they are Microsoft Teams, Zoom, Moodle, Google Classroom and Slack.

According to the limitations for students in China, the students often face challenges using certain programs effectively due to strict government regulations and internet censorship. The Chinese government enforces a robust firewall that restricts access to many foreign platforms and services, including educational tools like Google Classroom, Slack, and Microsoft Teams. These platforms are either blocked or their features are limited, making them inaccessible or less effective for students in China. Additionally, the preference for domestically developed alternatives, like DingTalk and WeChat Work, aligns with the government's efforts to promote local technology and maintain control over data and communication within the country.

When comparing DingTalk and WeChat in an educational context, both platforms have their strengths, but their suitability depends on the specific needs of the educational environment. The following comparisons in Table 3.2 help determine which might be more appropriate.

Table 3.3 The Comparisons between DingTalk and WeChat in Five Aspects

Aspects	Programs	
	DingTalk	WeChat
1. Strengths in Education	Dedicated for Work and Education: Originally designed for workplace collaboration, DingTalk has evolved to include features tailored for educational use. It supports virtual classrooms, homework submission, attendance tracking, and educational analytics.	Ubiquity and Familiarity: WeChat is one of the most popular apps in China, and nearly all students and teachers are familiar with its interface. Its widespread use makes it easy to adopt for educational purposes without the need for extensive training.
2. Structured and Simple Communication	DingTalk provides a more organized communication environment with features like designated channels for different classes or subjects, similar to an LMS. This helps keep educational activities separate from personal communication.	WeChat is known for its user-friendly communication features. Teachers can create group chats for classes, send out announcements, share learning materials, and conduct discussions with ease.
3.Homework and Assignment Management	Teachers can assign homework, collect submissions, and provide feedback directly through the platform. It also supports automated grading for some assignments, making it easier for teachers to manage workloads.	WeChat supports "Mini Programs," which are lightweight apps within WeChat that can be tailored for specific educational purposes, such as quizzes, polls, or even virtual classrooms. This allows for flexible customization.

Table 3.3 The Comparisons between DingTalk and WeChat in Five Aspects (Cont.)

4. Integration with Educational Tools	DingTalk integrates well with other educational resources and tools, such as online learning platforms, making it a more comprehensive solution for managing educational activities.	Personalized Learning: WeChat enables more personalized communication between teachers and students. Teachers can engage with students one-on-one or in smaller groups, making it easier to address individual learning needs.
5. Limitations in Education	Complex Interface: DingTalk's interface can be more complex, especially for younger students or those less familiar with digital tools. Primarily Work-Oriented: Despite its educational features, DingTalk's core design is business-focused, which may feel less intuitive for purely educational use.	Unlike DingTalk, WeChat lacks the structured environment that separates educational activities from personal communication, which could lead to distractions or a mix of work and personal messages. Limited Educational Features: While WeChat can be adapted for education, it lacks some of the specialized features that DingTalk offers, such as detailed assignment management and attendance tracking.

From the comparison in Table 3.2, DingTalk is more suitable for formal education due to its structured tools and course management features, while WeChat is better for informal communication and peer interaction. Combining both can create a balanced and effective learning environment.

For university students needing structured learning environments, DingTalk is generally more suitable due to its educational features like assignment management, structured communication channels, and integration with other educational tools.

For universities or institutions needing structured learning environments, DingTalk is generally more suitable due to its educational features like assignment management, structured communication channels, and integration with other educational tools.

For informal learning or institutions prioritizing ease of use and familiarity, WeChat may be the better choice. Its widespread use, familiarity, and flexibility through Mini Programs make it ideal for environments where formal educational tools are less critical.

In summary, DingTalk is better suited for more structured and formal educational settings, while WeChat is more appropriate for informal learning and situations where ease of use and familiarity are key priorities. Additionally, the researcher adapted the DingTalk and WeChat programs for online learning. Some programs, such as Microsoft Teams, Zoom, Moodle, Google Classroom, and Slack, are not suitable for use in China. For these reasons, the researcher combines the two programs to create a more suitable educational tool, named DingChat.

Testing and Evaluation

Conduct tests and evaluations to assess the effectiveness of the curriculum. The assessment includes four lessons, each consisting of 30 questions, as follows:

Lesson 1: Emphasizing Eternal Truths

Lesson 2: Ancient and Medieval Education

Lesson 3: Cognitive, Constructivist, and Behaviorist Learning Theories

Lesson 4: Cultural Foundations

Step 2 Verify the course self-discovery learning for online obtained from step 1 by evaluation from educational experts. The verification checks are as follows.

1) To ensure the accuracy of the content, the researcher has invited a group of five experts to review the learning management process. This group covers curriculum development, online teaching, and learning evaluation. The selection of these experts is based on the following criteria:

Experts with experience in developing educational curricula or who have authored textbooks or articles on curriculum development.

Experts with studies on curriculum development or training through online teaching.

Experts with experience in online teaching and online assessment.

Experts with research experience related to learning assessment.

2) To create evaluation forms for the Self-Discovery Learning Curriculum, develop the forms to be used by the experts. The questions covered aspects such as the learning curriculum, online teaching-based learning management, and assessment processes to ensure alignment with the original curriculum. The researcher used the experts' feedback to enhance the curriculum, modify the learning system, and refine the evaluation methods.

3.3.2 To Compare Achievement between Pre-tests and Post-tests on an Instructional Model for Self-discovery Learning for Online Teaching in the Foundation of Education Course.

1) Conduct a pre-test.

2) Implement the instructional experiment using the integration of online teaching with Self-Discovery Learning, which combines both approaches into learning activities that merge the two instructional formats.

3) Conduct a post-test.

4) Analyze group and individual learning outcomes using mean and standard deviation, and perform a t-test to assess learnin achievement.

3.3.3 To Assess the Student's Satisfaction with an Instructional Model for Self-discovery Learning for Online Teaching in the Foundation of Education Course.

Assessment of satisfaction in learning through self-discovery learning curriculum. It consists of the following topics.

Part 1: General information of the respondents, such as gender, grade level.

Part 2: Satisfaction regarding the content of the course, a total of 4 lessons, as follows:

Lesson 1: Emphasize eternal truths.
Lesson 2: Ancient and medieval education
Lesson 3: Features Cognitive, Constructivism, and Behaviorism learning theories.
Lesson 4: Cultural Foundations

Part 3: Satisfaction regarding online learning consists of the difficulty of using the system in various parts such as learning, evaluation, tests between chapters, etc.

The questions are divided into 5 levels to measure satisfaction levels. The scale ranges from 1 to 5 with the following interpretations.

5 = Very High
4 = High
3 = Medium
2 = Low
1 = Very Low

3.5 DATA ANALYSIS

3.5.1 To analyze the data collected based on the objective of 'developing an instructional model for self-discovery learning in online teaching for the Foundations of Education course'.

Data were collected from all three groups of experts using assessment forms. The data were then be analyzed using frequency, percentage, and mean to guide improvements in the curriculum.

3.5.2 To analyze the data collected based on the objective of 'comparing achievement between pre-tests and post-tests on an instructional model for self-discovery learning in online teaching for the Foundations of Education course'.

The results were organized and used to test learning achievement by utilizing a control system that stores standardized data. The pre-test, post-test, and pre-study results, along with post-study results, were analyzed using a t-test. The sample types are not independent (paired t-test).

3.5.3 To analyze the data collected from students' satisfaction with an instructional model for self-discovery learning in online teaching for the Foundations of Education course.

The evaluation was conducted using descriptive statistics, including number, percentage, mean, and standard deviation. The interpretation of the scores follows the method outlined by Pimentel (2010), which uses quartile ranges to divide the results into different levels of opinion. The score ranges and corresponding opinion levels are as follows:

4.20 – 5.00 = Very High
3.40 – 4.19 = High
2.60 – 3.39 = Medium
1.80 – 2.59 = Low
1.00 – 1.79 = Very Low

3.6 ETHICAL CONSIDERATION

This study must address two ethical components:

Authorization: The initial step involved obtaining authorization from Rangsit University to conduct the research. The details of the study were submitted to the RSU Ethics Review Board (ERB) for evaluation of human research ethics.

Protection of Participants: The second component focused on ensuring the protection and respect of the research specialists and participants involved in the project. This included:

Willing Participation: The researcher provided information about the study to both experts and participants, obtained their consent, and secured their signatures on informed consent forms.

Privacy: The data was maintained with strict confidentiality and will be permanently deleted one year after the publication of this dissertation in a journal.

Safety and Integrity: To ensure participant safety and the integrity of the study, the researcher implemented measures to prevent harm and deception. This included having two instructors present to supervise activities and protect all participants.

On August 20, 2024, the RSU Ethics Review Board (ERB) has issued an approval certificate No. # COA.RSUERB2024-140 (attached in Appendix J) to this research.

CHAPTER 4

DATA ANALYSIS

This research titled "The Development of an Instructional Model for Self-Discovery Learning for Online Teaching: Foundation of Education Course" aimed to achieve three key objectives: 1) to develop a teaching model, 2) to compare pre-test and post-test achievement, and 3) to evaluate student satisfaction with the teaching and learning process. The research results are divided into three sections to address these objectives as follows:

1) Development of the Teaching Model: This section details the process of creating the instructional model for self-discovery learning, outlining its core principles, methodologies, and digital tools used.

2) Comparison of Pre-test and Post-test Achievement: This part focuses on analyzing the academic performance of students before and after the implementation of the model, assessing improvements in knowledge and understanding.

3) Student Satisfaction Evaluation: The final section presents the results of student feedback on the effectiveness and engagement of the teaching model, highlighting areas of satisfaction and potential improvements.

The research findings are as follows:

4.1 PART 1: RESULTS OF DEVELOPING THE SELF-DISCOVERY LEARNING MODEL FOR ONLINE TEACHING IN THE FOUNDATION OF EDUCATION COURSE

The study in Objective 1 focuses on developing a self-discovery learning model for online teaching in the course of Educational Foundations and utilizing this self-discovery learning model to develop a comprehensive learning curriculum. The development process is outlined as follows:

4.1.1 Development of a Self-discovery Learning Model for Online Teaching in the Course of Educational Foundations

The development of the Self-Discovery Learning model involved an analysis of relevant theories and research, which were integrated with online teaching platforms. This resulted in the formulation of the Self-Discovery Learning model as follows:

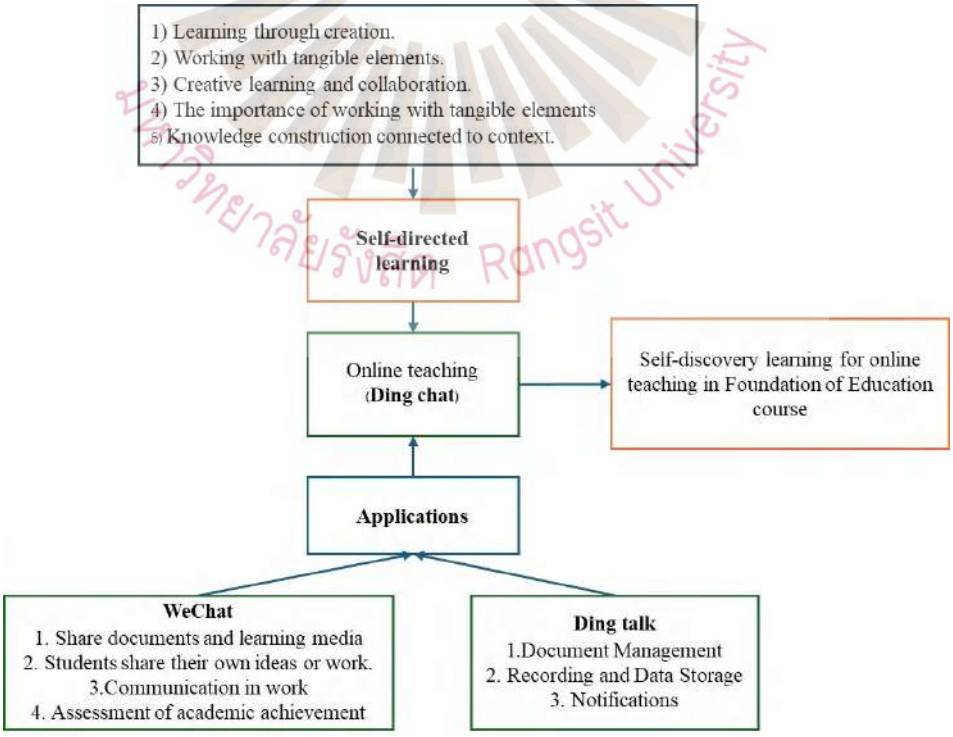

Figure 4.1 Self-discovery Learning Model for Online Teaching in Basic Education Subjects

The self-discovery learning model for online teaching utilizes self-discovery instructional techniques, with online learning as the primary process for teaching and learning. The model incorporates knowledge construction, working with tangible elements, creative learning and collaboration, and contextualized knowledge building into the instructional design. Each learning session employs the following processes and instructional methods.

