

The 14th TCU International e-learning Conference 2023 (IEC 2023)
and 7th International Conference on Smart Learning Environments (ICSLE 2023)

IEC2023

ICSLE2023

**Social Change and the Future of MOOCs and
Smart Learning for Sustainable Society : Emerging Technologies and Applications**

Abstract

As the landscape of education is undergoing a transformative shift with the rapid advancement of online learning platforms and technologies. This conference explores the emerging trends and innovative practices that are shaping the future of online education, with a specific focus on the role of Massive Open Online Courses (MOOCs). The Thailand Cyber University project, positions itself as the spearhead in enhancing the country's competitiveness with the missions to promote life-long learning, accelerate academic and research and support innovation production.

With these missions, it is essential to keep pace with the global dynamism and try to stay ahead of the game. Innovation and technology are utilized, including outcome-based education, higher education sandbox and digital technology. In collaboration with the private sector and higher education institution, the 14th International E-Learning Conference 2023 (IEC2023) will be held in conjunction with the 7th International Conference on Smart Learning Environments 2023 (ICSLE2023) The objective of this conference is to gather faculty members, researcher, MOOC providers, and policy makers to help share and redefining the way knowledge is delivered and acquired in virtual classrooms.

As the traditional boundaries of education continue to blur, the role of MOOCs becomes increasingly significant in shaping the future of online learning. This conference underscores the importance of adaptability, inclusivity, and learner-centered approaches, especially in the context of MOOCs. By harnessing the advantages of MOOCs and leveraging their potential for educators, institutions, and policymakers can navigate the evolving landscape to ensure accessible and high-quality education for diverse learners worldwide.

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Opening Speech



By Associate Professor Thapanee Thammetar, Ph.D.
Director, Thailand Cyber University Project
Ministry of Higher Education, Science, Research and Innovation, Thailand
at the Opening Ceremony of
the 14th International E-Learning Conference 2023 and
the 7th International Conference on Smart Learning Environments 2023
On Thursday 31st August 2023

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Distinguished speakers and guests,

Ladies and gentlemen

First of all, on behalf of the Ministry of Higher Education, Science, Research and Innovation, Thailand or MHESI And Thailand Cyber University project, I would like to express a cordial welcome to each and every participant to the Fifteenth International E-Learning Conference 2023 and The Seventh International Conference on Smart Learning Environments 2023. I appreciate an opportunity to preside physically at the meeting venue and virtually on Metaverse.

Before we commence the meeting, I would like to reiterate that MHESI and The Thailand Cyber University project, positions itself as the spearhead in enhancing the country's competitiveness. The main missions are to promote life-long learning, accelerate academic and research and support innovation production.

With these missions, we have no choice but to be proactive, keep pace with the global dynamism and try to stay ahead of the game. Innovation and technology are utilized, including outcome-based education, higher education sandbox and digital technology.

In collaboration with the private sector and higher education institution, invests heavily in MOOC development. The learning management system (LMS) and courses are developed and delivered through the Thailand Cyber University. It is to ensure accessibility to education for learners, regardless of their age, location and interests. At present, Thai MOOC platform offers over 600 courses, with more than 1,720,000 users. It has awarded certificate to 1,760,000 learners. The number is impressive. However, the recent global dynamism does allow us to enjoy the past and present success. The COVID-19, changing labor market needs and learner's habit force us to continuously develop and tailor our effort in online education and training provision.

Today we will have a chance to share current knowledge and practices on MOOCs spheres, discuss the future trends of MOOCs and come up with recommendations on the direction of online education. Hence, I would like to encourage every participant to seize this opportunity and move forward together.

I would like to conclude my remarks by express my sincere gratitude to the keynote speakers and invited speakers from all over the world. My appreciation also goes to International Association of Smart Learning Environments, Thai MOOC, TCU, paper reviewers and organizing committee for their effort in making the 14th IEC2023 and ICSLE 2023 possible. At this time, I would like to declare the Fifteenth International E-Learning Conference 2023 and The Seventh International Conference on Smart Learning Environments 2023 open. I wish the meeting a great success and look forward to productive outcomes.

Thank you. ขอขอบคุณค่ะ

Keynote speaker 1



Mr. Dhawal Shah

Founder and CEO, Class Central, USA

Title: Decoding the Business of Online Education

“Decoding the Business of Online Education”

"Decoding the Business of Online Education" is an in-depth exploration into the financial machinations of online education giants. It dissects and evaluates the revenue models, profit margins, and financial trends of industry leaders like Coursera, Udemy, Khan Academy, and Thinkific. Over the past decade, online education has witnessed exponential growth. This presentation offers a deep dive into the business strategies driving the platforms that educate millions across the globe.

In this session, we'll dissect the financials and operational blueprints of leading online education giants: Coursera, Udemy, Thinkific, and Khan Academy. We'll delve into Coursera's transformation from offering free courses to becoming a half-billion-dollar powerhouse, leveraging certificates, degrees, and strategic partnerships. We'll navigate Udemy's unique marketplace approach, which empowers anyone to craft and market courses, garnering the attention of countless learners worldwide. Additionally, we'll trace Thinkific's trajectory, from its triumphant IPO to its efforts in sustaining growth and ensuring profitability. Concluding, our focus will shift to Khan Academy's philanthropic model, sustained by generous donations, and its remarkable surge during the pandemic era. By unpacking the revenue channels, market segments, profit margins, and fiscal disclosures of these platforms, we aim to demystify the ascent of online education as both a transformative and profitable domain.

Keynote speaker 2



Masahiro Inoue, PhD, PMP, PEJp

Specially Appointed Professor,
Graduate School of System Design and Management
Keio University, Professor Emeritus, Shibaura Institute of Technology, Japan.

“Micro-credential, Innovative Framework for Higher and Lifelong Education”

The rapid development of industrial structure and technology have attracted attention and efforts for micro-credentials, which allow learners to study a specific field and certify their academic achievements. The transformation of higher education will change the learning process and qualifications. It will also increase student mobility among universities. Each university will offer distinctive educational programs and issue micro-credentials. Stacking These micro-credentials can lead to master’s and bachelor’s degrees. Learners can earn Micro-credentials as proof of their learning in line with their career goals. Micro-credentials are expected to involve not only higher education institutions, but also private training institutions, associations, and enterprises for reskilling and upskilling. A common framework for micro-credential is required for educational institutions to offer high-quality micro-credentials, for learners to choose micro-credentials, and for employers to evaluate micro-credentials. International cooperation on micro-credential frameworks is important to promote the use of human resources in the Asia-Pacific region.

Keynote speaker 3



Carlos Delgado Kloos, Ph.D.

VP for Strategy and digital Education,
Universidad Carlos III de Madrid, Spain.

“MOOC in the AI Era”

Cloud-based technologies like video platforms, interactive quizzes and online forums powered the rise of MOOC platforms more than a decade ago. Now, the surge in Generative AI heralds a new era. The future of MOOC production and deployment in This AI realm is intriguing. AI will deeply reshape video creation, interactive quizzes, and online forums, boosting efficiency and ushering innovations beyond imagination. Think personalized videos addressing learners by name, and Socratic AI-backed tutors catering to individual needs. Existing MOOC platforms are already incorporating some of these AI advancements, while new initiatives are popping up laying the groundwork for a MOOC renaissance. This shift extends beyond efficiency—it promises immersive, personalized learning. As we stand on this precipice, let’s anticipate a transformative journey into the next chapter of education.

Keynote speaker 4



Wang Xiaoxiao, Ph.D.

Director of Online Education Center at Tsinghua University,
Secretary General of MOE's Research Center for Online Japan
Education, PRC, and Secretary General of Global MOOC and Online Education Alliance.

“The Digital Transformation of Higher Education in China in the past 10 years”

In 2013, prestigious Chinese universities such as Tsinghua University, Peking University, and Shanghai Jiaotong University began promoting MOOCs. The goal was to enhance educational equity throughout the country and implement blended learning based on MOOCs in residential education. This was aimed at fostering more active learning and improving education quality. In 2015, the Ministry of Education introduced a national policy to stimulate a country-wide MOOC and blended learning initiative, encouraging all Higher Education Institutions (HEIs) to participate. Following the outbreak of COVID-19, the entire higher education system swiftly transitioned online to address the disruptions faced by HEIs. Over the years, everyone from faculty to policymakers came to understand that online education is not just beneficial but essential. Both HEIs and the government have supported domestic actions at the national level and global partnerships in this field. In 2022, the National Digital Strategic Action for the Digitalization of Education was initiated, emphasizing the importance of applying technology in education. On one hand, the younger generations are digital natives. On the other, the evolving technologies have significantly enhanced the efficiency and effectiveness of faculty, particularly evident during the COVID-19 period.

In early 2023, Generative AI was introduced to education, garnering considerable attention from experts, practitioners, and policymakers alike. This has highlighted the immense potential of Generative AI in online and adaptive learning, which will undoubtedly influence traditional face-to-face pedagogical methods. Recognizing these impacts, top Chinese HEIs and the government are preparing for imminent changes and are looking forward to collaborating with the global community in the near future.

Keynote speaker 5



Professor Hiroaki Ogata

Academic Center for Computing and Media Studies, Kyoto University, Japan.

“AI and Learning Analytics for Smart Learning Environments in Japan”

The LEAF system is a Learning and Evidence Analytics infrastructure that supports the collection, analysis, and utilization of learning logs (educational data). LEAF system consists of a Learning Management System (LMS), an eBook reader (BookRoll), Learning Record Store (LRS), and a Learning Analytics tool (Log Palette). BookRoll works as an ebook behavior sensor and records student log data. Log Palette analyzes and visualizes the log data obtained from BookRoll and LMS. The log data can be further used for interactive lectures, reflection, recommendations, and class improvement. LEAF system has been used in over 120 educational institutions, from elementary to higher education, within eight countries and regions. Our goal is to scientifically analyze those data, provide smart learning environments for teachers and students, and transform from “education and learning based on their experiences” into “education based on data and evidence.” This talk will introduce: (1) research for supporting data-and-evidence informed education, (2) practices of data-informed education with LEAF in K12 schools and universities, and (3) policies for educational data utilization in Japan.

Keynote speaker 6



Christian M. Stracke, Ph.D.

Coordinator Virtual Collaboration & Cloud Strategy,
Rheinische Friedrich-Wilhelms-Universität Bonn, Germany.

“Social changes for and through e-Learning and AI”

Digitalisation is a strong (if not the strongest) driver for social changes, not only in education. e-Learning and artificial intelligence (AI) are challenging and changing our societies. During the COVID-19 pandemic and lockdowns, e-Learning was often immediately and broadly introduced without any support and stable infrastructure leading to many problems and inequities. Afterwards and in particular through the published ChatGPT and its global promotion, AI became popular and now impacts educational settings and systems by offering new opportunities to create media, analyses and decisions. However, the AI services, their black boxes, hallucinations, lacking responsibilities and ongoing integrations into other systems are mostly unclear and non-transparent.

As a consequence, we need to reflect and adapt our current teaching and learning opportunities, especially the grading and assessments with main focus on written examinations and theses. And we should start the global discussion on how e-Learning and AI can be used to strengthen human rights, democracy and rules of law instead of supporting biases, fake news and inequity.

Invited speaker 1



Ms. Sooji Lee

Researcher, Higher Education and Academic Division, KERIS.

“Breaking Barriers: for More Dynamic and Flexible Higher Education Landscape”

The presentation will focus on the innovation and flexibility of educational technology, social trends, and challenges in Higher Education. With the increasing cost of education and student loan debt, many students are seeking alternative paths, i.e., blended, hybrid, etc., to education. Ensuring accessibility and equity for all students remains a challenge. Students face difficulties in staying enrolled and completing their degrees due to various reasons. In response to the competitive job market, students need to be equipped with skills that make them employable upon graduation. There is also a growing demand for flexible and convenient learning modalities that cater to students’ diverse needs. Online and blended learning, personalized learning, collaborative learning, and lifelong Learning are highlighted as important factors. Additionally, digital innovation, collaboration, online degrees, and vocational skills programs are discussed as important aspects of education with practical cases in Korea.

Invited speaker 2



Professor Qiu Hanqiu

Dean of International School of Cultural Tourism, Hangzhou City University, China.

“The Future of Online Education: A Chinese Perspective”

Professor Qiu Hanqin will review developments in global online learning, its advantages and disadvantages, and comment on how the covid pandemic has moved it from a peripheral to a primary form of teaching and distribution of knowledge. She also offers a focus on the Chinese experience, which due to its geographical size and population is a country where online teaching facilitates the support for education when face-face teaching was not possible. Although online teaching will not necessarily dominate traditional and campus-based teaching, depending on circumstances, a blended or balanced approach would be more appropriate.

Afterwards, she will present the ongoing practice being done by the International School of Cultural Tourism at Hangzhou City University to transform digital education, including version 1.0 online MOOC making to version 2.0 digital human technology and finally to version 3.0 live-streaming marketing.

Invited speaker 3**Professor Han Zhenhua**

Associate dean, Hangzhou City University, China.

“Teaching reform and practice path in digital age”

Digitalization urges schools and educational institutions to change their educational modes and reconstruct their teaching contents. Schools can realize remote teaching and online learning by building virtual learning environments and relying on the Internet. This model not only provides more learning opportunities and resources for students, but also enables education to transcend geographical constraints and then achieve global teaching and cooperation. Digital technology and innovative thinking are utilized to reconstruct the teaching content to meet the criteria of the new Era. In order to achieve two-way internationalization, the International School of Cultural Tourism at Hangzhou City University has set up micro credentials as Digital Operation of International Hotels. Through mutual recognition of credits and credit transfer, Hangzhou City University has committed itself to strengthen multilateral educational cooperation among those countries along the Belt and Road, and realize the sharing and equity of premium educational resources.

Invited Speaker 3



Dr. Melinda Dela Pena Bandalaria

Chancellor and Professor,

University of the Philippines Open University (UPOU), Philippines.

“Sustainable Lifelong Learning with MOOCs and Online Education: Insights from the Philippine Experience”

Sustainability has assumed another meaning when used in the context of education but the common bottom line remains: continuity and being able to withstand the challenges of disruptions. The Triple Bottom Line that represents the People, Environment, and (social profit) can also be articulated in an education ecosystem. The concept and concretization of sustainability in education came to the fore as an aftermath of the COVID-19 both from the perspective of the learners and the academic institutions. This presentation aims to share the insights drawn by the University of the Philippines Open University (UPOU) from its more than 20 years of implementing online education and 10 years of offering MOOCs to codify the different pillars that would define sustainable lifelong learning with MOOCs and online education. Further, the current undertakings for MOOCs that will shape its direction for the next seven years will also be shared with the objective of further contributing to the development of a framework for sustainable lifelong learning.

Invited speaker 4



Dr. Nurbiha A Shukor

Deputy Director, Center of Advancement in Digital and Flexible Learning UTM CDex, Chair, Malaysian e-Learning Council for Public Universities (MEIPTA), Malaysia.

“Sustainable Lifelong Learning with MOOCs and Online Education in Malaysia.”

MOOCs kick-started in Malaysia in 2014 with four pilot courses. The launching of Malaysia Education Development Plan (Higher Education) 2015-2025 further accelerated the development of MOOCs and online education through Shift #9 Globalized Online Learning. MOOCs development in Malaysia results from the selection of quality open courseware (OCW) that has the potential to be expanded to form an open online course. Documents such as Quality Practices in Malaysia MOOC was used to ensure quality MOOCs are developed in Malaysia.

The mechanisms for MOOC credit transfer, online learning recognition, and micro credential modules, have shaped the online education ecosystem. In fact, the recent introduction of blended learning, hybrid learning and flexible academic programs among higher education institutions helps to further promote lifelong learning sustainability with MOOCs and online education in Malaysia.

Invited speaker 5



Dr. Libing Wang

Chief, Section for Educational Innovation and Skills Development,

UNESCO Bangkok Office Asia and Pacific Regional Bureau for Education, Bangkok, Thailand.

“Nurturing Conducive Ecosystems for MOOCs in Higher Education”

This article explores the evolution of Massive Open Online Courses (MOOCs) and their transformative impact on higher education, with a focus on the Asia-Pacific region. Beginning with the inception of MOOCs in 2012 and their rapid global expansion, the article highlights how MOOCs have democratized access to quality education by seamlessly integrating content, pedagogy, quality assurance, and technology. It delves into the collaborative efforts among countries and institutions in the Asia-Pacific region to advance MOOCs, emphasizing the multifaceted benefits of these courses, such as their massive reach, openness, and alignment with micro-credential programmes. The article also discusses the vital role of infrastructure investment, incentivizing faculty members, and linking MOOCs with open educational resources (OERs) in fostering MOOC ecosystems. It concludes by underscoring the growing recognition of MOOCs' significance in higher education and calls for continued support and collaboration to strengthen MOOC frameworks in the Asia-Pacific region.

Workshop host 1



Prof. Dr. Daniel Burgos

Professor, International University of La Rioja Logroño, Spain

“How to write an Open Education & Open Science Policy for Higher Education”

Transversal, integrated Open Education and Open Science (OE & OS) is the key for success in Higher Education. Lonely efforts to create and use OE & OS are welcome. However, to secure sustainability and scalability, those efforts must be integrated in a backbone policy in every university. Only through an Open Education Policy, thoroughly described, and structured in a sensible way, OE & OS are likely to prevail and succeed. Every single department, faculty, lab, or any other production or service unit, must take part in the design, writing, implementation, and assessment of such policy, so that everyone is responsible, a key character, and accountable.

This workshop will guide the participants, in a hands-on session, to design, structure, and write the fundamentals of an Open Policy for their Higher Education Institutions. We will analyze the sections, the stakeholders, the target audience, the resources, the detailed planning, the dissemination actions, the risk assessment, and the KPIs. We will also present a number of examples already implemented. And, finally, specifics about hot topics, such as licensing, alternative credentials, competence frameworks adapted to OE & OS, Artificial Intelligence, ethics, plagiarism, and others. Altogether to ensure a productive, practical session

Workshop host 2



Ms. Hyojae Choi

Senior researcher, Lifelong and Higher Education Section, Higher Education and Academic Division, KERIS.

“Online Education in ASEAN, based on ACU Project and ACU-OER”

This presentation contains an introduction to the ASEAN Cyber University project, which has been promoted over the past decade, as well as ACU-OER and LMS, which provide online content for higher education in Korea and ASEAN. Furthermore, it proposes to share and distribute educational content of Korea and 10 ASEAN countries based on the platform to provide high-quality higher education content and to strengthen cooperation in higher education between Korea and ASEAN.

