TCLT

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第十二届国际汉语电脑教学研讨会论文集
(Proceedings of the 12th International Conference and Workshops on Technology and Chinese Language Teaching)

序言

第十二届国际汉语电脑教学研讨会和工作坊（Technology and Chinese Language Teaching, TCLT12）的举行是在非常特殊的时期进行的。一方面是国际汉语（或华语）教学的严峻现实：汉语 / 华语二语学习者数目下降，高校中文班注册人数减少，国际交流项目情况多变等等。另一方面是科技发展的革命性变化：以 ChatGPT 为标志的基于大规模语言模型(LLM)的人工智能的发展，为语言教学甚至人类生活的方式都提供了前所未有的契机以及挑战。在这个大环境下，洛杉矶加州大学（UCLA）联合国立台湾师范大学以及中田纳西州立大学利用线上平台，使全球从事汉语二语教学的同道可以就最新科技发展对语言教学带来的挑战和机遇及时进行反思，交流创新方案，以期把中文二语教学提高到新的高度。

这次研讨会沿用前面各届研讨会的方式，采用了大会主旨发言、个人报告和专题性的工作坊等多种形式在线上举行，以便实现更广泛的国际参与和交流。

本届研讨会的召开是多个地区、多个单位精心合作的成果。洛杉矶加州大学亚太研究所（UCLA Asia Pacific Center）、亚洲语言文化系及国立台湾师范大学多个单位提供资助及组织支援。洛杉矶加州大学的陶红印教授全面负责大会的组织、协调及会务工作，香港大学的林金锡教授共同主持组织和会务，中田纳西州立大学笪骏教授提供技术和会务支持。

大会在准备阶段和举办过程中得到多位学者和研究生同学的大力协助，包括本届大会组委会（陶红印、林金锡主持）、报告评审委员（张胜兰、刘士娟主持）、以及大会论文集编委会（林金锡、陶红印、笪骏、和刘士娟主持）；各委员会的名单请见附录。耶鲁大学的梁宁辉老师在会议组织、会务和推广也做了大量的工作。

本届大会共收到投稿 80 篇，分别来自美国、中国大陆、台湾、香港、澳门、日本、新加坡、加拿大、西班牙、意大利、英国、瑞典、和澳大利亚等十三个国家和地区。经匿名评审共推出论文报告 73 篇，分 25 组进行讨论。会议同时安排了 3 场特邀报告和 5 个电脑辅助教学工作坊（详见附件）。截至 2024 年 6 月 23 日，除了 113 位报告人外，本届大会另外还有来自 30 个国家和地区的 370 余人注册参会。

大会论文集共收录论文 16 篇，按（第一）作者本人提供的姓氏拼音、注音或英文字母顺序排列。我们对论文只做了体例上的基本加工，大致保持原作面貌。编辑过程中得到香港大学林金锡教授团队的协助。

陶红印，洛杉矶加州大学（UCLA），TCLT12 组委会主席
林金锡，香港大学，TCLT12 组委会主席
2024 年 8 月 17 日

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国际中文教师的信息素养发展：价值、内容、路径及实践——基于 2000-2023 年 68 篇核心文献的范围综述

(Information Literacy Development of International Chinese Language Teachers: Values, Contents, Paths and Practices ——A Scoping Review Based on 68 Core Literatures from 2000-2023)

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摘要：信息技术在教育领域中展示了广阔的应用前景，提升国际中文教师的信息素养变得越来越重要。本研究采用范围综述法，对 2000-2023 年发表于 CNKI 和 WoS 中的 68 篇相关文献，围绕国际中文教师教育信息素养发展的价值、内容、路径及实践四大主题进行综述。结果显示：国际中文教师信息素养发展价值涉及提升国际中文教学质量和促进教师专业发展；内容侧重教师信息素养发展的影响因素分析，以及国际中文教师素养模型或评价指标体系构建；路径主要包括基于国际中文教学现实需求和教师信息素养发展现状提出建议对策，并将技术应用于教师教育或培训；相关实践集中在实现信息技术的教学应用，以及教学资源开发、教学平台建设等。国际中文教师信息素养发展已经引起了学界的重视，未来尚需拓展相关研究，以更好地适应智能化时代的教学需求。

Abstract: Information technology has demonstrated a broad application prospect in the field of education, and it has become increasingly important to enhance the information literacy of international Chinese language teachers. This study adopts the scoping review method to review 68 related literatures published in CNKI and WoS from 2000 to 2023, focusing on the four major themes of value, content, path and practice of information literacy development in international Chinese language teachers' education. The results show that: the value of information literacy development for international Chinese language teachers involves improving the quality of international Chinese language teaching and promoting teachers' professional development; the content focuses on the analysis of factors influencing the development of teachers' information literacy and the construction of a model or evaluation index system for international Chinese language teachers' literacy; the paths mainly include the

suggestions and countermeasures based on the real needs of international Chinese language teaching and the current status of the development of teachers' information literacy, as well as applying technology to teacher education or training; the related practices aim at realizing information literacy in IT education. Relevant practices focus on realizing the pedagogical applications of information technology, as well as the development of teaching resources and the construction of teaching platforms. The development of information literacy among international Chinese language teachers has attracted attention from the academic community, and there is still a need to expand relevant research in the future to better meet the needs of teaching and learning in the age of intelligence.

关键词：国际中文教师、国际中文教育、信息素养、教师教育

Keywords: International Chinese language teacher, International Chinese language education, Information literacy, Teacher education

1. 引言

随着语音识别、虚拟现实、人机交互等技术的发展，教育中可利用的教学技术手段日益丰富，这给教师和学生从事更具挑战性和创造性的工作提供了技术支持。国际中文教育在应用多媒体、人工智能、网络通信等方面也取得了巨大的进步，我国教育部制定了《国际中文在线教育行动计划（2021-2025 年）》《国际中文教育数字资源建设指南》等政策文件，正在推动国际中文教育在 2025 年基本实现数字化、智能化、泛在化的发展目标（马箭飞，2022）。有学者预测，人工智能、教育机器人、多模态学习分析、自适应学习、扩展现实和混合学习空间六项关键技术将全面赋能国际中文教育的数字化转型发展（马瑞祾 & 梁宇，2023）。在此背景下，国际中文教师的信息素养已成为国际中文教育研究领域关注的焦点。国际中文教师信息素养研究已经取得了哪些进展、哪些问题有待解决、有哪些研究热点等也是国际中文教育研究领域密切关注的问题。近几年，学界对国际中文教育相关研究从不同角度做了一些梳理。例如，吴应辉、郭晶（2019）基于自建 2015-2017 汉语国际教育学术研究数据库，通过对研究主题、论文关键词、课题分类和博士论文选题等方面的分析，揭示了该领域的研究热点，提出国际中文教育应积极借助云计算、大数据、人工智能等现代科技的进步等观点；赵雅文、励智（2023）基于 2013-2022 年国家社科基金立项课题，总结了国际中文教育研究的新特点与趋势，发现国际中文教育立项课题，除运用传统的社会科学研究方法之外，还应用了大数据分析、认知心理学以及知识图谱、眼动跟踪、人工智能等技术；Wang & Devitt（2022）分析了全球范围内对外汉语学习中运用电脑辅助沟通研究的常见理论基础和方法论等，发现相关研究中，混合方法是最主要的研究方法，仅有少量的实验或准实验研究。然而，目前学界对国际中文教师信息素养研究的综述关注较少。国际中文教育正在朝着智慧化、泛在化发展，相关研究也不断深入，分析国际中文教师信息素养的研究进展有助于系统地总结其发展进程、分析当前的研究热点并判断其发展趋势，促进

该领域的发展。本研究聚焦国际中文教师的信息素养相关研究，包括对国际中文教师数字素养、数字能力、数字胜任力和技术意识的研究。将以 CNKI 数据库和 WoS 核心合集数据库为检索来源，对 2000-2023 年间国际中文教师信息素养研究文献进行综述，总结其研究内容和研究进展，为持续推进该领域研究提供参考。

2. 研究设计

本研究采用范围综述法（scoping review）对国际中文教师信息素养发展相关研究进行分析。该方法先对已有研究文献的规模、范围进行评估，以便进一步分析所综述文献的研究主题、类型和性质，具体流程包括：确定研究问题、确定相关研究、选取核心研究、绘制数据图/表、整理与报告结果。

2.1 确定研究问题

本研究提出以下研究问题：1.现有研究中，国际中文教师信息素养发展的价值体现在哪些方面？2.国际中文教师的信息素养包含哪些内容？3.提升国际中文教师信息素养的路径有哪些？4.推动国际中文教师信息素养发展的实践进展如何?

2.2 文献检索，确定相关研究

国际中文教师研究论文发表所使用的语言主要为中文和英文，为了提升文献样本的质量和代表性，中文文献来自 CNKI 数据库中的核心文献1，外文文献来自“WOS 核心合集”数据库2，采用关键词检索的方法搜集相关文献，并通过人工筛选的方法选取与本研究相关的文献。

2.3 文献筛选，选定核心研究

按上述检索方式，在 CNKI 数据库获得文献 430 篇，在 WoS 数据库获得文献 94 篇。然后按照范围综述文献筛选规则进行人工筛选。根据研究主题，审查文献标题和摘要进行初筛，排除 CNKI 检索获取的与主题关联度低的文献 385 篇，排除 WoS 检索获取的关联度低的文献 59 篇；依据纳入和排除标准，对剩余 80 篇文献进行全文阅读复筛，最终确定符合评价标准的文献共 68 篇。

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1 运用“国际中文教师”或者“对外汉语教师”进行高级检索，文献类型限定为论文，来源期刊选择 SCI、 EI 、北大核心、CSSCI、CSCD、AMI，时间范围限制在 2000-2023 年期间。

2 运用“Chinese language/mandarin Chinese AND teacher*AND international/ foreign language/second language AND computer /technology/multimedia/ artificial intelligence”检索式进行主题检索，文献类型限定为论文，语言限定为英文，时间范围限制在 2000-2023 年期间。

2.4 绘制图表与编码分析

首先，提取 68 篇文献基本信息（含作者、标题、发文期刊、年份、摘要、关键词等）并绘制表格，按照每篇文献的关键要点划分主题。其次，对 68 篇文献研究结果进行编码分析。将国际中文教师素养发展的价值、内容、路径、实践作为一级主题，根据文献内容梳理划分出二级主题。再次，将每篇文献按要点划分入对应主二级主题。最终，形成编码分析表，并对文献按主题进行量化统计，如表 1 所示。

表 1：国际中文教师素养发展研究文献编码分析

一级主题	二级主题	来源：CNKI	来源：WoS	篇目总数	数量占比（N=68）
国际中文教师素养发展价值	教师教育价值	9	2	11	16.2%
	教师专业发展价值	4	0	4	5.9%
国际中文教师素养发展内容	素养构成、影响因素	3	6	9	13.2%
	素养模型、指标体系	2	0	2	2.9%
国际中文教师素养发展路径	发展路径构建	5	1	6	8.8%
	教师培训研究	5	2	7	10.3%
国际中文教师素养发展实践	技术应用实践	8	18	26	38.2%
	平台/资源建设	2	1	3	4.4%

3. 研究结果

3.1 研究的基本特征

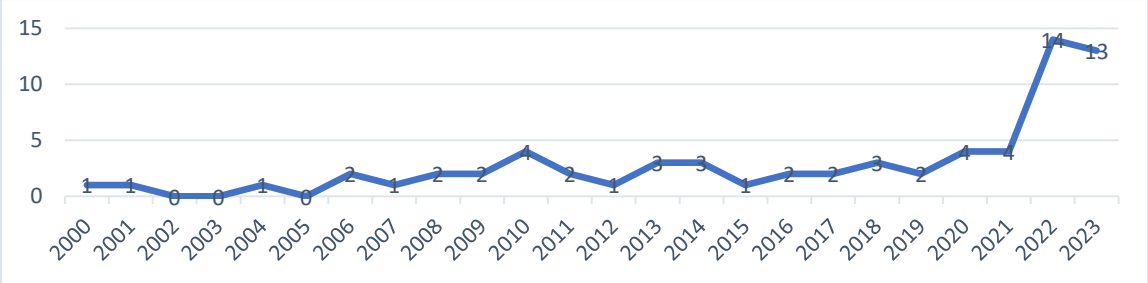

图 1：国际中文教师信息素养发展研究文献发表时间统计图

从文献发表时间数据看（见图 1），2000-2021 年国际中文教师信息素养发展研究文献数量总体偏少（每年 0-4 篇），2022 和 2023 年发文量猛增，2022 年最高，达 14 篇。

3.2 国际中文教师信息素养的价值

进入 21 世纪以来，信息和通信技术对教育的影响越来越大，国际中文教育界对技术与教学融合的兴趣与日俱增，对国际中文教师信息素养提升的需求也随之而来。随着网络的普及，在对外汉语课堂上利用网络打开了教学新天地，现代教育技