4.1.2 Development of Self-discovery Learning Curriculum for Online Teaching in the Course of Educational Foundations

In developing the self-discovery learning model, the researcher created a learning framework for online teaching by designing a self-discovery curriculum consisting of 4 lessons for online instruction as follows:

Lesson 1: Emphasize Eternal Truths
Lesson 2: Ancient and Medieval Education
Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning Theories
Lesson 4: Cultural Foundations

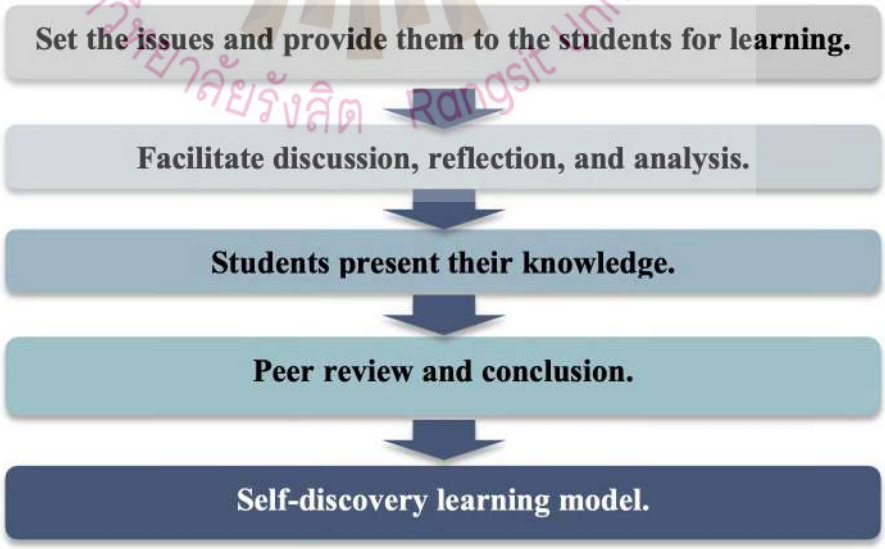

Figure 4.2 Development of Self-discovery Learning Curriculum

Figure 4.2 Development of self-discovery learning curriculum has the following teaching and learning processes:

1) Set the issues and provide them to students for learning.
2) Divide students into groups of 4-6 people to discuss and learn the issues in small groups.
3) Let students reflect, discuss, and analyze.
4) Have students present their knowledge to the online class.
5) Draw conclusions.

From the steps in Figure 4.2, it can be used to create The Learning Process and Activity Design Includes the Following Steps:

1) Defining Issues and Assigning Them to Students for Learning:

Lesson 1: Emphasizing Eternal Truths

Students are assigned to research "eternal truths" (e.g., justice, beauty, goodness) from various cultures or philosophical traditions individually and present their findings in an online forum or group discussion.

Lesson 2: Ancient and Medieval Education

Students are tasked with exploring online resources (e.g., virtual tours of ancient or medieval educational institutions) and recording key educational philosophies and methodologies they observe.

Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning Theories

Each student selects a real-world learning scenario (e.g., classroom, workplace, or personal experience) and analyzes it through the lenses of cognitive theory, constructivism, and behaviorism.

Lesson 4: Cultural Foundations

Students are assigned to explore cultural heritage: each student selects a culture and researches its educational values, traditions, and practices, presenting their findings through an online video or blog post.

2) Group Learning to Solve Issues:

Lesson 1: Emphasizing Eternal Truths

Students form groups to collaboratively analyze the "eternal truths" they researched individually.

Lesson 2: Ancient and Medieval Education

In group discussions, students debate how ancient and medieval education influenced modern education. They then create a group presentation summarizing their findings.

Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning Theories

Group learning involves defending a specific learning theory in a live online debate. Afterward, students vote on which theory they believe is most effective and explain why.

Lesson 4: Cultural Foundations

Students divide into small groups to share cultural perspectives, identifying how cultural foundations influence learning styles and classroom environments.

3) Facilitating Discussion, Reflection, and Analysis:

Lesson 1: Emphasizing Eternal Truths

Students reflect on each other's ideas and provide feedback, identifying similarities or differences in their understanding.

Lesson 2: Ancient and Medieval Education

Each student writes a brief essay comparing ancient, medieval, and modern educational approaches.

Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning Theories

Students create an online learning activity or lesson plan based on one of the theories, share it with their peers, and receive feedback.

Lesson 4: Cultural Foundations

Each student reflects on how their own cultural background influences their learning and suggests how they can integrate new cultural insights into their learning experience in group settings.

4) Students Present Their Knowledge:

Lesson 1: Emphasizing Eternal Truths

Each group presents their reflections on how the eternal truths relate to modern society and how these truths shape social values.

Lesson 2: Ancient and Medieval Education

Each student delivers a brief 5-minute presentation comparing ancient, medieval, and modern educational approaches.

Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning Theories

Students in each group summarize their group's online learning activity and present it to the class.

Lesson 4: Cultural Foundations

Students reflect on the analysis of their own cultural background and how it influences their learning, proposing ways to incorporate new cultural insights

into their group learning experiences.

5) Peer Review and Conclusion:

Lesson 1: Emphasizing Eternal Truths

Students collectively reflect on how eternal truths are relevant to modern society and how they shape their personal values.

Lesson 2: Ancient and Medieval Education

Students collectively reflect on their learning about ancient and medieval education.

Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning Theories

Students collectively reflect on the holistic, constructivist, and behaviorist approaches to learning.

Lesson 4: Cultural Foundations

The entire class summarizes the key cultural foundations and discusses how their cultural backgrounds influence their learning experiences.

6) Assessment of Self-Discovery Learning Model: Pre- and post-tests are administered to evaluate the effectiveness of the self-discovery learning model.

Teaching through WeChat and DingTalk can effectively facilitate online education, as each platform offers a range of functions and features that can be utilized to create a comprehensive and efficient learning process. The following outlines the teaching steps for each platform:

Teaching Steps via WeChat

WeChat is a communication application that can be adapted for use in the educational process, offering the following features:

1) Group Chat for Teaching Create a group where teachers and students can communicate in a single space. This group facilitates the exchange of information, notifications, and file sharing.

2) File Sharing WeChat supports the sharing of all file types, such as PDF, Word, Excel, as well as images and videos. It can be used to share teaching materials, exams, or homework.

3) Text and Voice Messaging Teachers can send text or voice messages to provide further explanations of the lesson content or to answer students' questions in real time.

4) Poll/Survey Creation Teachers can create surveys or polls to assess students' understanding or to collect data for evaluation purposes.

5) Mini Programs WeChat includes Mini Programs, which can be used to create interactive activities such as supplementary learning apps or online quizzes.

Teaching Steps via DingTalk

DingTalk is a platform specifically designed for collaboration and education, with features well-suited for online teaching as follows:

1) Class Management: DingTalk provides comprehensive online class management functions, such as creating class groups, setting class schedules, and tracking students' attendance.

2) Live Streaming: The Live Streaming function can be used for real-time teaching, allowing students to learn remotely and interact via the chat system.

3) Assignment Submission: Students can submit their assignments or homework directly through DingTalk, and teachers can review and grade these submissions within the platform.

4) Attendance Tracking: DingTalk includes an automated attendance tracking system, enabling teachers to monitor student participation efficiently.

5) Screen Sharing: Teachers can share their screens to explain teaching materials in real-time or to display slides and other relevant content.

6) Class Recording: DingTalk offers a class recording function, allowing students who cannot attend live sessions to review the content later.

7) Class Schedule Management Teachers can organize and share the class schedule through DingTalk, making it easier to track the timeline for lessons, assignments, and other activities.

By leveraging the functionalities of both WeChat and DingTalk (DingChat), teachers can create a structured and interactive learning environment for their students, ensuring both effective communication and a streamlined teaching process.

4.2 PART 2: RESULTS OF COMPARING PRE-TEST AND POST-TEST ACHIEVEMENT IN THE SELF-DISCOVERY LEARNING MODEL FOR ONLINE TEACHING IN THE FOUNDATION OF EDUCATION COURSE

In this study, an experiment was conducted on the Self-Discovery Learning Model for Online Teaching in the Foundation of Education course. A Pre-test and Post -test assessment of individual learning outcomes was administered. The results of the instructional experiment and the measurement of learning achievement are as follows:

4.2.1 Experiments in the Self-Discovery Learning Model for Online Teaching in the Foundation of Education Course

The experiment on the instructional design based on the Self-Discovery

Learning Model for Online Teaching in the Foundation of Education course involved self-directed learning activities using DingTalk and WeChat programs as learning tools. The instructional process was divided into five groups, with each group following the same learning model, as detailed below:

Lesson 1: Emphasize Eternal Truths

1) Learning Activities

(1) Critical reading and analysis of key texts and current research

(2) Case study analysis and problem-solving

(3) Summarization of philosophical foundations

(4) Pre- and post-assessment tests

(5) Homework: Summarize the content for the next lesson

2) Programs used for learning

(1) Students were divided into learning groups on DingTalk, sharing documents and collaboratively analyzing the assigned work.

(2) The instructor distributed case studies for each group to analyze and solve problems using DingTalk.

(3) Students collaboratively summarized the philosophical foundations through DingTalk.

(4) Students completed pre- and post-assessment tests via WeChat.

(5) The instructor assigned homework for students to summarize the next lesson, allowing them to discuss and share documents via WeChat.

3) Assignment:

(1) Research Project: Students should individually research an "eternal truth" (e.g. justice, beauty, goodness) in various cultures or philosophies and present their findings in an online forum or group discussion.

(2) Reflection Paper: Each student writes a reflection on how

this eternal truth is relevant to modern society and how it shapes their personal values.

(3) Peer Review: Students read each other's reflections and provide feedback, identifying similarities or differences in understanding.

Lesson 2: Ancient and medieval education

1) Learning Activities

(1) Group presentations

(2) Use of questions to encourage students to think and analyze, with the instructor guiding them throughout the learning process.

(3) Individual summaries of each group's presentation

(4) Pre- and post-assessment tests

(5) Homework: Summarize the content for the next lesson

2) Programs used for learning

(1) The instructor assigned students to analyze data and present as a group, allowing them to share documents and collaborate through DingTalk.

(2) Students posed questions to the presenting group, and the instructor provided feedback via DingTalk.

(3) Students individually summarized the presentations and submitted their summaries through WeChat.

(4) Students completed pre- and post-assessment tests via WeChat.

(5) The instructor assigned homework for students to summarize the next lesson, allowing them to discuss and share documents via WeChat.

3) Assignment:

(1) Virtual Museum Tour: Assign students to explore an online resource (like a virtual tour of an ancient or medieval educational institution) and document key educational philosophies and methods they observe.

(2) Group Discussion: In their groups, students discuss how education in the ancient and medieval periods influenced modern education, then

create a group presentation summarizing their findings.

(3) Comparative Analysis: Individually, students write a short essay comparing ancient, medieval, and contemporary education practices.

Lesson 3: Features Cognitive, Constructivism, and Behaviorism learning theories

1) Learning Activities

(1) Conduct psychological tests using a designated testing program

(2) Students were divided into classroom groups to analyze provided data, with3) Students asked questions to engage their classmates.

(4) Pre- and post-assessment tests

(5) Homework: Summarize the content for the next lesson

2) Programs used for learning

(1) Students completed psychological tests via WeChat.

(2) Students posed questions to the presenting group, and the instructor provided feedback via DingTalk.

(3) Students generated learning questions and engaged in group discussions via DingTalk.

(4) Students completed pre- and post-assessment tests via WeChat.

(5) The instructor assigned homework for students to summarize the next lesson, allowing them to discuss and share documents via WeChat.

3) Assignment

(1) Learning Theory Case Study: Each student selects a real-world learning scenario (e.g., a classroom, workplace, or personal experience) and analyzes it through the lens of cognitive, constructivist, and behaviorist theories.

(2) Group Debate: Groups are assigned a specific learning theory to defend in a live online debate. Afterward, students vote on which theory they

believe is most effective and why.

(3) Theory in Practice: Students create an online learning activity or teaching plan based on one of the theories, share it with their peers, and receive feedback.

Lesson 4: Cultural Foundations

1) Learning Activities

(1) Use historical events to teach modern education systems, enabling students to enhance their understanding.

(2) Students asked questions related to the lesson, and their classmates helped answer them.

(3) The instructor provided feedback throughout the learning process.

(4) Conduct pre- and post-assessment tests.

2) Programs used for learning

(1) Students were assigned to study in small groups and analyze historical events in the context of educational systems, each group generating at least six questions. Suggestions and feedback were shared through DingTalk.