การพัฒนาบทเรียนออนไลน์ รายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบการจัดการเรียนการสอนออนไลน์แบบเปิด

DEVELOPMENT OF INTRODUCTION TO DRUG INFORMATION ONLINE LESSON VIA THAILAND MASSIVE OPEN ONLINE COURSE
(THAIMOOC) PLATFORM

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บสพร อนุสรณ์พาณิชกุล **

กลุ่มงานคุ้มครองผู้บริโภคสาธารณสุข สำนักงานสาธารณสุขจังหวัดเพชรบูรณ์**

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บทคัดย่อ

การพัฒนาบทเรียนออนไลน์รายวิชา ความรู้เรื่องยาเบื้องต้น ผ่านระบบการจัดการเรียนการสอนออนไลน์แบบเปิด (Thai MOOC) มีวัตถุประสงค์ เพื่อ 1) พัฒนาบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น 2) เปรียบเทียบความรู้ความเข้าใจของผู้เรียนก่อนและหลังเรียนผ่านบทเรียนออนไลน์ 3) ศึกษาความพึงพอใจของผู้เรียนต่อบทเรียนออนไลน์แบบเปิด โดยเนื้อหามีเกี่ยวกับการใช้ยา เภสัชจลนศาสตร์ เภสัชพลศาสตร์ ปฏิกริยาระหว่างยา อาการไม่พึงประสงค์จากการใช้ยา ขนาดยา การชั่ง ตวง วัด การใช้ยาให้ถูกวิธี การเก็บรักษา และการใช้ในอาการต่าง ๆ ที่พบบ่อย ถูกนำมาพัฒนาตามรูปแบบ EDDIE Model ได้แก่ การวิเคราะห์ผู้เรียน การออกแบบ การพัฒนา การทดลองใช้ และการประเมินผล เมื่อผลิตบทเรียนเสร็จแล้วทำการทดลองกับผู้เข้าเรียนรายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบออนไลน์แบบเปิด Thai MOOC ซึ่งมีผู้เรียนที่ผ่านการเรียนสำเร็จจำนวน 972 คน ในปี พ.ศ.2563 ผลการทดลองพบว่า คะแนนความรู้หลังเรียนสูงกว่าก่อนเรียนอย่างมีนัยสำคัญ ($t=-25.12, P<0.01$) เมื่อทดสอบด้วยสถิติ Dependent t-test โดยคะแนนเฉลี่ยความรู้ก่อนเรียนมีคะแนนเท่ากับ 28.20 (S.D.=13.48) และคะแนนเฉลี่ยความรู้หลังเรียนมีคะแนนเท่ากับ 38.74 (S.D.=2.99) และผลการประเมินความพึงพอใจต่อบทเรียนออนไลน์ พบว่าผู้เรียนมีความพึงพอใจในภาพรวมเท่ากับ 4.20 (S.D.=0.79) ซึ่งอยู่ในระดับมาก

บทคัดย่อ

Development of introduction of drug information online courseware were performed through a Massive Open Online Courses teaching management system (Thai MOOC), the objectives were to 1) develop an online lesson on basic drug knowledge, 2) compare learners' knowledge and understanding before and after learning through online lessons, 3) study satisfaction of learners via Thai MOOC in regards to drug use, pharmacokinetics pharmacodynamics, drug interactions, adverse reactions from drug use, dosage, weighing, measuring, using the drug correctly medicine storage and the use of drugs in various common symptoms were developed according to the EDDIE Model (analysis, design, development, implementation and evaluation. After the production of the lessons were completed, an experiment was conducted with the participants in this course. Through the open online Thai MOOC system, there were 972 students who successfully passed the course in 2020. The experimental results showed that the post-test score was significantly higher than the pre-test score ($t=25.12$, $P<0.01$) by the dependent t-test hypothesis testing. The mean score of pre-test was 28.20 (S.D.=13.48) and the mean score of the post-test had a score of 38.74 (S.D.=2.99) and the satisfaction assessment results for online lessons. It was found that the learners had overall satisfaction equal to 4.20 (S.D.=0.79), which was at a high level.

คำสำคัญ

การใช้ยา, เกสัชวิทยา, เกสัชจลนศาสตร์, เกสัชพลศาสตร์, บทเรียนออนไลน์แบบเปิด

บทนำ

ความรู้เกี่ยวกับยามีความสำคัญเกี่ยวข้องกับการดูแลสุขภาพ การรักษาโรคของมนุษย์ ช่วยให้เข้าใจความปลอดภัยในการใช้ยา สามารถให้คำแนะนำที่ถูกต้องและเป็นประโยชน์แก่ผู้อื่น นอกจากนี้ยังมีความสำคัญกรณีเกิดการใช้ยาในทางที่ผิด การใช้ยาเพื่อบรรเทาอาการหรือลดความรุนแรงก่อนไปพบแพทย์ การใช้ยามีความจำเป็นต่อประชาชน เนื่องจากยาเป็นสิ่งจำเป็นหนึ่งในปัจจัยสี่ ปัจจุบันมีการใช้ยาที่ไม่ถูกต้องทำให้เกิดการรณรงค์ให้มีการใช้ยาอย่างสมเหตุสมผล Rational Drug Use (RDU) ซึ่งมีความจำเป็นอย่างสูงเนื่องจากส่งผลดีต่อการดูแลสุขภาพของบุคคลและสังคม ได้แก่ 1) ทำให้เกิดความปลอดภัยในการใช้ยา ช่วยให้มีการเลือกใช้ยาที่เหมาะสม ปลอดภัยต่อร่างกาย หลีกเลี่ยงการใช้ยาที่ไม่จำเป็นหรือผลข้างเคียงของยาที่อาจเกิดขึ้นได้ 2) ลดความเสี่ยงของยาต่อคน เช่น การใช้ยาผิดโดยที่ร่างกายไม่ได้ต้องการ การใช้ยาเกินปริมาณที่กำหนด หรือยาอาจเกิดปฏิกิริยากับยาอื่นที่ใช้อยู่ 3) ประหยัดทรัพยากร ลดความเสียเวลาและค่าใช้จ่ายในการรักษาโรค ใช้ยาให้เหมาะสมและเพียงพอตามความจำเป็น 4) สร้างความเข้าใจในการใช้ยา เช่น เพื่อให้ทราบว่ายาที่ใช้รักษาโรคใด ประสิทธิภาพของยา ปริมาณและระยะเวลาในการใช้ยา 5) การส่งเสริมการดูแลสุขภาพแก่ประชาชน ทำให้ประชาชนมีความตระหนักและรับผิดชอบในการดูแลสุขภาพทั้งของตนเองและคนใกล้ชิด (กองบริหารงานสาธารณสุข สำนักงานปลัดกระทรวงสาธารณสุข, 2563)

การสอนเรื่องความรู้เรื่องยาผ่านระบบการเรียนการสอนออนไลน์แบบเปิด MOOCs (Massive Open Online Courses) มีความสำคัญได้แก่ 1) ระบบการเรียนการสอนออนไลน์แบบเปิดช่วยเปิดโอกาสให้ผู้สนใจสามารถเรียนรู้ได้ทุกที่ทุกเวลา ทำให้

ผู้สนใจที่มีเวลาจำกัดหรืออยู่ห่างไกลสามารถเข้าถึงความรู้ได้มากขึ้น 2) สนับสนุนการเรียนรู้ตลอดชีวิต ซึ่งเป็นไปตามพระราชบัญญัติการศึกษาแห่งชาติ พ.ศ.2542 สำนักงานคณะกรรมการการศึกษาแห่งชาติ สำนักนายกรัฐมนตรี, 2545 ซึ่งกำหนดว่าการศึกษาตลอดชีวิตของไทย ตามมาตรา 15 คือการศึกษาในระบบ การศึกษานอกระบบ และการศึกษาตามอัธยาศัย 3) พัฒนาทักษะการเรียนรู้ต่าง ๆ ตั้งแต่การทำงานร่วมกับผู้อื่น การสื่อสาร การแก้ไขปัญหา และความรับผิดชอบ 4) ลดค่าใช้จ่ายในการเรียนรู้ โดยเฉพาะในระบบการเรียนการสอนออนไลน์แบบเปิด ของมหาวิทยาลัยไซเบอร์ไทย (Thai MOOC) ที่สามารถเรียนได้โดยไม่มีค่าใช้จ่าย 5) มีการร่วมมือกับผู้เชี่ยวชาญ อาจารย์ ที่มีความชำนาญในเนื้อหาเป็นผู้สอนโดยตรง

จากความสำคัญของปัญหาที่กล่าวมา ทำให้ผู้วิจัยได้ตระหนักถึงการนำเอาเนื้อหาเรื่องการใช้มาจัดการเรียนการสอนผ่านระบบการเรียนการสอนออนไลน์แบบเปิด โดยสามารถให้ผู้เรียนเป็นประชาชนทั่วไปที่สนใจ ในการดูแลสุขภาพในด้านการใช้ยาเภสัชจลนศาสตร์ เภสัชพลศาสตร์ วิธีทางการให้ยา รูปแบบยาเตรียม การคำนวณยา การใช้ยาแบบต่าง ๆ และการเก็บรักษายา เพื่อให้สามารถเรียนรู้ได้ทุกที่ทุกเวลา และสามารถใช้สอนเป็นความรู้พื้นฐานด้านยา สำหรับนักศึกษาในสายวิทยาศาสตร์สุขภาพและสาธารณสุข ในรายวิชาเภสัชวิทยา

วัตถุประสงค์ของการวิจัย

1. เพื่อพัฒนาบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบการเรียนการสอนออนไลน์แบบเปิด Thai MOOC
2. เพื่อเปรียบเทียบความรู้ความเข้าใจก่อนและหลังเรียนผ่านบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น
3. เพื่อศึกษาความพึงพอใจของผู้เรียนต่อบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น

วิธีการดำเนินการวิจัย

ประชากรเป้าหมาย ได้แก่ ผู้สนใจที่ลงทะเบียนรายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบการเรียนการสอนออนไลน์แบบเปิด Thai MOOC ที่เรียนรู้ ในปี พ.ศ.2563 จำนวน 972 คน ที่มีการทำการประเมินผลความรู้ทั้งก่อนและหลังเรียน

รูปแบบการวิจัย วิจัยนี้เป็นวิจัยเชิงพัฒนา (Developmental Research) โดยผู้วิจัยได้ทำการกำหนดวิธีการดำเนินการวิจัยออกเป็น 3 ส่วนได้แก่ 1) การพัฒนาบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบการเรียนการสอนออนไลน์แบบเปิด Thai MOOC 2) การประเมินผลความรู้ก่อนและหลังการเรียน เพื่อวัดความเข้าใจของผู้เรียน และ 3) การศึกษาความพึงพอใจของผู้เรียนต่อบทเรียน โดยมีรายละเอียดดังต่อไปนี้

1. การพัฒนาบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบการเรียนการสอนออนไลน์แบบเปิด Thai MOOC

ผู้วิจัยได้ดำเนินการพัฒนาบทเรียนออนไลน์ โดยใช้รูปแบบ ADDIE Model (Steven J McGriff, 2000) ซึ่งเป็นรูปแบบการสอนที่ออกแบบโดยอาศัยวิธีการระบบ (System Approach) ที่เหมาะสมสำหรับการพัฒนาบทเรียนผ่านระบบออนไลน์ เนื่องจากมีการดำเนินการเป็นขั้นตอนจนถึงการประเมินผล ประกอบด้วยขั้นตอนดังต่อไปนี้

ขั้นตอนที่ 1 การวิเคราะห์ (Analysis) โดยการวิเคราะห์ผู้เรียน ซึ่งกำหนดเป็นผู้สนใจและนักศึกษาที่ต้องเรียนในรายวิชาเภสัชวิทยา กำหนดเนื้อหาและเป้าหมาย ระบุวิธีการการนำเสนอเนื้อหา วางแผนขอบเขตของโครงการทั้งหมด และวางแผนการประเมินภาพรวม ในขั้นนี้ผู้วิจัยสามารถกำหนดผลการเรียนรู้ เป็น 5 ข้อ คือ ผู้เรียนสามารถอธิบายความหมายของยา บอกความแตกต่างของเภสัชจลนศาสตร์และเภสัชพลศาสตร์ อธิบายปฏิกิริยาระหว่างยา อาการไม่พึงประสงค์จากการใช้ยา เลือกใช้ยาที่พบบ่อยได้ตามความเหมาะสมกับอาการและโรคที่เป็น และสามารถใช้อารูปแบบต่าง ๆ ได้อย่างถูกต้อง รวมถึงการวิเคราะห์เนื้อหาการ

เรียนในรายวิชา ออกเป็น 8 บทย่อย ได้แก่ ความหมายของยา เภสัชจลนศาสตร์ เภสัชพลศาสตร์ ปฏิกิริยาระหว่างยาและอาการไม่พึงประสงค์จากการใช้ยา ขนาดยาและการชั่ง ตวง วัด การใช้ยาให้ถูกวิธี การเก็บรักษา ยา และการใช้ยาในอาการต่าง ๆ ทำการขอใช้พื้นที่ของระบบการสอนออนไลน์แบบเปิด Thai MOOC ผ่านผู้อำนวยการของวิทยาลัยการสาธารณสุขสิรินธร จังหวัดพิษณุโลก คณะสาธารณสุขศาสตร์และสหเวชศาสตร์ สถาบันพระบรมราชชนก

ขั้นตอนที่ 2 การออกแบบ (Design) ผู้วิจัยได้กำหนดวัตถุประสงค์การเรียนรู้ วิธีเรียนรู้ จัดทำแผนการเรียนรู้รายบท ลำดับเนื้อหาของบทเรียน ตามลำดับความยากง่าย กำหนดกิจกรรมการเรียนรู้โดยการบรรยายผ่านระบบ กำหนดสื่อและทรัพยากรที่ต้องใช้ กำหนดเกณฑ์การประเมินผล ที่สอดคล้องกับผลลัพธ์การเรียนรู้ รวบรวมเนื้อหาในการบรรยาย ออกข้อสอบ ดำเนินการส่งโครงสร้างรายวิชา และประมวลรายวิชา ให้แก่มหาวิทยาลัยไซเบอร์ไทย และทำความเข้าใจกับผู้ผลิตวิดีโอและสื่อการสอน

ขั้นตอนที่ 3 การพัฒนา (Development) มีการนำผลจากการออกแบบมาดำเนินการ ในการผลิตสื่อวิดีโอ และเตรียมสื่อประกอบบทเรียน การสร้างแบบทดสอบออนไลน์ และทำการผลิตตัวบทเรียน การจัดการบทเรียน ผ่านการตรวจสอบจากผู้เชี่ยวชาญทางด้านเนื้อหา และสื่อการสอน จากนั้นทำการผลิตสื่อทั้งวิดีโอคลิป แบบทดสอบก่อนเรียน ระหว่างเรียน และหลังเรียน สื่อประกอบการสอนอื่น ๆ

ขั้นตอนที่ 4 การทดลองใช้ (Implementation) โดยการนำบทเรียนที่พัฒนาขึ้นไปทดลองใช้กับกลุ่มเป้าหมายตามแผน และวิธีการที่กำหนดไว้ในระบบการสอนออนไลน์แบบเปิด Thai MOOC

ขั้นตอนที่ 5 การประเมินผล (Evaluation) โดยเป็นการประเมินผลบทเรียน โดยการประเมินผลความรู้ และความพึงพอใจต่อบทเรียน และมีการปรับตามมาตรฐานที่กำหนดไว้ของระบบการสอนออนไลน์แบบเปิด Thai MOOC

2. การประเมินผลความรู้ก่อนและหลังการเรียน เพื่อวัดความเข้าใจของผู้เรียน

เนื่องจากการวิจัยนี้ต้องการทราบผลสัมฤทธิ์ของการเรียน จึงออกแบบการทดลองโดยวัดความรู้เป็นแบบหนึ่งกลุ่มทดสอบก่อนและหลังเรียน (1 group pre-test post-test design) โดยกลุ่มตัวอย่างที่ศึกษาใช้กลุ่มผู้สนใจที่เข้าเรียนรายวิชาความรู้เรื่องยาเบื้องต้น ที่เข้าเรียนในปี พ.ศ. 2563 โดยเครื่องมือในการศึกษาเป็นข้อสอบที่ผ่านการตรวจสอบหาค่าดัชนีความสอดคล้อง (Index of Item-Objective Congruence: IOC) และผ่านการทดสอบค่าความเชื่อมั่น (Reliability) ได้ค่าสัมประสิทธิ์แอลฟา เท่ากับ 0.787 สำหรับสถิติที่ใช้ ในการวิเคราะห์ข้อมูล ได้แก่ สถิติเชิงพรรณนา ความถี่ ร้อยละ ค่าเฉลี่ย และส่วนเบี่ยงเบนมาตรฐาน และสถิติเชิงอนุมานที่ใช้เปรียบเทียบความรู้ก่อนและหลังการเรียนของบทเรียนออนไลน์แบบเปิด Thai MOOC รายวิชาความรู้เรื่องยาเบื้องต้น ได้แก่ Dependent t-test

3. การศึกษาความพึงพอใจของผู้เรียนต่อบทเรียน ใช้แบบสอบถามความพึงพอใจหลังเรียน ในระบบ Thai MOOC ซึ่งเป็นแบบสอบถามโดยใช้วิธีมาตรวัด 5 ระดับโดยแบ่งระดับความพึงพอใจ เพื่อแปรผลเป็น 5 ระดับ 4.51-5.00 ระดับมากที่สุด 3.51-4.50 ระดับมาก 2.51-3.50 ระดับปานกลาง 1.51-2.50 ระดับน้อย และ 1.00-1.50 ระดับน้อย เพื่อนำผลการประเมินความพึงพอใจต่อบทเรียนไว้สำหรับการปรับปรุงต่อไป

ผลการวิจัย

การพัฒนาบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบการสอนออนไลน์แบบเปิด Thai MOOC สามารถสรุปผลการวิจัย ตามวัตถุประสงค์การวิจัยได้ดังนี้

1. การดำเนินการเพื่อพัฒนาบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น ได้มีการดำเนินการตามขั้นตอนที่กำหนด โดยใช้รูปแบบ ADDIE Model สามารถเผยแพร่ตามมาตรฐานของการนำบทเรียนเข้าสู่ระบบการสอนออนไลน์แบบเปิด Thai MOOCs (ภาพที่ 1 และ ภาพที่ 2) ซึ่งประกอบด้วยเนื้อหาและรายละเอียด ดังนี้

การปฐมนิเทศรายวิชา ประกอบด้วย การแนะนำโครงการ Thai MOOC แนะนำรายวิชา แบบสำรวจก่อนเรียน กิจกรรมแนะนำตัวก่อนเรียน

แบบทดสอบก่อนเรียน ประกอบด้วย แบบทดสอบก่อนเรียนจำนวน 40 ข้อ กิจกรรมยกตัวอย่างยาที่รู้จัก และรูปแบบของยา