术的利用开始受到重视（郑燕群，2001）。学界讨论了信息技术与对外汉语课程整合的模式和策略，希望通过与信息技术的整合实现对外汉语教学的跨越式发展（徐娟 & 史艳岚，2007）、提升对外汉语教学质量（王玉英 & 邸焕双，2009），并且开始探索基于网络推广远程的汉语教学（孟繁杰，2010）。之后，为应对疫情等突发情况而带来的线上教学需求以及学习者个性化、差异化、多样化的语言学习需求，提升国际中文教师信息素养成为客观必然（李宝贵 & 庄瑶瑶，2021）；最近几年，随着 ChatGPT 等智能化工具在教育中的应用，实现国际中文教育“数字转型”“数字革命”的呼声高涨（金晓艳等，2022；徐娟等，2023）。从教学的网络化实践到智能化探寻，对教师信息素养的要求也逐步提升，信息素养也逐渐成为国际中文教师专业能力的重要组成部分。教师信息素养是影响国际中文教师能动性的重要因素（王帅 & 邢姝婷，2022），将智能教学工具融入职前 TCFL 教师的学习过程有助于提高他们的教学能力（Oubibi et al.，2022）。综上，相关研究中，国际中文教师信息素养价值可总结为两大方面：一是教师的信息素养具有明显的教育教学价值，有助于满足信息化时代学习者的需求，提升国际中文教育的质量；二是发展国际中文教师的信息素养，可以促进国际中文教师的专业发展。

3.3 国际中文教师信息素养的内容

国际上关于教师信息素养的构成和标准的研究较多，为构建国际中文教师信息素养框架提供了重要参考。但是，还需要结合国际中文教育的特点，制定具体、明确的国际中文教师信息素养模型或评价标准。2000-2023 年间对国际中文教师信息素养内容的研究主要包括两大方面，一是对信息素养的构成、影响因素分析，二是素养模型、指标体系构建。其一，对国际中文教师信息素养的构成、影响因素进行了多角度的研究。已有研究涉及的主要有年龄、学历、培训、任教身份等影响因素。有研究显示，相关课程培训对数字能力的影响较为显著，年龄和学历对数字能力的一些具体方面有一定的影响（刘玉屏等，2021），教龄、任教身份、任教国家、数字教学环境是影响国际中文教师数字资源接受的重要因素（李诺恩、梁宇，2023）。也有研究显示，国际中文教师在教学中的技术使用情况可通过感知有用性、自主使用意识和客观的技术使用便利条件来预测（Liu et al.,2017）。其二，通过国际比较和现状调研等多种方法，构建国际中文教师信息素养模型和评价体系。早在 2006 年徐娟等参照美国国家教师教育技术标准等国际标准，初步设计了评价指标体系（徐娟、宋继华，2006）。近几年，这方面的研究更加丰富、深入，成果多样。例如，林海燕、赵寰宇（2020）结合国际汉语教师信息素养现状建立的国际汉语教师信息素养评价体系和培养模型；李晓东等（2022）构建的包括数字意识、数字知识等 6 个维度的 27 项能力的国际中文教师数字能力模型等。

3.4 国际中文教师信息素养发展的路径

教师信息素养有多个层级、不同维度，提升国际中文教师的信息素养的路径也会涉及多种多样的方法、策略和步骤。2000-2023 年，国内外学者对国中教学教师素养发展路径的研究主要有 13 篇核心论文，所涉及的路径归纳为以下两个方面：

第一，在分析国际中文教师信息素养发展现状和现实挑战的基础上，构建信息素养发展路径。相关研究针对不同的问题，从不同的角度提出了相应的对策和建议。例如，针对国际中文教师 TPACK 培养理念缺失、培养模式单一、协作培养不足等问题，提出在理念、活动、同行协作和情境创设方面提升国际中文教师整合技术的学科教学能力（刘婷婷等，2022）。依托欧盟教师数字胜任力框架，通过个案研究，为提升远程教学的国际中文教师数字胜任力，从教育规划者、教育机构和教师群体视角等方面提出了相关建议（王陈欣等，2022）。第二，搭建网络平台或运用技术手段进行国际中文教师培训。随着网络和信息技术的进一步发展，学者们纷纷探索新的教师培训思路。例如，针对教师培训往往重知识轻技能的问题，提出了基于课堂教学视频案例的对外汉语教师培训新模式（黄晓兰等，2010）；为适应教师的网络教学需求，提倡进行致力于提升汉语教师网络教学能力的培训（章欣等，2017）；利用教师支持小组通过网络会议技术语言发展教师的汉语教学知识（Tseng et al., 2016）等，Lan et al.（2012）构建了基于合作的认知、行动和反思（CoCAR）三阶段循环在线同步培训模式，以增强对外汉语教师 ICT 能力。

3.5 推动国际中文教师信息素养发展的实践

目前，已有不少研究（n=29）进行国际中文教师信息素养发展实践探索，主要涉及技术应用、平台/资源建设两个方面。第一，技术应用方面，国际中文教师及研究者不断尝试应用新的程序或设备，教学手段、教学模式持续升级。主要的技术应用包括：网络课件制作（宋继华等，2004）、虚拟现实技术（仇鑫奕，2006）、汉语搭配检索工具（Chen et al., 2016）、视频自我建模（VSM）（Li et al., 2022）等。开发的教学模式或教学工具有：基于网络的的对外汉语同步多媒体教学系统设计（Chen & Liu, 2008），利用博客、QQ、iTalki 等社会性网络工具的对外汉语教学 IAST-A 模型（徐品香，2013），利用融合 2D 和 3D 卷积神经网络搭建的汉语语音情感识别模型（欧志刚等，2023）等。第二，平台/资源建设方面，充分利用网络或人工智能技术搭建教学平台、教学资源网站或人才库。例如，从网站内容、服务功能等方面构建对外汉语教育网站资源建设思路（肖俊敏、黄如花，2011）；通过"互联网+"平台建立国际中文教师人才库，形成汉语学习共同体（周满生，2018）等。

4. 讨论

本研究系统梳理了国际中文教师信息素养发展在价值、内容、路径及实践方面的研究进展，从这些研究中可以发现该领域研究的一些基本特点：目前国际中文教师信息素养主要强调对网络、信息、人工智能等技术的教学转化与应用。从价值来看，学者普遍认为信息科学知识是对教师知识的扩充与深化，信息素养是教师专业能力的重要组成部分；从研究内容上看，侧重探讨哪些因素影响教师信息素养提升，以及如何构建信息素养框架和评价体系；发展路径上，无论是基于现状的策略构建还是教师培训改进，其主要目的是为促进教师对各种技术的转化应用；实践方面，以网络化、数字化、智能化技术的教学应用探

索和网络教学平台、资源库的开发为主。然而，国际中文教师的信息素养如果过于强调信息技术的知识传递和教学应用是否符合国际中文教育发展的逻辑和现实要求？教师的信息筛选、信息过滤能力，以及有效预防“信息过载”“数字鸿沟”等对教学造成的不良影响的能力，是否也需要纳入教师信息素养体系？这些仍是值得进一步探究的问题。

当前，国际中文教师信息素养研究尚处于起步阶段，未来这一研究领域还有很大的拓展空间。首先，就国际中文教师信息素养的价值而言，除了关注其教育教学价值和教师专业发展价值，还应关注教师教育与信息科学对接的多元价值。例如，从学科发展层面，教师教育与信息科学的对接对各自学科具有双向促进价值。其次，从国际中文教育信息素养的内容来看，在关注教师的信息获取、整合、交流、使用等能力的同时，还应关注教师自身的信息意识与态度、信息创新、信息思维和终身学习等能力的发展，以便适应智能化时代的教学需求。再次，当前发展路径探索侧重教师对信息技术的掌握与应用，而对如何更好地对信息或技术进行鉴别、整合，或者如何改造技术以更好地适应教师的需求等问题关注不足。最后，推动国际中文教师信息素养发展的实践探索主要集中在技术的教学应用和资源/平台建设，有一定的同质化倾向，如何更好地利用人工智能促进教师和学生个性化、创新性地开展教学与交流等仍需继续探索。

5. 结语

本研究采用范围综述法，从价值、内容、路径和实践四个方面对国际中文教师信息素养发展研究进行整理和评述。结果表明，国际中文教师信息素养提升已经得到了一定的重视，但相关研究仍处于起步阶段，未来尚需继续拓展相关研究。作为对该领域进行研究综述的一项尝试，本研究无论在综述的范围、分析的内容，还是研究的方法方面都有很多局限。就评估的范围而言，本研究仅检索了 CNKI 和 WoS 两个数据库的核心期刊，检索结果未能反映整个国际中文教师信息素养研究的全貌。就分析的内容而言，本研究仅探讨了价值、内容、路径、实践四个方面，没有具体详细对比分析各种教师信息素养模型或评价指标的异同，讨论的内容也比较肤浅。针对以上局限，后续研究将采用更加严密的研究设计、用更宽广的视野对国际中文教师信息素养研究进行多维分析，为进一步深入该领域的研究提供参考和依据。

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Collaboration Across Time and Space -Leveraging Technology to Create a Triple-Win Scenario （跨越時空的數位合作——利用科技創造學生、教師、與實習生的互利共榮）

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Abstract: The pandemic has posed challenges for Chinese teaching and learning in the United States, which include decreased opportunities for study abroad and significant shifts in learning styles. However, it has also inspired instructors to use video conferencing tools to collaborate with graduate students in Taiwan. Through this collaboration, the learners benefited from additional support and intercultural exchange via online tutoring and class discussions, while graduate students enhanced their teaching experiences and global perspectives. Additionally, this partnership has aided the instructor in better understanding learners' needs and challenges and provided insights into popular culture in Taiwan. This paper will share the insights, challenges, and future implications for successful collaboration.

摘要：受新冠疫情影響，美國高等教育的中文教學面臨了海外留學機會銳減以及學生學習策略改變的挑戰。與此同時，各種視訊會議工具的快速發展也開啟了遠距合作與教學的可能。本篇報告將介紹美國大學中文教師如何與台灣華語教學研究所學生藉由視訊工具進行合作，讓研究生能與學生進行一對一課外輔導，並進入課堂與學生分享討論。遠距合作的模式提供了學生個人化的學習資源和跨文化交流的機會，並給予實習的研究生海外教學的訓練, 而主課教師透過跟研究生的討論，也更能掌握學生個別狀況，了解台灣當下的社會風向。除了分享遠距合作的模式以及成果，本篇報告也會討論合作過程中所面臨的挑戰以及因應建議。

Keywords: Video conferencing tools, Online internship, Online teaching and learning collaboration

关键词：視訊會議工具、線上實習、遠距合作教學

1. Introduction

In the wake of the pandemic outbreak in early 2020, Chinese language instruction in the United States faced significant challenges. In addition to the drastic decrease in study abroad opportunities, learners' learning styles shifted due to remote instruction and interruption to the learning environment. Therefore, it is crucial for instructors to explore ways to cultivate language exposure and cultural exchange and provide customized instructions to accommodate individual learner's needs (Ali, 2020; Christoforou, 2021). Conversely, the pandemic encouraged the use of video conferencing tools like Zoom and Google Meet to support remote working and learning. The development of virtual meeting technology opened up opportunities for Chinese learners to interact with native speakers across the globe and provided accessible gateways to facilitate cross-cultural exchange (Hampel et al., 2012; Bayerlein et al., 2018; Camilleri et al., 2021; 黎海情、安妮, 2022).

On the other hand, video conferencing tools have also expanded the possibility of overseas internships for graduate students who want to teach Chinese as a foreign or second language. Online internships not only provide the opportunity for graduate students to complete their training and academic requirements, but also the possibility of tutoring Chinese learners globally without going abroad.

Therefore, with the need for teaching resources and overseas internship opportunities, the instructor in the United States and the graduate program in Taiwan decided to establish a partnership in 2020. The collaboration aims to provide personalized learning assistance for the learners, overseas teaching experiences for the graduate students, and foster cultural exchange and personal connections for all parties involved.

2. Collaboration setup

After several years of trial and error, a consistent online collaboration process emerged. The setup is as follows:

2.1 Orientation meeting: Before the semester started, the instructor met with the graduate students on Zoom. This initial meeting clarified the curriculum design, graduate student's roles and performance expectations for the duration of the course.

2.2 Introduction to the class: At the start of the semester, the graduate students joined the first day of class through Zoom to introduce themselves before the learners signed up for weekly online individual tutoring sessions.

2.3 Weekly individual tutoring sessions: Each learner met with a tutor once a week on Zoom or Google Meet for an hour to review the lesson and practice speaking. Then the graduate students updated their tutoring notes to document the learners' progress.

2.4 Weekly meeting: During the weekly Zoom meeting, the instructor and graduate students discussed each learner's progress and the challenges they faced. Then, they reviewed and prepared for the upcoming lessons and assignments.

2.5 In-class discussions: Throughout the semester, the graduate students participated in a series of Zoom discussions during the regular class time. For example, after learners read about the Hong Kong protest, they were broken into one-on-one groups with a graduate student over Zoom to ask questions and share their thoughts.

2.6 Wrap-up meeting: After the semester ended, the instructor and the graduate students gathered together on Zoom to share their thoughts and feedback on the collaboration. Graduate students also filled out a survey to reflect on their own experiences.