(2) Students asked questions related to the lesson, and their classmates answered them via DingTalk.

(3) The instructor provided feedback throughout the learning process via DingTalk.

(4) Students completed pre- and post-assessment tests via WeChat.

3) Assignment

(1) Cultural Heritage Exploration: Each student selects a culture and researches its educational values, traditions, and practices, presenting their findings through an online video or blog post.

(2) Cultural Exchange Discussion: In groups, students exchange cultural perspectives, identifying how cultural foundations influence learning styles

and classroom environments.

(3) Cross-Cultural Reflection: Students individually reflect on how their own cultural background influences their learning and propose how they can incorporate new cultural insights into their educational experience.

4.2.2 Learning Outcomes in the Self-Discovery Learning Model for Online Teaching in the Foundation of Education Course

In the Pre-test and Post-test, 30 students were tested in Lesson 1, Lesson 2, Lesson 5 and Lesson 4. The remaining lessons were the process of summarizing the work and using the group process in teaching. The results of the Pre-test and Post-test are as follows.

Comparison of Academic Achievement Before and After Instruction in the Self-Discovery Learning Approach for Online Teaching in the Basic Education Curriculum for Lesson 1.

Table 4.1 Lesson 1 Test Results

Group	Number of students	Pre-test	Post-test	Point difference	Mean Group Pre-test	Mean Group Post-test
1	1	6	17	11	16.00	23.50
	2	16	22	6		
	3	19	25	6		
	4	22	24	2		
	5	18	27	9		
	6	15	26	11		
2	1	16	25	9	11.33	22.67
	2	16	28	12		
	3	10	20	10		
	4	12	26	14		
	5	5	20	15		
	6	9	17	8		
3	1	12	25	13	12.83	25.50

Table 4.1 Lesson 1 Test Results (Cont.)

	2	19	30	11		
	3	10	25	15		
	4	15	29	14		
	5	6	18	12		
	6	15	26	11		
4	1	21	26	5	17.50	26.33
	2	14	28	14		
	3	16	27	11		
	4	16	25	9		
	5	19	25	6		
	6	19	27	8		
5	1	16	23	7	15.00	23.83
	2	17	25	8		
	3	13	24	11		
	4	17	25	8		
	5	17	26	9		
	6	10	20	10		
Mean		14.53	24.37	9.83	14.53	24.37
Standard Deviation		4.42	3.38	3.14	2.46	1.51

Table 4.1 presents the results of the Pre-test and Post-test for Lesson 1. It is observed that, following instruction, the average score increased compared to before the lesson. Specifically, the average score after instruction was 24.37, compared to an average score of 14.53 before the lesson, resulting in a score differential of 9.84.

Table 4.2 Comparison of Academic Achievement Before and After Studying Lesson 1

Test	Number of students	Full score	Average score	Standard deviation	t	Sig.
Before	30	30	14.5333	4.41575	-17.146	.000
After	30	30	24.3667	3.37826		

Table 4.2 presents the comparison of academic achievement before and after instruction for Lesson 1. The results indicate that the post-instruction academic

performance significantly surpassed the pre-instruction performance at a statistical significance level of 0.05.

4.2.3. Comparison of Academic Achievement Before and After Instruction in the Self-Discovery Learning Approach for Online Teaching in the Basic Education Curriculum for Lesson 2.

Table 4.3 Lesson 2 Test Results

Group	Number of students	Pre-test	Post-test	Point difference	Mean Group Pre-test	Mean Group Post-test
1	1	7	19	12	14.00	25.00
	2	17	24	7		
	3	17	27	10		
	4	15	27	12		
	5	17	27	10		
	6	11	26	15		
2	1	11	26	15	11.33	23.67
	2	14	21	7		
	3	16	24	8		
	4	13	25	12		
	5	3	20	17		
	6	11	26	15		
3	1	11	20	9	11.83	23.83
	2	11	26	15		
	3	11	24	13		
	4	17	28	11		
	5	6	17	11		
	6	15	28	13		
4	1	21	25	4	18.17	25.83
	2	16	29	13		
	3	18	25	7		
	4	21	27	6		
	5	18	23	5		
	6	15	26	11		
5	1	18	22	4	15.00	23.50
	2	17	24	7		

Table 4.3 Lesson 2 Test Results (Cont.)

	3	12	25	13		
	4	17	24	7		
	5	16	24	8		
	6	10	22	12		
Mean		14.07	24.36	10.3	14.07	24.37
Standard Deviation		4.25	2.86	3.56	2.75	1.01

Table 4.3 shows the Pre-test and Post-test results for Lesson 2. It is observed that the average score after instruction was higher than before instruction, with a post-instruction average score of 24.36 compared to a pre-instruction average score of 14.07, resulting in a score differential of 10.30.

Table 4.4 Comparison of academic achievement before and after studying Lesson 2

Test	Number of students	Full score	Average score	Standard deviation	t	sig
Before	30	30	14.06	4.25	-15.831	.000
After	30	30	24.36	2.85		

Table 4.4 presents the comparison of academic achievement before and after instruction for Lesson 2. The findings reveal that the post-instruction academic performance was significantly higher than the pre-instruction performance at a statistical significance level of 0.05.

Comparison of academic achievement before and after instruction in the self-discovery learning approach for online teaching in the basic education curriculum for Lesson 5.

Table 4.5 Lesson 5 Test Results

Group	Number of students	Pre-test	Post-test	Point difference	Mean Group Pre-test	Mean Group Post-test
1	1	9	20	11	12.83	26.33

Table 4.5 Lesson 5 Test Results (Cont.)

	2	12	23	11		
	3	11	29	18		
	4	21	30	9		
	5	13	29	16		
	6	11	27	16		
2	1	15	26	11	14.67	24.17
	2	10	23	13		
	3	19	25	6		
	4	20	25	5		
	5	7	19	12		
	6	17	27	10		
3	1	8	16	8	12.67	23.83
	2	17	26	9		
	3	13	25	12		
	4	14	30	16		
	5	9	17	8		
	6	15	29	14		
4	1	20	26	6	14.50	26.33
	2	10	28	18		
	3	14	25	11		
	4	11	27	16		
	5	17	25	8		
	6	15	27	12		
5	1	17	21	4	15.67	23.50
	2	17	25	8		
	3	14	25	11		
	4	17	26	9		
	5	17	24	7		
	6	12	20	8		
Mean		14.06	24.83	10.77	14.07	24.83
Standard Deviation		3.79	3.63	3.81	1.28	1.39

Table 4.5 shows the Pre-test and Post-test results for Lesson 5. It is noted that the average score after instruction was higher than before instruction, with a post-instruction average score of 24.83 compared to a pre-instruction average score of 14.06, resulting in a score differential of 10.77.

Table 4.6 Comparison of Academic Achievement Before and After Studying Lesson 5

Test	Number of students	Full score	Average score	Standard deviation	t	sig
Before	30	30	14.06	3.78	-15.471	.000
After	30	30	24.83	3.63		

Table 4.6 presents the comparison of academic achievement before and after instruction for Lesson 5. The results indicate that the post-instruction academic performance was significantly higher than the pre-instruction performance at a statistical significance level of 0.05.

Comparison of academic achievement before and after instruction in the self-discovery learning approach for online teaching in the basic education curriculum for Lesson 4.

Table 4.7 Lesson 4 Test Results

Group	Number of students	Pre-test	Post-test	Point difference	Mean Group Pre-test	Mean Group Post-test
1	1	16	19	3	14.83	25.17
	2	17	25	8		
	3	16	26	10		
	4	12	30	18		
	5	16	26	10		
	6	12	25	13		
2	1	12	18	6	13.83	23.67
	2	12	26	14		
	3	16	30	14		
	4	18	28	10		
	5	12	19	7		
	6	13	21	8		
3	1	12	23	11	14.67	23.17
	2	15	26	11		
	3	14	18	4		
	4	21	29	8		

Table 4.7 Lesson 4 Test Results (Cont.)

	5	13	18	5		
	6	13	25	12		
4	1	13	28	15	14.00	25.00
	2	11	24	13		
	3	16	20	4		
	4	17	28	11		
	5	15	25	10		
	6	12	25	13		
5	1	16	28	12	20.50	26.50
	2	12	27	15		
	3	12	24	12		
	4	25	27	2		
	5	27	29	2		
	6	27	28	1		
Mean		15.56	24.7	9.13	15.57	24.70
Standard Deviation		4.72	3.65	4.97	2.79	1.32

Table 4.7 displays the Pre-test and Post-test results for Lesson 4. It is observed that the average score after instruction was higher than before instruction, with a post-instruction average score of 24.70 compared to a pre-instruction average score of 15.56, resulting in a score differential of 9.13.

Table 4.8 Comparison of academic achievement before and after studying Lesson 4

Test	Number of students	Full score	Average score	Standard deviation	t	sig
Before	30	30	15.56	4.72472	-10.057	.000
After	30	30	24.70	3.64975		

Table 4.8 presents the comparison of academic achievement before and after instruction for Lesson 4. The results reveal that the post-instruction academic performance was significantly higher than the pre-instruction performance at a statistical significance level of 0.05.

Summary of Learning Outcomes from Integrating Teaching Techniques with Self-Discovery Learning through Online Processes

It can be observed that the learning outcomes from the four lessons, which integrated teaching techniques with self-discovery learning through online processes, showed a statistically significant difference between pre-learning and post-learning outcomes at the 0.05 significance level. This indicates that the learning outcomes have a significant impact on self-discovery learning, as follows:

Table 4.9 Learning Outcomes from Integrating Teaching Techniques with Self-Discovery Learning through Online Processes

Self-discovery Learning	Lesson 1	Lesson 2	Lesson 5	Lesson 4
1) Learning through creation	/	/	/	
2) The importance of working with tangible elements			/	/
3) Creative learning and collaboration.	/	/		
4) Knowledge construction that is linked to context	/		/	/
5) Incorporation of online teaching techniques.		/		/

From Table 4.9 Summary of Learning Outcomes from Integrating Teaching Techniques with Self-Discovery Learning through Online Processes. It can be observed that the learning outcomes, which integrated all five teaching techniques, significantly impacted self-discovery learning through all five online processes.

4.3 PART 3: RESULTS OF THE ASSESSMENT OF STUDENT SATISFACTION WITH THE SELF-DISCOVERY TEACHING MODEL FOR ONLINE TEACHING IN BASIC EDUCATIION SUBJECTS

Results of the assessment of student satisfaction with the self-discovery teaching model for online teaching in basic education subjects. Based on the interpretation of the score range (Pimentel, 2010), obtained by determining quartiles, opinion level ranges are divided as follows:

4.20 – 5.00 = Very High
3.40 – 4.19 = High
2.60 – 3.39 = Medium
1.80 – 2.59 = Low
1.00 – 1.79 = Very Low

Table 4.10 Overall of Students' Satisfaction

Overall of Students' Satisfaction	Mean	S.D.	Level of Perception
1. Targeting	4.31	0.96	Very High
2. Various learning processes	4.21	0.93	Very High
3. Use of supporting technology	4.23	0.95	Very High
4. Development of the learning process	4.13	0.91	High
Total	4.23	0.96	Very High

Table 4.10 indicates that the overall satisfaction is at the Very High level ($\bar{x}$ = 4.23, S.D. = 0.96). In each aspect, it was found that Targeting satisfaction level is at the Very High level ($\bar{x}$ = 4.31, S.D. = 0.96). Use of supporting technology Satisfaction level is at the Very High level ($\bar{x}$ = 4.21, S.D. = 0.93). Various learning processes Satisfaction level is at the Very High level ($\bar{x}$ = 4.23, S.D. = 0.95), and Development

of the learning process satisfaction level is at the Very High level ($\bar{x}$ = 4.13, S.D. = 0.91).

Table 4.11 Satisfaction in Targeting

Targeting	Mean	S.D.	Level of Perception
1. Learning goals are set every time there is teaching.	4.43	0.50	Very High
2. There are clear learning guidelines.	4.67	0.48	Very High
3. Providing opportunities for students to determine learning methods together.	4.47	0.51	Very High
4. Clarification of teaching guidelines and score details	4.40	0.50	Very High
Total	4.49	0.13	Very High

Table 4.14 Targeting is at the Very High level. ($\bar{x}$ = 4.49, S.D. = 0.13). There are clear learning guidelines. satisfaction level is at the Very High level ($\bar{x}$ = 4.67, S.D. =0.48). Providing opportunities for students to determine learning methods together. satisfaction level is at the Very High level ($\bar{x}$ = 4.47, S.D. = 0.51). Learning goals are set every time there is teaching. satisfaction level is at the Very High level. ($\bar{x}$ = 4.43, S.D. = 0.50). and Clarification of teaching guidelines and score details satisfaction level is at the Very High level ($\bar{x}$ = 4.40, S.D. = 0.96).