บทที่ 1 ความหมายของยา ประกอบด้วยวิดีโอ 5 คลิป เนื้อหาพระราชบัญญัติยา ประเภทของยา ยาปลอม ยาผิดมาตรฐาน ยาเสื่อมคุณภาพ เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน และกิจกรรมการเรียนรู้บัญญัติยาหลักแห่งชาติ

บทที่ 2 เภสัชจลนศาสตร์ ประกอบด้วยวิดีโอ 7 คลิป เนื้อหาความหมายและกระบวนการเภสัชจลนศาสตร์ เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน และ กิจกรรมอภิปรายสรุปเนื้อหาที่เรียน

บทที่ 3 เภสัชพลศาสตร์ ประกอบด้วยวิดีโอ 4 คลิป เนื้อหา ความหมายของเภสัชพลศาสตร์ ตัวรับและการออกฤทธิ์ของยา เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน และกิจกรรมตอบคำถามเสริมความเข้าใจความแตกต่างของยาที่จับกับตัวรับแล้วออกฤทธิ์ กับต้านฤทธิ์ต่อสารในร่างกาย

บทที่ 4 ปฏิกิริยาระหว่างยา อาการไม่พึงประสงค์จากการใช้ยา ประกอบด้วยวิดีโอ 4 คลิป เรื่องความหมาย และตัวอย่างของปฏิกิริยาระหว่างยาชนิดต่าง ๆ เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน และ กิจกรรมเรียนรู้เกี่ยวกับการแพ้ยา

บทที่ 5 ขนาดยา และการชั่ง ตวง วัด ประกอบด้วยวิดีโอ 4 คลิป เกี่ยวกับขนาดยา การคำนวณขนาดยา และการชั่ง ตวง วัดยา เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน กิจกรรมการเรียนรู้ ฝึกคำนวณขนาดยา

บทที่ 6 การใช้ยาให้ถูกวิธี ประกอบด้วยวิดีโอ 11 คลิป เกี่ยวกับรูปแบบยาเตรียม วิธีทางการให้ยาแบบต่าง ๆ และการใช้ยาให้ถูกวิธี การใช้ยาแบบพิเศษ เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน กิจกรรมการเรียนรู้เกี่ยวกับยาฉีดและยารับประทาน

บทที่ 7 การเก็บรักษา ยา ประกอบด้วยวิดีโอ 3 คลิป เกี่ยวกับการเก็บรักษา ยาในแต่ละรูปแบบ เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน กิจกรรมการเรียนรู้ เกี่ยวกับการเสื่อมของยา

บทที่ 8 การใช้ยาในอาการต่าง ๆ ประกอบด้วยวิดีโอ 4 คลิป เกี่ยวกับการใช้ยาให้เหมาะสมตามอาการต่าง ๆ และการใช้ยาในกลุ่มที่พบบ่อย เอกสารประกอบการสอน แบบทดสอบระหว่างเรียน กิจกรรมการเรียนรู้ยาที่ให้ก่อนและหลังอาหาร

วัดผลประเมินผลความรู้ เป็นแบบทดสอบหลังเรียนจำนวน 40 ข้อ เพื่อวัดผลสัมฤทธิ์ และแบบสำรวจความพึงพอใจหลังเรียน

★ Bookmarks YouTube Maps drive.google.com Daniel | Font & Te... Gmail Google gsuite.moe.go.th โปรแกรมวิเคราะห์สื่อ... Other Bookmarks

Thai MOOC ค้นหาชื่อรายวิชา รายวิชา หน่วยงาน ผู้ให้บริการ วิธีใช้งานระบบ ▼

ความรู้เรื่องยาเบื้องต้น | Introduction to Drug Information
scphpl001
สุขภาพและการแพทย์

ความรู้เรื่องยาเบื้องต้น
Introduction to drug information

คำอธิบายรายวิชา
ความหมายของยา แนวคิดพื้นฐานทางเภสัชวิทยา เภสัชจลนศาสตร์ เภสัชพลศาสตร์ ปฏิสัมพันธ์ของยา อาการไม่พึงประสงค์จากการใช้ยา หลักการพิจารณาข้อห้ามใช้ยาที่ใช้ในอาการสำคัญต่างๆ

พัฒนาวิชาโดย
III สถาบันพระบรมราชชนก

สถาบันพระบรมราชชนก
เปิดลงทะเบียน
15 April 2020
ภาษาที่ใช้สอน
th
ค่าใช้จ่าย
Free
ลักษณะรายวิชา
self-paced

ภาพที่. 1: หน้าเว็บไซต์รายวิชาความรู้เรื่องยาเบื้องต้น ในระบบ Thai MOOC

★ Bookmarks YouTube Maps drive.google.com Daniel | Font & Te... Gmail Google gsuite.moe.go.th โปรแกรมวิเคราะห์สื่อ... Other Bookmarks

การใช้ยาต่าง ๆ ให้ถูกวิธี (ตอนที่ 1)

1 ช้อนโต๊ะ หมายถึง ปริมาตร 15 มิลลิเมตร
ครึ่ง
เราจะสังเกตเห็นภาพนี้บน
ว่าช้อนชาที่เราใช้ที่บ้านขนาดเท่ากับช้อนชาที่โรงพยาบาล
มีขนาดไม่เท่ากันนะครับ ช้อนชาที่โรงพยาบาลหรือ
โหลมาจากยาที่
เราไปซื้อหรือได้มาจากสถานบริการจะมีขนาด 5 มิลลิตร นะ
ครับ มีขนาดไม่เท่ากับช้อน ช้อนชาที่โหลมาจากโรง
พยาบาลคือโหลจากยาที่
เราไปซื้อหรือได้มาจากสถานบริการจะมีขนาด 5 มิลลิตร นะ
ครับ
เรียกว่า 1 ช้อนชา 1 ช้อนโต๊ะ 1 ช้อนโต๊ะ มีปริมาตรอยู่ที่ 15
มิลลิตร นะครับ
ไม่ใช่ช้อนที่เราใช้ที่บ้านในชีวิตประจำวัน เพราะฉะนั้นต้อง
ระวังกันครับ
ในการใช้ยานี้ก็จะใช้วัดกันตรงของอาหารตวงหรือชั่ง
นะครับ
ช้อนตวงช้อนชานะครับ ระวังกัน ให้สอดคล้องกันมีขีด
หรือขีดนี้ เพราะจะทำให้เกิดการผิดเพี้ยนครับ
ในบริเวณที่ช้อนชานหรือช้อนตวงได้ระดับครับ ช้อนตวงอาหารนี้
เมื่อเปิดใช้แล้วระดับน้ำ อาจจะลด ไม่ควรใช้เกิน 1 เดือน

เราไปซื้อหรือได้มาจากสถานบริการจะมีขนาด 5 มิลลิตร นะครับ

Speed 1.0x HD

ภาพที่. 2: หน้าสื่อวิดีโอรายวิชาความรู้เรื่องยาเบื้องต้น ในระบบ Thai MOOC

2. การเปรียบเทียบความรู้ความเข้าใจก่อนและหลังเรียนผ่านบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น จากการประเมินผลการเรียนรู้ในกลุ่มผู้เรียนที่เข้าเรียน และเข้าทำแบบประเมินทั้งก่อนและหลังเรียน จำนวน 972 คน

ผลการศึกษาข้อมูลทั่วไปของผู้ที่เข้าเรียนในบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น (ตารางที่ 1) ส่วนใหญ่เป็นเพศหญิง คิดเป็นร้อยละ 85.60 กลุ่มอายุที่เข้าเรียนมากที่สุดเป็นกลุ่มอายุ 26-40 ปี คิดเป็นร้อยละ 45.27 มีการศึกษาระดับปริญญาตรีมากที่สุดคิดเป็นร้อยละ 63.17 มีสถานะส่วนใหญ่เป็นพนักงานเอกชน ร้อยละ 51.85

ตารางที่ 1. ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

ตัวแปร	ข้อมูล	จำนวน (คน)	ร้อยละ
เพศ	ชาย	140	14.40
	หญิง	832	85.60
อายุ	ต่ำกว่า 13 ปี	6	0.62
	13-18 ปี	146	15.02
	19-25 ปี	294	30.25
	26-40 ปี	440	45.27
	41-60 ปี	85	8.74
	มากกว่า 60 ปีขึ้นไป	1	0.10
ระดับการศึกษา	ต่ำกว่าปริญญาตรี	316	32.51
	ปริญญาตรี	614	63.17
	ปริญญาโท	41	4.22
	ปริญญาเอก	1	0.10
สถานะ	นักเรียน/นักศึกษา	338	34.77
	นักศึกษาบัณฑิตศึกษา	18	1.85
	ครู อาจารย์/บุคลากรทางการศึกษา	52	5.35
	ราชการ/พนักงานของรัฐ/รัฐวิสาหกิจ	34	3.50
	พนักงานเอกชน	504	51.85
	ธุรกิจส่วนตัว	11	1.13
	ว่างงาน	15	1.54
รวม		972	100.00

ผู้วิจัยได้ทำการทดสอบความรู้ความเข้าใจก่อนและหลังเรียน จากผู้เรียนทั้งหมด พบว่าผู้เรียนมีความรู้ก่อนเรียนเฉลี่ยเท่ากับ 28.20 (S.D.=13.48) จากคะแนนเต็ม 40 คะแนน และมีคะแนนความรู้หลังเรียนเฉลี่ยเท่ากับ 38.74 (S.D.=2.99) และจากการทดสอบสมมติฐานด้วยสถิติ Dependent t-test พบว่า ความรู้ความเข้าใจของผู้เรียนก่อนเรียนแตกต่างจากความรู้ความเข้าใจหลังเรียนอย่างมีนัยสำคัญทางสถิติที่ระดับ 0.01 ($t=-25.120$, $p\text{-value}=0.001$) ดังตารางที่ 2

ตารางที่ 2.เปรียบเทียบความรู้ของผู้เรียนก่อนและหลังการเรียนรายวิชาความรู้เรื่องยาเบื้องต้น

ผ่านระบบการสอนออนไลน์แบบเปิด Thai MOOC

ความรู้	n	mean	S.D.	t	p-value
ความรู้ก่อนเรียน	972	28.20	13.48	-25.120	0.001*
ความรู้หลังเรียน	972	38.74	2.99		

3. การศึกษาความพึงพอใจของผู้เรียนต่อบทเรียน

จากการศึกษาความพึงพอใจของผู้เรียนต่อบทเรียนออนไลน์ รายวิชาความรู้เรื่องยาเบื้องต้น (ตารางที่ 3) พบว่า ผู้เรียนมีความพึงพอใจในภาพรวมอยู่ในระดับมาก ค่าเฉลี่ยความพึงพอใจเท่ากับ 4.20 (S.D.=0.79) จากคะแนนเต็ม 5 คะแนน โดยความพึงพอใจด้านเสียงที่ใช้ในสื่อเหมาะสม มีค่าเฉลี่ยความพึงพอใจสูงสุด เท่ากับ 4.28 (S.D.=0.66) รองลงมาคือด้านเนื้อหาที่มีความทันสมัยทันต่อการเปลี่ยนแปลง มีค่าเฉลี่ยความพึงพอใจเท่ากับ เท่ากับ 4.25 (S.D.=0.82) และด้านรูปแบบกิจกรรมแบบทดสอบ เหมาะสม ชัดเจน มีค่าเฉลี่ยความพึงพอใจเท่ากับ เท่ากับ 4.23 (S.D.=0.85)

ตารางที่ 3. ความพึงพอใจของผู้เรียนต่อบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น

หัวข้อ	ค่าเฉลี่ย	SD	การแปลผล
1. เนื้อหาที่มีความทันสมัยทันต่อการเปลี่ยนแปลง	4.25	0.82	ระดับมาก
2. ลำดับเรื่องเข้าใจง่ายชวนติดตาม	4.19	0.84	ระดับมาก
3. รูปแบบการนำเสนอสวยงาม	4.16	0.86	ระดับมาก
4. ตัวอย่าง/กรณีศึกษา เพียงพอ ชัดเจน	4.17	0.85	ระดับมาก
5. รูปแบบกิจกรรม/แบบทดสอบ เหมาะสม ชัดเจน	4.23	0.85	ระดับมาก
6. ภาพคมชัด/กราฟฟิคมี่ขนาดที่เหมาะสม	4.18	0.86	ระดับมาก
7. เสียงที่ใช้ในสื่อเหมาะสม	4.28	0.66	ระดับมาก
ความพึงพอใจในภาพรวม	4.20	0.79	ระดับมาก

สรุปและอภิปรายผล

ผลการวิจัย เรื่องการพัฒนาบทเรียนออนไลน์ รายวิชาความรู้เรื่องยาเบื้องต้น ผ่านระบบการจัดการเรียนการสอนออนไลน์แบบเปิด พบว่า

1. ได้บทเรียนออนไลน์ รายวิชาความรู้เรื่องยาเบื้องต้นที่สามารถใช้เรียนรู้ได้อย่างมีประสิทธิภาพ ตามการออกแบบการเรียนรู้ตามรูปแบบ EDDIE Model เนื่องจากผ่านการตรวจสอบจากผู้เชี่ยวชาญ และผ่านเกณฑ์มาตรฐานของระบบการเรียนการสอนออนไลน์แบบเปิดในระดับประเทศ (Thai MOOC) โดยการออกแบบการเรียนการสอน เนื้อหา กิจกรรมต่าง ๆ รวมถึงคลิปวิดีโอที่มีความชัดเจนทั้งภาพและเสียง ส่งผลให้มีผู้เรียนที่ผ่านการทดสอบตามเกณฑ์การประเมินของรายวิชาเป็นจำนวนมาก และมีความพึงพอใจในการเรียนอยู่ในระดับมาก สอดคล้องกับการวิจัยของอดิศักดิ์ โคตรชุม, 2562 ที่กล่าวว่า การออกแบบ สื่อ ภาพที่สวยงาม ชัดเจน ทำให้เกิดการเรียนรู้ที่ดีและสร้างความพึงพอใจในการเรียนรูปแบบออนไลน์ นอกจากนี้การพัฒนาบทเรียนออนไลน์ตามรูปแบบ ADDIE Model ที่มีการดำเนินการเป็นขั้นตอนยังช่วยให้สามารถวางแผน นำเสนอเนื้อหาที่เหมาะสมกับการเรียนรู้ของผู้เรียน

สอดคล้องกับการวิจัยของ อมีนา ฉายสุวรรณ และชุมพล จันทร์ฉลอง, 2565 ในการพัฒนาสื่อมัลติมีเดียตามรูปแบบ ADDIE Model ผ่านการประเมินของผู้เชี่ยวชาญ ให้ได้เนื้อหาภาพกราฟิก การเคลื่อนไหวรวมทั้งเสียงที่เหมาะสม ทำให้สื่อมีความน่าสนใจ

2. การประเมินผลความรู้ก่อนและหลังการเรียน เพื่อวัดความเข้าใจของผู้เรียน ในบทเรียนออนไลน์รายวิชาความรู้เรื่องยาเบื้องต้น พบว่าผลการประเมินความรู้หลังเรียนสูงกว่าก่อนเรียนอย่างมีนัยสำคัญ ($p < 0.01$) เนื่องจากบทเรียนออนไลน์ที่ถูกพัฒนา มาอย่างเป็นระบบสามารถส่งเสริมการเรียนรู้ได้อย่างมีประสิทธิภาพ ประกอบกับบทเรียนออนไลน์มีสื่อการเรียน และการออกแบบ ประเมินที่สามารถเรียนได้ทุกที่ทุกเวลา สามารถทบทวนได้หลาย ๆ ครั้ง ตามความต้องการของผู้เรียน จึงส่งผลต่อผลการประเมิน ความรู้มีคะแนนสูงขึ้น สอดคล้องกับการวิจัยของ เมธิตา สาไพรวัน และคณะ, 2565 พบว่าการใช้บทเรียนออนไลน์ช่วยให้ผู้เรียน พัฒนาความรู้ได้เป็นอย่างดี เนื่องจากสื่อออนไลน์มีประสิทธิภาพในการส่งเสริมให้ผู้เรียนเกิดความร่วมมือในการเรียนสูงกว่าก่อน เรียน

3. การศึกษาความพึงพอใจของผู้เรียนต่อบทเรียนออนไลน์ที่พัฒนาขึ้นอยู่ในระดับมาก เนื่องจากคุณภาพของบทเรียน ตั้งแต่การออกแบบการเรียนรู้ การกำหนดเนื้อหาที่ชัดเจน การส่งเสริมการเรียนรู้ด้วยกิจกรรมที่หลากหลาย สื่อเนื้อหาต่าง ๆ ที่เป็น วิดีโอจะช่วยให้ส่งเสริมความเข้าใจและจดจำได้ดีกว่าสื่ออื่น สอดคล้องกับการวิจัยของปิยะณัฐ อักษรดี และธีรภรณ์ พลายเล็ก, 2564 ที่ทำการทดลองใช้สื่อวิดีโอในการสอนให้จำคำสนทนาภาษาอังกฤษ ได้ดีจนถึงระดับวิเคราะห์ได้ด้วย นอกจากนี้ระบบการเรียนการสอนออนไลน์ในระบบเปิด (Thai MOOC) เป็นระบบที่เข้าถึงง่าย ผู้เรียนสามารถเรียนรู้ด้วยตนเอง ตามอัธยาศัยของผู้เรียน สอดคล้องกับการวิจัยของธนาธิป มะโนคำ และคณะ, 2565 ที่พบว่าระบบการเรียนการสอนออนไลน์ ช่วยส่งเสริมการเรียนรู้โดยที่ ผู้เรียนไม่ต้องเข้าชั้นเรียนปกติ เป็นรูปแบบการสอนที่มีความสะดวก ทันสมัย การใช้สื่อที่เหมาะสมกับวัยของผู้เรียน จะกระตุ้นให้เกิดความสนใจมากขึ้น

ข้อเสนอแนะในการวิจัยครั้งต่อไป

ควรมีการปรับปรุงเนื้อหาในระบบออนไลน์ เมื่อมีการใช้ไปแล้วระยะเวลาหนึ่ง ให้มีความทันสมัย ประกอบกับการพัฒนา สื่อการสอน และกิจกรรมเพิ่มเติมให้เหมาะสมกับการพัฒนาผลการเรียนรู้ของผู้เรียนต่อไป

กิตติกรรมประกาศ

งานวิจัยนี้สำเร็จลุล่วงไปด้วยดี โดยได้รับความร่วมมือจากทีมงานที่ผลิตสื่อจากคณะครุศาสตร์อุตสาหกรรมและเทคโนโลยี มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี การสนับสนุนจากมหาวิทยาลัยไซเบอร์ไทยที่ได้สนับสนุนทุนการสร้างรายวิชา และ คำแนะนำจากผู้บริหารของวิทยาลัยการสาธารณสุขสิรินธร จังหวัดพิษณุโลก คณะสาธารณสุขศาสตร์และสหเวชศาสตร์ สถาบันพระบรมราชชนก ผู้วิจัยต้องขอขอบคุณผู้เข้าเรียนในรายวิชานี้ทุกท่าน ที่ได้เข้าเรียนและให้ข้อเสนอแนะในการปรับปรุงต่อไป

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ONLINE TEACHING OF MATHEMATICS TO SENIOR HIGH SCHOOL STUDENTS

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ABSTRACT

The purposes of this study were 1) To study teachers' opinions toward online teaching in mathematics at senior high schools. 2) To compare teachers' opinions according to teachers' experience with online teaching in mathematics at senior high school. 3) To compare demographics by teacher's gender and teaching experience in the schools and education system (Public and Private schools). The sample subjects were 400 high school mathematics teachers in Zhejiang Province. Research tools include online teaching activities and questionnaires to measure teachers' Satisfaction with online teaching activities. Statistics for data analysis are percentage, arithmetic mean, standard deviation, t-test dependent, and ANOVA. The findings indicated: 1) Most teachers feel that online courses require more teacher-student interaction and that it is a challenge to keep all students excited to learn. So far, it is difficult for network teaching to completely replace traditional teaching. 2) There is a difference between teachers' work experience of more than five years and that of less than five years, and work experience has a significant impact on online teaching. 3) There are significant differences in the attitudes of teachers in different education systems towards online teaching

Keywords: Online teaching, Mathematics, MOOC, Senior High school

Introduction:

Since the Ministry of Education proposed ending the novel coronavirus pneumonia in January 2020, various provinces and cities have launched their implementation plans to deal with the epidemic. In order to ensure the orderly development of teaching activities during the epidemic period and achieve "non-stop teaching and uninterrupted suspension of classes," online education has become the only choice. Almost all schools, teachers, students, and families have been engaged in the "grand experiment" of the world's most considerable home-based online teaching for over a month.