3. Results and Challenges

To better assess the impact of this collaboration, we collected and analyzed survey results, course feedback forms, tutoring notes, and meeting minutes to gain a holistic understanding. All the data is anonymized to protect the confidentiality of the participants whom will be referred to using only their respective roles and assigned numbers, such as "Tutor 1." Additionally, the sources of this data, such as "meeting minutes," will also be indicated following each example and quotation. After examining the data from the perspectives of the instructor, graduate students and learners, we concluded the following.

3.1 From instructor's perspective

3.1.1 Gaining a better grasp of each Chinese learners' learning progress

The instructor received detailed feedback and updates on each learner's progress from weekly meetings and tutoring notes. Not only did this help the instructor get to know each learner on a more personal level, but the one-on-one sessions also helped the learners gain extra emotional or academic support when faced with challenges during the learning process. For example, one graduate student shared with the group that she developed a word chain game (文字接龙) as a warm-up activity, which motivated and engaged her tutee who was going through a particularly stressful and exhausting period of time. (Tutoring note, week 8, 10.16.2023)

3.1.2 Tailoring and adjusting teaching to respond to learners' needs

With a better understanding of each learner, the instructor implemented more class discussion aligned with learners' interests. By understanding their challenges, the instructor also readjusted the pace and teaching methods to tackle difficult concepts in the textbook. For instance, after a few graduate students observed that their tutees had difficulties using the grammar "却" correctly, the instructor acknowledged this feedback and made a conscious effort to review this specific structure. (Meeting minutes, 09.05.2023)

3.1.3 Learning about current mass culture and newly developed slang in Taiwan

Since the instructor works on the other side of the globe, it became a challenge to keep up with Taiwan's rapidly changing pop culture. However, through the discussions and exchanges with the graduate students, the instructor learned about contemporary matters in Taiwan that some American learners might find relevant or interesting. For example, one time the graduate students shared their perspectives on independent music and how it influenced the younger generations and shaped current political movements in Taiwan. This conversation inspired the instructor to explore Taiwanese independent bands and incorporate the music into future teaching material. (Meeting minutes, 11.05.2023)

3.2 From graduate students' perspectives

First, the partnership enhanced graduate students' teaching knowledge through hands-on learning. For example, they learned new strategies to: (a) help learners distinguish Chinese tones; (b) practice pronunciation; (c) address individual learners' difficulties; (d) improve speaking skills; and (e) deepen the understanding of Chinese words, grammar and sentence structure. In addition to improving teaching capacity, the graduate students also gained additional insights and competencies which are described in the following section.

3.2.1 Understanding how to ask effective questions to encourage learners to speak more. For example, a graduate student noted that "I had the opportunity to re-examine the text from the textbook and come up with extended questions, which enhanced my techniques for asking effective questions. (tutor 1, survey result, 12.30.2023)" Another graduate student commented on the ways to foster a meaningful discussion. "To facilitate a fruitful discussion, the tutors can supplement with relevant materials, engage learners with questions, and create an open and deliberate space for discussion. (tutor 7, survey result, 12.30.2023)"

3.2.2 Understanding how to create a productive atmosphere in the classroom where Chinese learners are willing to engage in learning. For instance, a graduate student mentioned that "[I learned that] I can create this type of [safe] atmosphere in my classroom, everyone can have different opinions and all should be valid and respected. (tutor 6, survey result, 12.24.2023)"

3.2.3 Understanding how to effectively guide Chinese writing activities to help learners express themselves in written Chinese. After we discussed this topic few times during the weekly meetings, one of the graduate students reflected on in the survey. "I learned that the most important method to improve Chinese learners' writing skills is to encourage them to write with previously studied words and structures instead of immediately feeding them the correct answers. (tutor 5, survey result, 12.22.2023)"

Second, through multiple one-on-one interactions with Chinese learners and regular meetings with the instructor to review course materials, graduate students also gained a critical awareness of foreign language acquisition. Such classroom awareness is an essential quality for any teacher. The key insights are as follows:

3.2.4 Graduate students were able to observe the thinking process and the values of learners with different cultural backgrounds. As one of them commented in the survey, "By discussing political issues with the learners, I can gain a more comprehensive understanding of the political issues and also understand the perspectives of the learners, such as topics related to the presidential election. (tutor 7, survey result, 12.30.2023)"

3.2.5 As suggested by the following survey results, graduate students were able to enhance their cross-cultural communication skills and broadening their global perspective "Previously, the topics discussed with learners were relatively basic, and the opinions expressed were superficial. Since I seldom engaged with international issues before, preparing lessons for this internship provided me with an opportunity to broaden my global perspective. (tutor 6, survey result, 12.24.2023)"

3.2.6 Graduate students were able to gain a deeper understanding of how to approach planning, designing, and implementing Chinese courses in the United States. For example, graduate students realized that in these classes, the teacher encouraged Chinese learners to apply their acquired knowledge and complete various tasks related to global or real-life topics. (Meeting minutes, 10.08.2023) The graduate students also found that the interconnected relationship between lesson plans, practice, homework, and assessments was essential for a holistic curriculum design. (Meeting minutes, 10.16.2023)

Third, the instructor held weekly meetings to discuss each graduate student's performance from the previous weeks. If graduate students raised any concerns, the instructor provided thoughts and suggestions but also encouraged graduate students to brainstorm solutions together so everyone could share their ideas and experiences. This collaborative model offered several benefits:

3.2.7 Graduate students learned about the potential challenges that can arise in the classroom and were thus more equipped to handle unexpected situations when they occurred. For example, graduate students realized that teachers may encounter learners with a low motivation for learning. In such cases, teachers should focus on rekindling learners' interest, rather than concentrating solely on explanations of the content. (Meeting minutes, 10.22. 2023)

3.2.8 Graduate students had time to learn from each other, focus on self-reflection and improve their problem-solving techniques. The following survey result well illustrates this take away. " I learned how to be an encouraging and energetic teacher who brings positive energy... It's rewarding to come together with everyone to share and solve problems! (tutor 2, survey result, 01.02.2024)"

3.2.9 Graduate students were able to share their opinions freely in a positive, equal and supportive environment. For example, graduate students mentioned that the instructor encouraged them to ask more questions and gave positive feedback to those who were consistently engaged or shared their opinions. (Meeting minutes, 12.22. 2023)

3.3 From the Chinese learner's perspective

As previously mentioned, at the end of the semester, the instructor gave learners the opportunity to fill-out course feedback forms to better understand the impacts of this project. From the survey data, three themes emerged.

3.3.1 The one-on-one tutoring style gave Chinese learners time to focus on individualized skills such as listening, speaking or reading. For example, while one learner, "found it [tutoring sessions] especially useful to review essays, and practice reading (student 6, course feedback)," a different learner chose to focus on speaking. "Being able to discuss the concepts in my own terms with my own opinions really helped me understand what I was doing and gave me much more confidence in my speaking abilities. (student 6, course feedback)"

3.3.2 The tutor acted as another source of information when questions arose after class or after the professor's designated office hours. A couple Chinese learners emphasized how they used the tutoring sessions as a designated time to ask specific questions. (students 1 and 2, course feedback) Another learner explained, "They [the tutors] were honestly so helpful. Having a tutor who specifically spoke much less English than my tutors in the past forced me to think more in Chinese and allowed them to re-explain concepts and terms in Chinese (student 4, course feedback)." This illustrates another benefit of the tutoring sessions being conducted solely in Chinese, because learners could only get these questions answered in the target language which only added to the immersion experience.

3.3.3 Chinese learners connected topics in class to culture, current events and ideologies in Taiwan and China. 85.7% of the seven learners who took the survey rated their experience as a five (one a scale from 1 to 5) when asked if they were able to connect real life experiences with Chinese language through activities with the tutors. One learner wrote, "I thought that it was a brilliant idea to have tutors in Taiwan because we could learn about what's happening currently and what the tutors think about current events or topics in our textbook (student 1, course feedback, Fall 2023)." One response even mentioned specifically how, "One–on–one tutor sessions helped me a lot in getting questions answered and learning more about Chinese colloquialisms (student 2, course feedback, Fall 2023)," which shows how learning slang and popular phrases expanded the learner's knowledge of Taiwanese culture.

Overall, these responses showed how the tutoring sessions created a positive impact on the Chinese class as a whole and contributed to individual improvement as well. For instance, learners "loved the tutor sessions" which "greatly improved" their learning experience (student 7, course feedback, Fall 2023). During class, the benefits of the tutoring sessions were clear, as one learner put it: "Often the classes immediately after a tutor session were the ones I performed the best in orally (student 4, course feedback, Fall 2023)." Another response that stood out said, "all the people I've told about it [the tutoring program] are amazed at [the] many amazing opportunities the Chinese department offers (student 1, course feedback, Fall 2023)" which signals that these types of programs, although beneficial, may not be as developed in traditional language learning curriculums.

Speaking of the broader implications of this program, these learner-tutor partnerships provided other opportunities even extending outside of the classroom. For instance, one learner who participated in the one-on-one tutoring sessions, had the opportunity to meet their tutor in-person during a semester abroad. Since the tutor already had a developed understanding of the learners' language level, they were easily able to communicate with each other in Chinese. Additionally, the tutor acted as a guide to introduce the learner to various attractions and foods in Taiwan to broaden the learner's cultural knowledge. Due to the previous experience interacting and getting to know their tutor online, this helped the learner feel more comfortable in a new environment and improve her cross-cultural communication skills.

3.4 Challenges during this internship

While the results of this collaboration are overwhelmingly positive, this internship program faced some inevitable challenges. The first difficulty was the 12 or 13 hour time difference between Taiwan and the United States. Thus, graduate students and Chinese learners encountered certain restrictions when scheduling their meetings. The time difference also made it hard for graduate students to participate in regular class activities.

Similarly, Chinese learners also had other course work and extracurricular activities in addition to their online tutoring sessions. A few learners struggled to balance their class work and social life, making it challenging for them to consistently participate in the graduate students' tutoring sessions. As one of the graduate students mentioned during the meeting, "My student stopped showing up for the sessions so I had to find the time to make up for the missed meetings (tutor 4, Meeting minutes, 09.25.2023)." Finally, there are always inevitable challenges when it comes to online instruction, such as network accessibility and technical issues that affect the quality of the meetings.

4. Implications

Based on the aforementioned results, below are the suggestions for developing a successful and collaborative internship program that benefits instructors, learners, and graduate students:

4.1 Clear curriculum structure

It is crucial for the instructor to supply an explicit overview of the curriculum and the internship requirements when recruiting graduate students. This helps attract graduate students who are genuinely interested in this type of internship. Meanwhile, having a clear and shared goal from the start facilitates a smoother collaboration.

4.2 Structured flexibility

Even though learners and tutors scheduled regular meeting times at the beginning of each semester, sometimes extenuating circumstances disrupted the regularly appointed time slots. Therefore, to mitigate this issue, Chinese learners were only required to attend 10 tutoring sessions during the 14-week semester. This "structured flexibility" helps

Chinese learners fulfill the requirements with less stress and allows them to be responsible for their own time management. This structure also reduces graduate students' workload, since there is no need to reschedule every time their tutee misses a session.

4.3 Scaffolding for graduate students

The instructor should consciously provide structures to help graduate students scaffold their teaching skills and knowledge, yet give flexibility for them to develop and explore their own teaching styles during one-on-one sessions. For example, in this internship, the instructor designed an oral practice worksheet as a guide, but the graduate students ultimately made the final decision as to what to practice and how to execute based on the learner's needs.

4.4 Supportive and collaborative partnership

Due to the nature of the internship, there is an inevitable hierarchy constructed between the instructor and the graduate students. However, nourishing an open and supportive environment is crucial for a successful partnership (Beck et al., 2002; 盧巧穎, 2022). It is evident that mutual respect and trust contribute to seamless collaboration and prompt thoughtful responses when issues arise. The interactions between instructors, Chinese learners and graduate students foster a sense of community through listening, caring, communicating, and respecting each other when conflicts occur.

4.5 Regular meetings and communication

Weekly meetings between the instructor and graduate students are essential and beneficial to all the parties involved. Through these meetings, the instructor gains a deeper understanding of each individual learner's progress, while the graduate students familiarize themselves with the learning objectives of the upcoming lessons. The regular meetings present a great opportunity to share experiences, brainstorm ideas, and explore solutions collectively. For example, the graduate students can introduce newly developed social phenomena that the instructor can incorporate into the next lesson plan. At the same time, graduate students can learn about classroom management skills through sharing experiences and discussions.

4.6 The experience of returning participant

Since this type of collaboration was established in 2020, the returning participants who previously took part in the internship played a key role in ensuring a successful partnership. During the recruitment process, interested graduate students could seek further insight and advice about the program before applying. Conversely, while recruiting tutors, the experienced participants could recommend candidates directly to the instructor. At the beginning of the internship, returning graduate students often served as a reference point or contact person to help newcomers get acquainted with the new routine. Once the internship was underway, they also helped create a friendly environment for the first-time tutors by sharing their experiences and providing peer support.

5. Conclusions

This program is underpinned by current online technology which acts as a tool for enhancing Chinese learners' language acquisition in a college setting. By nature, this technology comes with flaws, such as unstable connections and video issues, but the overall impacts remain consistently positive. Not only does the development of online teaching methods contribute to Chinese learner's individual success through one-on-one-design, but this type of proposed structure benefits all parties equally, including instructors, learners and graduate students, as they learn to navigate cultural exchanges and learn how to be reflexive throughout the entire process. Therefore, these skills and partnerships that the online sessions foster extend far beyond the tutoring sessions and support each individual in achieving their goals. This project shows how virtual spaces, collaboration, reflection and reciprocity can be integrated to create new modes of language learning in the twenty-first century.