Table 4.12 Satisfaction in Various Learning Processes

Various learning processes	Mean	S.D.	Level of Perception
1. Providing self-study	4.47	0.51	Very High
2. Presentation of research results both in groups and alone	4.53	0.51	Very High
3. Using case studies in the learning process	4.40	0.50	Very High
4. Designing your own learning process	4.30	0.47	Very High

Table 4.12 Satisfaction in Various Learning Processes (Cont.)

5. Using questions, such as asking questions or answering during learning	4.33	0.48	Very High
Total	4.41	0.48	Very High

Table 4.12 1 displayed various learning processes is at the Very High level ($\bar{x}$ = 4.41, S.D. = 0.48). Presentation of research results both in groups and alone, satisfaction level is at the Very High level ($\bar{x}$ = 4.53, S.D. = 0.51). Providing self-study satisfaction level is at the Very High level ($\bar{x}$ = 4.47, S.D. = 0.51). Using case studies in the learning process, satisfaction level is at the Very High level ($\bar{x}$ = 4.40, S.D. =0.50). Using questions, such as asking questions or answering during learning, satisfaction level is at the Very High level ($\bar{x}$ = 4.33, S.D. = 0.48) and Designing your own learning process, satisfaction level is at the Very High level ($\bar{x}$ = 4.30, S.D. = 0.47).

Table 4.13 Satisfaction in Use of Supporting Technology

Use of Supporting Technology	Mean	S.D.	Level of Perception
1. Using video media to help teach Makes students understand the content more	4.60	0.50	Very High
2. Using teaching aids such as Quizizz	4.40	0.50	Very High
3. Using technology to help in teaching, such as behavioral tests	4.27	0.45	Very High
4. Selecting teaching media suitable for online learning	4.30	0.47	Very High
Total	4.39	0.59	Very High

Table 4.13 shows that the use of supporting technology is at the Very High level ($\bar{x}$ = 4.39, S.D. = 0.59). Using video media to help teach Makes students understand the content more, satisfaction level is at the Very High level ($\bar{x}$ = 4.60, S.D. = 0.50). Using teaching aids such as Quizizz, satisfaction level is at the Very High level ($\bar{x}$ = 4.40, S.D. =0.50). Selecting teaching media suitable for online learning,

satisfaction level is at the Very High level ($\bar{x}$ = 4.30, S.D. = 0.95) and Using technology to help in teaching, such as behavioral tests satisfaction level is at the Very High level ($\bar{x}$ = 4.27, S.D. = 0.45).

Table 4.14 Satisfaction in Development of the Learning Process

Development of the learning process	Mean	S.D.	Level of Perception
1. Assessment of learning outcomes before class, during class, and after class.	4.15	0.93	High
2. Teacher reflection on learning outcomes	4.21	0.99	Very High
3. Allowing students to solve problems during learning	4.20	0.99	Very High
4. Using different ideas to solve problems or analyze case studies	4.08	0.96	High
Total	4.16	0.97	High

Table 4.14 shows that Development of the learning process is at the High level ($\bar{x}$ = 4.16, S.D. = 0.97). Teacher reflection on learning outcomes, satisfaction level is at the Very High level ($\bar{x}$ = 4.21, S.D. =0.99). Allowing students to solve problems during learning, satisfaction level is at the Very High level ($\bar{x}$ = 4.20, S.D. = 0.99). Assessment of learning outcomes before class, during class, and after class. satisfaction level is at the High level ($\bar{x}$ = 4.15, S.D. = 0.93), and Using different ideas to solve problems or analyze case studies, satisfaction level is at the High level ($\bar{x}$ = 4.08, S.D. = 0.96).

CHAPTER 5

CONCLUSION, DISCUSSION, AND RECOMMENDATIONS

This chapter outlined the purpose of the conclusion, highlighted the significance of the research outcomes, and provided discussion and recommendations that followed. The details of findings, analysis, and practical suggestions are presented in this chapter.

5.1 CONCLUSION

5.1.1 Results of the Development of Self-discovery Learning Teaching Model for Online Teaching in The Basic Education Curriculum

Development of the Teaching Model

The development of the self-discovery learning model in this study is rooted in constructivist theory, which promotes active learning through exploration, collaboration, and real-world application. This model is specifically designed for online teaching, integrating both pedagogical principles and modern digital tools to create a flexible, interactive learning environment.

The instructional framework includes eight lessons focused on key educational concepts such as Cognitive Constructivism and Behaviorist Learning Theories, as well as Cultural Foundations and Philosophical Education. Each lesson utilizes a combination of teaching strategies, such as group discussions, case study analysis, and knowledge construction through digital media.

1) Learning through creation: Students were actively engaged in the learning process by constructing knowledge through creative tasks, such as presentations

2) and case studies. This method emphasized Self-Discovery learning, allowing students to develop critical thinking and deepen their understanding by creating their own interpretations of the content.

3) Working with tangible elements: Incorporating tangible elements, like real-world case studies and historical analysis, helped students connect abstract theories to concrete examples. This hands-on approach facilitated better comprehension of complex concepts by enabling students to interact directly with educational materials.

4) Creative learning and collaboration: The learning model fostered a collaborative environment where students worked in groups to solve problems, debate theories, and engage in peer-to-peer learning. This collaboration not only promoted creativity but also facilitated the exchange of diverse perspectives, enriching the overall learning experience.

5) The importance of working with tangible elements: Tangible learning activities were highlighted as essential for student engagement and understanding. By utilizing case studies, psychological tests, and practical assignments, students were able to see the direct application of theories to real-life scenarios, thus reinforcing their learning.

6) Knowledge construction connected to context: The instructional design ensured that knowledge was connected to students' existing contexts and experiences. Lessons were linked to relevant cultural and historical foundations, enabling students to build upon their prior knowledge and apply learning in contextually meaningful ways, which supported deeper learning outcomes.

The digital platforms employed play a significant role in this teaching model. DingTalk allows for video-based classes, real-time communication, and document sharing, while WeChat is used for collaboration, assignment submission, and student discussions. The use of these tools reflects an adaptation to the specific technological

context in China, where other tools like Zoom or Google Classroom may face restrictions. Through this integration of technology, the self-discovery model aims to create an inclusive and effective virtual learning space, allowing students to explore content, collaborate, and reflect on their learning.

In summary, this section describes the careful construction of an instructional model that is Learner-Centered and leverages digital tools to promote Self-Discovery Learning. The model fosters an environment where students can experiment with ideas, solve problems, and apply knowledge in a collaborative, technologically-enhanced setting.

5.1.2 Comparison of Academic Achievement Results between the Pre-test and Post-test of the Self-Discovery Learning Teaching Model for Online Teaching in the Basic Education Curriculum

The effectiveness of the self-discovery learning model was quantitatively measured by comparing pre-test and post-test results across various lessons. These tests assessed students' understanding of key concepts before and after engaging with the instructional model. The analysis showed significant improvements in students' academic performance, confirming the effectiveness of the teaching model in fostering deeper learning.

For example, in Lesson 2, which focused on Eternal Truths, the average pre-test score was 14.53, while the post-test score rose to 24.37, resulting in a mean increase of 9.83 points. This substantial improvement suggests that the interactive and exploratory nature of the self-discovery learning model allowed students to grasp complex philosophical concepts more effectively.

Similarly, in Lesson 7, which dealt with Cultural Foundations, the pre-test score averaged 15.56, while the post-test score reached 24.70, reflecting a mean increase of 9.13 points. Statistical tests, such as the dependent samples t-test, were conducted to assess the significance of these improvements, with results confirming

that the differences between pre- and post-test scores were statistically significant at the 0.05 level. This indicates that the gains in knowledge were not due to chance but rather a direct result of the instructional interventions applied through the self-discovery model.

The lessons in this study, including Lesson 3 (Ancient and Medieval Education) and Lesson 5 (Learning Theories), followed a similar pattern of improvement, with average post-test scores significantly higher than pre-test scores. The consistent increases in performance across multiple lessons suggest that the self-discovery learning model is highly effective in promoting critical thinking, knowledge retention, and conceptual understanding.

This section highlights the measurable impact of the teaching model on student achievement, providing strong evidence that the interactive, student-centered approach improves learning outcomes compared to traditional methods.

5.1.3 Results of the Evaluation of Student Satisfaction with the Self-discovery Learning Teaching Model for Online Teaching in the Basic Education Curriculum

In addition to the academic performance improvements, the study also assessed student satisfaction with the self-discovery learning model. Feedback was collected through a comprehensive survey, evaluating multiple aspects of the learning experience, including the use of technology, learning processes, and instructional design.

Overall, student satisfaction was rated as "Very High" across most categories, with an average score of 4.23 out of 5. This suggests that students found the model not only effective in terms of learning outcomes but also engaging and supportive of their educational needs. The following aspects received particularly high satisfaction ratings:

1) Use of supporting technology: Students rated the integration of tools like DingTalk and WeChat highly, with an average score of 4.39. They appreciated the use of video media and interactive quizzes, which helped clarify complex concepts and made learning more accessible. For example, the use of quizzes like Quizizz was particularly popular, as it provided an interactive way to test knowledge and get immediate feedback.

2) Various learning processes: The model's emphasis on self-study, group collaboration, and case-based learning also received high praise. Students particularly valued the opportunities for individual and group presentations (mean score of 4.53) and the flexibility to design their own learning processes (mean score of 4.30). This feedback underscores the importance of giving students autonomy in their learning, which aligns with the constructivist principles underlying the self-discovery model.

3) Targeted learning objectives: Students felt that the learning objectives were clear and well-aligned with each lesson, rating this category at 4.49. They appreciated that the model provided clear guidelines for learning and assessment, allowing them to track their progress effectively.

4) Development of the learning process: Students rated the development of the learning process highly, with an average score of 4.04. They appreciated the structured assessment of learning outcomes before, during, and after lessons (mean score 4.15). The model's emphasis on problem-solving and case study analysis received high satisfaction (mean score 4.20), fostering critical thinking and collaboration. However, teacher reflection on learning outcomes was rated lower (mean score 3.73), indicating a need for more detailed feedback from instructors.

While overall satisfaction was very high, some areas for improvement were identified. For instance, students rated the reflection on learning outcomes lower, with an average score of 3.73, indicating a desire for more comprehensive feedback from instructors on their performance. Similarly, while the process of assessing learning

outcomes before, during, and after class was rated highly (4.15), this suggests that ongoing assessment and feedback loops could be further refined to enhance the learning experience.

This section illustrates that, beyond academic achievement, the self-discovery learning model also effectively engages students and meets their expectations for a modern, interactive, and flexible learning environment. The high levels of satisfaction reported provide strong support for the continued use and further development of this model in online education.

In conclusion, this study provides robust evidence that the self-discovery learning model is effective in both improving student academic performance and enhancing student satisfaction. By integrating constructivist principles with modern digital tools, the model creates a flexible and engaging learning environment that fosters both individual exploration and collaborative problem-solving. The significant gains in post-test scores across multiple lessons demonstrate the model's potential to improve learning outcomes in online education. Additionally, the high levels of student satisfaction suggest that the model not only meets educational goals but also aligns well with students' expectations for modern, technology-enhanced learning. The findings support the broader application of the self-discovery learning model in various educational contexts, particularly in online settings where student engagement and interaction are critical for success.

5.2 DISCUSSION

5.2.1 Results of the Development of Self-discovery Learning Teaching Model for Online Teaching in the Basic Education Curriculum

The self-discovery learning model presented in this study is fundamentally rooted in constructivist theory, which posits that learners actively construct knowledge by interacting with their environment and making sense of new information based on their prior experiences (Piaget, 1952). This theoretical foundation is critical for

understanding the model's efficacy, as it promotes an active learning environment where students are engaged in discovery, experimentation, and problem-solving, rather than passive reception of information. Vygotsky's (1978) social constructivism further supports the collaborative nature of the learning model. His theory emphasizes the importance of social interaction in cognitive development, suggesting that learning occurs most effectively through meaningful exchanges with others. In the self-discovery model, collaboration is fostered through group discussions and peer-to-peer learning, which not only promote deeper understanding but also align with Vygotsky's concept of the Zone of Proximal Development (ZPD). The ZPD indicates that learners can achieve higher levels of understanding with guidance from peers or instructors, which is evident in the study's use of group activities and collaborative tasks.

Dewey's experiential learning theory also resonates with this model, particularly in the emphasis on real-world application and tangible learning experiences. Dewey (1938) argued that education should be grounded in real-life experiences and practical engagement. The self-discovery learning model effectively incorporates this by integrating real-world case studies, psychological tests, and practical assignments. This approach helps bridge the gap between theoretical knowledge and its application, making abstract concepts more accessible and meaningful for students (Hashmi et al., 2021). The integration of digital platforms such as DingTalk and WeChat for video-based classes, document sharing, and communication further supports the model's alignment with modern educational frameworks. The use of these platforms facilitates real-time interaction and collaboration, essential components for fostering active learning in an online environment. This mirrors findings from contemporary research on the role of technology in enhancing engagement and accessibility in online education (Byukusenge et al., 2022; Xue, 2022).