Compared with traditional teaching and Learning, the advantage of online teaching lies in the flexibility of time and space and the continuity of teaching effect, giving students equal learning opportunities and realizing fragmented Learning. However, online education in colleges and universities during the epidemic has exposed various problems: Teachers do not adapt to online teaching, there is no corresponding courseware, methods, and skills; The combination of teaching platform and teaching method is not good (Li, 2021). Online teaching, especially live teaching, does not provide autonomy and freedom for both teaching parties. The teaching environment is greatly affected by external factors, such as hardware equipment that can not keep up, poor network, Etc., which significantly affect the teaching quality.

In the era of "Internet +," the role of teachers in educational practice is affected by teaching means, teaching contents, teaching environment, teaching, and learning needs, Etc., and can no longer be limited to the traditional education of knowledge explanation and transmission. In the article "Internet + Education," Li Hongliang(2017)It is proposed that teaching should be transformed from the traditional mode of interaction between teachers and students to the emotional reaction among teachers, students, resources, Internet technology, and other multiple elements, and the role of teachers is more significantly presented as developers and designers. Tian Ali(2017) pointed out that teachers should shift from explaining to motivating and dissolving, and the role of teachers in classroom teaching is to guide students around. Wang Ying (2016) believed that in online teaching during the "anti-epidemic" period, teachers should be students' ideological and political mentors, defenders of students' mental health, supervisors of topic area discussions, open classroom learning consultants, learning partners of students and motivators of learning interests.

The widespread use of the Internet in schools and homes has changed how individuals live and learn and has also influenced educators' teaching methods. Then innovation in education followed. The Web-based teaching of Chinese senior high school mathematics teachers discussed in this paper is a teaching mode of inquiry teaching that advances with the times and integrates information technology and inquiry teaching. The difference between mathematics and other disciplines is that it fosters students' thinking and communication skills to improve their mathematical literacy, better form their thinking ability, and promote the Learning of other subjects. Senior high school is the stage of rapid literacy improvement in all aspects. If only proper teaching is adopted, students' comprehensive quality can be improved, so the idea of science education with the simultaneous development of five education can be realized (Song Tingting, 2021).

Therefore, this paper analyzes the advantages and disadvantages of online mathematics teaching and puts forward teachers' views and opinions, aiming at further improving the teaching effect.

Research Objectives

There are three main objectives of this study such as:

1. To study teachers' opinions toward online teaching in mathematics at senior high school.
2. To compare teachers' opinions according to teachers' experience with online teaching in mathematics at senior high school.
3. To compare demographics by teacher's gender and teaching experience in the schools and education system (Public and Private schools)

Research Questions

There are two research questions of this study such as:

1. What are teachers' opinions toward online teaching in mathematics at senior high school?
2. Are there differences between teachers' gender, teaching experiences, and education system?

Literature Review

Online Teaching

Online Learning is a teaching mode based on the network as the medium. Through the network, students and teachers can carry out teaching activities even if they are thousands of miles apart. In addition, with the help of network courseware, students can also learn anytime and anywhere, breaking time and space limitations. Although different teaching contents are placed on the specific online education - this carrier, the experience brought to students will be different. However, some common factors in the process are outside the teaching content. It includes factors such as the opening of online teaching, cursor set, audio and video quality of online teaching, the presentation ability of the lecturer, blackboard writing, the teacher's personal explaining ability, and the student's personality and acceptance ability. (ManYu Hui, 2022)

The flipped Classroom, translated from "inverted classroom," refers to transferring the decision-making power of learning from teachers to students and redistributing the time inside and outside the Classroom (David et al., 2008). In addition, after the outbreak of COVID-19 in 2020, Ding Talk, Tencent Conference, Rain Classroom, And so on .have become the major online education platforms. Among them, Ding Talk is an enterprise-level intelligent mobile office platform built by Alibaba Group and a collaborative office and application development platform in the era of the digital economy. Ding Talk integrates complex information technology means and establishes a communication bridge between extracurricular preview and classroom teaching so that classroom interaction will never go offline. Using online classrooms, teachers can push pre-class preview courseware with video, exercises, and voice to students' mobile phones and communication between teachers and students for timely feedback. Real-time answer and barrage interaction in class provides a perfect solution for teacher-student interaction in traditional classroom teaching. Ding Talk scientifically covers every teaching link before-class-after class, providing complete and three-dimensional data support for teachers and students, personalized reports, and automatic task reminders to clarify teaching and Learning.

Teaching Strategies in Mathematics

Teaching strategies in mathematics are various means teachers use various means in teaching to arouse students' awareness of active Learning, guide students to carry out correct self-evaluation, develop students' main potential, and give full play to students' main role to improve teaching effect.

Based on long-term theoretical research and practical application, R. E. Mayer, an internationally famous educational psychologist, and master of learning science, proposed an integrated learning science application system of "learning teaching evaluation" (Richard et al., 2016). In addition, to make teaching more effective in promoting students' Learning, Marzano and other researchers stressed that "the starting point of teaching is not the teaching of knowledge, but the attention to students' self-system' (composed of attitude, belief, and emotion)." On this basis, Marzano put forward the "thinking system map of teaching," believing that all teaching will generally undergo a sequential transformation process from "self-system" to "metacognitive system" and then to "cognitive system." The "self-system" is the "filter" of the Learning and teaching process. The metacognitive system acts as the "manager" and "coach" in students' learning process, undertakes the monitoring and regulation of the learning process, and the "cognitive system" plays the role of "designer" (Robert et al., 2014).

The Situation of Students and Teachers in Online Teaching

Students' participation is the most direct embodiment of students' subjectivity in classroom education and teaching activities. Students' participation in online teaching can be described in five dimensions: online teaching, learning adaptability, online interaction, supervision and management, and learning experience. Most students hold a positive attitude toward the flexibility of the online teaching method and believe that supervision and management are more precise compared to traditional teaching. They are more interested in this kind of method.

Teacher preparation means that teachers can quickly master the use of online course live broadcasting and playback, online check-in and examination, online interactive discussion, homework, and correction, Etc., so that teachers can quickly master the functions of online teaching, make full use of online teaching platform, realize the transition from offline Classroom to online teaching, and ensure the smooth development of online teaching. According to the different teaching tasks, teachers can scientifically and reasonably use the advantages of online time and space for teaching, which can effectively enhance teaching efficiency.

Senior High School Mathematics

Senior high school is the stage of the rapid development of students' thinking and cognitive abilities. In the study of senior high school mathematics, students should actively participate in thinking activities and thinking training under the guidance of teachers. In the teaching of senior high school mathematics, classroom questioning is an interactive teaching link, which is also an important form to play the guiding and enlightening role of teachers. Therefore, it is necessary to actively optimize the classroom questioning link in the senior high school mathematics teaching process. Through the teaching strategy of inquiry and implementation, teachers are able to enhance the effectiveness of problems and strengthen their influence on guiding students' thinking in order to realize the improvement of the efficiency of teaching senior high school mathematics and the effective development of students' thinking ability (Huang Bo, 2022).

Information technology has become one of the common teaching methods of mathematics in senior high school, which has a very important teaching value. The scientific and reasonable application of information technology in mathematics can fully mobilize students' learning enthusiasm and improve teaching effectiveness. However, the application effect of information technology in teaching mathematics in senior high school is comprehensively influenced by various factors, such as differentiation of students' needs, inertial thinking of traditional teaching mode, and insufficient concern for information technology application (Wei Chunsong, 2021).

Based on the network, online teaching can well improve the flexibility of teaching so that students can taste the freshness of Learning, and it can help to stimulate students' interest in Learning. In teaching mathematics in senior high schools, teachers should do a good job in online teaching related to theory learning, combining students' reality and their own teaching experience to actively seek relevant strategies to improve the efficiency of online teaching (Chen Li, 2021).

Research Framework

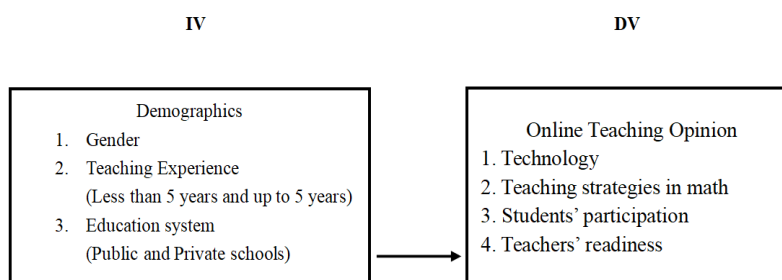


Fig 1. Research Framework

Research Methodology

Population and sample

The target population is 2000 high school teachers in Zhejiang Province. First, the researchers selected 400 in-service math teachers with different work experience and education systems in different high schools in different cities in Zhejiang province.

Data collection

This survey designed a questionnaire by ourselves; then, the researcher started to distribute the questionnaires to the respondents. All the respondents were math teachers in senior high schools in Zhejiang Province. First, use the questionnaire star to design the questionnaire, and then ask these high school mathematics teachers to answer online through WeChat. When all the questionnaires had been collected, the data were entered into a database and computed with the SPSS program.

Data Analysis

Data analysis Statistical methods used to analyze process data are descriptive statistics, percentages, ranges, and analytical statistics. Quantitative data were analyzed from interviews form, and Qualitative data were analyzed by SPSS software. The statistical methods used to analyze the personal data of respondents are frequency and percentage. Frequency, percentage, mean, and standard deviation were used to quantify students' online learning attitudes. The questionnaire was collected for quantitative research, and the frequency, percentage, mean value, and standard deviation were statistically analyzed. Qualitative research and content analysis on the interview content to further answer the research questions. The data obtained from the questionnaire were transformed into descriptive statistics, including means and standard deviation (S.D.). The findings were analyzed based on the five-point Likert scale ranging, from the participants were asked to rate their degree of agreement on each statement - from number 1-5. The interpretation of each number is described as follows: 5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree, 1 = strongly disagree.

Findings

The data were collected from 400 high school teachers in Zhejiang Province, and the data results are summarized in Table 1.

Table 1. Demographics of participants

Gender, Teaching Experience, and education system			(n = 400)
Item	Type	Frequency	Percentage
Gender	Male	158	39.5%
	Female	242	60.5%
Work experiences	Less than or equal to Five years	246	61.5%
	over five years	154	38.5%
Education system	Public school	157	39.25%
	Private school	243	60.75%

RQ 1.1: Teachers' opinions toward online teaching

Table 2. Feedback on technology

Items	\bar{x}	S.D.	Level of Agreement
1. High school mathematics online teaching technology is now good.	4.018	0.796	Agree
2. DingTalk fits you.	4.465	0.670	Strongly Agree
3. DingTalk is more suitable for high school mathematics teaching than MOOC.	4.198	0.800	Strongly Agree
4. MOOC is an excellent, intelligent online teaching resource platform.	3.8	0.613	Agree
5. DingTalk provides a good open forum, interactive, and sharing platform for high school mathematics online teaching.	3.915	0.970	Strongly Agree
6. Technology can realize the teaching effect through the collection and analysis of big data.	3.903	0.944	Agree
7. DingTalk and intelligent learning networks, and other online education resources can be used together to have more teaching effects.	3.773	1.041	Agree
8. DingTalk is the most suitable online teaching platform for high school mathematics teaching among all technologies.	3.893	1.076	Strongly Agree
9. High school mathematics network teaching platform has richer teaching resources than offline teaching.	4.073	1.015	Strongly Agree
10. Technology is a favorable auxiliary tool for high school mathematics teaching.	4.05	1.034	Strongly Agree

According to the data in the table, teachers' Satisfaction with online teaching can be known. Question 2 "Dingding suits you." The highest score was 4.465. Question 3. "Pegging is better for high school math teaching than MOOCs." (Average score: 4.198). So the vast majority of teachers think Dingpin is better than Moocs and better for online teaching—question 10. "Technology is a helpful aid to mathematics teaching in high school." (Average score: 4.05). This reflects the fact that most teachers think technology is helpful for online teaching. However, for question 4, "MOOCs are an excellent platform for intelligent online teaching resources." "When used together with online educational resources such as Smart Learning Network, Nail Nail can produce more teaching effects" (3.8 average scores). (Average score: 3.773). Question 8 "Dingding is the most suitable online teaching platform for high school mathematics teaching among all the technologies." (Average score: 3.893). The teachers' recognition of these three problems is relatively low. They feel there are better platforms for teaching high school math than MOOCs.

RQ 1.2: Analysis of Teaching Strategies in Mathematics

Table 3. Feedback on teaching strategies

Items	\bar{x}	S.D.	Level of Agreement
1. High school mathematics teachers' online teaching can optimize the teaching content according to the specific learning status of students.	3.825	1.023	Strongly Agree
2. In online teaching, teachers use a large number of complex images to help students understand better.	4.6	0.490	Strongly Agree
3. High school mathematics teachers' online teaching can focus on explaining, answering individual questions, and teaching students in accordance with their aptitude.	3	1.567	Strongly disagree
4. High school mathematics teachers' online teaching improves the interaction between teachers and students and enlivens the classroom atmosphere of higher mathematics.	1.8	0.715	Strongly disagree
5. Combine pictures, videos, and audio together to give students a new feeling and increase interest and novelty.	3.915	0.970	Strongly Agree
6. Teachers use richer interactive means than in offline classrooms, and carrying out teaching and learning interaction can better attract students' attention.	2.213	1.149	Strongly disagree
7. Through the discussion section of the online course, teachers can let students participate in the discussion to investigate students' learning behavior, which can increase students' participation in Learning.	2.925	1.341	Agree
8. Complete the short and concise online course task point test questions within a limited time, which can investigate the effectiveness of students' mastery of task knowledge points.	3.835	1.175	Strongly Agree
9. With the help of learning links, mutual assessment of homework can promote students' mutual Learning and check the learning effect.	1.932	0.990	Strongly disagree
10. The video interaction in the live broadcast can not only stimulate students' interest in Learning but also better grasp students' online learning behavior.	4.69	0.463	Strongly disagree
11. Teachers can interact with students in real-time by asking voice and connecting wheat and video connection so as to master students' learning dynamics in time.	4.59	0.492	Strongly Agree
12. Teachers can improve students' participation in online classrooms and increase the interactivity, interest, and	4.7	0.459	Strongly disagree

Items	\bar{x}	S.D.	Level of Agreement
diversity of the teaching process through group video conferences and sending bullet screens.			
13. High school mathematics teachers timely answer the questions raised by students through online teaching, which is more convenient for students to master knowledge points.	1.85	0.358	Strongly disagree
14. Teachers set up online discussion groups and set aside ten minutes in each online course for students to discuss the same problem and expand students thinking.	4.69	0.463	Strongly Agree

Question 14 can be drawn from the table "Teachers set up online discussion groups and set aside 10 minutes for students to discuss the same issue in each online course to expand students' thinking". The average score was 4.69. Teachers believe that online teaching can stimulate students' interest in Learning. Question 12: "Teachers can improve students' participation in online classes by means of group video conferencing and sending bullet screens and increase the interactive, interesting, and diverse teaching process." (Average score 4.7). Teachers believe that some teaching interactions are more conducive to stimulating students' interest in Learning

Question 4: "High school mathematics teachers' online teaching promotes teacher-student interaction and enlivens the classroom atmosphere of higher mathematics" (average score 1.8). Question 13. "High school math teachers answer students' questions in a timely manner through online teaching, making it easier for students to master knowledge points." (The average score is 1.85). Question 9. With the help of the learning block, the mutual evaluation of assignments can promote students' mutual Learning and check the learning effect. (Average score 1.933). Teachers' awareness of these three problems is relatively low, and they all think that network teaching can improve students' autonomous learning ability with a relatively low

RQ 1.3: Analysis of students' participation

Table 4. The feedback on students' participation

Items	\bar{x}	S.D.	Level of Agreement
1. High school mathematics teachers' online teaching can optimize the teaching content according to the specific learning status of students.	3.825	1.023	Strongly Agree
2. In online teaching, teachers use a large number of complex images to help students understand better.	4.6	0.490	Strongly Agree
3. High school mathematics teachers' online teaching can focus on explaining, answering individual questions, and teaching students in accordance with their aptitude.	3	1.567	Strongly disagree
4. High school mathematics teachers' online teaching improves the interaction between teachers and students and enlivens the classroom atmosphere of higher mathematics.	1.8	0.715	Strongly disagree