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为实现日本高校汉语教育资源的数字化所做的尝试与探索
初级汉语电子教材的可行性与问题点
(Digitization of Chinese Language Education Resources in Japanese Universities: Opportunities and Issues in Creating an Elementary-level Chinese E-textbook)

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摘要：目前，日本高校汉语教育基本使用纸质教材。纸质教材的缺点为成本高，而且大量的印刷及纸张废弃也不利于自然环境的保护，另外还不便于携带，更无法实现发音及生词拼写等练习。最近，日本由于贫富差距而引起的教育上的不平等也日益凸显。为解决以上问题，我们尝试创建一个由初级到高级的汉语电子教材库，免费提供学生用。本研究的内容为制作日本高校使用的初级汉语电子教材，并对使用者进行了相关调查。调查结果显示我们开发的初级汉语电子教材在便利性、操作简便性以及学习效果等方面收到了良好的效果，并得到了学生以及任课老师的高度认可。同时，几乎所有学生都表示与纸质教材相比，更愿意使用电子教材。这一调查结果更加坚定了我们今后要创建一套完整的汉语电子教材库的信心。

Abstract: At present, Japanese colleges and universities primarily use paper textbooks for Chinese classes. However, the disadvantages of these textbooks include they have a high cost, they are difficult to carry, they do not help students practice pronunciation or spelling of new vocabulary, and they use a large amount of paper, which is harmful to the environment. In order to alleviate these problems, and in recognition of the rich/poor gap among students, we have created a library of electronic Chinese teaching materials from elementary to advanced levels, which can be used by all students, free of charge. This aim of this paper is to examine how easy it is to use these electronic teaching materials. The purpose of this study is to consider electronic textbooks as the primary textbooks used in Chinese classes in Japanese colleges and universities. The survey results suggest that the Chinese e-textbook we developed achieved good results in terms of

convenience, ease of operation and the effect on student learning. The e-textbook was also well received by both students and teachers. At the same time, almost all of the students surveyed said that they preferred electronic textbooks to paper textbooks. The results of this survey further strengthen our confidence in the value of creating a complete set of Chinese electronic teaching materials in the future.

关键词：电子教材、教育效果、便利性

Keywords: E-textbook, Educational effectiveness, Convenience

1. 引言

近年来，随着信息技术的发展以及智能手机、平板电脑等电子设备的普及，全球已进入了信息化社会。在此大环境下，教育领域也需要逐步进入信息化，以满足现代学习者和时代的需求。我校所在国日本，其文部科学省近年来也提出了 GIGA 学校构想（GIGA School Program），提倡实现 ICT 环境，以便能公平地、切实地提高每个孩子的素质和能力。根据文部科学省官方网站记载，全日本每名中小学生各配一台带有各种学习软件的平板电脑这一计划于 2022 年 3 月末已几乎全部完成。目前，日本各大院校也开始提倡学生运用电脑等电子设备提交作业、上网课等。但与电脑相比，智能手机在大学生中的普及率更高，甚至可以说日本没有一个大学生没有智能手机。因此，如何利用智能手机进行有效的学习已成为我们教育研究者应该探讨的问题。

最近，各种用于语言学习的电子教材及电子软件如雨后春笋般涌现，并得到了越来越多的认可。电子教材因具备能练习发音、练习听力等优势，可以有效地帮助学生进行语言学习。但目前日本用于高等院校的英语电子教材居多，而汉语电子教材却很少，并且大多汉语电子教材都只能练习一些简单的汉语发音及汉语会话，另外几乎都要收费。本研究所开发的汉语电子教材可适用于日本高等院校的汉语教学并能免费使用。其目的不仅是要方便学生携带，便于学生的汉语学习，提高汉语教学质量，而且还要为贫困家庭提供接受高等教育的平等权力及条件。

2. 研究背景

如上所述，电子教材的开发是信息化社会发展的时代需求。再看日本社会现状，虽然日本政府出台了各种教育改革政策，但是由于家庭经济贫困、地域差距等原因而带来的教育不平等现象仍然明显。很多家庭贫困的大学生不得不勤工俭学或者借助各种奖学金或学费贷款来维持学业。本研究所开发的电子汉语教材之所以提供免

费使用，就是想为那些贫困家庭减少一些经济负担，为缩小因经济原因而造成的教育上的不平等尽微薄之力。

众所周知，在开发电子教材时首先面临的是教材的版权问题。因此，要想创建一整套适用于日本高等院校使用的汉语电子教材首先需要解决或拥有一整套汉语教材的版权。而要编写一整套由初级到高级、能学习会话、作文、阅读等语言能力的教材则需要花费大量时间，更需要经过多年的教育实践进行不断的完善。值得庆幸的是，我校有一套由初级到高级、适用于会话、阅读、作文及翻译等各种汉语教学的 27 本纸质教材，这些教材都是本研究的代表者冯富荣等花费了二十多年的时间编写的，并在教学实践中得到了不断改进完善。多年来，这些教材不仅得到了学生及汉语老师的广泛认可，并取得了显著的教学效果。

另外，我校早在二十多年前就致力于开发 e-Learning 汉语学习系统，实现了课下学生可用电脑自习，可用电脑提交作业。为此我们做出了很多努力，比如为了让学生确实掌握所学的知识，我们把作业提交程序设置为学生不把所有练习题全部答对就提交不了作业。因此，学生为了能提交作业必须得反复练习。开始学生对此是有一些抵触情绪，但慢慢地也就习惯了。通过多次反复练习，学生们也切身能感受到自己的进步，能感受到其好处，因此对电子教材的抵触心理也会逐渐消失。

二十多年来，我们在 e-Learning 汉语学习系统开发中，进行了很多各种尝试，其中有成功，当然也有失败。在成功与失败中，我们学到了很多东西：懂得了学生一次学习所能接受的限度；了解了汉语学习中多次简单的重复是何等重要；更明白了我们可以要求学生什么，不可以要求什么等等。早在二十年前的 2004 年，我们就在日本私立大学情报教育协会的期刊杂志上发表了一篇题为《原创 e-Learning 汉语教学尝试》的论文（冯富荣 & 杜英起，2004），并获得了日本私立大学情报教育协会的三等奖。而这篇论文的内容就是我们开发的 e-Learning 汉语学习系统中的一门初级教材。但是，由于当时还没有出现智能手机等时代背景所限，我们开发的 e-Learning 汉语学习系统只能用于电脑，还不能用于智能手机等移动设备。

从 2023 年起，我们开始致力于开发可以用于智能手机等移动设备的汉语电子教材。2023 年，我们初步尝试开发我校汉语专业三年级使用的、能用于智能手机等移动设备的高级汉语电子教材。我们之所以把初步尝试的使用对象设定为汉语专业的三年级，主要有以下原因：①使用者的汉语水平高，想掌握汉语的愿望强烈，因此愿意多次使用；②毕业前的就业活动（日本大学生的就业活动一般从三年级末或四年级初开始）还没开始，能有较多的时间用来学习汉语；③汉语专业的三年级学生人数远远少于一年级的汉语学习者，因此我们能随时询问使用上出现的问题，便于进一步修改和完善我们开发的汉语电子教材。通过一段时间的使用，我们对使用者进行了问卷调查，其调查结果显示：85%以上的学生对其教育效果给予了肯定，特别是对发音练习和听力练习以及生词拼写练习等功能给予了高度评价，并一致认

为携带方便并能随时随地学习汉语是其一大优势（冯富荣 & 高飞，2023）。在此研究的基础上，今年我们又开始开发适用于日本高等教育的初级汉语电子教材。

3. 研究目的

总而言之，本研究有以下几个目的：①为学生提供能免费使用的汉语电子教材，为缩小因经济困难等原因而造成的教育上的不平等做贡献。②为学生提供汉语学习上的方便，帮助学生可随时随地学习汉语，可随时随地练习发音、练习听力，帮助他们提高汉语的学习效果。③探讨初级汉语学习者在使用电子教材时会出现哪些问题，为创建一整套由初级到高级的汉语电子教材库做铺垫。作为一名日本高等院校的汉语教育工作者，我们的最终目的是为实现日本高等教育汉语教材的电子化做出贡献，为更多想学汉语的人提供方便。

4. 研究内容

4.1 本电子汉语教材的特点

本汉语电子教材的原稿是由冯富荣编写的（2008），对象为日本高等院校初级汉语学习者。众所周知，目前用于智能手机及各种电子设备的语言学习电子教材大多采取的是应用程序等方式。应用程序这一方式固然有许多优点，但我们认为用这种方式开发语言电子教材不仅成本高，而且随着智能手机等电子设备的更新换代，应用程序方式的电子教材也需不断更新，因此维持下去需要不断投资，这样很难实现免费提供学生使用。为了降低制作成本，达到维护零成本，为了能让学生免费使用，也为了能用于各种不同系统的智能手机，我们决定这次开发的电子教材采用网页应用方式。为了达到更好的学习效果，我们在设计本电子教材时加入了以下功能：

(1) 听声音功能

如图 1 所示，本电子教材可以通过点击“播放”（日语为再生）按钮，可听到课文、生词和语法说明的例句等声音。其中课文与生词既能从头到尾听一遍完整的声音，又能逐句或逐个地反复听，学生可根据其自身的学习需求，有针对性地选择使用。

(2) 生词练习功能

本电子教材每课都设置了生词练习功能。当学生在做完各课的生词练习时，电子教材会显示出其正确率。当然，练习的次数越多其正确率就会越高。学生通过练习后正确率的变化可感受到练习的效果和自己的进步，所以能激发他们学习汉语的积极性。有些学生为了使正确率达到百分之百而不断地反复练习。此外，在设计生

词练习时，我们把 10 个生词做成一组，让学生一组一组地练，避免学生因生词太多而产生厌倦情绪。如果学生在练习生词时回答错误，电子教材会马上显示出正确答案，并指示学生重新练习，直到十个生词全部作对才能进入下一组的生词练习。这种设计的目的是为了帮助学生彻底学会生词、记住生词（参考图 2）。另外，在做生词练习时，既可以选择听声音来书写生词，又可以看日语意思来书写生词，这样既能提高他们的汉语听力，又能帮助他们做翻译练习，更能帮助他们记住其生词的日语意思。当然，这两种练习方式都能使学生有效地掌握汉字的正确书写方法。

图 1：听声音功能的界面

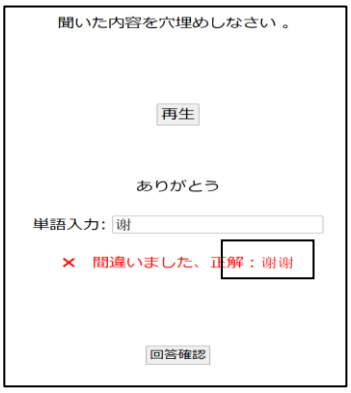

图 2：生词练习功能的界面

(3) 生词和语法的跳转功能

如图 3 所示，本电子教材在课文部分加入了生词和语法的跳转功能，学生只需点击一下就能跳转到生词解释或语法说明页面。纸质教材很难在课文中显示出哪个词语是没学过的生词、哪个语法点是该课文中需要说明的语法点。因此，每当学生在课文中遇到一个不懂的生词或没学过的语法点时，必须得翻找到相应的生词表或该语法说明的页面，因此学起来比较麻烦。但本研究开发的汉语电子教材将每课出现的生词标成蓝色，将需说明的语法点标成红色，这样学生在看课文时，对哪个是生词、哪个是本课要说明的语法点一目了然。当学生需要理解生词的意思或语法说明时，只需点击一下即可，这种设计不仅为学生的学习提供了方便，还能有效地提高他们的学习效率。为了防止学生忘记了以前学过的生词，我们的生词跳转功能不仅限于本课出现的生词，还能跳转到本教材中本课以前学过的生词。

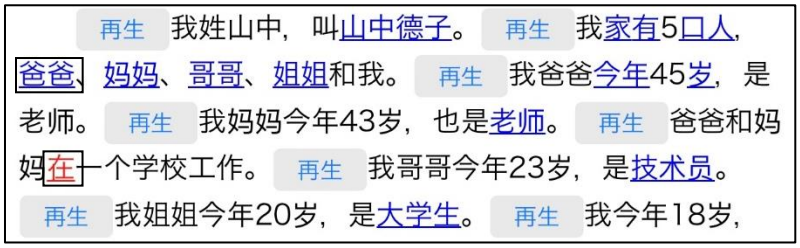

图 3：生词和语法的跳转功能界面

(4) 参照日语翻译功能

一般纸质教材很少有在课文中附加日语翻译的，这可能是由于篇幅有限的原因。虽然任课老师在课上都会对课文进行解释说明，但不能保证所有学生都能把老师的说明完全理解并记住。本研究所开发的电子教材不仅生词表、语法说明用的例句有日语翻译，而且还在课文中也加入了课文的日语翻译，以便帮助学生课下自习时也能理解课文的日语意思，进一步方便他们的课下自习。