The Role of Constructivism and Self-Discovery Learning in Online Environments The success of the self-discovery learning model also ties closely with Self-Discovery learning (SDL) theories. SDL emphasizes learners' autonomy and responsibility in guiding their own learning process, which is a core aspect of the self-

discovery model. As pointed out by Knowles (1975), Self-Discovery learners are motivated to take initiative in identifying their learning needs, setting goals, and evaluating their progress. The model's structure, which allows students to engage in creative tasks such as presentations and self-guided projects, reflects these principles. Ryan and Deci's (2000) self-determination theory (SDT) further enhances this understanding by highlighting the importance of autonomy, competence, and relatedness in promoting intrinsic motivation. The self-discovery learning model facilitates autonomy by allowing students to choose how they interact with the material, and it fosters competence through structured tasks that challenge students to apply their knowledge. Moreover, the collaborative elements of the model help build a sense of relatedness, enhancing both engagement and satisfaction.

Research on Self-Regulated Learning (SRL), which closely aligns with SDL, supports the finding that learners perform better when they are able to regulate their own learning process through goal setting, self-monitoring, and reflection (Azevedo et al., 2022). The inclusion of reflection and feedback loops in the model, although noted as an area for improvement, is crucial for helping students internalize what they have learned and apply it to future tasks.

5.2.2 Comparison of Academic Achievement Results between the Pre-test and Post-test of the Self-discovery Learning Teaching Model for Online Teaching in the Basic Education Curriculum

The improvement in students' academic performance, as evidenced by the pre-test and post-test scores, is consistent with the theory of cognitive development in constructivism. Constructivist approaches emphasize learning as an active process where students must be engaged in problem-solving and knowledge construction, which leads to better retention and understanding (Chernikova et al., 2020). The significant increase in scores, such as the 9.83-point rise in the post-test for Lesson 2 (Eternal Truths), demonstrates the model's effectiveness in promoting deeper comprehension of complex philosophical concepts. This finding aligns with research by Mayer (2002), who found that active engagement with learning materials, as

opposed to passive listening or reading, significantly enhances cognitive processing and long-term retention. The statistically significant improvement across multiple lessons, confirmed through dependent samples t-tests, suggests that the self-discovery learning model is highly effective in promoting critical thinking, conceptual understanding, and knowledge retention. These outcomes mirror findings from studies on the efficacy of discovery-based and inquiry-based learning, which have been shown to foster deep learning and improve problem-solving skills (Byukusenge et al., 2022).

Alignment with Technology-Enhanced Learning (TEL) Research. The digital tools employed in the study—DingTalk and WeChat—reflect the growing trend of utilizing Technology-Enhanced Learning (TEL) to create interactive and accessible learning environments. According to Lázaro and Duart (2023), technologies such as these can overcome the limitations of traditional classrooms by facilitating collaboration, real-time feedback, and flexible learning paths. The positive student feedback on the use of these technologies, particularly the interactive quizzes and video-based learning, underscores the importance of technological integration in modern education. Moreover, the blended learning approach that combines digital platforms with Self-Discovery learning strategies aligns with research by Reeves and Crippen (2020), who found that virtual laboratories and interactive environments can enhance student engagement and provide hands-on experiences that are otherwise difficult to achieve in traditional settings. This study's results further support the notion that well-implemented TEL strategies can lead to significant gains in both student performance and satisfaction.

5.2.3 Results of the Evaluation of Student Satisfaction with the Self-discovery Learning Teaching Model for Online Teaching in the Basic Education Curriculum

The high levels of student satisfaction reported in the study are particularly noteworthy, as they suggest that the self-discovery learning model not only promotes

academic success but also creates a positive and engaging learning environment. The mean satisfaction score of 4.23 out of 5 indicates that students appreciated the flexibility and autonomy afforded by the model, which allowed them to tailor their learning to their individual needs and preferences. This finding aligns with research on learner autonomy and motivation, which shows that students are more engaged and perform better when they are given control over their learning processes (Anca, 2023). The high ratings for the use of technology, such as Ding Talk and WeChat, further suggest that students found the digital tools to be effective in supporting their learning. Wallace et al. (2020) noted that digital tools that facilitate real-time feedback and peer collaboration can significantly enhance student satisfaction and engagement, particularly in online and blended learning environments.

However, the relatively lower score for instructor feedback (3.73 out of 5) highlights an area for improvement. Providing more comprehensive and timely feedback could further enhance the learning experience by helping students reflect on their performance and understand how to improve. This aligns with findings from Porter et al. (2020), who emphasized the importance of feedback in promoting self-regulation and continuous improvement in learning outcomes. Implications for Future Research and Practice. The findings of this study have important implications for both research and practice. First, they suggest that the self-discovery learning model, with its foundation in constructivist theory and integration of technology, is highly effective in improving student outcomes in online education. This supports calls for the broader application of constructivist and inquiry-based models in online and blended learning environments (Xue, 2022).

Future research should explore ways to enhance the feedback mechanisms within the model to provide more detailed and constructive guidance for students. Additionally, further studies could investigate the scalability of the model across different educational contexts and subjects, particularly in light of the growing demand for flexible, student-centered learning approaches in the digital age.

5.3 RECOMMENDATIONS

5.3.1 General Recommendations

1) Enhance Feedback Mechanisms: Although the self-discovery learning model demonstrated high effectiveness in fostering student engagement and knowledge retention, students expressed the need for more comprehensive and detailed feedback. It is recommended that future implementations of this model emphasize structured and timely feedback, especially on students' reflective activities and performance. Instructors should consider integrating more frequent formative assessments that provide actionable insights, supporting students in their Self-Discovery learning processes. This would not only enhance learning outcomes but also boost student confidence and motivation (Ryan & Deci, 2000).

2) Increase Instructor Reflection: Student responses indicated a lower satisfaction score for instructor reflection on learning outcomes, highlighting a gap in the feedback loop. Instructors are encouraged to increase their involvement in reflecting on and addressing student learning challenges. Providing more detailed reflections on students' progress can support more targeted learning interventions and reinforce key concepts. This aligns with the principles of social constructivism, where instructor guidance plays a crucial role in bridging gaps between a learner's current capabilities and desired learning goals (Vygotsky, 1978).

3) Leverage Technology for Enhanced Collaboration: Given the positive feedback on the use of digital platforms such as DingTalk and WeChat, it is recommended to further expand their use for collaborative learning. Instructors should explore more advanced features, such as live polls, real-time collaborative tools, and asynchronous discussions, to foster even deeper engagement. Research shows that the integration of advanced technology enhances learner interaction and supports critical thinking in online learning environments (Lázaro & Duart, 2023).

4) Strengthen Assessment and Feedback Cycles: The structured assessment of learning outcomes was highly appreciated by students. It is recommended that continuous and iterative assessment cycles be strengthened to ensure that students receive feedback before, during, and after each instructional phase. This would provide them with a more comprehensive understanding of their progress, aligning with self-regulated learning (SRL) theories, which emphasize the importance of ongoing assessment to support student autonomy and self-monitoring (Azevedo et al., 2022).

5.3.2 Recommendations on Academic, Policy, and Practical Aspects

The followings are the recommendations focusing on Academic, Policy, and Practical aspects for enhancing the Self-Discovery Learning Model for Online Teaching:

Academic Recommendations

1) Incorporate Constructivist Pedagogy into Curriculum Design: Given the success of the self-discovery learning model in this study, academic institutions should consider integrating constructivist approaches, such as Self-Discovery learning, collaborative learning, and real-world application, into their curriculum. These methods have been shown to promote critical thinking and deeper conceptual understanding, aligning with contemporary educational theories such as those proposed by Vygotsky (1978) and Piaget (1952). Curriculum developers should focus on creating student-centered learning environments that encourage active participation and exploration.

2) Promote the Use of Digital Tools in Online Learning: The use of digital platforms like DingTalk and WeChat was instrumental in facilitating interaction and collaboration among students. Academic institutions should promote the use of appropriate technology to enhance engagement and learning outcomes, especially in online and blended learning environments. The alignment of technology with learning objectives can facilitate better communication, real-time feedback, and

student collaboration, as supported by research on Technology-Enhanced Learning (TEL) (Reeves & Crippen, 2020).

3) Encourage Continuous Professional Development for Instructors: Instructors play a pivotal role in the success of self-discovery learning models. Continuous professional development should be provided to equip educators with the skills needed to effectively facilitate Self-Discovery and constructivist learning environments. Training programs should focus on digital pedagogies, formative assessment techniques, and feedback strategies, enabling instructors to support student autonomy and collaboration (Hashmi et al., 2021).

Policy Recommendations

1) Develop National and Institutional Policies for Technology Integration in Education: Policymakers should advocate for national and institutional frameworks that support the integration of digital tools in educational settings. This involves ensuring that digital infrastructure, such as reliable internet access and appropriate learning management systems, are available and accessible to both students and instructors. Policies should promote the use of technology to enhance teaching and learning experiences, particularly in online education where digital tools play a critical role (Xue, 2022).

2) Support Policies on Self-Discovery and Lifelong Learning: Educational policies should emphasize the importance of developing students' Self-Discovery learning skills, which are crucial for lifelong learning. As technology and the workforce evolve, students need to be equipped with the ability to learn independently and adapt to new knowledge. Policies should support the inclusion of self-regulation, goal-setting, and reflective practices in national curricula, fostering skills that students will carry beyond formal education (Ryan & Deci, 2000).

3) Standardize Assessment and Feedback Protocols in Online Learning: Policy frameworks should establish clear guidelines for assessment and feedback in online learning environments. Given the lower student satisfaction scores regarding

instructor feedback, policies should ensure that institutions provide comprehensive and timely feedback to support student learning. This will involve setting standards for formative assessment and feedback loops to improve learning outcomes and maintain student engagement (Wallace et al., 2020).

Practical Recommendations

1) Enhance Feedback Mechanisms in Online Courses: Instructors should prioritize providing more detailed and constructive feedback, particularly in online learning environments where students may feel isolated. Implementing more frequent formative assessments, peer feedback opportunities, and reflective activities can foster a deeper understanding of the material and help students improve their learning strategies. Practical tools such as real-time quizzes, video feedback, and discussion forums can be employed to create an interactive and supportive online learning environment (Lázaro & Duart, 2023).

2) Optimize Collaborative Learning Opportunities: The study found that collaborative learning activities, such as group discussions and case study analysis, were highly effective in promoting student engagement and creativity. Institutions should design courses that include structured opportunities for students to collaborate on projects, discuss theoretical concepts, and solve problems together. Collaborative tools, including virtual whiteboards, breakout rooms, and shared documents, should be integrated into online learning platforms to facilitate teamwork and peer-to-peer learning (Reeves & Crippen, 2020).

3) Expand Access to Digital Learning Resources: To maximize the potential of self-discovery learning models, institutions should ensure that all students have access to the necessary digital resources, such as laptops, software, and internet connectivity. Additionally, institutions should invest in user-friendly platforms that support student autonomy and allow for interactive learning experiences. The widespread adoption of digital platforms can enable students to access learning materials anytime, anywhere, which is particularly important in online education (Byukusenge et al., 2022).

4) Design Flexible and Adaptive Learning Paths: The study emphasized the importance of aligning learning objectives with students' existing knowledge and experiences. Institutions should design flexible learning paths that allow students to progress at their own pace, offering adaptive assessments that respond to individual learning needs. Utilizing learning analytics and personalized feedback mechanisms can help tailor the learning experience to the needs of each student, fostering better outcomes (Azevedo et al., 2022).

5.3.3 Recommendations for Future Research

1) Investigating Long-Term Effects of Self-Discovery Learning: Future research should focus on assessing the long-term impacts of the self-discovery learning model on student learning outcomes. While this study demonstrated immediate improvements in academic performance, longitudinal studies could provide insight into how this model influences knowledge retention and the development of critical thinking skills over time. Exploring long-term outcomes can determine if the benefits of Self-Discovery, constructivist learning persist beyond the duration of the course.

2) Comparative Studies with Other Instructional Models: To further validate the efficacy of the self-discovery learning model, future research should include comparative studies with traditional or other innovative learning models, such as flipped classrooms or inquiry-based learning. Such comparisons could offer valuable insights into the specific advantages and limitations of each model, allowing for a more nuanced understanding of their impact on student engagement and achievement (Xue, 2022).

3) Exploring Scalability and Adaptation in Different Educational Contexts: While the study was designed for online education in a specific technological and cultural context, future research should explore the scalability of the self-discovery learning model across different educational settings. Investigating its

applicability in hybrid, face-to-face, and various regional contexts will help determine its flexibility and adaptability. This would also shed light on any potential cultural or technological barriers that could affect its implementation in diverse educational systems (Reeves & Crippen, 2020).