Items	\bar{x}	S.D.	Level of Agreement
5. Combine pictures, videos, and audio together to give students a new feeling and increase interest and novelty.	3.915	0.970	Strongly Agree
6. Teachers use richer interactive means than in offline classrooms, and carrying out teaching and learning interaction can better attract students' attention.	2.213	1.149	Strongly disagree
7. Through the discussion section of the online course, teachers can let students participate in the discussion to investigate students' learning behavior, which can increase students' participation in Learning.	2.925	1.341	Agree
8. Complete the short and concise online course task point test questions within a limited time, which can investigate the effectiveness of students' mastery of task knowledge points.	3.835	1.175	Strongly Agree
9. With the help of learning links, mutual assessment of homework can promote students' mutual Learning and check the learning effect.	1.932	0.990	Strongly disagree
10. The video interaction in the live broadcast can not only stimulate students' interest in Learning but also better grasp students' online learning behavior.	4.69	0.463	Strongly disagree
11. Teachers can interact with students in real-time by asking voice and connecting wheat and video connection so as to master students' learning dynamics in time.	4.59	0.492	Strongly Agree
12. Teachers can improve students' participation in online classrooms and increase the interactivity, interest, and diversity of the teaching process through group video conferences and sending bullet screens.	4.7	0.459	Strongly disagree
13. High school mathematics teachers timely answer the questions raised by students through online teaching, which is more convenient for students to master knowledge points.	1.85	0.358	Strongly disagree
14. Teachers set up online discussion groups and set aside ten minutes in each online course for students to discuss the same problem and expand students thinking.	4.69	0.463	Strongly Agree

It can be concluded from the table that "online teaching can better cultivate and exercise students' spirit of exploration and innovation." (The average score is 4.6). Question 4 "New multimedia technology teaching based on network teaching platform can stimulate students' thirst for knowledge to a large extent." (The average score was 4.65). Question 6 "Online teaching changes students' view of learning mathematics and promotes learning." (Average score: 4.625). Teachers believe that network teaching can change the learning concept of learning mathematics and stimulate students' thirst for knowledge

Participants responded to question 1, "The novel teaching environment brought by online teaching is more conducive to students' math learning." (Average score: 1.325). Online teaching is very effective in improving students' self-discipline and efficiency in learning mathematics. (The average score is 1.3). The third is question 9, "Online teaching is more conducive to students to translate teachers' teaching objectives into their own learning objectives as soon as possible." (Average score: 1.525). There is very little consensus on these three issues. They do not agree that online teaching can improve students' learning efficiency. Online teaching can not improve students' self-discipline, and the online teaching environment is not more favorable to mathematics Learning than the original teaching environment

RQ 1.4 :Analysis of Teachers' Readiness

Table 5. The Feedback on Teachers' Readiness

1. The novel teaching and learning environment brought by online teaching is more conducive to students' learning mathematics.	1.325	0.469	Strongly disagree
2. Online teaching can better cultivate and exercise students' exploration and innovation spirit.	4.6	0.491	Strongly Agree
3. Online teaching can improve students' interest in Learning.	2.4	1.448	Strongly disagree
4. The new multimedia technology teaching with online teaching platforms as the medium can stimulate students' desire for knowledge to a great extent.	4.465	0.499	Agree
5. Through online teaching, students have a good grasp of the key contents in the process of mathematics learning in senior high school.	3.915	0.967	Strongly Agree
6. Online teaching has changed students' learning view of learning mathematics and promoted Learning.	4.625	0.557	Strongly disagree
7. Online teaching realizes personalized Learning in class mathematics teaching situations.	2.925	1.341	Agree
8. Online teaching promotes the comprehensive and personalized development of students.	3.835	1.175	Strongly Agree
9. Online teaching is more conducive for students to transform teachers' teaching objectives into their own learning objectives as soon as possible.	1.525	0.5	Strongly Disagree
10. Online teaching is very effective in improving students' self-discipline and efficiency in learning mathematics.	1.3	0.459	Strongly Disagree

The three questions participants were most satisfied with. Question 1 "High school mathematics teachers quickly grasp the use of network teaching platform, can better teaching." Question 2: "Teachers should fully

The three questions participants were most satisfied with. Question 1 "High school mathematics teachers quickly grasp the use of network teaching platform, can better teaching." Question 2: "Teachers should fully understand the online education course platform, be familiar with the characteristics and scope of application of

online courses, and better apply it to teaching." Question 6. "Teachers choose and refine teaching content in class so as to arouse students' enthusiasm for learning and attract their attention." The scores were 4.73, 4.64, and 4.625, respectively. Teachers believed that they could quickly master online teaching and make full use of more resources and materials on the network to improve students' learning enthusiasm and attract students' interest in Learning.

The participants were the least satisfied with the three questions. Question 7: "Teachers should incorporate students' learning effect into the design of teaching content, evaluate students' learning effect in time, and establish a feedback relationship among purpose, action, and effect." (Average score: 4.213). The second is question 8: "The teacher elaborately makes PPT and other teaching courseware to explain in class and share with students." (Average score: 4.285). Among them, the ninth question, "from the actual needs of students, carefully designed and put enough energy into teaching, in-depth analysis of the hot topics of this subject." Teachers had the lowest level of agreement (average score: 1.525). Teachers think that online teaching can not be well based on the reality of students.

RQ2: Whether has any differences in teachers' opinions on online teaching

At last, the study will show whether teachers with different teaching experiences have different opinions on online Learning. Among them, Q1-Q3 is the problem existing in the preparation process before teaching, Q4-Q6 is the understanding of the situation in teaching, Q7-Q10 is the understanding of the handling of problems after class, and Q11-Q13 is the teachers' views on online mathematics teaching. It can be seen from the interview that teachers make full preparations before class. For example, teachers should understand the learning situation of students, understand the foundation of students' classroom teaching design, choose teaching-related content, carefully plan how to import, how to display knowledge, knowledge expansion, and knowledge consolidation, each link about the use of time for the teacher to estimate. The difficult problems encountered during the course preparation process should also be anticipated.

Based on different teaching experiences, the differences in teachers' views on online teaching are discussed in Table 6.

Table 6. A comparison of different work experiences.

Group Statistics									
DV	IV	N	X	S	Levene's test		t	df	Sig.
					F	Sig.			
Technology	up to 5 years	154	4.79	.29	50.15	.000	-4.29	398	.000
	Less than five years	246	4.90	.21			-4.00	255.40	.000

Teaching strategies in math	up to 5 years	154	3.85	0.85	253.26	.000	-14.88	398	.000
	Less than five years	246	4.76	.35			-12.60	185.30	.000
Students' participation	up to 5 years	154	3.97	.82	234.66	.000	-13.69	398	.000
	Less than five years	246	4.80	.38			-11.77	193.84	.000
Teachers' readiness	up to 5 years	154	4.52	.47	168.24	.000	-12.11	398	.000
	Less than five years	246	4.91	.15			-10.02	173.00	.000

Through the statistical analysis, it can be seen that in the online teaching test of work experience, there are statistical differences between work experience of more than five years and work experience of fewer than five years in teaching strategy, technology, student participation, teacher preparation, the P value is 0.00, Sig>.05. Therefore, the results show that work experience has a significant impact on online teaching.

The differences in teachers' views on online teaching based on gender are discussed in Table 7.

Table 7 Contrast between the sexes

Group Statistics									
DV	IV	N	X	S	Levene's test		t	df	Sig.
					F	Sig.			
Technology	Female	242	3.60	.82	143.13	.000	-21.67	397	.000
	Male	158	4.86	.31			-18.51	187.02	.000
Teaching strategies in math	Female	242	4.47	.45	30.29	.000	-6.06	397	.000
	Male	158	4.70	.33			-5.70	268.26	.000
Students' participation	Female	242	4.56	.29	115.25	.000	-17.54	397	.000
	Male	158	4.93	.12			-15.19	195.93	.000

Teachers' readiness	Female	242	4.42	.55	125.85	.000	-11.73	397	.000
	Male	158	4.88	.22			-10.06	189.26	.000

Through the statistical analysis, it can be seen that in the online teaching test of work experience, there are statistical differences between men and women in teaching strategy, technology, student participation, and teacher preparation, and the P value is 0.00, Sig>.05. Therefore, the results show that work experience has a significant impact on online teaching.

The differences in teachers' views on online teaching based on different education systems are discussed in Table 8.

Table 8. Education system (Public and Private schools)

Group Statistics									
DV	IV	N	X	S	Levene's test		t	df	Sig.
					F	Sig.			
Technology	Public schools	157	3.61	.82	132.73	.000	-21.21	396	.000
	Private schools	243	4.86	.33			-18.18	189.00	.000
Teaching strategies in math	Public schools	157	4.44	.47	30.24	.000	-6.18	396	.000
	Private schools	243	4.69	.348			-5.81	266.05	.000
Students' participation	Public schools	157	4.55	.32	157.67	.000	-17.04	396	.000
	Private schools	243	4.94	.12			-14.52	185.46	.000
Teachers' readiness	Public schools	157	4.41	.55	126.22	.000	-11.82	396	.000
	Private schools	243	4.88	.22			-10.11	187.89	.000

Through the statistical analysis, it can be seen that there are statistical differences in teaching strategies, techniques, student participation, teacher preparation, and other aspects between public and private online teaching tests, with a P value of 0.00 and Sig>.05. Therefore, the research results show that the public and private sectors have a significant impact on online teaching.

Discussion

1. Under the background of the development of Chinese curriculum reform, online teaching can realize the

2. personalized development of students by constructing an open, shared, and harmonious teaching environment. With the help of the online course platform, teachers release teaching materials and learning tasks in advance to become the provider of course resources and the guide of Learning. Students can use teachers' resources to study independently, or they can collect resources on the Internet according to the learning tasks published by teachers. Either way, Learning becomes an active and autonomous activity for students. Teachers' ability to improve online teaching and flexible teaching will help to promote the transformation of teaching methods so that students become master of Learning. (Zhong Suwan., 2022).

2. Online teaching teachers, like students, need to quickly and skillfully master the use of online platforms, which is very crucial. The difficulty of teachers in designing teaching activities determines students' classroom participation (Li Pin., 2021). In spite of the advantages of online teaching, students' self-control is greatly tested during online teaching. At present, online teaching is only an effective supplement to traditional education. The combination of online education and offline education is the future development direction. (Fan Xuncheng, 2021) Compared with face-to-face classroom teaching, the advantage of online teaching is that it can break through the limitation of time and space and realize the sharing of high-quality resources. The disadvantage is that interaction and supervision are difficult to ensure the quality of teaching. The advantages of online interaction cannot be replaced by offline interaction. For example, they are breaking the limitation of time and space, convenient text communication, recording, and playback. Education has its own inherent nature and laws, which will not be changed by the development of technology. They defend the dignity of human nature, oppose the distortion and alienation of human nature by technology, and insist that all activities should be people-oriented. The goal of online teaching has never been to replace the Classroom but to surpass the Classroom and adapt to the needs of The Times. (Wang Zhuli., 2020).

3. Through the correlation analysis and difference analysis of the data, the research results show that the obstacles to online teaching of higher vocational teachers are sorted as follows: teaching interaction, psychological cognition, evaluation mechanism, policy support, ability and literacy, technical support, emotional attitude, quality management; Quality management and teaching interaction positively influence perceived usefulness. Teaching resources, teaching platforms, and social presence have no significant influence on perceived usefulness. Evaluation mechanisms, technical support, and policy support all positively affect perceived ease of use; Psychological recognition, emotional attitude, and ability literacy all positively affect perceived ease of use. There are significant differences in online teaching barriers among vocational teachers of different genders, different teaching years, and different experiences. (Britain-based authority. 2021), The results show that there is a significant difference between female teachers and male teachers in information technology behavior intention (Xu Jiang. Lin 2021).

Conclusion

Based on the current situation of online Learning in China and the research status of online teaching of teachers in Zhejiang Province. Through the study of the online teaching of 400 online teachers and the data analysis of their questionnaires. Give their opinions on online teaching. The following conclusions can be drawn from sitting through this study.

1. As can be seen from the results of the questionnaire survey, most teachers believe that online Classroom lacks teacher-student interaction, and it is difficult to maintain the enthusiasm of all students in Learning. It cannot timely answer the questions of current students, which means that online teaching also needs super new teaching methods. However, the ability to record lessons for students to watch over and over again after class is accepted by most teachers.

2. Online courses fail to hold students' attention. Students will worry and easily distracted; serious cases have to avoid learning and learning rejection. Some students prefer to be guided by teachers personally, and the learning tasks with low-value online book resources are not so encouraging

3. In order to better adapt to online teaching, teachers and students need to think about the comprehensive and multi-angle improvement path of online teaching of different courses from their own perspective so as to better improve the corresponding courses and promote the differentiated development and targeted improvement of online teaching. Improve teaching quality teaching. Online Learning has yet to be quite mature, but it will be there in the future.

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ENHANCING TEACHER TRAINING THROUGH VIRTUAL REALITY: UNDERSTANDING OF STUDENTS WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

This research aims to enhance teacher training and support for students with autism spectrum disorder through the use of Virtual Reality (VR) technology, while also investigating the impact of VR on future VR MOOCs creation. The VR training program is designed for teachers at Guangxi College for Preschool Education in China, based on Applied Behavior Analysis (ABA), an evidence-based therapeutic approach for individuals with ASD. The paper outlines the key components of this VR training program. To achieve this objective, a collaborative approach was adopted, forming a working team of eight experts comprising individuals with expertise in VR technology, ASD, and ABA. The team included three specialized lecturers with extensive experience in training special education teachers, ABA, and child rehabilitation. Collaborative efforts were conducted from March to November 2022. The outcome of this collaboration is a comprehensive VR training program that emphasizes authentic and immersive simulations to replicate real-world interactions with students on the autism spectrum. The program includes ten innovative tasks, addressing gaps in traditional teacher training and enabling teachers to practice ABA techniques in a safe environment. Through these simulations, teachers gain valuable insights into the behavioral patterns and communication styles of students with ASD, fostering empathy and informed instructional strategies. By leveraging VR technology and ABA principles, educators enhance their abilities to understand and cater to the unique needs of students with ASD, ultimately creating an inclusive and enriching learning environment. The research findings hold important implications for enhancing educational practices to aid teachers in comprehending individuals with ASD, and they will also contribute positively to the future creation and advancement of VR MOOCs.

KEYWORDS

Applied Behavior Analysis, Autism Spectrum Disorder, Inclusive Education, Special Education, Virtual Reality, Online Learning, Social Change, MOOC.

1. INTRODUCTION

Effective support for students with Autism Spectrum Disorder (ASD) demands that teachers cultivate empathy and understanding of their unique needs. Achieving this goal faces challenges arising from limited exposure to ASD, misconceptions, and communication barriers. Traditional teacher training methods may not adequately prepare educators to grasp the diverse challenges faced by students with ASD. To address this, innovative approaches like Virtual Reality (VR) simulations hold promise in providing a more immersive understanding of ASD (Dixon et al., 2020). This research carries significant ethical importance as it seeks to enhance the training of teachers in

understanding ASD, while also bridging the scarcity of VR-based training solutions, thereby fostering inclusive education for all students, including those with ASD. The VR training program aims to immerse teachers in authentic virtual experiences, simulating real-world interactions with students on the autism spectrum. By doing so, teachers gain invaluable insights into the behavioral patterns and communication styles of individuals with ASD, thereby enhancing their empathy and informing effective instructional strategies. Applied Behavior Analysis (ABA) emerges as an evidence-based therapeutic methodology that focuses on understanding behavior and implementing targeted interventions to bring about positive changes in individuals with autism and other developmental disorders. Grounded in the principles of learning theory, ABA employs systematic analysis of behavior to identify influential variables. By breaking down complex behaviors into manageable components, ABA utilizes positive reinforcement, prompting, and shaping techniques to teach and reinforce desired behaviors while simultaneously reducing challenging ones. The individualized nature of ABA programs allows for the targeting of specific skills, ranging from communication and social interactions to academic and daily living abilities. The VR training program draws its foundation from ABA, recognizing it as the mainstream therapy for autism rehabilitation education (Wong et al., 2021). For special education students, mastering ABA is vital, as it helps design real behavior feedback of autistic child models in corresponding situations, facilitating practical training within the ABA course. MOOCs' convenience, independence, and impact drive scholars to prefer online learning, while integrating virtual reality into ABA classroom teaching offers a foundational guide for combining VR with MOOCs to advance ABA VR education (Hafshejani et al., n.d.).

Research Objective

This research article introduces a VR training program for teachers at Guangxi College for Preschool Education, China, rooted in ABA, an evidence-based approach for ASD individuals, to enhance understanding, support, and assess VR's effect on ABA online course development.

2. LITERATURE REVIEW

ASD is a multifaceted neurodevelopmental condition that significantly impacts individuals' social communication, behavior, and sensory processing. The hallmark features of ASD include difficulties with social interaction, inflexible behaviors, and restricted interests (Schreibman et al., 2015). The prevalence of autism in children is soaring, and the core symptoms persist throughout life, seriously affecting human progress and the achievement of the Sustainable Development Goals (United Nations, 2021). According to the Centers for Disease Control and Prevention (CDC), the prevalence of autism among 8-year-olds in 2020 was 1 in 36, indicating that approximately 2.76 percent of children in the United States will be diagnosed with an autism spectrum disorder (Maenner et al., 2023). The key to solve this problem is to train a large number of high quality autism rehabilitation teachers. ABA is an internationally recognized mainstream intervention for autism rehabilitation. At present, a number of studies have reported that ABA has achieved good intervention effects in autism education and rehabilitation (Eckes et al., 2023). Therefore, it has a certain prospect to cultivate the ABA practical skills of teachers of autistic children through VR technology.

VR technology has been widely used in the field of rehabilitation education for autistic children (Morozov et al., 2023), and a number of studies have shown that the intervention of VR can help improve the social and communication abilities of autistic children (Abu-Amara et al., 2021). However, the use of VR technology to train special education teachers to promote their understanding and intervention of autistic children is still in the blank stage. Because there are some ethical problems in the direct use of autistic children in experimental teaching, it is not conducive to the ability training of autistic children rehabilitation teachers, nor can they truly understand the behavioral characteristics of autistic children. VR technology can highly restore the real class situation and the model of autistic children, which can make up for this defect to a large extent and is conducive to the training of autistic children rehabilitation teachers. The ABA virtual practice teaching network is the future of education, combining VR

technology with MOOCs (Kim et al., 2019). Scholars are exploring this integration in various fields, such as using VR content for chemical experiments and tracking student learning and interactions. Qian Huang's study analyzed VR's impact on cognitive psychology and thinking optimization in solfeggio ear training through a comparison with traditional teaching in MOOCs (Huang, 2021).

3. RESEARCH METHODOLOGY

The research methodology employed in this study involves a collaborative approach, bringing together a group of eight experts who specialize in training teachers, along with an expert in VR technology, each of whom has more than five years of experience. Moreover, this working group including three of the lecturers who are specialized in special education, ABA, and child rehabilitation at Guangxi College for Preschool Education, China. The methodology focuses on developing a comprehensive VR training program that enhances teacher understanding and support for students with ASD. The primary focus of the methodology is to conduct VR Simulation Creation. Leveraging the expertise of the VR technology expert, realistic virtual simulations are created to emulate real-world interactions between teachers and students with ASD. These simulations aim to provide an immersive learning experience, enabling teachers to gain valuable insights into the unique needs of individuals with ASD. The development of the virtual training system was successfully completed in November 2022, and it will be officially used in teaching in March 2023. Since the establishment of the VR Research Group in March 2022, members of the Research and Development team have held online development discussions once every two weeks, with a total of more than 10 discussions as of November 2022. The successful establishment of virtual training system is inseparable from the joint efforts of team members. The following steps are involved in the research methodology:

3.1 Collaborative Development: Experts and lecturers work together with the VR technology expert to design the training program, ensuring it caters to the needs of students with ASD.