4.2 调查内容与调查结果分析

4.2.1 调查方法与调查对象

为了了解本教材在使用中所出现的问题并确认其使用效果，我们对使用本教材的任课老师和学生进行了问卷调查。问卷调查采取了 Forms 的形式，其调查对象为初级汉语学习者，即选修我校“汉语入门 1”这门课的学生（151 名）以及有关任课老师（3 名）。同时还对该 3 名任课老师进行了采访。

4.2.2 问卷调查的内容与结果

本研究的调查问卷共设有 9 道选择题和 1 道自由记述题。选择题主要想确认本电子教材的使用是否便捷、学习效果是否理想等等，以便确认本电子教材是否达到了我们开发研究的目的；自由记述题主要是想了解使用者在使用本电子教材后的具体感受。

如表 1 所示，我们把问卷内容归纳为四个范畴：①本电子教材是否便利（以下简称“便利性”），内容为设问 1 与设问 2；②本电子教材的操作是否简便（以下简称“简便性”），内容为设问 3 与设问 4；③使用本电子教材的学习效果是否理想（以下简称“学习效果”），内容为设问 5 与设问 6；④是否继续支持本电子教材的开发（以下简称“未来期待”），内容为设问 7、设问 8 与设问 9。除此以外，设问 10 是想了解使用本电子教材后的具体感受。

有关本电子教材“便利性”的调查结果表明，93.4%的学生认为本电子教材比纸质教材更方便，其理由最多的是“可听声音”，其次是“可随时随地学习”。总之，本范畴的调查结果表明本电子教材达到了我们的研究目的，得到了预期效果。特别是学生对“可听声音”这一功能给予了高度认可，另外有近三分之二的学生认可了“可随时随地学习”这一便捷性。这一调查结果表明，本电子教材确实方便了学生的汉语学习。

表 1：问卷调查结果

	NO	设问内容与回答结果		
便利性	1	您认为本汉语电子教材比纸质教材更方便吗？	是的(93.4%)	不是(6.6%)
	2	从以下选项中选出您认为本汉语电子教材更方便的理由（能多项选择）。		
	A.可听声音 (88.7%)		B.可看课文翻译(38.4%)	C.不必携带纸质教材(51.7%)

	D.可随时随地学习(63.6%)		E.其他(2.0%)	
简便性	3	您认为本汉语电子教材的操作简单吗？	是的(96.7%)	不是(3.3%)
	4	您认为本汉语电子教材的操作不简单的理由是什么？ “输入生词有些繁琐”“不会设置安卓系统的汉语输入法”		
学习效果	5	您认为本汉语电子教材有助于汉语的学习吗？	是的(98.7%)	不是(1.3%)
	6	您认为本汉语电子教材在哪些方面对您的汉语学习有帮助？		
	A.可进行发音练习(88.7%)	B.可做生词练习(56.3%)	C.可听语法例文发音 (55.6%)	
	D. 可以帮助理解课文，进行朗读练习(41.7%)	E.其他(2.0%)		
未来期待	7	您如何看待本汉语电子教材的免费使用？	很难得(100%)	不免费也没关系(0%)
	8	您希望今后使用哪种教材？	电子教材(92.1%)	纸质教材(7.9%)
	9	您希望未来继续开发这种类型的电子教材吗？	希望(98.0%)	不希望(2.0%)
	10	请自由写出您使用本汉语电子教材后的感想。		

有关本电子教材“简便性”的调查结果表明，96.7%的学生认为本电子教材操作简便。这一结果表明本电子教材不仅能方便学生可随时随地学习汉语，而且学生不会因操作繁琐而不愿意使用，从而解除了我们在开始时担心学生因操作繁琐而不愿使用的担心。根据表 1 可以知道认为本电子教材操作不方便的学生只有 3.3%，其主要原因有两个：一个是“输入生词有些繁琐”；另一个是“不会设置安卓系统的汉语输入法”。通过这个结果，我们懂得了以后在让初级汉语学习者使用本电子教材时，应该对他们加强汉语输入法的训练。我们去年开发以高级汉语学习者为对象的电子教材（冯富荣 & 高飞，2023）时，也做了相应的调查，但在那次调查中并没有出现这样的结果。我们认为其主要原因是高级汉语学习者已经熟悉了使用智能手机输入汉字，并完全掌握了汉语输入法，而本研究的调查对象大多是进大学后开始学汉语的，学汉语还不到一个月，难免有学生还不熟悉汉语输入法。

有关本电子教材“学习效果”的调查结果表明，98.7%的学生认为本电子教材有助于他们的汉语学习。特别是设问 6 最多的回答是“可进行发音练习”，其次是“可做生词练习”。这一调查结果表明本电子教材确实可以帮助学生练习听力、练习发音、练习汉字书写，并能帮助他们记忆生词。这一调查结果表明本电子教材确实有一定的学习效果，可以说本教材可以成为学生学习汉语的有效工具。

下面我们再看有关本电子教材“未来期待”的调查结果，100%的学生认为本电子教材的免费使用非常难得，92.1%的学生希望今后继续使用这种电子教材，还有 98%的学生希望今后继续开发这种电子教材。这一结果进一步增强了我们继续开发这种电子教材的信心，也更坚定了我们建立一整套汉语电子教材库的决心。

总结设问 10 的学生感想，可以得知本电子教材的优点主要体现在以下三个方面：①简便性。本电子教材不仅操作简单，而且不需携带纸质教材便可随时随地学习汉语，不管是课间休息时还是乘坐电车时，拿出手机便可学习汉语，零散时间可以得到有效的利用。②可反复学习。大多数学生在自由感想中都特意提到能反复学

习、反复练习这一功能。③学习效率高。使用智能手机、平板电脑等移动设备随时可听发音，可练习生词，可看课文翻译，还可随时查看学过但没记住的生词，同时还可随时做课下复习或课下预习。因此学生感到他们的汉语学习效率得到了提高。

从学生的感想中，还可以得知本电子教材有待改进的地方主要为有些地方文字与声音不一致。由于本电子教材在四月得到研究助成金之后才开始试做，试做时间非常仓促，还不到一个月，因此产生了一些文字与声音或拼音与汉字不符的现象。另外学生还提到了网络迟缓问题，但这一问题不属于本研究范围。

4.2.3 对任课老师进行的采访结果

通过对任课老师的采访我们了解到本教材的课上使用主要有以下三种方式：①生词的发音练习。任课老师在讲解完生词后，先带领学生练习几遍发音，然后让学生各自用手机边听边练生词的发音。最后老师确认每个学生的发音是否正确，结果老师发现学生利用本教材可针对自己的弱点进行集中有效的练习，比跟读这种统一练习方式效果好得多。②生词书写练习。练完生词的发音以后，任课老师让学生用电子教材进入生词练习功能进行生词的输入练习。既让他们边听边输入，也让他们看日语翻译输入生词。任课老师反应通过这种练习，加深了学生对生词的记忆。③课文会话练习。任课老师在讲完课文会话意思后带领全班学生朗读一遍，然后让学生分组用手机使用电子教材进行会话练习，学生边听课文的声音边进行发音练习，最后老师通过小组发表的方式来确认各个小组课文发音练习的效果。

在采访中，我们还询问了任课老师对本电子教材的使用感想。这些感想可以归纳为三个方面：①提高了教学效率。以前，纸质教材虽然附带 CD，但实际上很少有学生使用 CD 练习听力或发音。为了方便学生练习发音，任课老师需要在课上让学生用手机把自己的发音录下来。学生也需要不断地整理各课的声音数据。但使用本电子教材以后，不仅省去了任课老师的录音环节，还节省了课上时间，学生也不用整理声音数据，并可随时打开自己想听的地方。②功能丰富且操作方便。本电子教材不仅有课文、生词和语法说明例句的发音，还具有生词练习等功能，而且手机操作非常简便。③教育效果得到了提高。利用本电子教材可以随时随地进行复习和预习，还有助于学生掌握发音要领、理解课文。另外，任课老师还一致反应学生都很欢迎本教材的免费使用，问卷调查结果也证明 100%的学生对免费使用给予了肯定。总之，本电子教材的各种功能及其教学效果得到了任课老师们的一致好评。

5. 总结

本研究所开发的汉语电子教材适用于日本高等院校初级汉语学习者，本电子教材在试用近一个月后，我们对使用者做了问卷调查。调查结果表明本电子教材的便利性、操作简便性、免费使用以及学习效果在教育实践中得到了证实，并得到了学

生以及任课老师的高度认可。调查结果还表明，不管是学生还是任课老师都表示比起纸质教材更愿意使用本电子教材，并都很期待继续开发这种电子教材。令人欣慰的是，三名任课老师一致表示本电子教材不仅有较好的教学效果，而且还提高了教学效率，更容易组织学生进行小组发音练习和小组发表，促进了学生之间的互动，活跃了课堂气氛。同时，本调查的结果也提示我们在让初级汉语学习者使用本电子教材时，应对他们增加汉语输入练习指导。总之，可以说本研究所开发的初级汉语电子教材经过了教育实践的考验，得到了使用者的一致支持。今后我们要为创建一整套由初级到高级、适用于日本高等院校的汉语电子教材库继续努力。

致谢：本研究所尝试的电子教材是在爱知淑德大学 2024 年度研究助成金的支持下才得以实现的，对此我们深表感谢。同时也对积极配合并参与本研究调查的任课老师以及学生表示诚挚的感谢。

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AR 赋能于不同群体提升高阶思维之实证研究
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摘要：借助“AR”等人工智能技术赋能中华优秀名篇的赏读，促进新时代人才创意水平与高阶思维等时代素养提升。为使技术赋能应用在提高中文学习创新能力培养和提升自主学习方面产生新的效能，以增强现实(AR)等人工智能技术作为媒介手段，在应用、探索、研究中走进数字化中文学习创新模式与发展领域。

AR 赋能，应用于幼儿园小朋友游戏活动，借助 AR 信息技术与 AR 样品《钱塘湖春行》相融合，构建以 AR 动画为中介的活动，促进幼儿习惯迁移内化。AR赋能，对于中小学生而言，AR扩增实景技术的虚实结合特点，更重要是激发了学习者主动探索的动机与机制，掌握自主习得的方法和规律。AR 赋能，应用于中国内地广东潮州市寒假中小学文科教师培训。现场老师们反馈热烈，语文特级教师还主动参与体验。本文旨在抛砖引玉。

Abstract: Leveraging artificial intelligence technologies like "AR" to enhance the appreciation of China's renowned literary masterpieces, we aim to promote the enhancement of talents' creative abilities and advanced

thinking in the new era. To ensure that technology-enabled applications yield new efficiencies in fostering innovative abilities in Chinese language learning and promoting self-directed learning, we employ artificial intelligence technologies like augmented reality (AR) as a medium to delve into the realm of digital Chinese language learning innovation models and development through application, exploration, and research. AR empowerment is applied to the game activities of kindergarten children. With the help of AR information technology and the AR sample "Qiantang Lake Spring Walk", an activity mediated by AR animation is constructed to promote the internalization of children's habits. AR empowerment, for primary and secondary school students, is more important in stimulating learners' motivation and mechanism for active exploration, and mastering the methods and rules of autonomous learning. AR empowerment is applied to the winter vacation training of liberal arts teachers in primary and secondary schools in Chaozhou City, Guangdong Province, China. The teachers on the scene gave warm feedback, and the special-grade Chinese teachers also actively participated in the experience. This article aims to stimulate further discussion.