4) Enhancing Instructor Professional Development for Online Facilitation: Future studies should explore how professional development for instructors can enhance the effectiveness of the self-discovery learning model. Given that effective facilitation is crucial for guiding student exploration and collaboration, research should focus on how to best train instructors to provide meaningful feedback, design collaborative activities, and foster student autonomy in an online learning environment. Instructor training in digital pedagogical tools and techniques will be essential in maximizing the potential of this model (Hashmi et al., 2021).

5) Assessing the Role of Peer Learning and Feedback in Self-Discovery Models: Further research is recommended to assess the role of peer learning and feedback in self-discovery learning environments. Investigating the impact of structured peer-to-peer interactions on learning outcomes can provide deeper insights into how students benefit from collaboration and how peer feedback mechanisms can be optimized to support knowledge construction and reflection (Wallace et al., 2020).

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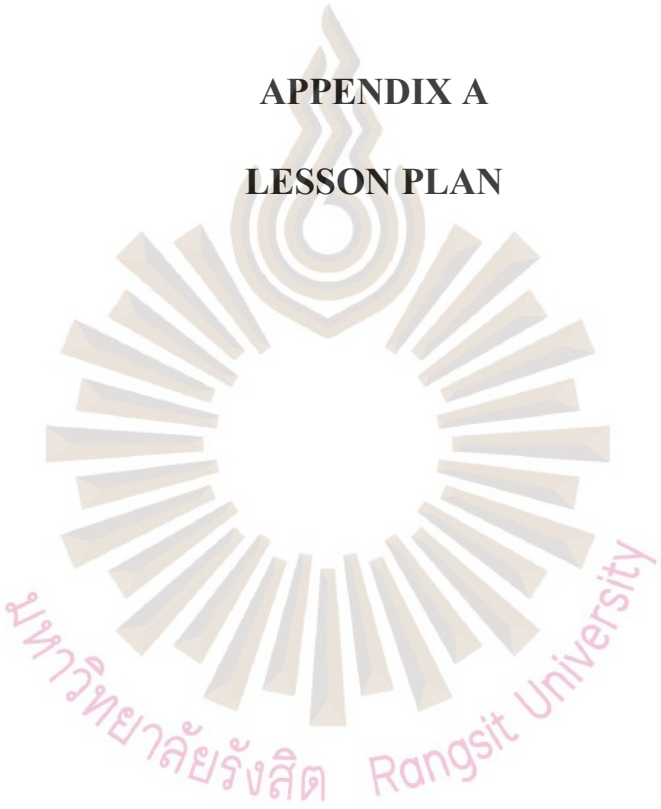
APPENDICES

APPENDIX A

LESSON PLAN



Teaching and Learning Activities as Examples of Self-discovery Learning

Lesson 1: Definition and Objectives of Education

1. Setting learning goals for each time
2. Making an agreement together to study
3. Teaching style
4. Researching “philosophy concerned with the way in which people come to know things.”

Lesson 2: Emphasize eternal truths.

1. Applying the results of research on “philosophy concerned with the way in which people come to know things.” Criticizing and analyzing textbooks.
2. Analyze the case study and problem-solving Using Abraham Maslow's theory.
3. Homework: Study about “Ancient and medieval education” and present it next time.

Lesson 3: Ancient and medieval education

1. Group presentation.
2. Students summarize the presentation information from all groups. and end of class.
3. Homework: Study about “Sociological Foundations” in the following topics.
   - 3.1 Important studies in contemporary society.
   - 3.2 Differences in society.
   - 3.2 Piaget's idea of an ever-expanding and dynamic knowledge base.
   - 3.3 Vygotsky's notion of learning as an exercise in social interaction.

Lesson 4: Sociological Foundations

1. Using questions to ask students about the following topics.

1.1 Important studies in contemporary society.

1.2 Differences in society.

1.2 Piaget's idea of an ever-expanding and dynamic knowledge base.

1.3 Vygotsky's notion of learning as an exercise in social interaction.

2. Analyze the case study and problem solving Using the theory of Piaget's idea and Vygotsky's. and submitting a synthesis after the lesson.

Lesson 5: Features Cognitive, Constructivism, and Behaviorism Learning Theories.

1. Have students test “16 types of personality test” according to MBIT theory.

2. Students design teaching and classroom arrangements using Features Cognitive, Constructivism, and Behaviorism learning theories.

3. Random presentation to students and to deliver the results of teaching and learning management design after the teaching is finished.

4. Assign students to study “Education Policy and Governance” and ask questions for next study.

Lesson 6: Education Policy and Governance

1. Have students ask the questions they have prepared. and randomly ask classmates.

2. Providing case studies and summarize and compare various educational systems. and future challenges and sent after teaching ends.

3. Summarize the “Cultural Foundations” information and submit it before the next class.

Lesson 7: Cultural Foundations

1. Random learners to present on the topic “Cultural Foundations” according to their written report.

2. The teacher opens the learning video. “Historical events to the modern education system” and ask questions for students to answer throughout learning.

3. Teacher reflects on learning.
4. Assign students to search for online learning tools.

Lesson 8: The Role of Digital Tools and Online Learning in Education

1. Exchange of knowledge on online learning tools.
2. Experimenting with various online tools.

APPENDIX B

COURSE DESCRIPTION

Course Description: Foundations of Education (Graduate Level)

Course Title: Foundations of Education

Course Code: EDU 5001

Credits: 3

Course Description:

The Foundations of Education course for master's degree students provides a comprehensive and critical examination of the historical, philosophical, sociological, and psychological foundations that have influenced education systems globally. This advanced course is designed to deepen students' understanding of the complex factors shaping education, encouraging critical analysis and application of foundational theories to contemporary educational challenges. Students will engage with seminal texts, current research, and case studies to develop a nuanced perspective on the role of education in society and their professional practice.

Course Objectives:

1. To critically analyze the historical evolution of education and its impact on contemporary practices and policies.

2. To explore and evaluate philosophical theories and their application to educational practice and curriculum development.

3. To investigate sociological issues related to education, including equity, diversity, and the role of education in social change.

4. To understand and apply psychological theories of learning and development in educational contexts.

5. To assess the implications of current educational policies and reforms at local, national, and global levels.

6. To develop a reflective and well-articulated professional philosophy of education informed by foundational theories and current research.

Key Topics:

1. Definition and Objectives of Education
2. Emphasize eternal truths.

3. Ancient and medieval education

4. Sociological Foundations

5. Features Cognitive, Constructivism, and Behaviorism learning theories.

6. Education Policy and Governance

7. Cultural Foundations

8. The Role of Digital Tools and Online Learning in Education

Learning Activities:

1. Course Design.

1.1 Course Structure: Determine the topics and sequence of the lessons.

Week	**Learning course content**	**Class time**
Week 1	Lesson 1: Definition and Objectives of Education	3 hr
Week 2	Lesson 2: Emphasize eternal truths.	3 hr
Week 3	Lesson 3: Ancient and medieval education	3 hr
Week 4	Lesson 4: Sociological Foundations	3 hr
Week 5	Lesson 5: Features Cognitive, Constructivism, and Behaviorism learning theories.	3 hr
Week 6	Lesson 6: Education Policy and Governance	3 hr
Week 7	Lesson 7: Cultural Foundations	3 hr
Week 8	Lesson 8: The Role of Digital Tools and Online Learning in Education	3 hr

1.2 Content Organization: Prepare the content in a suitable order of importance.

1.3 Instructional Methods: The researcher organized learning for the sample students through a self-discovery learning curriculum. The researcher collected most of the student learning data and recorded it. The learning will be carried out through the DingTalk program according to the designed teaching curriculum.

Learning	Learning details	learning activities	Learning
Lesson 1: Definition and Objectives of Education	Study and consideration of study 1. learning in it 2. Details of learning activities 3. Learning Rating	1. Creating a joint agreement 2. Assignment to study the foundations of philosophy.	Lesson 1: Definition and Objectives of Education
Lesson 2: Emphasize eternal truths.	Philosophical foundations: 1. Analysis of important educational philosophies (e.g. realism, idealism, pragmatism existentialism) 2 Ethical considerations in education 3. Philosophical discussion about the aims of education	1. Critical reading and analysis of primary texts and current research. 2. Case study analysis and problem solving 3. Summary of philosophical foundations 4. Assignment Summary of ancient and medieval studies and present it next time.	Lesson 2: Emphasize eternal truths.
Lesson 3: Ancient and medieval education	Ancient and Medieval Studies 1.Roman Church 2. Studying the Greeks 3. The Renaissance 4.Analysis of the western region in the Middle Ages	1. Group presentation 2. Assignment to summarize the presentation information of every group individually. 3. Using questions for students I have thought and analyzed. The instructor will	Lesson 3: Ancient and medieval education

Learning	Learning details	learning activities	Learning
		provide guidance throughout the learning process. 4. Assignment By giving a summary based on the given topics regarding the foundations of sociology.	
Lesson 4: Sociological Foundations	Sociological foundations: 1. Education and social stratification 2. The role of education in promoting social justice 3. Cultural and social influences on education	1. Using questions by randomly selecting students to answer. 2. Providing case studies and provide case study analysis and problem solving. The instructor will provide guidance throughout the learning process. 3. Summary of the foundational content of sociology. 4. Assignment Using questions about the foundations of sociology.	Lesson 4: Sociological Foundations
Lesson 5: Features Cognitive,	Psychological foundations: 1. Advanced theories	1. Allowing students to use questions. Randomly ask	Lesson 5: Features Cognitive,

Learning	Learning details	learning activities	Learning
Constructivism, and Behaviorism learning theories.	of cognitive and affective development (e.g. constructivism, behaviorism, humanism) 2. Implications of learning theory for instructional design and classroom management. 3. Psychological assessment and its role in education	classmates 2. Allowing students to try out psychological tests using a testing program. 3. Allowing students to design teaching and group classroom arrangements from using the information received. The instructor will provide guidance throughout the learning process. 4. Assigning students to study educational policy and supervision. By selecting case studies Group work	Constructivism, and Behaviorism learning theories.
Lesson 6: Education Policy and Governance	5. Educational policies and practices: 5.1 Analysis of contemporary education policies and their effects 5.2 Comparative studies: Examination of different educational systems. 5.3 Global trends and	1. Learners present educational policy and governance from selected case studies. 2. Assigned to summarize and compare different educational systems. and future challenges. The instructor will	Lesson 6: Education Policy and Governance

Learning	Learning details	learning activities	Learning
	challenges in education	provide guidance throughout the learning process. 3. Assignment is given to the students to summarize historical foundation information.	
Lesson 7: Cultural Foundations	Historical foundation: 1. Major milestones in educational history 2. Influence of historical events on the modern educational system 3. Contributions of important educational theorists and reformers	1. Using questions to allow students to answer the information they have researched. 2. Using media from historical events to the modern education system for students to learn. 3. Teacher reflects on learning.	Lesson 7: Cultural Foundations
Lesson 8: The Role of Digital Tools and Online Learning in Education	The role of digital tools and online learning in education 1.Digital tools for online learning 2. Learning through online systems	1. Allowing students to search for online learning tools. 2. Giving students Tried online learning	Lesson 8: The Role of Digital Tools and Online Learning in Education

Assessment Methods:

The results obtained will be used to organize the data and test learning achievement using a control system that stores standard data and bring the results to

the value of pre-testing, post-testing, research, results 80 /80 and pre-study results and after studying using t-test. The sample types are not independent. (Based on t test)

Prerequisites: None

Recommended for: Graduate students in education, current educators seeking advanced knowledge, and professionals aiming to deepen their understanding of the foundational aspects of education.

By the end of this course, students will possess an advanced and critical understanding of the foundational theories and issues in education, enabling them to apply this knowledge to their professional practice and further academic research.

APPENDIX C

PRE-TEST: FOUNDATIONS OF EDUCATION

Pre-test: Foundations of Education

学前考试:教育基础

1. A teacher who follows the law of effect would most likely
   遵循效果法则的老师最有可能

   A : encourage students to work independently.
   鼓励学生独立完成作业。

   B: create activities that take into account multiple intelligences.
   创造考虑到多元智能的活动

   C : reward students with prizes for good behavior
   奖励表现良好的学生

   D: form small groups to facilitate peer-to-peer learning
   组成小组，促进同伴之间的学习

2. Lev Vygotsky's theory of cognitive development includes which of the following concepts?
   维果茨基的认知发展理论包括以下哪个概念?

   A : Egocentric speech
   以自我为中心的演讲

   B: Zone of proximal development
   最近发展区

   C : Naive psychology.
   朴素心理学

   D: All of the answer choices are correct.
   所有的选项都是正确的。

3. The work of Edward Thorndike played an integral role in the development of which field?
   爱德华·桑代克的工作在哪个领域的发展中发挥了不可或缺的作用?