3.2 VR System Components: "Classroom Training" VR software and HTC Cosmos hardware are chosen for the program.

3.3 Mockup Pages: The team creates mockups of tasks and scenarios with descriptions, offering a clear understanding of the training program's structure.

4. THE VIRTUAL REALITY FOR TEACHER TRAINING

The research result demonstrates that the VR training program comprises ten innovative tasks, which serve as a transformative tool to bridge gaps in teacher training. Notably, it showcases the program's ability to create authentic and immersive simulations replicating classroom interactions with students on the autism spectrum. Experts and lecturers in special education unanimously agree on the suitability of VR as a technology for ABA training. The benefits of VR in ABA training include:

1. Realistic Simulations: VR offers lifelike scenarios, enabling teachers to practice ABA skills with virtual students displaying various behaviors, fostering a safe and controlled learning environment.

2. Immersive Learning: The immersive nature of VR enhances engagement and knowledge retention, preparing teachers effectively for real-life ABA implementation.

3. Repeated Practice: VR facilitates repetitive practice of ABA techniques, enabling skill refinement without the need for real-world interactions.

4. Individualized Training: Customizable VR applications cater to specific learning needs, allowing teachers to focus on targeted ABA techniques and ASD intervention areas.

5. Feedback and Assessment: VR platforms provide immediate feedback, aiding teachers in identifying areas for improvement and monitoring their progress over time.




6. Overcoming Barriers: VR overcomes logistical challenges, particularly for teachers in remote areas or with limited access to individuals with ASD.






Preparation Stage are as follows:



- Set up computer-based workstations (Windows system) with VR headsets and controllers for the training program.
- Create a user login interface with credentials entry and a login button.
- Display VR glasses with modules and operation instructions for selection using the controller.
- Provide clear instructions on using the VR controller effectively for the training program.

The VR task flow is demonstrated in the following table.

Table 1. Virtual Reality Task Flow of Autism Spectrum Disorder Behavior based on Applied Behavior Analysis

Tasks	Steps and objectives for the user to complete	Screen capture figures
1. Motivation & Requirement Training	<ul style="list-style-type: none"> - User selects the "Motivation + Requirement training" task and clicks start. - The user enters a training scene where they face a blackboard and receive task requirements through scene prompts and dialogue boxes. - The user follows the prompts to complete the task, such as placing toys on a desk and interacting with virtual characters. 	
2. Imitation Speaking Training	<ul style="list-style-type: none"> - User selects the "Imitation speaking training" task and clicks start. - The user interacts with virtual characters and performs tasks related to imitation speaking. - They receive prompts and feedback based on their pronunciation and responses. - The task ends with a congratulatory message upon successful completion. 	
3. Naming Training	<ul style="list-style-type: none"> - User selects the "Naming Training" task and clicks start. - The user engages in activities involving object identification and naming. - They receive prompts and feedback to correctly identify and name objects. - The task ends with a congratulatory message upon successful completion. 	

4. Movement Imitation Training	<ul style="list-style-type: none"> - User selects the "Motion Imitation Training" task and clicks start. - The user follows instructions to imitate specific movements or actions. - They receive prompts and feedback to improve their imitation skills. - The task ends with a congratulatory message upon successful completion. 	
5. Visual Perception Matching Training	<ul style="list-style-type: none"> - User selects the "Visual perception matching Training" task and clicks start. - The user engages in activities related to visual perception and matching objects. - They receive prompts and feedback to correctly match objects based on visual cues. - The task ends with a congratulatory message upon successful completion. 	
6. Reception Instruction Training	<ul style="list-style-type: none"> - User selects the "Receptive Instruction Training" task and clicks start. - The user follows voice commands and visual prompts to perform specific actions. - They receive prompts and feedback to successfully execute the instructed tasks. - The task ends with a congratulatory message upon successful completion. 	
7. Receive Naming Training	<ul style="list-style-type: none"> - User selects the "Receive Name Training" task and clicks start. - The user follows prompts to understand and respond appropriately to instructions. - They receive prompts and feedback to correctly respond to naming tasks. - The task ends with a congratulatory message upon successful completion. 	
8. Complex Listener Identification Training	<ul style="list-style-type: none"> - User selects the "Complex Listener Identification Training" task and clicks start. - The user engages in activities related to listening comprehension and question answering. - They receive prompts and feedback to correctly answer questions based on auditory cues. - The task ends with a congratulatory message upon successful completion. 	

9. Interactive Language Training	<ul style="list-style-type: none"> - User selects the “Interactive Language Training” task and clicks start. - The user engages in interactive conversations with virtual characters. - They receive prompts and feedback to respond appropriately to dialogue and questions. - The task ends with a congratulatory message upon successful completion. 	
10. Examination Process	<ul style="list-style-type: none"> - The user selects the “exam module”. - The available test tasks are displayed based on the user's class and test content. - During the exam, if the user loses two points in any score point, they are considered to have failed the exam and will automatically exit the exam. 	

5. CONCLUSION AND RECOMMENDATIONS

In conclusion, the outlined VR training program for teachers at Guangxi College for Preschool Education holds tremendous promise in enhancing teacher understanding, empathy, and support for students with ASD. By immersing educators in virtual experiences, VR offers a unique opportunity for teachers to gain a deeper understanding of the challenges faced by students with ASD. This fosters a more compassionate and supportive approach to education, ultimately promoting inclusive learning environments.

Utilizing the data collected from VR scenarios, teachers can create personalized Individualized Learning Plans tailored to the unique needs and strengths of each student with ASD. This data-driven approach allows for more effective and targeted support, optimizing the learning experience for students with ASD. Moreover, incorporating real-time feedback and self-reflection through VR-based training can significantly enhance teacher development. By analyzing their interactions and responses in virtual simulations, educators can identify areas for improvement and refine their teaching strategies to better support students with ASD. Additionally, promoting collaborative learning with VR platforms can provide a valuable space for teachers to share experiences and strategies for supporting students with ASD effectively. This collaborative approach encourages knowledge-sharing and fosters a supportive community of educators committed to inclusive education.

Overall, the integration of VR technology in teacher training presents a powerful tool for transforming education and improving the understanding and support of students with ASD. By empowering educators with immersive experiences and data-driven insights, the VR training program at Guangxi College for Preschool Education has the potential to create a positive and nurturing learning environment that benefits all students in the classroom. The innovative application of VR technology in classroom teaching also provides more possibilities and references for the construction of VR MOOCs.

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Revitalizing Critical Thinking in English Essay Writing: Chatbot-Enabled Cognitive Offload Instruction Approach

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ABSTRACT.

This research is an exploratory study that aims to present a chatbot-enabled cognitive offload instruction approach to revitalize students' critical thinking in English essay writing. The literature review provides a comprehensive understanding of the cognitive offload theory, its application to English essay writing instruction, and the role of chatbots in facilitating cognitive offload to enhance students' critical thinking. The paper presents in detail the chatbot-enabled cognitive offload instruction approach, outlining its learning objectives, instructional strategies, lesson structure, and assessment methods. Finally, this paper explores the application of this approach in online learning environments, highlighting its positive impact on social change, and contextualized this approach within the growing trend of Massive Open Online Courses (MOOCs).

KEYWORDS

cognitive offload instruction, chatbot-enabled, critical thinking, English essay writing

1. INTRODUCTION

In today's fast-paced and interconnected world, the demand to possess strong critical thinking skills and effective communication abilities has become increasingly vital. Critical thinking empowers individuals to analyze information, evaluate arguments, and make informed decisions (Conway, 2022). Among various academic domains, English essay writing stands as an area where honing critical thinking skills is of utmost importance. Consequently, enhancing critical thinking skills in English essay writing has emerged as a crucial research problem in the field of education.

However, educators are confronted with the challenge of devising effective instructional strategies to enhance critical thinking skills in English essay writing. The integration of chatbot into the instructional process offers

unique opportunities for personalized feedback, interactive learning experiences, and individualized guidance, which can stimulate students' critical thinking abilities and enhance their overall writing skills (Limna et al., 2023). So, this research aims to address the aforementioned need by presenting the chatbot-enabled cognitive offload instruction approach, which can promisingly fill a gap in current pedagogical approaches, promoting students' critical thinking.

2. LITERATURE REVIEW

2.1 Cognitive offload theory

Cognitive offload theory refers to the process of transferring cognitive tasks from an individual's limited working memory to external resources, such as technology or external aids (Sweller, 2011). By incorporating cognitive offload strategies into instructional practices, educators can provide learners with external supports that aid in information processing and cognitive load management (Dawson, 2020).

2.2 Application of cognitive offload theory to English essay writing instruction

English essay writing is a complex cognitive task that requires students to demonstrate critical thinking skills, analyze information, generate ideas, and articulate their thoughts effectively. The application of cognitive offload theory to English essay writing instruction involves providing students with external resources and strategies to ease the cognitive burden on students, such as idea generation, template provision, language support, individualized feedback, etc.

2.3 Role of chatbots in cognitive offload instruction to enhance critical thinking

Chatbots, as conversational artificial intelligence systems, have emerged as valuable tools in educational contexts (Huang et al., 2022). Chatbots can understand students' queries, respond with relevant information, and engage in dynamic exchanges. This availability of resources assists students in overcoming informational barriers and encourages them to think critically about content, structure, and argumentation in their essays (Guo et al., 2022). Also, chatbots can assist in scaffolding students' writing process by guiding students through the different stages of essay writing, providing prompts for brainstorming, outlining, and revising. Furthermore, chatbots can identify areas where students may need improvement, enabling students to critically evaluate and revise their work, promoting a deeper understanding of effective writing strategies.

2.4 Relevant research

The relevant research indicates a growing interest in integrating chatbots in language learning and writing instruction. Yan (2023) explored the impact of ChatGPT's text generation in an L2 writing practicum, revealing its potential in enhancing writing efficiency and pedagogy. Guo et al. (2022) proposed Argumate, a chatbot system to scaffold argumentative writing, showcasing its advantages in supporting students' argument construction. Huang et al. (2022) identified technological and pedagogical affordances of chatbots in language learning, emphasizing their role as interlocutors, simulations, and helplines. Limna et al. (2023) highlighted chatbot's potential in providing immediate feedback and support, reducing educator workload. These studies collectively underscore chatbot's promising role in language education while acknowledging potential limitations. However, there is currently limited research that presents instructional approach on how to integrate chatbots into English writing classrooms to enhance students' critical thinking.

3. CHATBOT-ENABLED COGNITIVE OFFLOAD INSTRUCTION

3.1 Learning objectives

The chatbot-enabled cognitive offload instruction approach aims to enhance critical thinking in English essay writing through five specific learning objectives (LOs), as shown in the figure 1:

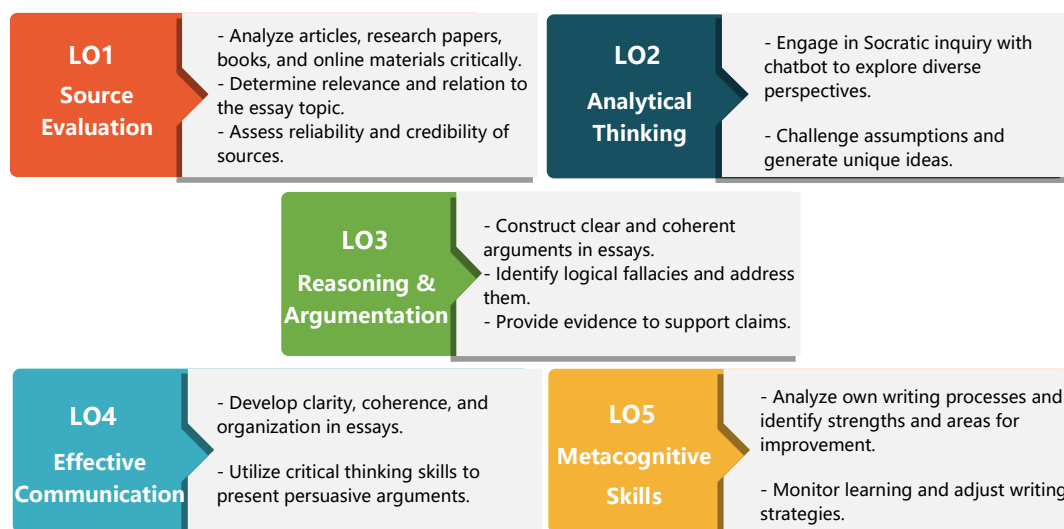


Fig.1: The learning objectives of the critical thinking in English essay writing

3.2 Instructional strategies

The instructional strategies and specific practices that align with the learning objectives mentioned above are shown in the table 1 below:

Table 1. The instructional strategies of the chatbot-enabled cognitive offload instruction

No.	Instructional strategies	Specific practices	Learning objectives
1	Instructing students to critically respond to chatbot's answers	(1) Discuss the limitations of a chatbot	LO1
		(2) Provide examples	
		(3) Teach students how to verify information	
		(4) Provide opportunities for discussion and reflection	
		(5) Foster a growth mindset	
2	Instructing students to utilize chatbot to realize cognitive offload to enhance critical thinking in writing English essay	(1) Teach students how to ask chatbot more specifically	LO3
		(2) Teach students to use Socratic inquiry	LO2
		(3) Utilize chatbot to offer Language Support	LO4
		(4) Utilize chatbot to offer multiple perspectives	LO2
		(5) Utilize chatbot to provide evidence	LO3
		(6) Debate with the chatbot	
		(7) Utilize chatbot to provide examples of well-written essays	LO3, LO4
		(8) Utilize chatbot to provide revision suggestions	LO5
		(9) Organize discussion forums for reflective practice	
3	Instructing students to avoid plagiarism when utilizing chatbot to write English essay	(1) Provide alternative resources	LO2
		(2) Conduct in-class discussions	LO3, LO5
		(3) Create authentic writing tasks	LO2
		(4) Provide individualized feedback	LO5
		(5) Use AI Content Detection tools	LO2

3.3 Lesson structure

The lesson structure outlines the sequence of activities for each instructional session with the duration of each step and how they build upon one another to foster critical thinking skills in writing English essay. It is shown in Table 2 below:

Table 2. The lesson structure of the chatbot-enabled cognitive offload instruction

Sections	Steps	Activities	Duration (120 min)
		(1) Introduce the essay topic and provide relevant background information.	15 min

1. Preparing for essay writing	Topic introduction and thesis statement	(2) Instruct students to interact with the chatbot to analyze the topic and develop a clear and concise thesis statement.	
2. Interactive chatbot activity and essay development	2.1 Interactive chatbot engagement	Instruct students to interact with the chatbot for guidance on topic exploration, argument development, and evidence gathering.	20 min
	2.2 Source evaluation and analyzation	Teach students how to critically evaluate sources, cite them properly, and avoid plagiarism, with the chatbot providing assistance.	15 min
	2.3 Essay structure and organization	(1) Provide guidance on structuring an essay, including the introduction, body paragraphs, and conclusion. (2) Instruct students to seek the chatbot's advice on organizing their ideas and maintaining coherence throughout the essay.	15 min
	2.4 Writing and revision Process	(1) Instruct students to draft their essays based on the developed thesis statement, supporting arguments, and gathered evidence. (2) Encourage self-reflection and revision, utilizing the chatbot's feedback to improve their essay.	20 min
3. Peer Review and Finalization	3.1 Peer review and feedback	(1) Facilitate peer review sessions where students exchange essays and provide constructive feedback. (2) Encourage critical analysis and suggestions for improvement, utilizing the chatbot's guidance.	15 min
	3.2 Final draft and reflection	(1) Instruct students to revise their essays based on the feedback received. (2) Allocate time for students to reflect on their learning experience, including the role of the chatbot in enhancing critical thinking and writing skills.	15 min
	3.3 Conclusion and wrap-up	(1) Summarize key concepts covered in the lesson and reinforce the importance of critical thinking in writing. (2) Allow students to ask questions, share insights, and provide final reflections on the lesson.	5 min

In the whole process, chatbots play a crucial role in the chatbot-enabled cognitive offload instruction approach to facilitate critical thinking in English essay writing. Here's how each step contributes to the development of critical thinking skills, as shown in table 3:

Table 3. The contribution of each step to the development of critical thinking skills

Sections	Steps	Contribution to the development of critical thinking skills
1. Preparing for essay writing	Topic introduction and thesis statement	Students begin to engage in critical thinking from this step. They analyze the topic, consider different perspectives and formulate a concise and arguable thesis statement with the help of the chatbot's guidance.
2. Interactive chatbot activity and essay development	2.1 Interactive chatbot engagement	Students ask questions, receive prompts and engage in dialogue that encourages them to analyze information, consider multiple viewpoints, and refine their arguments.
	2.2 Source evaluation and analyzation	The chatbot assists in critical evaluation of sources, encouraging students to select credible and reliable information. This activity helps students develop their research and analytical skills.
	2.3 Essay structure and organization	Structuring their essays builds their critical thinking skills in terms of organizing ideas, developing logical arguments, and maintaining coherence. The chatbot provides guidance on organizing thoughts, making connections between paragraphs, and ensuring a well-structured essay.
	2.4 Writing and revision Process	Students analyze the chatbot's suggestions, assess their own arguments, and revise their work to enhance clarity, coherence, and depth of critical thinking.
3. Peer Review and Finalization	3.1 Peer review and feedback	Students critically analyze each other's essays, identify strengths and weaknesses, and offer constructive suggestions for improvement.

3.2 Final draft and reflection	This process encourages critical reflection on their own writing, the effectiveness of their arguments, and the overall improvement of their critical thinking skills. The chatbot's role in providing feedback and guidance throughout the process further enhances students' metacognitive awareness.
3.3 Conclusion and wrap-up	It prompts students to reflect on their progress, summarize key concepts, integrate their learning, and consider the transferability of their critical thinking skills.

Throughout these steps, students gradually build their critical thinking skills in writing English essays. The activities are designed to scaffold their learning and promote higher-order thinking. The chatbot serves as a valuable resource, providing guidance, feedback, and prompts to facilitate the development of critical thinking skills.