关键词：AR 赋能、不同群体、高阶思维、实证研究

Keywords: AR empowerment, Different groups, Higher-order thinking, Empirical research

1. 研究依据

1.1 AR 技术应用教育指导理论

2019 年中国教育三十人论坛第六届年会上，顾明远教授说：“关于未来教育，我们要充分利用人工智能、大数据、数字化等信息技术改变人才培养的模式，关键是要充分认识学生的内在潜力”。

AR（Augmented Reality），是在现实世界中迭加虚拟信息，也即给现实做“增强”，这种增强可以是来自视觉、听觉乃至触觉，主要目的均是在感官上让现实的世界和虚拟的世界融合在一起。AR 流程的三个关键点。首先是 3D 环境理解。主要依靠物体/场景的识别和定位技术。第二个关键技术：显示技术。这其中又分为视频透视和光学透视，其他的代表有光场技术（主要因 Magic Leap 而显名）、全息投影。AR 中的第三个关键技术在于人机交互，用以让人机迭加后的虚拟信息互动，AR 追求在触摸按键之外自然的人机交互方式，比如语音、手势、姿态、人脸等，用的比较多的语音跟手势。虚拟现实和现实增强技术（VR/AR）技术是现代人工智能高度发展的结果。AR 技术作为新兴的现代教育技术，具有趣味性、沉浸性、交互性、可视性等特点，同时，提供给读者良好的阅读体验。

1.2 AR 技术应用心理学指导理论

1.2.1 创造力与好奇心

创造能力具有三个基本特征：一是独特性，即对客观事物具有不同寻常的独特见解，不循常规和标新立异；二是变通性，即能随机应变，不容易心理定势的约束与干扰，能举一反三，触类旁通，构思新奇；三是流畅性，即心智活动畅通无阻。比较一致的看法是把创造力定义为“根据一定的目的，运用一切已知信息，产生出某种新颖、独特有社会或个人价值的产品能力。

好奇心是人对新异事物产生诧异并进行探究的一种心理倾向。求知欲又称认知兴趣，它是好奇心的升华，是人渴望获得知识的一种心理状态。好奇心和求知欲是推动人们主动积极地观察世界，进行创造性思维的内容动因，具有好奇心和求知欲的人。对事物有着执着的追求和迷恋，不会感到学习和创造是一种负担，而是在活动中获得极大的精神鼓舞和情感满足。

https://www.chxckc.com，研究组通过平台创新模式以探索新时期“培养人才好奇心创造力”主轴，“汉语习得过程”为左轴，“创科技术人工智能等”为右轴，探索人字形三维立体创新模式。以眼、脑、手协同作用的动作技能和大脑认知对语言文字加工有机结合。该研究探索阅读者可自主调整快速阅读可感可控习得过程，将快速阅读速度、效率、理解率的技能与网络技术的开放互动自主，和阅读者、阅读材料、阅读者鼠标动作，以及眼、脑、手协同并用多元多维深度融合行动研究，给现行 AR 研究提供丰富借鉴与参考。本项研究中，“AR 助力文学作品鉴赏创新教学设计文本选评”COR 之 AR 新增专项，设计以“品、赏、析、联、创”为引导的教学原型，讨论了创新科技与教育科学理论给中文教育教学实践带来的新挑战。分享了创新教学设计的“默认和生成”模型。

1.2.2 AR 技术赋能的学习动力

AR 赋能进行学习时，往往能有更高的满意度，体会到更多的乐趣以及会很愿意进行重复学习。能够与 AR 物体产生交互，达到沉浸式的体验或是通过游戏的方式进行学习，使他们主动地去探索知识，增强学习动力。

（1）信息的选择性建构和互动性呈现，引导注意力投入。为了引导和保持学习者的注意力，就需要有一定吸引力的形式和内容作支撑——AR 呈现的虚拟教育信息往往就是通过形式和内容的良好设计来吸引个体的注意力。形式上，AR 技术对学习对象、情境的模拟仿真往往不仅立足于客观世界，还会对学习对象进行选择性建构甚至重新建构，且通常以夸张和动态的形式演示、以多媒体的形式呈现，凸显学习现象的关键特征。内容上，AR 一般以有趣的互动设计激发学习者的学习兴趣，使其持续投入注意力。在实际学习过程中，AR 学习内容是在学习者与学习对

象的互动中生成的，对此学习者不仅可看，还能触摸和操作，在此互动过程中学习者的注意力易被吸引并维持一段时间。

（2）3D 虚拟空间的创建，增进行为参与和个体体验。学习者注意力得到引导的同时，AR 逼真的虚拟信息能使学习者产生较强的近体空间效应，促进身体姿势、行为动作的参与，并丰富个体体验。

（3）多模态信息的刺激，丰富有关客体的经验。通过多模态信息对个体多种感官的刺激，以及多种信息互相补充、共同诱发和引导，有助于唤醒个体积极的情绪、情感，增强个体的情境感，进而丰富个体有关客体的信息和经验。

2. 研究内容

2.1 高阶思维的概述

高阶思维是发生在较高认知水平层次上的认知能力，它主要由信息整合能力、新知识建构能力、逻辑思维能力、批判思维能力、创造性思维、评价反思能力等内容构成。信息整合能力：信息整合包含两方面：对信息内容本身的整合和对学习过程的整合

新知识建构能力：学习者通过新、旧知识经验之间的相互作用，建构新知识的能力。学习是一个不断建构的过程，需要通过新、旧经验之间的相互作用而得以实现。这种相互作用存在两种相反的作用方式：同化与顺应（皮亚杰的理论）。要成为一名终身学习者，这个能力很关键。

逻辑思维能力：逻辑思维又称抽象思维或理论思维，是一种前后一贯、有根据、有条理、确定的思维，是人脑的一种理性活动。逻辑思维的基本形式分为概念、判断和推理三种。

批判思维能力：是通过一定的标准评价思维、改善思维，是合理的、反思性的思维。它既是思维技能也是思维倾向，现代社会普遍将批判性思维确立为教育的目标之一，是新世纪所需要的核心能力之一。

创造性思维能力：指思维活动的创造意识和创新精神，不墨守成规，求异、求变，表现为创造性地提出问题和创造性地解决问题。这也是新世纪全球胜任力要求中的重点能力。

评价反思能力：是指学习者主动对新知识做出理解和判断，并对结果进行回顾与思考的能力。学习者运用原有的经验知识对新概念（原理）或问题进行分析、鉴别、评价，形成自我对知识的理解，建构新知序列，并对自我建构结果进行审视与

反思，吐故纳新形成对学习积极主动地检查、评价、调控和改造。评价反思是深度学习和浅层学习的本质区别所在。

2.2 AR 技术赋能文学作品鉴赏用品建模设计

AR 技术以增强现实（AR）等人工智能技术作为媒介手段，包含多媒体、三维建模、实时视频显示及控制、多传感器融合、实时跟踪及注册、场景融合等新技术与新手段，研究设计并评估基于人工智能与视觉元素交互作用，对增强诗词的现实体感效果。

其中，以中华古诗词白居易名篇“钱塘湖春行”为实例，策划者与技术团队根据作品描绘的内容进行建模研究，通过对古诗中描写内容所出现的场景，中国浙江杭州西湖，进行场景建模。”先着眼于作者写作的内容、要点，聚焦于实物和方位处所，并根据诗句的重点文字内容，如“几处早莺争暖树，谁家新燕啄春泥。浅草才能没马蹄…，找好建模的基准点。

再领略诗词作品的情景、意境，品味诗词句中修饰语精准理解景物的特点，如“几处早莺争暖树，谁家新燕啄春泥。丰富建模内容，进行 360 度全息影像与 3D 动感制作。进行整体与局部、时间与空间与宏观与微观实体设计布局，然后迭加三维虚拟内容。配与雄浑明亮的播音朗读声，与柔和悦耳的音乐声浑然一体。设计模型。

3．研究过程

3.1 提升思维能力为主线的“品、赏、析、联、创”原型设计

AR 技术助力文学作品鉴赏进行高阶思维的过程，建议根据不同学习对象，加入有所重点的个性化策略如图 6-7 提升思维能力为主线的“品、赏、析、联、创”原型设计如下：

品：诗词品鉴，“细品”与“精鉴”，着意于 3D 效果特点，进行“品”与“鉴”，提升阅读体验。

赏：欣赏鉴赏；着意于 360 全息影像呈现的诗词场景效果特点赏情鉴理。

析：解析、分析、品析，建议比较（对比）的方法，横比、纵比、同模拟、异模拟，抓特点，此物与他物的不同处。如 AR 效果与动画效果。

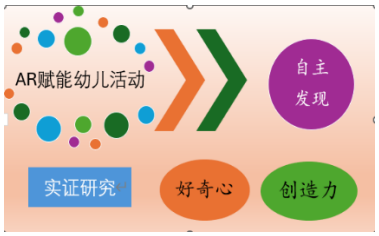
联：背景联想、对比联想、细想联想……多角度、多元素、全方位进行联想……。

创：创造。开发想象力，启迪智慧。发挥再造想象和创造性想象。如……自由发挥……。读、写、说、画、游戏等等，个性化创意特点。开展“阅读古诗词是一种创造性活动”这一研究性学习。通过这一主题的研究性学习，培养学生的创意思维能力。问题发现与求解、在资料查找中去发现新创意，如各不同类的创意活动，让每一幼儿都能开动小宇宙，都能灵气闪动，创造出充满智慧火花的杰作。选 https://www.paper.edu.cn/releasepaper/content/202002-95）

3.2 AR 技术助力文学作品鉴赏活动体验

3.2.1 AR 技术助力幼儿游戏式活动体验

2024 年初，北京军区机关幼儿园园长段春梅老师亲自主持，以幼儿园 10 个大班和 1 个中班为主，有 13 组共 39 位老师参加的 COR8·AR 助力文学作品鉴赏教学设计文本选评，老师们不仅积极体验创新科技给教学实践带来的创新机遇，更是想方设法，将设计通过教学实践，在宝宝的感受和体验中，逐步提升自己的经验与水平。以中十班钱媛媛老师率先尝试的将 AR 情景教学引入课堂实践为例，相关教学设计及过程如下。



北京军区机关幼儿园中十班共 8 名 5 岁左右幼儿参加，设计包含问卷调查、课堂观察、教师访谈和幼儿作品分析等。

AR 赋能，应用于幼儿园小朋友游戏活动，北京军区机关幼儿园借助 AR 信息技术与《钱塘湖春行》等 AR 样品相融合，以深度融合赋能生动活泼的 AR 互动教学情境、构建以 AR 动画为中介的活动，促进幼儿习惯迁移内化。老师基于 AR 技术的教学活动中，引导幼儿能运用视觉影像进行游戏和学习，实现各感官的结合，达到幼儿最大化的学习和发展。比如通过呈现虚拟对象的颜色外观、结构、三维立体的空间形态给予幼儿直观的、可操作的视觉刺激。通过语音提示讲解知识、布置任务或反馈评价给予幼儿听觉刺激；以 AR 技术为主的沉浸式媒体，营造一种身临其境的感觉，这种感觉是对虚拟世界和真实世界的主观感受。

幼儿园进行了在线问卷，即时对参加实证研究的小朋友和家长进行个案访谈和提问回复，统计数据和汇总信息如下：

（1）学生

序号	请简单表述小朋友参加“钱塘湖春行”AR 体验课后的最大变化：
1	我喜欢上了古诗，我每天晚上都喜欢朗诵古诗。
2	我喜欢这个游戏，以后还要上。
3	喜欢老师，喜欢古诗。
4	喜欢唐诗。
5	我感觉很好玩，还想玩这个 AR 游戏课，我还喜欢探索，还喜欢古诗。
6	爱上了唐诗，还有古诗。
7	喜欢古诗，我每天晚上都要学一首才睡觉。

（2）家长

序号	请简单表述小朋友参加“钱塘湖春行”AR 体验课后的最大变化：
1	孩子特别喜欢，特别开心，还喜欢朗诵古诗了。

（1）学生

序号	请参加的小朋友表述参加的最新发现?
1	我发现有小河、小鱼、大山、小亭子，还有小草，小马而且都会动。
2	有小船、有小鱼、还有云，比平时的游戏活动好玩，平时没有这种感觉，那天我非常高兴所以看看能不能咬到草地。
3	我最喜欢的是小船，大山，还有云朵，还可以变化，还有荷叶，有水和水上的那些花，树上全是小鸟的叫声。
4	我特别特别喜欢，感觉特别好，比别的游戏都好，还想上一次，特别好玩。
5	我发现宋庆平很可爱，我看见上面的屏幕，感觉他在吃草，我想进去想看看，和平时游戏不一样，我觉的很开心，我喜欢里面有鸟叫，我喜欢 AR 体验游戏，下次还想看，还想去探索一下。

（2）家长

序号	请参加的小朋友表述参加的最新发现?
1	平时的游戏不能投到屏幕上，这个可以用手机投影，里面的小船、水、石头、花和平时的不一样，还可以触摸。
2	和我们平时玩的游戏不一样，而且是手机弄出来的。
3	孩子发现了山、还有小鱼、还有小船、还发现了一座大山。

3.2 AR 赋能中学生沉浸式赏读

以深度融合赋能生动活泼的 AR 互动教学情境、构建以 AR 动画为中介的活动，合作探究模式、注重持续动态的延伸拓展与交流评价三大实施路径，促进良好中文阅读习惯迁移内化。过程采用研习、习得、测评实验行动范式，进行 T 检验统计，根据语言能力认知发展的特点，基于多功能平台设计的专栏。引导主动投入，轻松愉快和有效地提升中国语文素养，在多知觉运动中，提升对中文语言综合感知，并在快乐习得中，大量地体验与积累语言与词汇，实现轻松个体正强化，提升中文与心理、教育、语言等综合技能和优秀时代素养。

基于 AR 人工智能與視學元素交互作用，品味增强詩詞現實體感效果特别的閱讀效能。AR赋能，对于中小学生而言，AR扩增实景技术的虚实结合特点，更重要是激发了学习者主动探索的动机与机制，掌握自主习得的方法和规律。为今天的数字原住民们提供一个主动乐于阅读、大胆探索、自我激励、走向卓越的机遇。

虚实结合作为增强现实技术的最突出特点，目的是为了实现真实世界和虚拟信息的“无缝”融合。虚实结合技术重在将虚拟的事物可视化，使其学习者能够理解、感知真实的世界信息，这也是人机交互技术的重要发展方向。当 AR 技术应用于中

小学教学活动时，学生在真实的环境学习过程中，还能感知虚拟技术创造的信息世界。此外，虚拟世界是学习情境的重要组成部分，既拓展了真实的物理空间，也实现了信息空间与真实物理空间的有机融合。在这种技术场景下，学生获得的是一体化的空间体验。比起传统的借助平面图像，学生在三维环境里去认识虚拟化的信息和事物，更容易被理解和认识，这不仅有利于学生对抽象知识的理解，还有利于空间思维能力的训练和发展。此外，以 AR 技术为主的沉浸式媒体，将给学生营造一种身临其境的感觉，这种感觉是学生对虚拟世界和真实世界的主观感受。这种虚实结合的沉浸式环境能够使学习的内容变为真实世界中的问题和环境成为可能。