A : Behavioral Psychology
行为心理学
B: Social Psychology
社会心理学
C : Developmental Psychology
发展心理学
D: Cognitive Psychology
认知心理学

4. Billy is very good at solving 3-D puzzles. According to Howard Gardner, he is likely to be high in which of the following intelligences?
比利很擅长解三维拼图。根据霍华德·加德纳的说法，他可能在以下哪一种智力上很高?

A : Spatial
空间
B: None of these answer choices are correct.
这些选项都不对。
C : Both intrapersonal and spatial
包括人际关系和空间关系
D: Intrapersonal
人际关系

5. Two-year old Kimmy is coloring a picture of Elmo. As she colors, she talks to herself about what color she will use next and which part of Elmo she will color. This is an example of:
两岁的 Kimmy 正在给 Elmo 的画上色。当她给自己上色时，她会告诉自己接下来要用什么颜色，以及她要给埃尔莫的哪一部分上色。这是一个例子:

A : Autonomous speech
自主语言

B: Communicative speech

交际语言

C : Preintellectual speech

智力前语言

D: Egocentric speech

以自我为中心的演讲

6. Better teacher training, increased rigor in the curriculum, and tying teacher salaries directly to student performance and achievements are public education outcomes associated with which publication?

更好的教师培训，更严格的课程，将教师工资直接与学生的表现和成就挂钩，这些公共教育成果与哪个出版物有关?

A : A Nation Capable of Change

一个能够变革的国家

B: U.S. Education and the World

美国教育与世界

C : Regaining a Competitive Edge in Mathematics and Science

在数学和科学领域重获竞争优势

D: A Nation at Risk

一个处于危险中的国家

7. Brown v. Board of Education had the greatest impact on which element of U.S. public education?

布朗诉教育委员会案对美国公共教育的哪个方面影响最大?

A : Educational desegregation

废除教育上的种族隔离

B: Common core standards

共同核心标准

C : Special education requirements

特殊教育要求

D: Student self-expression balanced against school uniform standards
学生的自我表达与学校的统一标准相平衡

8. The Tinker Test would be applied by district educational officials concerning matters dealing with which element of school activity?
修补匠测试将由地区教育官员应用，涉及学校活动的哪些要素?

A : School lunch policies for traveling to off-campus dining facilities
前往校外用餐设施的学校午餐政策

B: Uniform policies balanced against student self-expression rights
统一政策与学生自我表达的权利相平衡

C : Senior privilege (upperclassmen leaving campus before the end of the official school day)
高年级特权(高年级学生在正式放学前离校)

D: Elective class availability and student selection of such classes
选修课程的可用性和学生对这些课程的选择

9. Partnerships with parents to educate the whole child, prepare students to start school ready to learn, and provide environments conducive to learning, are all specific goals outlined in which educational act?
与家长合作教育整个孩子，让学生准备好开始上学，并提供有利于学习的环境，这些都是哪些教育行为中概述的具体目标?

A : Educate America Act
美国教育法案

B: The Morrill Act of 1862
1862 年的《莫里尔法案》

C : Brown v. Board of Education of Topeka
布朗诉托皮卡教育委员会案

D: No Child Left Behind (NCLB)
不让一个孩子掉队(NCLB)

10. Title IX (9) primarily addresses which aspect of discrimination in public education?
第九条主要针对公共教育中哪个方面的歧视?

A : Age discrimination
年龄歧视

B: National origin discrimination
国籍歧视

C : Gender discrimination
性别歧视

D: Racial or ethnic discrimination
种族或民族歧视

11. From the standpoint of connectionism, which of the following would present a problem in the stimulus-response connection?
从连接主义的观点来看，刺激-反应联系中存在以下哪个问题?

A : A student who loves to learn but has trouble getting along with other kids
一个喜欢学习但与其他孩子相处有困难的学生

B: A student who is not wealthy or supported by wealthy relatives
不富裕或由有钱的亲戚供养的学生

C : A student who does not arrive at school prepared to learn, such as one who has been up all night
一个没有准备好上学的学生，比如一个整晚没睡的学生

D: A student who does not work well in groups and, therefore, cannot receive stimuli.
一个不能很好地在团队中工作的学生，因此不能接受刺激

12. What does cognitive load refer to?
认知负荷是指什么?

A : Having too much information in working memory and not being able to remember anything

工作记忆中信息太多，什么都记不住

B: The process of making a task automatic so it is easier to learn
使一项任务自动化的过程，这样更容易学习

C : Grouping information into manageable chunks so it's easier to remember
将信息分成可管理的块，这样更容易记住

D: Remembering and recalling information through sustained, regular practice
通过持续、有规律的练习来记忆和回忆信息

13. How do repetition and practice enable learning?
重复和练习是如何促进学习的?

A : They reduce the individual's anxiety response.
它们减少了个体的焦虑反应。

B: They contribute to cognitive construction.
它们有助于认知构建。

C : They are not aspects of information processing theory.
它们不是信息处理理论的范畴。

D: They free up storage in working memory.
它们释放了工作记忆中的存储空间

14. Each time Jamal spent at least an hour studying before a quiz (stimulus), he got an A (response). He soon realizes that he should always make sure to get in an hour's worth of studying prior to taking a quiz. Jamal's learning is an example of educational
每次贾马尔在测验(刺激)前至少花一个小时学习，他都会得到 a(反应)。他很快意识到，他应该确保在参加测验之前花一个小时的时间学习。贾马尔的学习是教育的典范

A : theory.
理论

B: Jeffersonian perennial
杰弗逊多年生杂志

C : connectionist

联结主义者

D: humanistic

人文

15. How might a perennialist structure a study of The lliad and The Odyssey?

一个多年生主义者如何组织对《伊利亚特》和《奥德赛》的研究?

A : By proving how irrelevant these works are to our modern lives

通过证明这些作品与我们的现代生活是多么的不相干

B: A perennialist would not be concerned with the study of classic literature.

一个多年生学者不会关心古典文学的研究。

C : By applying the themes of these works to modern-day issues

通过将这些作品的主题应用于现代问

D: By clearly demonstrating the evolution of language from the time when these works were written

通过清楚地展示这些作品创作时语言的演变

APPENDIX D

SAMPLE OF THE (POST) TEST: FOUNDATIONS OF EDUCATION (FROM ONE OF THE EIGHT CLASSES)

Post-test: Foundations of Education
学后考试:教育基础

16. Lev Vygotsky's theory of cognitive development includes which of the following concepts?
维果茨基的认知发展理论包括以下哪个概念?

A : Egocentric speech
以自我为中心的演讲

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朴素心理学

D: All of the answer choices are correct.
所有的选项都是正确的。

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学生的自我表达与学校的统一标准相平衡

18. The Tinker Test would be applied by district educational officials concerning matters dealing with which element of school activity?
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C : Senior privilege (upperclassmen leaving campus before the end of the official school day)
高年级特权(高年级学生在正式放学前离校)

D: Elective class availability and student selection of such classes
选修课程的可用性和学生对这些课程的选择

19. Two-year old Kimmy is coloring a picture of Elmo. As she colors, she talks to herself about what color she will use next and which part of Elmo she will color. This is an example of:
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自主语言

B: Communicative speech
交际语言

C : Preintellectual speech
智力前语言

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20. Better teacher training, increased rigor in the curriculum, and tying teacher salaries directly to student performance and achievements are public education outcomes associated with which publication?
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在数学和科学领域重获竞争优势

D: A Nation at Risk

一个处于危险中的国家

21. Partnerships with parents to educate the whole child, prepare students to start school ready to learn, and provide environments conducive to learning, are all specific goals outlined in which educational act?

与家长合作教育整个孩子，让学生准备好开始上学，并提供有利于学习的环境，这些都是哪些教育行为中概述的具体目标?

A : Educate America Act

美国教育法案

B: The Morrill Act of 1862

1862 年的《莫里尔法案》

C : Brown v. Board of Education of Topeka

布朗诉托皮卡教育委员会案

D: No Child Left Behind (NCLB)

不让一个孩子掉队(NCLB)

22. Title IX (9) primarily addresses which aspect of discrimination in public education?

第九条主要针对公共教育中哪个方面的歧视?

A : Age discrimination

年龄歧视

B: National origin discrimination

国籍歧视

C : Gender discrimination

性别歧视

D: Racial or ethnic discrimination

种族或民族歧视

23. A teacher who follows the law of effect would most likely

遵循效果法则的老师最有可能

A : encourage students to work independently.

鼓励学生独立完成作业。

B: create activities that take into account multiple intelligences.

创造考虑到多元智能的活动

C : reward students with prizes for good behavior

奖励表现良好的学生

D: form small groups to facilitate peer-to-peer learning

组成小组，促进同伴之间的学习

24. From the standpoint of connectionism, which of the following would present a problem in the stimulus-response connection?

从连接主义的观点来看，刺激-反应联系中存在以下哪个问题?

A : A student who loves to learn but has trouble getting along with other kids

一个喜欢学习但与其他孩子相处有困难的学生

B: A student who is not wealthy or supported by wealthy relatives

不富裕或由有钱的亲戚供养的学生

C : A student who does not arrive at school prepared to learn, such as one who has been up all night

一个没有准备好上学的学生，比如一个整晚没睡的学生

D: A student who does not work well in groups and, therefore, cannot receive stimuli.

一个不能很好地在团队中工作的学生，因此不能接受刺激

25. The work of Edward Thorndike played an integral role in the development of which field?
爱德华·桑代克的工作在哪个领域的发展中发挥了不可或缺的作用?

A : Behavioral Psychology
行为心理学
B: Social Psychology
社会心理学
C : Developmental Psychology
发展心理学
D: Cognitive Psychology
认知心理学

26. Billy is very good at solving 3-D puzzles. According to Howard Gardner, he is likely to be high in which of the following intelligences?
比利很擅长解三维拼图。根据霍华德·加德纳的说法，他可能在以下哪一种智力上很高?

A : Spatial
空间
B: None of these answer choices are correct.
这些选项都不对。
C : Both intrapersonal and spatial
包括人际关系和空间关系
D: Intrapersonal
人际关系

27. What does cognitive load refer to?
认知负荷是指什么?

A : Having too much information in working memory and not being able to remember anything

工作记忆中信息太多，什么都记不住

B: The process of making a task automatic so it is easier to learn
使一项任务自动化的过程，这样更容易学习

C : Grouping information into manageable chunks so it's easier to remember
将信息分成可管理的块，这样更容易记住

D: Remembering and recalling information through sustained, regular practice
通过持续、有规律的练习来记忆和回忆信息

28. How do repetition and practice enable learning?
重复和练习是如何促进学习的?

A : They reduce the individual's anxiety response.
它们减少了个体的焦虑反应。

B: They contribute to cognitive construction.
它们有助于认知构建。

C : They are not aspects of information processing theory.
它们不是信息处理理论的范畴。

D: They free up storage in working memory.
它们释放了工作记忆中的存储空间

29. Each time Jamal spent at least an hour studying before a quiz (stimulus), he got an A (response). He soon realizes that he should always make sure to get in an hour's worth of studying prior to taking a quiz. Jamal's learning is an example of educational
每次贾马尔在测验(刺激)前至少花一个小时学习，他都会得到 a(反应)。他很快意识到，他应该确保在参加测验之前花一个小时的时间学习。贾马尔的学习是教育的典范

A : theory.
理论

B: Jeffersonian perennial
杰弗逊多年生杂志

C : connectionist

联结主义者

D: humanistic

人文

30. How might a perennialist structure a study of The lliad and The Odyssey?

一个多年生主义者如何组织对《伊利亚特》和《奥德赛》的研究?

A : By proving how irrelevant these works are to our modern lives

通过证明这些作品与我们的现代生活是多么的不相干

B: A perennialist would not be concerned with the study of classic literature.

一个多年生学者不会关心古典文学的研究。

C : By applying the themes of these works to modern-day issues

通过将这些作品的主题应用于现代问题

D: By clearly demonstrating the evolution of language from the time when these works were written

通过清楚地展示这些作品创作时语言的演变

APPENDIX E

STUDENTS' SATISFACTION QUESTIONNAIRE

Students' satisfaction questionnaire
学习满意度调查问卷

Instruction: You are requested to answer this questionnaire truthfully. The results of the responses will be kept confidentially and have no effect on learning scores in the subject.