3.4 Assessment method

To gauge students' critical thinking skills and ensure academic integrity, teachers can implement the AI Content Detector to identify potential plagiarism of text generated by chatbots. Additionally, the Analytical Rubric, which is adapted from Holistic Critical Thinking Scoring Rubric (HCTSR) (Facione, 1994), assesses critical thinking in English essay writing based on the five learning objectives: LO1 evaluates the depth of critical examination and evaluation of sources, LO2 assesses the level of creativity and unique ideas generated, LO3 measures the strength of reasoning and logical thinking, LO4 examines the effectiveness of articulating thoughts through writing, and LO5 gauges the metacognitive skills applied in self-analysis and improvement. The rubric utilizes a four-level scale, ranging from "significantly weak" to "strong". Thus, by integrating AI Content Detector and Analytical Rubric, instructors can comprehensively evaluate students' critical thinking development and maintain academic integrity in the chatbot-enabled cognitive offload instruction.

4. DISCUSSION AND RECOMMENDATION

This study has significant implications for various aspects of education, particularly within the realms of Online Learning, Social Change, and the utilization of MOOCs. Firstly, the chatbot's immediate feedback and personalized interactions can mitigate the challenges of distance learning and enhance learning outcomes in virtual environments, effectively bridging the gap between students and instructors. Secondly, by equipping students with the skills to think critically, challenge conventions, and develop unique perspectives, this instruction approach prepares students to contribute meaningfully to social discourse and navigate complex challenges, ultimately driving positive social change. Thirdly, the findings underscore the viability of integrating such tools into MOOCs to promote critical thinking skills in a large and diverse learner population. This synergy enhances accessibility to quality education and equips learners worldwide with essential critical thinking skills. In conclusion, chatbot-enabled cognitive offload instruction approach has the potential to contribute to the transformative landscape of MOOCs. Educators and institutions can leverage the power of technology to cultivate critical thinkers who are adept at navigating complexities, effecting positive societal shifts, and engaging in lifelong learning pursuits.

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EFFECT OF INQUIRY-BASED LEARNING OF CLASSICAL CHINESE: A CASE STUDY IN YUNNAN PROVINCE, CHINA

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ABSTRACT

This quasi-experimental research aimed to investigate the effect of inquiry-based learning on classical Chinese at a public school in Mouding, Yunnan Province, China. The study had three specific objectives: (1) to design inquiry-based learning in classical Chinese; (2) to validate inquiry-based learning in classical Chinese; and (3) to compare the academic achievement of students in classical Chinese under traditional learning methods and inquiry-based learning. The study population comprised 600 grade 10 students in the 2022 academic year, with 35 students purposefully selected for the research. Data were collected from March to May 2023. The experimental group consisted of 21 grade 10 students who were taught using inquiry-based learning, while the control group comprised 14 grade 10 students who were taught using traditional methods. Pre-test and post-test results were used to determine students' academic achievement in classical Chinese. The statistical methods used included mean and standard deviation, paired sample t-test, and independent sample t-test to compare the independent variables (inquiry-based learning versus traditional teaching methods) and dependent variables (pre-test and post-test scores). The findings of this study indicate that the inquiry-based approach resulted in higher scores for grade 10 students than the traditional approach (91.43 and 81.87, respectively). However, the independent sample t-test showed no significant difference in classical Chinese academic achievement between grade 10 students taught using inquiry-based learning and those taught using traditional methods.

Keywords:

Digital media for education, High school Chinese Education, Inquiry-based learning, Academic Achievement Test.

1.Introduction

The present state of traditional teaching in the discipline of classical Chinese involves teachers conveying knowledge to students through books and following the texts while students passively listen and attempt to comprehend the information presented. Classical Chinese subjects, in particular, predominantly use teacher-centered learning methods, with lectures being the primary mode of delivery. This one-way mode of communication results in decreased student engagement, as students are not encouraged to participate actively in learning (Husni, 2020). Consequently, high school students enrolled in classical Chinese courses have been subjected to a teaching method that relies heavily on textbook-based knowledge dissemination and one-way communication for a long time. However, this approach has some drawbacks, as classical Chinese is often considered a passive and tedious subject. The approach may cause students to become disinterested and disengaged from learning, leading to weariness and resistance to learning. In particular, some students may find classical Chinese challenging and not know how to approach learning it, which further exacerbates their resistance to the subject matter. If a subject is too challenging and fails to motivate students, it can lead to inactivity and disinterest.

Moreover, students may also view the subject as irrelevant, which causes them to adopt a lackadaisical attitude toward the course and affect their learning behavior. This lack of active participation is often attributed to the teacher implementing a less engaging learning model (DePorter & Hernacki, 2007). The problem of students needing to be more active in learning classical Chinese is attributed to various complex factors. These factors arise from the students, teachers, subjects, learning methods, classroom, and school environment. Specifically, using suitable learning methods significantly motivates students to become more engaged and enthusiastic. Learning can become creative, effective, and fun by using suitable learning models and fostering a more engaging learning environment (DePorter & Hernacki, 2007). The emergence of digital media, including mobile Internet, microblogs, and social media, is transforming traditional modes of information transmission. Integrating digital media technology into inquiry-based classroom teaching challenges traditional teaching methods and knowledge transmission. Digital media inquiry-based teaching is a form of inquiry-based learning. It involves teaching students the main content while inspiring and guiding them to engage in independent learning forms, such as setting topics, group discussions, innovative thinking, and practical operations. This approach allows students to use their digital lives, digital marketing, and digital network communities as reference objects for inquiry-based learning activities, making it suitable for independent learning content. In an environment that emphasizes free expression, questioning, inquiry, and problem discussion, the approach focuses on cultivating students' innovative thinking and speculative abilities through individual, group, and mutual problem-solving attempts. Combining digital media and inquiry-based teaching offers a new classroom learning mode and a new learning experience for students that integrates an inquiry-based learning

mode while experiencing science and technology classrooms. The role of students in digital media inquiry-based learning shifts from passive to active, while the role of teachers shifts from teaching to guidance. Learning space transforms from closed to open, and learning forms shift from single to diversified. Despite this approach's challenges, there is no doubt that students' acceptance and satisfaction with this classroom learning mode are far greater than those of traditional classroom-based learning.

2. Literature Review

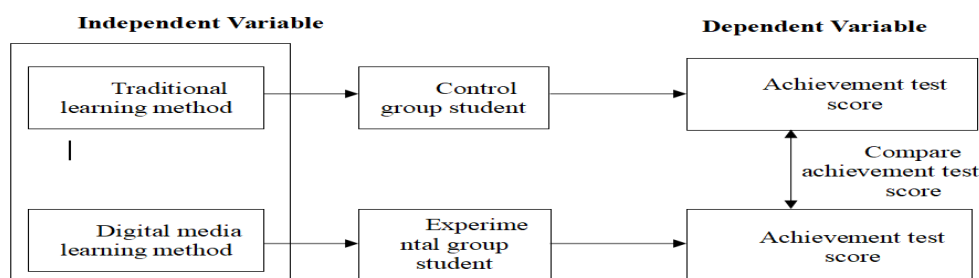
2.1 Inquiry-based learning

Inquiry-based learning is a way to develop learners' curiosity and desire to explore, as well as their critical thinking and problem-solving skills (Onyema et al., 2019). It engages students in a genuinely scientific discovery process and increases their participation and collaboration. Inquiry-based learning involves autonomous learning, where students decide what knowledge, they need to learn, identify resources, and evaluate their improvement. It focuses on personal stories of "learning journeys" It fosters students' exploration of novel ideas and concepts via personal discovery and interaction with tangible objects and individuals in real-life settings. It is an educational tenet in higher education that hinges on students' self-reliance and self-governance, i.e., learning through research. It is not the sole approach to learning, nor is it the sole method for teachers to instruct students and for students to absorb information (tell-listen). The two learning methods should complement and improve each other. In light of the current situation in China, we (students and teachers) should vigorously advocate the research and practice of inquiry-based learning (Huber, 2009). Inquiry-based learning is an instructional approach in higher education that centers on the principles of self-directed and autonomous student learning through research. This approach is consistent with a long-standing academic tradition that sees research as an ongoing process of academic inquiry. Many higher education institutions adopt the inquiry-based learning framework (Huber, 2009). As a primary defense of their work. Inquiry-based learning is a teaching philosophy that emphasizes students' autonomy in learning, and research is the primary mode of knowledge acquisition. This approach is deeply rooted in the academic tradition of ongoing inquiry, with research being an indispensable tool for exploring new knowledge.

2.2 Digital media for education

Digital media pertains to information media stored, processed, and transmitted in binary form, encompassing digital words, graphics, images, audio, video, animation, and so on (Rajko et al., 2022). Simply put, the media that employs digital technology as a communication medium can be classified as digital media, such as Tencent, Sina, NetEase, and other portals that we usually get information from; Baidu, 360, Sohu and other search engines for searching information; Common social platforms such as WeChat, Weibo, and QQ; and video music websites such as Youku, Tencent Video, Baidu Video, QQ Music, and NetEase Cloud Music. E-commerce platforms such as Taobao, JD. COOM, and Suning.cn; Apps involving clothing, food, housing, transportation, and other aspects, including Meituan, Public Comment, Ctrip, and Qunar.com. In addition, digital media is integrated with traditional media in development; the communication format that delivers information and entertainment services to users through digital technology, network technology, and traditional media is known as "new media." (Rajko et al., 2022). "New media" can be understood as the integration of digital media and traditional media, and it can also be understood as the integration of digital media and various fields, that is, digital media life, culture, industry, education, and so on. For example, the integration of the Internet, broadband local area networks, wireless communication networks, satellites, and other channels, along with computers, mobile phones, digital televisions, and other terminals, as well as traditional media, is employed. (Zhao & Zhao, 2022). With the development of modern multimedia technology, the development of the digital media teaching industry is unstoppable. Digital media teaching is a new educational model combining digital technology and multimedia education (Zhao & Zhao, 2022). Specifically, it refers to the activities of teachers in classroom teaching according to the teaching purpose and the characteristics of teaching objects, adopting appropriate teaching methods, reasonably selecting and using modern teaching media, harnessing various forms of media information to impact students, establishing a rational teaching structure, and attaining the most favorable teaching outcomes. The digital multimedia teaching mentioned in this paper is a kind of teaching method that uses computers, mobile phones, tablets, and other electronic devices as the media and the teaching content as words, graphics, images, audio, video, animation, and other media (Fang & Huang, 2019). It is a modern digital teaching method that combines teaching content and ideas, especially the process of teachers using multimedia courseware made in advance to carry out teaching with the help of digital multimedia teaching software.

3 Conceptual Framework



The current study will use a pretest and post-test to understand the learning situation, prepare for understanding the basis of knowledge, and determine teaching strategies. It is compared with a post-test, the purpose of which is to verify the teaching effect and provide an excellent basis for improving teaching. Both the pretest and post-test were written tests, aiming to test the overall

performance basis of the experimental research. The content of the test was selected from the teaching materials "5-Year College Entrance Examination 3-Year Simulation" (a book published by China Capital Normal University Press and Education Science Press in June 2008). The time of the pretest and post-test is 40 minutes, respectively. The content of the test is divided into three items: Item 1, classical Chinese lexical knowledge, accounts for 30 points; Item 2, reading comprehension, accounts for 20 points; and Item 3, classical Chinese translation, accounts for 50 points.

4. Research Methodology

This study focused on teaching classical Chinese with digital media as an additional teaching tool in the classroom to show the learning of classical Chinese and let students learn Chinese through an inquiry-based learning mode.

4.1 Data Collection

The data were collected through the achievement test. The "test" provides information on the participants' basic knowledge of Chinese and guides researchers in planning courses. The tested data is used for comparison. The test scores of both the experimental and control groups are comparable, as they received identical problem types. In terms of testing language proficiency, students can compare theories (accuracy, score, speed of answer, etc.). Academic Achievement Test data: Text data, which can be quantified, can be researched and analyzed by the researcher.

4.2 Data Analysis

This study used Statistical Package for Social Science (SPSS) version 25.0 for data analysis. Descriptive statistics were used to analyze the participants' demographic data, including frequency, percentage, mean, and standard deviation. Independent sample t-test and paired sample t-test were used to analyze the differences between the two groups.

5 Results

Table 1 provides descriptive statistics of the experimental group, which compared the pre-test and post-test scores of 10th-grade students who underwent inquiry-based learning using digital media. The average score of students who passed the pre-test was 84.92, ranging between 92 and 76. Conversely, those who passed the post-test achieved an average score of 91.43, ranging between 98 and 79. The noteworthy difference between the scores implies that the students in the post-test experimental group learned better than their pre-test counterparts.

Table 1: Descriptive statistics on the experimental group performance of 10th-grade students who were taught using traditional methods.

Descriptive statistics					
	N	Min	Max	Mean	S. D
Pre-test	21	76	92	84.29	3.964
Post-test	21	79	98	91.43	4.996

Table 1 provides descriptive statistics of the experimental group. The average score of students who passed the pre-test was 84.92, ranging between 92 and 76. Conversely, those who passed the post-test achieved an average score of 91.43, ranging between 98 and 79. The noteworthy difference between the scores implies that the students in the post-test experimental group learned better than their pre-test counterparts.

Table 2: Descriptive statistics on the control group

Descriptive statistics					
	N	Min	Max	Mean	S. D
Pretest	14	64	87	76.71	6.911
Post-test	14	69	89	81.71	6.450

The findings indicate that students who passed the pre-test achieved an average score of 76.71, with a range of scores between 87 and 64. Conversely, those who passed the post-test obtained an average score of 81.71, with a range of scores between 87 and 89. The considerable difference in the scores suggests that the post-test group outperformed the pre-test group.

Table 3: Dependent Samples t-test Results (Experimental group)

Paired t-test						
Group	N	M	S. D	t	df	Sig(one-tailed)
Pre-test	21	84.29	3.964	-6.065	20	0.001
Post-test	21	91.43	4.996			

Table 3 presents the results of the dependent samples t-test conducted on the experimental group. The results indicate that sig (0.001) < 0.05, signifying a significant difference in the test scores. Thus, the use of digital media to enhance inquiry-based teaching has a substantial impact on improving students' academic performance.

Table 4: Dependent Samples t-test Results (Control group)

Paired t-test						
Group	N	M	S. D	t	df	Sig(one-tailed)
Pre-test	14	76.71	6.911	-3.947	13	0.001
Post-test	14	81.71	6.450			

The table above presents the results of the dependent sample t-test conducted on the control group. The data analysis revealed that sig (0.001) > 0.05, indicating that there was no significant difference in the test scores. Thus, traditional teaching methods did not significantly improve students' scores.

Table 5: Independent sample T-test group statistics

	number	Mean of Post-test	S. D	t	df	Sig(two-tailed)
Experimental	21	91.43	4.996	5.015	33	0.108
Control	14	81.71	6.450	4.763		

An independent sample t-test was performed to investigate the significant difference in the achievement of Grade 10 students between the digital media-enhanced inquiry teaching method and the traditional teaching method in their post-test. The researcher employed post-test data, utilized the gap between the post-test of the two groups, and employed the t-test to compare the significant difference between the two teaching methods. The results revealed that the average post-test score in the experimental group was 91.43, while that in the control group was 81.71. The experimental group's score was significantly higher than the control group, with no sig (0.108) > 0.05, indicating no significant difference in students' achievement scores between the two teaching methods. Numerous factors contribute to this phenomenon, encompassing various aspects that can significantly influence the outcomes of experimental research. One of these factors is the restricted duration of the experiment, which imposes inherent limitations on the depth and breadth of the investigation. Additionally, variations in students' interests and levels of engagement play a crucial role in shaping the research outcomes. The diverse range of interests among students participating in the experiment can lead to discrepancies in their motivation and commitment, potentially affecting the quality and reliability of the results obtained. Furthermore, another pertinent factor is the constraint on practicing outside the class. There need to be more opportunities for students to engage in practical application and reinforce the knowledge gained during classroom sessions to ensure their understanding and mastery of the subject matter, thereby influencing the overall experimental outcomes. Collectively, these factors underscore the intricate nature of experimental research, highlighting the need for meticulous consideration and management of the multiple variables at play to ensure accurate and meaningful results.

6. Suggestion

The current study provides valuable recommendations for students and teachers involved in teaching classical Chinese, administrators, and future researchers in this field.

6.1. Recommendations for Students:

Based on the study findings, it is recommended that students adopt digital media-enhanced inquiry-based learning methods to achieve better academic performance. The study suggests that such methods can motivate and engage students, leading to more active and practical learning. Specifically, performance-motivated, suggestive, and inquiry-based teaching methods are suggested to improve the academic nature of Chinese lessons.

6.2 Recommendations for Teachers:

For teachers, the study highlights the importance of adopting effective teaching methods that enhance students' understanding of the text. The study's findings indicate that some students may have difficulty understanding the background of the text due to ineffective teaching methods. Therefore, it is recommended that teachers use digital media-enhanced inquiry-based learning methods to help students with poor academic performance to understand better and engage with the subject matter. The study's findings suggest that such methods can lead to improved academic performance and a deeper understanding of the subject matter. Future researchers are recommended to

explore the potential of advanced technology-enhanced learning for teaching classical Chinese. For instance, artificial intelligence (AI) and chatbots can be utilized to create personalized learning experiences that adapt to each student's individual needs and learning styles. Furthermore, incorporating inquiry-based learning methods into these technology-enhanced learning environments can provide students with deeper insights and better promote their learning of Chinese as a Foreign Language. Therefore, more practice and experimentation are necessary to identify the most effective learning methods and further improve the quality of education in classical Chinese.

6.3 Recommendations for Future Researchers:

For prospective researchers, delving into inquiry-based methods for learning classical Chinese remains a promising avenue. As society continues to evolve, higher education undergoes a profound transformation due to escalating global interconnectedness, as highlighted by Brennan (2008). This shift has prompted changes in educational formats, with numerous US institutions adapting traditional courses into online, hybrid, or technologically augmented formats. This adaptation, driven by accessibility and the need to cater to a diverse student population, has opened up new avenues for learning, as evidenced by the potential of online instruction emphasized by Keengwe and Kidd (2010).

In the digital landscape, the concept of Massive Open Online Courses (MOOCs) emerges as a potent tool for personalized learning, capable of guiding students along tailored learning paths. Just as MOOCs have revolutionized education, inquiry-based techniques hold a similar transformative potential for the pedagogy of learning classical Chinese. The effectiveness of these methods, particularly in the realm of foreign language acquisition such as Chinese, warrants careful empirical investigation. The central question remains: can inquiry-based learning more effectively engage students and facilitate the development of deeper perspectives? This question prompts a comprehensive exploration aimed at enhancing the education of classical Chinese.