教育技术的发展破解了时空分离、远程互动、移动学习的难题，每一次进阶都带来了一次新的变化，同时教育变革也越来越难。AR 技术以信息化为基础，以学习者为中心， 顺应“互联网+”发展趋势，可以实现信息技术与教育教学全方位的融合。教育系统只有新技术的加注，才能在不断变化的中保持相关性，并高效地完成自己使命。

近日，适逢完成香港创新科技署科技券计划 TVP/0507/21 项目，获得 AR 样品“钱塘湖春行”、“一剪梅 • 花外神仙”、“枫桥夜泊”。

2024 年 5 月 13 日，研究组带领 AR 样品走进了香港教育工作者联会黄楚标中学的中二课堂，同学们兴奋与惊奇，主动积极投入互动，注意率达 100%。现场的师生关注，表现出对 AR 技术助力于文学作品鉴赏探索研究的高度热情。




事实表明，学生一旦成为虚拟技术应用的中心，让其积极参与到教学信息处理的环境中去，又取得身临其境的体验。这不仅对于理论与实操协作式学习、专业理论知识的理解、研究性学习。这种以“教”转换为以“学”为中心的教学方式，能更直观地体现教与学的关系。增强了生生学习的互动性、趣味性，同时也大大提升了教师的教学质量。这为推进教学模式的变革“赋能”，带动了新的技术革命。

3.3 AR 赋能中小学教师培训

AR 赋能，应用于中国内地广东潮州市寒假中小学文科教师培训。现场老师们反馈热烈，语文特级教师还主动参与体验。现场有效问卷 56 份中，认为“AR 研究重点新颖有活力”的选项占比是非常好占 64.29%，很好的占 21.43%，https://www.chxckc.com/news/#/2677。

运用 AR 技术将真实世界信息和虚拟世界信息“无缝”集成，把原本在现实世界的一定时间空间范围内很难体验到的实体信息（视觉信息、声音、味道、触觉等）

通过计算机等科学技术，仿真模拟后再迭加，将虚拟的信息应用到真实世界，被人类感官所感知，从而达到超越现实的感官体验，使真实的环境和虚拟的物体实时地迭加到了同一个画面或空间同时存在。

而从心理学的角度来说，人的右脑主于综合、整体的听辩，包括想象、感知、直觉等等，而左脑主于语言及与语言相关的功能在欣赏 AR《钱塘湖春行》的春景中活动。诗，美在意境，欣赏古诗的目的就是提升思维能力为主线的品鉴、欣赏、解析、联想、创造性的阅读活动，将带入诗境之中。因此，借助 AR 信息技术与《钱塘湖春行》AR 样品相融合，以深度融合赋能生动活泼的 AR 互动教学情境、构建以 AR 动画为中介的活动，以合作探究模式、注重持续动态的延伸拓展与交流评价三大实施路径，将抽象概念可视化，将教学时间多元化，促进习惯迁移内化。

研究认为，新时代代的孩子（应）能熟练掌握“人工智能思维”的三点核心，把人工智能当作人类的工具，锻炼自己成为具有创造力和协作能力等核心竞争力的优秀人才。

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教师和学习者共同制作的多媒体教材的潜力：将个人学习成果转化为学习资源的 PBL
(The Potential of Multimedia Teaching Materials Co-created by Teachers and Learners: a Case Study of PBL that Transforms Individual Learning Outcomes into Learning Resources)

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摘要：在 Web 3.0 和生成式 AI 迅速发展的背景下，个人用户生成的信息价值得到了显著提升。本研究旨在通过促进学习者之间的反馈和互助，构建一个循环支持系统，将其作为混合式教学设计中的关键环节。研究基于协作学习、支架理论和语言产出假设，提出“多媒体支持下的协作学习”教学过程。学生从学习者角度出发，参与教学活动，通过协作学习和互动反馈生成支持性学习成果。本研究还探讨其他学习形式，采用项目式学习（PBL），让初学者亲自制作多媒体教材。通过对 PBL 参与者和观众的定性分析，总结学生对教材的看法、自主学习情况、激发学习动机潜力及其支架功能评价。

Abstract: The rapid development of Web 3.0 and generative AI has significantly enhanced the value of user-generated information. This study aims to build a cyclical learning system by promoting feedback and mutual assistance among learners, as a crucial part of hybrid course design. Based on collaborative learning, scaffolding theory, and the output hypothesis, it proposes a teaching process centered on "collaborative learning supported by multimedia." Students participate in teaching activities from a learner's perspective, generating supportive learning outcomes through collaboration and feedback. Additionally, the study explores other learning forms, employing Project-Based Learning (PBL), where learners create multimedia teaching materials. Qualitative analysis of PBL participants and viewers summarizes students' perceptions, self-directed learning, motivation, and evaluations of scaffolding functions.

关键词：信息通信技术、多媒体教材、协作学习、项目式学习（Project-Based Learning，PBL）

Keywords: Information and Communication Technologies (ICT), Multimedia teaching material, Collaborative learning, Project-Based Learning (PBL)

1. 引言

随着“与新冠共存”稳定期的到来，大中华区的旅游市场逐渐复苏。特别是日本北海道地区，疫情前来自大中华区的游客占整体旅游人数约 60%（据 JNTO 讯息）。在旅游业中，从业者与游客沟通时更多依赖中文和韩文而非英语。因此，提高中文教育的效果与效率、培养相关人才已成为地区社会的迫切需求。同时，随着 Web3.0 时代的到来，教学形式和沟通方式转变为多模态，利用互联网、AI、ICT 等新技术已成为教学的前提。近年来生成 AI 迅速发展，个人的创意活动及其成就逐渐接近专业水平。在这种背景下，不更新新技术的应用将加深数字鸿沟，无法满足学习者需求。此外，在学校教育中，教师与学习者应共同创建课程内容、共同创新，以共同的教学目标为导向进行实践探索，而不是传统的供应者和消费者关系。

2. 文献简述

本研究的理论框架基于协同学习（関田・安永，2005）、输出假设（Swain，1985）、以及同伴学习和支架式学习的效果（Wood 等，1976）。在协同学习的过程中，将自己的知识和技能教授给别人，作为一种与学习不同的刺激功能。学习者的教学行为有可能成为优质的学习机制（Bausell 等，1975；Biswas 等，2005）。此外，先行研究还报告了学习者间的教学、知识与技能的获取，以及支架式教学在信息和体验共享中的重要性和同伴辅导的互动效果。然而，先行研究的教学环境是由于共享没有实体的知识和技能而构成。再加上，在混合式教学中，四个基本价值与原则（Beatty，2019）（见表 1）极为重要。

表 1：混合式教学的四个基本价值与原则

① 学习者选择性 Learner Choice	提供有意义的课程模式选择。学生可以根据时间段或主题选择课程模式。
② 等效性 Equivalency	在所有课程模式中提供相同的学习成果。
③ 可复用性 Reusability	将各模式中的学习活动成果（如聊天和讨论记录、文件提交、同伴评审记录等）作为学习内容重新利用。
④ 可访问性 Accessibility	在所有课程模式中为学生提供技术技能和公平的访问权。

本研究特别强调③可复用性。通过新技术的应用，可以使学习者自己创造出多媒体教材作为对以往学习内容的反思，同时也可将其作为其他学习者的学习资源，这为既存的教学模式提供了一个新的视角。

3. 研究目的与方法

本研究旨在通过将混合式教学中的学习成果重新利用为其他学习者的教育资源，实现一种模拟协同学习的设计方案。通过这一方案，改善混合式学习环境，提高教学相结合的可持续性。为了满足北海道地区对外语教学，特别是在初级中文课程领域的特殊需求，探讨应用 AI 和 ICT 等新技术的 PBL 的教学设计。具体的研究课题是：学习者如何通过协同学习对个人学习成果进行内省和外化，并将其输出为多媒体教材？以及学习者如何意识到超越个人的知识学习和技能学习的意义与价值？

4. PBL 实践

4.1 参与者与环境

本研究在 2023 年春季学期以实施了 PBL（见表 2）。作为第二外语学习中文（选择性必修课）的大学一年级学生参加了 PBL。参与者可以自由选择该学期学过的内容，以协作学习的方式开发学生视角的多媒体教材（幻灯片和视频等）。由教师、学生成员（开发者，9 名）及教材观众（其他中文学习者，14 名）对多媒体教材进行评估。为了探讨将多媒体资料用作视频（点播）课程教材的可能性以及与中文学习相关的因素，PBL 结束后进行问卷调查，并对数据进行汇总和质性分析。本研究还初步探讨了学习者参与教材开发的经验所带来的影响和学习效果等。

表 2：PBL 概况

参与者	修读初级中文课的大学一年级学生，文理混合班级（开发者 9 名，学习者 14 名）
环境	课外开发（分组协作学习）；策划、拍摄、录音、编辑等由学习者主导分担；BYOD
活动与方式	每月一次定期会议（共 4 次），最终会议（教材的展示、观看及相互评估，1 次） 通过 SNS 群组保持联系、报告进展、共享数据、评论反馈等

4.2 由学生开发的多媒体教材

学生分成三组，各自决定主题后，制作了视频和 PowerPoint（PPT）资料。每组的主题、工具、数据格式及内容特点和挑战详情如下。

（1）A 组
主题：①能愿动词，②大数字，③选择疑问句，④ 在搭讪中使用的表达
工具：Canva（视频）及 PPT（幻灯片）
内容特征与挑战：
【视频】由一名具有家教经验的学生制作，题目为“会”、“能”、“可以”的用法。该学生解释三个动词的语法后，添加了十道问答题（每题回答时间为 5 秒），并巧妙使用计时器声效提示思考时限。虽然视频中有些中文发音错误，但这反映了课堂上同学间互相教学的实际情况，是互动学习情景的真实再现。
【幻灯片】学生创作了自动播放录音的 PPT，从学习者视角整理课本语法要点。PPT 分为基础篇和应用篇，统一背景色以提高易读性。最后设计了搭讪场景对话，

使用课本词汇和语法。尽管有一些发音错误，对话由男女学生配对朗读，巧妙利用插图等视听表达。但 PPT 翻页时声音自动播放，观众调节整体音频有些困难。

图 1：A 组开发的教材

（2）B 组
主题：考试、星期、量词
工具： PPT（幻灯片）
内容特征与挑战：
【幻灯片】利用课本词汇和例句，设计考试前的学生对话场景。结构包括对话文本、词汇列表、语法要点、语法解释和量词练习题（6 种量词）。团队成员分工合作，自己朗读中文（存在发音问题）。为了便于观众自行控制音频时间或重复视听，没有设置自动播放功能。简体字上面拼音的标注位置及显示时间设置不妥。

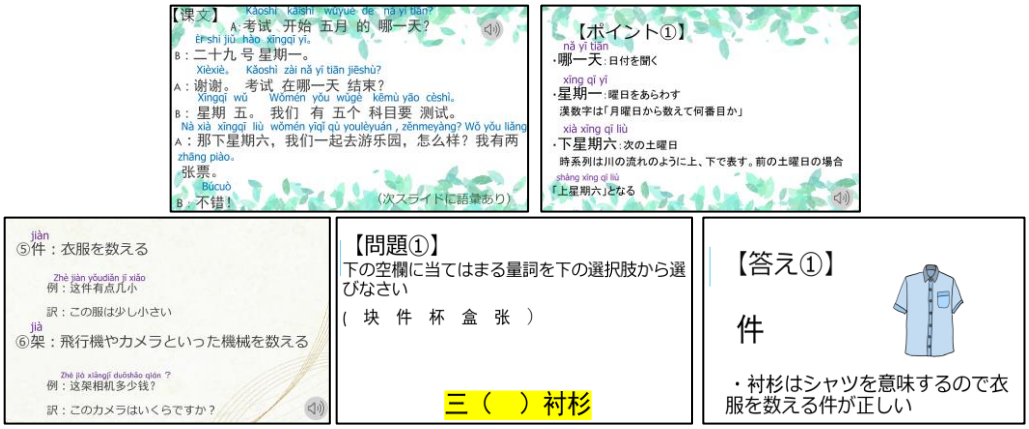

图 2：B 组开发的教材

（3）C 组
主题：数字的表达与问答（年龄或课时数）
工具：Vrew（视频），文字转语音工具（音频）
内容特征与挑战：
【视频】学生使用自己的声音录制及机械合成语音生成素材，并用视频编辑软件 Vrew 进行字幕添加等编辑。团队成员分担素材制作，一名擅长软件应用的学生负责编辑。视频结构包括①对话文本②语法解释③练习题④答案解释。利用 AI 和 ICT 工具制作了日语和中文的合成语音，确保准确发音。人声提供了朴实而安心的质感，吸引学习者，增强学习体验。C 组成员在视频开头以统一声音问候，增强集体认同感，带来亲切一致的开场与结束，使视频教材更具完整性和可观赏性。这种多种工具和技术的综合使用不仅提高了教材的多样性，还促进了制作者和观众之间的互动。