声明:我们要求您如实回答此问卷。回答的结果将保密。对这门课的学习成绩没有影响。

Scores meaning: 5 = highest, 4 = high, 3 = moderate, 2 = low, and 1 = lowest

评分如下:5 =最高，4 =高，3 =中等，2 =低，1 =最低

	Satisfaction list 满意度列表	Degree of satisfaction 满意度				
		5	**4**	**3**	**2**	**1**
Targeting 学习目标						
1	Learning goals are set every time there is teaching. 每次教学时都会设定学习目标。					
2	There are clear learning guidelines. 有清晰的学习指南					
3	Providing opportunities for students to determine learning methods together. 为学生提供共同决定学习方法的机会					
4	Clarification of teaching guidelines and score details 清楚的教学方针和分数细节					
Various learning processes 学习过程						
5	Providing self-study 提供自学机会					
6	Presentation of research results both in groups					

Satisfaction list 满意度列表		Degree of satisfaction 满意度				
		5	4	3	2	1
	and alone 提供小组演讲和个人演讲的展示机会					
7	Using case studies in the learning process 在学习过程中使用案例研究					
8	Designing your own learning process 允许学生设计自己的学习过程					
9	Using questions, such as asking questions or answering during learning 使用问题教学法，例如在学习过程中提问或回答					
Use of supporting technology 学习配套技巧						
10	Using video media to help teach Makes students understand the content more 使用视频媒体帮助教学，使学生更好地理解内容					
11	Using teaching aids such as Quizizz 使用 Quizizz 等教学辅助工具					
12	Using technology to help in teaching, such as behavioral tests 使用各种技巧来帮助教学，比如行为测试					
13	Selecting teaching media suitable for online learning 选择适合在线学习的教学媒体					
Development of the learning process 学习过程的发展						
14	Assessment of learning outcomes before class, during class, and after class.					

Satisfaction list 满意度列表		Degree of satisfaction 满意度				
		5	4	3	2	1
	课前、课中、课后的学习成果评估。					
15	Teacher reflection on learning outcomes 教师对学习成果的反思					
16	Allowing students to solve problems during learning 让学生在学习过程中解决问题					
17	Using different ideas to solve problems or analyze case studies 用不同的想法来解决问题或分析案例研究					

APPENDIX F

IOC ASSESSMENT TEACHING AND LEARNING ACTIVITIES

TEACHING AND LEARNING ACTIVITIES ARE EXAMPLES OF SELF-DISCOVERY LEARNING

IOC Assessment Teaching and Learning Activities Teaching and Learning Activities are Examples of Self-discovery Learning

Satisfaction list		IOC		
		1	0	-1
1	Teaching and learning sets complete learning goals.			
2	The learning content is consistent with the course description.			
3	Learning activities emphasize self-discovery learning.			
4	There is a learning management process that allows students to research on their own.			
5	A learning management process that allows students to analyze from example situations.			
6	A learning management process that uses questions to learn.			
7	Using technology to support learning			
8	Problem solving process during learning			
9	Promoting learners learned by myself			
10	Evaluation of learning outcomes is systematic.			

Suggestions: .....

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APPENDIX G

IOC OF PRE-POST-TEST: FOUNDATIONS OF EDUCATION

Pre-test: Foundations of Education

1. A teacher who follows the law of effect would most likely

A : encourage students to work independently.

B: create activities that take into account multiple intelligences.

C : reward students with prizes for good behavior

D: form small groups to facilitate peer-to-peer learning

IOC Item 1		
1	0	-1

2. Lev Vygotsky's theory of cognitive development includes which of the following concepts?

A : Egocentric speech

B: Zone of proximal development

C : Naive psychology.

D: All of the answer choices are correct.

IOC Item 2		
1	0	-1

3. The work of Edward Thorndike played an integral role in the development of which field?

A : Behavioral Psychology

B: Social Psychology

C : Developmental Psychology

D: Cognitive Psychology

IOC Item 3		
1	0	-1

4. Billy is very good at solving 3-D puzzles. According to Howard Gardner, he is likely to be high in which of the following intelligences?

A : Spatial

B: None of these answer choices are correct.

C : Both intrapersonal and spatial

D: Intrapersonal

IOC Item 4		
1	0	-1

5. Two-year old Kimmy is coloring a picture of Elmo. As she colors, she talks to herself about what color she will use next and which part of Elmo she will color. This

is an example of:

A : Autonomous speech

B: Communicative speech

C : Preintellectual speech

D: Egocentric speech

IOC Item 5		
1	0	-1

6. Better teacher training, increased rigor in the curriculum, and tying teacher salaries directly to student performance and achievements are public education outcomes associated with which publication?

A : A Nation Capable of Change

B: U.S. Education and the World

C : Regaining a Competitive Edge in Mathematics and Science

D: A Nation at Risk

IOC Item 6		
1	0	-1

7. Brown v. Board of Education had the greatest impact on which element of U.S. public education?

A : Educational desegregation

B: Common core standards

C : Special education requirements

D: Student self-expression balanced against school uniform standards

IOC Item 7		
1	0	-1

8. The Tinker Test would be applied by district educational officials concerning matters dealing with which element of school activity?

A : School lunch policies for traveling to off-campus dining facilities

B: Uniform policies balanced against student self-expression rights

C : Senior privilege (upperclassmen leaving campus before the end of the official school day)

D: Elective class availability and student selection of such classes

IOC Item 8		
1	0	-1

9. Partnerships with parents to educate the whole child, prepare students to start school ready to learn, and provide environments conducive to learning, are all specific goals outlined in which educational act?

A : Educate America Act

B: The Morrill Act of 1862

C : Brown v. Board of Education of Topeka

D: No Child Left Behind (NCLB)

IOC Item 9		
1	0	-1

10. Title IX (9) primarily addresses which aspect of discrimination in public education?

A : Age discrimination

B: National origin discrimination

C : Gender discrimination

D: Racial or ethnic discrimination

IOC Item 10		
1	0	-1

11. From the standpoint of connectionism, which of the following would present a problem in the stimulus-response connection?

A : A student who loves to learn but has trouble getting along with other kids

B: A student who is not wealthy or supported by wealthy relatives

C : A student who does not arrive at school prepared to learn, such as one who has been up all night

D: A student who does not work well in groups and, therefore, cannot receive stimuli.

IOC Item 11		
1	0	-1

12. What does cognitive load refer to?

A : **Having too much information in working memory and not being able to remember**

IOC Item 12		
1	0	-1

anything

B: The process of making a task automatic so it is easier to learn

C : Grouping information into manageable chunks so it's easier to remember

D: Remembering and recalling information through sustained, regular practice

13. How do repetition and practice enable learning?

A : They reduce the individual's anxiety response.

B: They contribute to cognitive construction.

C : They are not aspects of information processing theory.

D: They free up storage in working memory.

IOC Item 13		
1	0	-1

14. Each time Jamal spent at least an hour studying before a quiz (stimulus), he got an A (response). He soon realizes that he should always make sure to get in an hour's worth of studying prior to taking a quiz. Jamal's learning is an example of educational

A : theory.

B: Jeffersonian perennial

C : connectionist

D: humanistic

IOC Item 14		
1	0	-1

15. How might a perennialist structure a study of The Iliad and The Odyssey?

A : By proving how irrelevant these works are to our modern lives

B: A perennialist would not be concerned with the study of classic literature.

C : By applying the themes of these works to modern-day issues

D: By clearly demonstrating the evolution of language from the time when these works were written

IOC Item 15		
1	0	-1

APPENDIX H

IOC OF STUDY SATISFACTION QUESTIONNAIRE

Study satisfaction questionnaire

Instruction: Please answer this questionnaire truthfully. Your responses will be kept confidential and will not affect your subject learning scores. The scores' meanings are as follows: 5 = highest, 4 = high, 3 = moderate, 2 = low, and 1 = lowest.

	Satisfaction list	IOC		
		1	0	-1
Targeting				
1	Learning goals are set every time there is teaching.			
2	There are clear learning guidelines.			
3	Providing opportunities for students to determine learning methods together.			
4	Clarification of teaching guidelines and score details			
Various learning processes				
5	Providing self-study			
6	Presentation of research results both in groups and alone			
7	Using case studies in the learning process			
8	Designing your own learning process			
9	Using questions, such as asking questions or answering during learning			
Use of supporting technology				
10	Using video media to help teach Makes students understand the content more			
11	Using teaching aids such as Quizizz			
12	Using technology to help in teaching, such as behavioral tests			
1	Selecting teaching media suitable for online learning			

Satisfaction list		IOC		
		1	0	-1
3				
Development of the learning process				
14	Assessment of learning outcomes before class, during class, and after class.			
15	Teacher reflection on learning outcomes			
16	Allowing students to solve problems during learning			
17	Using different ideas to solve problems or analyze case studies			

Additional Comments ……
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APPENDIX I

THE RESULTS OF IOC CHECK ON INSTRUMENTS

The List of IOC Check Experts

Dr. Shuwen Wang

Chengdu Normal University

China

Dr. Kaiping Huang

Fu Jen Catholic University

China

Dr. Shusheng Yang

Southwest Jiaotong University

China

Dr. Yujie Li

Yunnan University

China

Dr. Qiong Yang

Yunnan University

China

IOC Results of the Research Instrument

Items	Rating by Experts					IOC Average	Remarks
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5		
Part Ⅰ: Pre-test: Foundation of Education							
1	+1	+1	+1	+1	+1	1	
2	+1	+1	+1	+1	+1	1	
3	+1	+1	+1	+1	+1	1	
4	+1	+1	+1	0	+1	0.8	
5	+1	+1	+1	+1	+1	1	
6	+1	+1	+1	+1	+1	1	
7	+1	+1	+1	+1	+1	1	
8	+1	+1	+1	+1	+1	1	
9	+1	+1	+1	+1	+1	1	
10	+1	+1	+1	0	+1	0.8	
11	+1	+1	+1	+1	+1	1	
12	+1	+1	+1	+1	+1	1	
13	+1	+1	+1	+1	+1	1	
14	+1	+1	+1	+1	+1	1	
15	+1	+1	+1	+1	+1	1	
Part II: Study satisfaction question							
1	+1	+1	+1	+1	+1	1	
2	+1	+1	+1	0	+1	0.8	
3	+1	+1	+1	+1	+1	1	

4	+1	+1	+1	+1	+1	1	
5	+1	+1	0	+1	+1	0.8	
6	+1	+1	+1	+1	+1	1	
7	+1	+1	+1	+1	+1	1	
8	+1	+1	+1	+1	+1	1	
9	+1	+1	+1	+1	+1	1	
10	+1	+1	+1	+1	+1	1	
11	+1	+1	+1	+1	+1	1	
12	+1	+1	+1	+1	+1	1	
13	+1	+1	+1	+1	+1	1	
14	+1	+1	+1	0	+1	0.8	
15	+1	+1	+1	+1	+1	1	
16	+1	+1	+1	+1	+1	1	
17	+1	+1	+1	+1	+1	1	
Part III: Assessment Teaching and Learning Activities Teaching and Learning Activities are Example of Self-Discovery Learning							
1	+1	+1	+1	+1	+1	1	
2	+1	+1	+1	+1	+1	1	
3	+1	+1	+1	+1	+1	1	
4	+1	+1	+1	+1	+1	1	
5	+1	+1	+1	+1	+1	1	
6	+1	+1	+1	+1	0	0.8	
7	+1	+1	+1	+1	+1	1	
8	+1	+1	+1	+1	+1	1	
9	+1	+1	+1	+1	+1	1	
10	+1	+1	+1	0	+1	0.8	

APPENDIX J

CERTIFICATE OF APPROVAL

COA. No. RSUERB2024-140

RSU-ERB

RSU ETHICS REVIEW BOARD

Certificate of Approval
By
Ethics Review Board of Rangsit University

COA. No.	**COA. No. RSUERB2024-140**
Protocol Title	**THE DEVELOPMENT OF AN INSTRUCTIONAL MODEL FOR SELF-DISCOVERY LEARNING FOR ONLINE TEACHING: FOUNDATION OF EDUCATION COURSE**
Principle Investigator	**Xingran Zhao**
Co-Investigator	**Asst. Prof. Dr. Supinda Lertlit**
Affiliation	**Suryadhep Teachers College, Rangsit University**
How to review	**Expedited Review**
Approval includes	**1. Project proposal** **2. Information sheet** **3. Informed consent form** **4. Data collection form/Program or Activity plan**

Date of Approval: **20 August 2024** **Date of Expiration:** **20 August 2026**

Date of Renewal: **within 20 July 2026**

The prior mentioned documents have been reviewed and approved by Ethics Review Board of Rangsit University based Declaration of Helsinki, The Belmont Report, CIOMS Guideline and International Conference on Harmonization in Good Clinical Practice or ICH-GCP

RSU-ERB
20 AUG 2024

Signature.....

(Associate Professor Dr. Panan Kanchanaphum)
Chairman, Ethics Review Board for Human Research

Ethics Review Board of Rangsit University, 5th floor, Arthit Ourairat Building (Bldg.1) Rangsit University
Tel. 0-2791-5728 Email: rsuethics@rsu.ac.th

BIOGRAPHY

Name	Xingran Zhao
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Work position	Teacher