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The Effect of Simulation-Based Inquiry Learning on Learning Achievement in a Chemical Safety and Management Course

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ABSTRACT

The objective of this research was to find the effect of simulation-based inquiry learning on students' learning achievement. It was verified whether virtual reality simulation technology would promote students' learning achievement with inquiry-based learning. The experimentation that included experimental group as well as control group was used. One hundred and twenty students in a college in southern China were selected using cluster random sampling. The research instruments included Oubeier Cloud Platform Simulation Experiment Training System with five simulated experiments, lesson plans in seven weeks, a test that was examination paper with fill in blank, multiple choice, true or false question, short answer question, calculation, case analysis and essay questions. Furthermore, the statistical methods used in data analysis were mean, standard deviation and independent sample t-test. After the experiment, the students were required to do the examination paper. The result showed that the scores of students who learned with simulation-based inquiry learning were significantly higher than those who learned with traditional method at .05 level.

KEYWORDS

Virtual reality simulation technology, Inquiry-based learning, Learning achievement, Chemical safety and management.

1.Introduction

With the rapid development of modern technology, students can learn on their own by taking advantage of the information technology such as virtual laboratory and simulation experiment (Lazar & Panisoara, 2018). Simulation experiments make a virtual laboratory (Thees et al., 2020) where students can think independently, discuss the situation with their group members and [complete](#) their projects (Yuen et al., 2023). In this environment, students can experience various kinds of risks (Sarwono & Lyau, 2022). In addition, simulation system have many advantages such as no limitation of time and place so that students can learn whenever and wherever, with few resources including equipments, reagents and avoiding the danger in real laboratories (Álvarez-Marín & Velazquez-Iturbide, 2021).

Inquiry-based learning method is also applied in the research. It is an approach that students raise a question, make assumptions, check resource or use the knowledge that they ever learned to design schemes (Boğar, 2019). Lawson (2010), one of [educationalists](#), says students will enhance their creative thinking, critical thinking and the ability of actual operation. Inquiry-based learning makes students comprehend the knowledge of courses deeply especially in science, learn how to collaborate with each other that they share resources to other group members, know how to learn various kinds of subject even working skills that are beneficial for them to form the habit of life-long learning (Quintana et al., 2005; Shih et al., 2010; Wenk, 2000; Wilke & Straits, 2005). In this research, inquiry-based learning is combined with simulation experiment system to improve student learning achievement.

The course chemical safety and management was used in this research. In recent years, chemical plant explosions and chemical laboratory explosions have caused casualties and hazardous chemical leakage to pollute the environment. The cause of these explosion accidents is usually due to imperfect factory safety management or nonstandard operation of personnel in related positions, which has caused many countries to attach great importance to chemical safety. According to the impacts of chemical accidents, it is necessary for students especially whose major is related to chemical engineering to grasp chemical safety knowledge. However, based on constraint of real laboratory condition, students cannot experience the consequence of chemical disaster, which leads them feel bored

in class. In order to solve the problem, this study focuses on how to combine virtual reality simulation technology with inquiry-based learning to improve students' knowledge on chemical safety and management.

2.The Literature Review

2.1 Virtual reality simulation technology

Computer simulation technology belongs to non-immersive system that is one of virtual reality systems (Cipresso et al., 2018). Non-immersive system means users only use desktop where they can see the dynamic scenes (Cipresso et al., 2018). Nowadays, virtual reality is applied in a number of subjects or fields including simulated training in physics, chemistry, medicine, social phenomenon, news, entertainment, etc. (Gallagher et al., 2005; Schmidt et al., 2017; Slater & Sanchez-Vives, 2016). For example, Oubeier Cloud Platform Simulation Experiment Training System is used in this research, which is developed by Beijing Oubeier Software Technology Development Co., Ltd. Students can further familiarize themselves with professional basic knowledge, understand the basic laboratory experimental environment, train basic hands-on ability. The following pictures in Figure 1 shows simulated experiments programmes as well as the scene in simulated experiments in Oubeier Cloud Platform Simulation Experiment Training System.



Figure 1.

Experiment Scenario 1 and Experiment Scenario 2

In the future, there will be many opportunities that virtual reality may decline the demand in input facilities like bend-sensing gloves. It is possible for users to only use their hands to interact with virtual scenes or objects (Cipresso et al., 2018). Nevertheless, it requires display equipment with higher [distinguishability](#) and [synchronous rate](#). Besides, the virtual scene in the display equipment currently is still not vivid enough, which will be a challenge for developers.

2.2 Inquiry-based learning

In this research, there are five steps by applying inquiry-based learning:(1) asking questions (2) hypothesizing (3) formulating plans for verifying hypotheses (4) implementing plans (5) drawing conclusions and communicating. Actually, the five steps were based on Dewey's inquiry-based learning theory. In Dewey's opinion, "Inquiry" is students who face uncertain situation explore [distinguishing](#) factors and make them integral in order to design a certain situation (Dewey, 1938; Dimova & Kamarska, 2015). One of Dewey's inquiry-based learning model mentioned thinking, which is the way to explore the core of problems and the approach to transform inference to conclusion even evidence (Dewey, 1910).

3.Research Methodology

The objective of this research was to find the effect of simulation-based inquiry learning. Therefore, this research took advantage of experimental method where participants were divided into experimental group and control group. Before this study, they are not exposed to chemical safety and management courses.

3.1 Experimental Design

This study adopts two-group experimental design

	Treatment	Posttest
Experimental Group	X	O ₁
Control Group	-	O ₂

X is Oubeier Cloud Platform Simulation Experiment Training System with inquiry-based learning. O₁ is the score of the experimental group and O₂ is the score of the control group.

3.2 Research Instruments

(1) Oubeier Cloud Platform Simulation Experiment Training System: The system is designed by Beijing Oubeier Software Technology Development Co., Ltd, where there are five models of simulated experiments. It has a strong vivid sense of the operating environment, operational flexibility and autonomy.

(2) Lesson plan: There are 7 weeks lesson plans, which include three learning objectives: affective, cognitive and performance objectives as well as use five steps of inquiry-based learning to teach students.

(3) Test: The test uses an examination paper that has seven types of question: fill in blank, multiple choice, true or false question, short answer question, calculation, case analysis and essay questions. The content of the learning achievement test is from a chemical safety and management course.

3.3 Data Collection

60 students in the experimental group and 60 students in the control group randomly selected using cluster random sampling, and they were also recruited by the university through the *national unified examination for admission* to ordinary colleges in China. The experimental group was taught with simulation-based inquiry learning, while the control group was taught with the traditional method. After 7 weeks of experiments, both groups were administered on the same examination test.

3.3 Data Analysis

Students' test scores were analyzed to determine whether there is significant difference between an experimental group and a control group by using independent t-test.

4.Result

In this research, the test scores of 60 students in the experimental group and 60 students in the control group were analyzed by independent samples t-test. The following tables showed the result:

Table 1. Mean and Standard deviation of the test scores of two groups

Group	The case number	\bar{X}	S.D	Standard error mean
Control group	60	67.52	10.39	1.34
Experimental group	60	87.7	8.37	1.08

Table 2. Independent samples t-test of the effect of simulation-based inquiry learning on learning achievement

Group	Control group		Experimental group		t	P
	\bar{X}	S.D	\bar{X}	S.D		
Test scores	67.52	10.39	87.07	8.37	-11.35	.000

Table 1 and Table 2 showed analyzed results. First, the mean of experimental group was 87.07 and that of control group was 67.52. Secondly, the standard deviation of control group was higher than that of experimental

group. Moreover, P value was .000 that was smaller than α that was 0.05. That is to say, there was a significance between control group and experimental group.

5. Discussion

From the discussion, the result showed the scores of students who were taught by Oubeier Cloud Platform Simulation Experiment Training System together with inquiry-based learning were higher than that of students who were taught with the traditional method. Pulijala et al.(2018) did an experiment with two groups of student who were taught human bloodstream. One group was taught by virtual reality simulation technology and another group was taught by PowerPoint slide. After the experiment, they did the same test. The score of the group with virtual reality was higher than that with PowerPoint slide. Another study had a same result, which took advantage of virtual reality chemistry laboratory. They also divided participants into experimental group as well as control group. Before the experiment, the scores of experimental group pre-test were similar with that of control group pre-test. After the experiment, the scores of experimental group post-test were higher than that of control group post-test. Moreover, the increase of experimental group test scores was bigger than that of control group test scores (Su & Cheng, 2019). The reasons why the scores of students with virtual reality simulation technology were higher than those with PowerPoint slide were the advantages of virtual reality simulation technology as well as inquiry-based learning. Virtual reality had various resources such as simulated experiments, micro-videos, and colorful images for students comprehending chemical safety and management concepts or regulations (Thees et al., 2020). Another point is inquiry-based learning that made students query the knowledge confirmed, use creative thinking to analyze problems, express their ideas bravely (Hamm & Adams, 1992; Hinrichsen et al., 1999; Rutherford & Ahlgren, 1991; Wilder & Shuttleworth, 2005). Furthermore, students could experience directly the disasters from virtual reality simulation technology that was caused by chemical accidents. That would make them understand the real impact of the incidents.

6. Conclusion

This research set out to find the effect of simulation-based inquiry learning and identify virtual reality simulation technology could promote students' learning achievement with inquiry-based learning. The significance of this research was that virtual reality simulation technology could be combined with inquiry-based learning to make students comprehend the knowledge of chemical safety deeply and understand that it is very important for everybody to grasp chemical safety knowledge especially students majoring in chemistry engineering.

7. Recommendation

Virtual reality simulation technology with inquiry-based learning also can be applied in the factories in all kinds of high-risk industries. When new employees as well as workers who never learn safe production are trained, managers or technicians in enterprises can take advantage of virtual reality simulation technology in an online platform to make new employees and workers learn safe production knowledge and accident in production. It will lead new employees and workers to understand that if they do not operate seriously according to safe production regulation or standards, they will face how dangerous situation and huge responsibility. In addition, virtual reality simulation technology with inquiry-based learning via online classroom can be even learnt by managers, technicians and old employees because they will review the safe production regulation or standards. This will help them find the errors or non-standard operation they ever did, which will may prevent them from facing huge responsibility even losing their life.

Of course, Oubeier Cloud Platform Simulation Experiment Training System included Massive Open Online Courses (MOOCs) where students could learn operation requirements, announcements and some chemical knowledge. Inquiry-based learning can be applied in MOOCs in the future, which will lead students think on their own and they will find the approaches or related knowledge in MOOCs. Sometimes they will have chances to design projects or do experiments to verify whether the knowledge teachers said in MOOCs was exact or not. This will make them be more interested and promote them to finish a whole course.

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INVESTIGATING THE CUTTING-EDGE SKILLS AND COMPETENCIES OF ADVERTISING PRACTITIONERS THROUGH AN ENGAGING INTERVIEW STUDY

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ABSTRACT

This study adopted qualitative interviews and content analysis to explore the digital competencies of advertising practitioners in the digital economy. The interview subjects were from 5 leading advertising companies in Shanxi Province, China, and 12 people participated in the interview, and the interview recordings were transcribed and then openly encoded and analyzed by NVIVO.14 software. The results identified data-driven decision-making skills, digital marketing strategy formulation skills, digital media management and optimization skills, and user experience design and optimization skills as four core dimensions of digital competencies for advertising practitioners. This provides guidance for talent recruitment and development in the advertising industry, and also offers implications for curriculum design and teaching reforms in higher education institutions.

KEYWORDS

Advertising Practitioners; Digital Competencies; Digital Economy; Management; MOOCs; Online Learning; Social Change

1. INTRODUCTION

With the rapid evolution of digital technologies such as mobile internet, 5G, and artificial intelligence, the advertising

industry is undergoing significant transformations and challenges (Bohan, 2018). Possessing strong digital competencies has become crucial for advertising practitioners (Martín & Echegaray, 2018). This study aims to explore the digital competencies of advertising practitioners in the digital environment through interviews and content analysis. The findings will provide insights for talent recruitment and development in the advertising industry, enabling practitioners to navigate the complex digital landscape effectively, and also offers implications for curriculum design and teaching reforms in higher education institutions.

2. LITERATURE REVIEW

Digital competencies encompass a range of skills, knowledge, and mindsets necessary to perform work tasks in the digital era (Gallardo-Echenique et al., 2015). According to Redecker (2017), these competencies involve multidimensional abilities such as information retrieval, technology application, and collaboration. In the context of advertising practitioners, digital competencies focus on specialized capabilities including data-driven decision-making, digital marketing strategy formulation, digital media management, and user experience optimization (Bohan, 2018; Dwivedi et al., 2021). Targeted training in digital competencies can assist students in adapting to industry demands and improving their employability (Reddy et al., 2023). It is crucial to develop systematic digital competency models and quantitative evaluations to address the research needs in this area (Carolus et al., 2023).

Recent studies emphasize the importance of developing digital skills that align with industry requirements to bridge talent gaps in the digital economy (Reddy et al., 2023). However, higher education institutions currently face shortcomings in this aspect and need to strengthen reforms through tailored teaching practices (Kožuh et al., 2021). The cultivation of digital competencies among advertising students demands sustained attention and efforts to ensure they are well-prepared for the digital landscape (Bryukhanova et al., 2021).

3. RESEARCH METHODOLOGY AND RESULTS

3.1 Interviews and Content Analysis of the Interviews

This study randomly selected five of the top ten advertising companies in Shanxi Province as the survey sample. Each company provided three interview subjects, including the CEO and the heads of two departments, resulting in a total of 15 intended interviewees. However, three participants were unable to take part, leaving a total of 12 actual interviewees. Among them, 10 were male and two were female, with ages ranging from 28 to 45 years old, and about one-third of the respondents were over 35 years old. On average, the interviewees had 11.5 years of work experience.

The interviews were primarily conducted face-to-face, while some respondents were interviewed over the phone and WeChat voice. These semi-structured interviews aimed to explore advertising practitioners' digital competency requirements. The recordings were transcribed and translated into English for analysis. Content analysis using open coding and axial coding (Urquhart, 2013) was performed to identify themes and dimensions, employing NVIVO.14 software for text content analysis.

At the study's initial stage, word frequency statistics were applied to the interview transcripts, resulting in 874 terms, which included key and high-frequency words commonly mentioned by the participants. Figure 1 displays the high-frequency word clouds from the interviews.



Fig. 1: Word clouds of the Interview

3.2 The Results of the Open Coding

During the open coding process, the researcher meticulously read through the transcriptions of each interview, marking and coding statements that expressed relevant concepts or viewpoints pertaining to the research questions. For instance, in the 1st interview, the statement "*the most important employee abilities are innovative thinking and digital communication skills*" was marked and coded as "*innovative thinking*" and "*digital communication skills*." On average, each interview audio file generated 118 open codes. Taking the 9th interview as an example, it produced 113 open codes, covering 279 reference points, including aspects such as "digital literacy," "data analysis," "digital content creation," and others.

Through meticulous parsing, judicious comparison, and thoughtful synthesis of the content contained within the open codes, the researcher distilled the voluminous raw data into a concise compendium of 81 refined open codes. This systematic process of optimization crystallized the core conceptual elements embedded in the textual data, thus laying a solid foundation for the subsequent axial coding construction.

3.3 The Results of the Axial Coding

During axial coding, the open codes were compared, associated, and categorized, leading to the identification of 8 key dimensions: Data-driven decision-making skills; Digital marketing strategy formulation skills; Digital media management and optimization skills; User experience design and optimization skills; Team collaboration skills; Learning skills; Industry insight skills; Career development skills.

Through further analysis and integration, the researcher pinpointed that while teamwork skills were important, they extend beyond the digital realm as general competencies. Similarly, learning ability, career development skills, and industry insight were essential but not specific to digital competency. Considering all factors, this study identified four key dimensions of digital competencies: data-driven decision-making skills, digital marketing strategy formulation skills, digital media management and optimization skills, and user experience design and optimization skills.

Data-driven decision-making skills are crucial in the digital environment, as advertising decisions need to be grounded in a comprehensive analysis of big data. The interview results revealed that practitioners recognize the importance of data collection, processing, and modeling capabilities, as these skills generate valuable insights for decision-making (P3, P5). For instance, interviewees mentioned leveraging tools like Python to mine big data and optimize marketing allocation decisions (P9).

Digital marketing strategy formulation skills are vital for advertising practitioners to develop effective strategies in response to evolving consumer demands and preferences (P2, P8). This requires astute

judgment of market and industry trends (P1, P10), along with the ability to select appropriate digital marketing channels and content (P6, P11). Interviewees mentioned formulating differentiated digital marketing mix strategies based on customer profiles and purchasing cycles (P12). **Digital media management and optimization skills** are essential as advertising practitioners navigate various digital media channels, such as social media and search engines (P4, P7). In-depth understanding of channel strengths, evaluation of effectiveness, and driving continuous improvements are key aspects of these skills (P2, P9). For example, interviewees highlighted the importance of testing different e-commerce product page options to improve conversion rates (P12).

User experience design and optimization skills emerged as a critical dimension in the digital environment (P1, P3). Interviewees emphasized the significance of focusing on user needs, conducting user research, and applying interaction design principles (P5, P8). Adopting a user-centered design approach was mentioned as a strategy to enhance user stickiness in mobile app development (P10).

In conclusion, the identification of these four key dimensions of digital competencies provides valuable insights into the requirements of advertising practitioners in the digital environment. Data-driven decision-making skills, digital marketing strategy formulation skills, digital media management and optimization skills, and user experience design and optimization skills all contribute to successful performance in the digital advertising landscape. Understanding and developing these competencies can enhance the effectiveness and competitiveness of advertising practitioners.

4. Discussion and Conclusion

This study identified four core competencies required for advertising practitioners in the digital economy through qualitative research methods. The findings provide insights for online learning, social impact, and MOOC platform development:

First, Advertising professionals and undergraduate are expected to develop knowledge and capabilities necessary to serve a digitized consumer or risk becoming individual contributors to a growing digital skills gap (Langan et al., 2019). By taking relevant online courses, learners can obtain abilities needed for industry digital transformation, expanding job opportunities and meeting corporate needs for digital skills talent.

Second, nurturing advertising practitioners' digital core competencies can significantly improve brand communication efficiency and economic benefits (Dwivedi et al., 2021). For instance, data-driven decision-making can support companies in targeted marketing for segmented user groups, enhancing marketing ROI; strong digital media management and optimization abilities can expand brand coverage and influence across digital channels, effectively acquiring more potential users. This demonstrates the positive impact of digital capabilities on improving brand awareness and sales performance. Therefore, investing in cultivating these digital capabilities will not only increase practitioners' personal career competitiveness and advertising firms' industry advantage, but also generate social benefits for brands and enterprises. This merits great attention from advertising companies and education institutions.

Third, the research findings can provide guidance for the professional development of advertising focused MOOCs (Zhu et al., 2018). Educational institutions can partner with companies to develop tailored MOOCs based on real business cases. This industry-oriented learning content can efficiently cultivate digital capabilities for advertising

practitioners, and provides new concepts for MOOC design. In conclusion, this study not only identified core digital capabilities in advertising for the digital economy, but also expanded research value from perspectives like online education, social impact, and MOOC platforms. This provides useful references for subsequent research and practice.

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