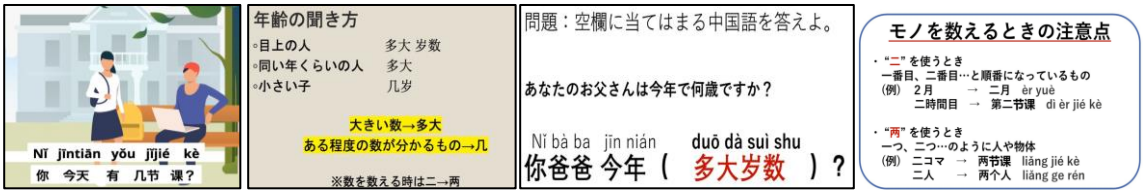

图 3：C 组开发的教材

5. 数据分析与讨论

为了知悉学生如何认为通过多媒体教材开发的学习内容的内省和外化过程，以及中文学习者对多媒体教材的评价，对 8 名 PBL 成员（9 名中 1 名缺席）和 14 名观看教材的中文学习者，共 22 人进行了在线问卷调查（Google Form）。本文展示部分问项及分析结果。问卷主要分为以下三方面：①学习者对学生开发教材的印象和满足度，②在缺席面授课情况下利用视频的可能性，③教材开发 PBL 对中文学习的意义与价值（仅面向 PBL 成员）。调查旨在评估多媒体教材的质量和学习资源的利用空间。

问项	问题文本	回答方式
1-1	你观看学生制作的教材后，有任何发现或印象深刻的地方？（可多选）	多选题： ☐内容的覆盖性 ☐解释的易理解性 ☐发展性、应用性 ☐幻灯片的可视性及设计 ☐学生视角的同感和共鸣 ☐简明性、条理性 ☐发音的易听性
1-2	对学生制作的教材和学习资料的满意度如何？	10 分数制评价
2	你缺席面授课程时，如何补习未学习的单元和内容？	单项题： ☐通过小测试和作业来补充 ☐没有补习就参加下一节课 ☐从未缺席 ☐看点播视频 ☐听课本的模范音频 ☐向老师提问 ☐借用朋友的笔记 ☐自学课本内容和练习题 ☐其他（自由作答）
3-1	参与 PBL 活动中，你觉得自己的中文能力有所提高吗？	5 分数制评价
3-2	自己感觉提高了哪些方面的能力？（可多选）	多选题： ☐词汇量增多 ☐准确地发音 ☐理解了语法要点 ☐造句，写作中文例句 ☐理解中文的细微表达差异 ☐用中文进行在线交流 ☐应用电脑、智能手机、平板等使用中文
3-3	参与 PBL 活动中，有了什么样的困难？	开放题
3-4	参与 PBL 活动中，你认为学到了哪些东西？	开放题
3-5	你认为通过开发视频教材和学习资料的 PBL，会更开心地学习中文吗？	5 分数制评价

图 4：问卷问项

关于①的回答如表 4 所示。尽管课本内容覆盖性强，学生开发的教材信息较为有限。学生对教材的易理解性、发展性、应用性、可视性、设计、学生视角的共鸣、简明性、条理性评价很高。发音易听性和不准确发音的接受度存在分歧，有些

接受课堂多语言视角，有些要求准确发音。部分回答理解和支持初学者的发音不准确。教材总体满足度较高（见图 5），但也有 5-6 分的评价，需探究具体原因。

表 4：问项①的回答

内容的覆盖性	信息量多	4	解释的易理解性	易理解性高	11
	信息量少	8		易理解性低	1
发展性、应用性	从课本中发展出的内容	19	幻灯片的可视性及设计	可视性高	14
	按照课本的内容	3		可视性低	4
学生视角的同感和共鸣	有同感，能够共鸣	13	简明性、条理性	促进理解	9
	没有同感，难以共鸣	4		不促进理解	0
发音的易听性	听得懂，听得清楚	8			
	听不懂，听不清楚	5			

*表内数字为回答人数

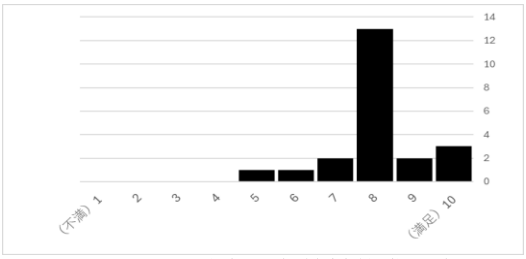

图 5：对于学生开发教材的满足度

关于②的回答如图 6 所示。缺席时自主进行点播视频补习的学生非常少。由于学生已养成传统的个人学习习惯，习惯于利用课文与练习题，并借用同学的课堂笔记进行自学。虽然大学的 LMS 中保存所有单元的点播视频，但许多学生不知道其存在或从未使用过。即使有优质的自学教材，如果学生不知道如何使用或者没有习惯观看，任何资源都没有意义。教师要推广普及这些学习资源的利用方法，比如在课堂上共享观看体验等。

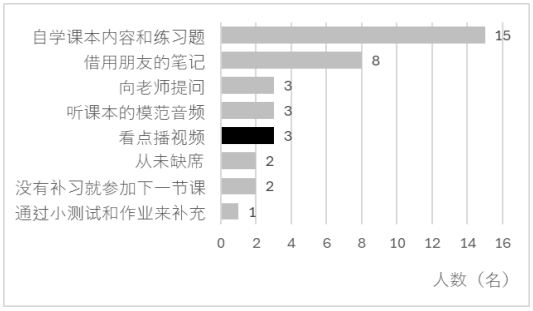

图 6：缺席面授课程时的补习方法

关于③的回答如图 7、8 以及表 5 所示。PBL 成员感受到中文能力有所提升，体验到了对各种具体知识和技能理解的加深。特别是在思考如何能让其他学习者理解语法解释和例句语义的过程中，对于促进语法要点的理解、对细微表达差异的理解以及例句产出方面，都显示出了一定的效果。在活动中，由于必须利用 ICT 共同制作视频，学生也体验到了自己在技术应用和使用中文进行交流或沟通方面的能力有所提升。

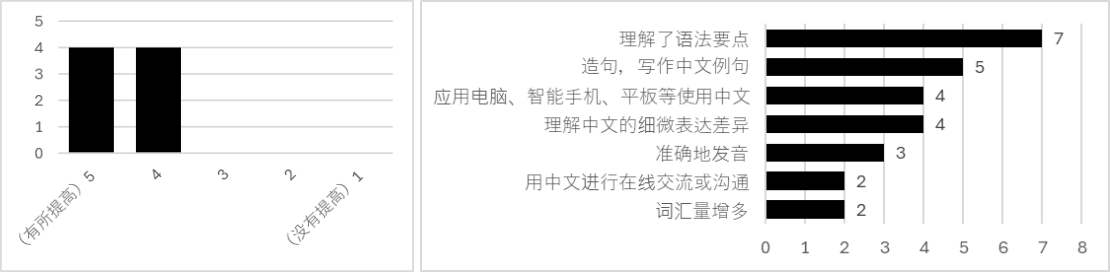

图 7：参与 PBL 活动自己的中文能力是否提高

关于 PBL 中遇到的困难及收获，我们通过开放性问题的质性分析进行编码和分组（见表 5）。学生在准确发音与拼音标记、内容策划与构成、公平分工、时间管理等方面遇到困难。由于策划与构成需要产出优质学习成果（视频教材），团队合作和协同学习是必需的，但外语课通常不包含这些设计，学生因此感到吃力。分组学习中常出现工作负担偏差，因此除了学生自我调整，还需教师适当调控。在收获方面，学生不仅加强了对所学知识的理解，提高了实践技能，还在信息传达力、主观表达力、创意思维、协作与团队合作等方面感受到了成长。这些成长与实践中的困难密不可分，通过协作学习分享经验并解决问题，每个人都会获得成长的实感。我们研究了“通过视频教材和学习资料制作 PBL 能否更愉快地学习中文”这一课题，总体获得了积极评价（见图 8）。

表 5：PBL 中遇到的困难以及自己学到的东西

困难	准确地发音与拼音标记	6	自己学到的东西	中文课堂上学过的知识和技能的加强	3
	内容的策划与构成	3		协作性和团队合作	3
	公平性和合理的分工	2		传达力和表达力	2
	时间管理	1		创意和思考	1

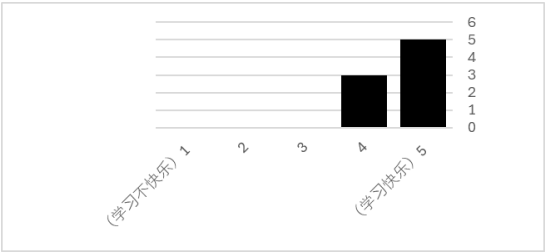

图 8：通过视频教材和学习资料制作的 PBL 能否愉快地学习中文

6. 总结与今后的课题

在 PBL 过程中，学生基于课堂所学内容自主制作教材，在教与学的循环过程当中深化了理解，提升了中文运用能力和元认知学习能力（如企划力、思考力、表达力、ICT 应用技能等）。学生整理了中文的基本词汇、语法和会话表达方式，并以视频和幻灯片的多模态形式表现。这一过程为学生提供了知识重构和确认的机会，实现了更深入的中文学习。观看教材的中文学习者高度评价多媒体表达和内容的可访问性。然而，学生制作的教材中存在发音不准确的问题。在学习者创建教材的过

程中，需要考虑语言准确性与学习者在同伴学习的真实氛围之间的平衡。这成为未来研究的挑战，需要调整语言准确性和学习者视角的教材开发之间的适当平衡。

混合式教学的设计是提高教学质量的有效手段。根据先行研究，学习者间的互动，如支架教学、辅导和同伴学习，为了增强学习动机和学习效果具有积极影响。此外，Active Learning 的设计需要融合知识和技能的学习以及元学习、元认知和人格成长等多个层面（Fadel 等，2016）。知识和技能的学习往往依赖于母语者或成功的外语学习者（外语教师）的指导。今后需要进一步探究的是，在知识、技能、人格、元学习这四个层次中，PBL 对人格和元学习方面的具体影响。本研究探讨了学习者基于自己的学习经验产生的成果物作为其他学习者的学习资源的可能性。通过学生担任教材开发者与指导者的角色，会促进学习的自主性和动机。基于本研究的成果，将继续改进教学设计，以持续产出和运用可持续的教育资源。

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Optimizing the Potential of Technology in Chinese Language Learning through Project-Based Learning (通过项目式学习优化汉语学习中的技术潜力)

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Abstract: This research study describes the implementation and assessment of an action research project carried out by an instructor at an Indonesian institution, with an emphasis on the use of project-based learning (PBL) to teach Chinese as a second language with the use of technology. The aim of this study was to investigate the efficacy of PBL in Chinese language and culture teaching by soliciting input from students and instructors on their experiences and impressions of it. Data was acquired through student interviews, questionnaires, analysis of project outputs, classroom observations, and teacher diaries. The findings show that PBL is an effective technique for simultaneous language and culture acquisition, as well as the development of other abilities. PBL is successful in engaging and motivating students, promoting cultural understanding, and increasing Chinese language ability. Although students encountered difficulties in using the target language throughout PBL, notably in sentence construction and character memorization, they were able to recognize their language shortcomings and requirements and shown a strong desire to overcome them. Throughout the PBL process, the teacher created a collaborative connection with the students, taking on the roles of both learner and facilitator of their learning. This study also emphasizes the importance of teacher research as a useful tool for practitioners investigating student learning outcomes and instructors' teaching strategies, especially when introducing technology into language education.

摘要：这项研究描述了印度尼西亚一所大学的一位讲师开展的一项行动研究项目的实施和评估，重点是探讨使用项目式学习（PBL）和技术教授汉语作为第二语言的情况。本研究旨在通过征求学生和教师对他们使用 PBL 的经验和印象，调查 PBL 在汉语语言和文化教学中的有效性。数据是通过学生访谈、问卷调查、项目成果分析、课堂观察和教师日记收集的。研究结果表明，PBL 是一种有效的同时习得语言和文化以及发展其他能力的技术。PBL 在吸引和激励学生、促进文化理解和提高汉语语言能力方面表现出色。虽然学生在 PBL 过程中在使用目标语言方面遇到了困难，特别是在句子构建和字符记

忆方面，但他们能够认识到自己在语言方面的不足和需求，并表现出强烈的克服困难的愿望。在整个 PBL 过程中，教师与学生建立了协作关系，同时扮演了学习者和学生学习的促进者角色。本研究还强调了教师研究作为一种有用的工具，对于研究学生学习成果和教师教学策略的实践者具有重要意义，特别是在将技术引入语言教育时。

Keywords: Chinese Language Learning, Project Based Learning, Innovation Technology

关键词：中文教学、基于项目的学习、创新技术

1. Introduction

The integration of technology in education has revolutionized traditional teaching approaches and opened up new possibilities for language learning. In recent years, there has been a growing interest in leveraging technology to optimize language learning experiences, particularly in the context of learning Chinese as a second language. This action study reported a project-based learning (PBL) activity in order to meet the international Chinese education standards in the new era

The study discovered that PBL activities increased learning motivation and autonomy while also achieving learning objectives in a variety of aspects, including cultural knowledge, cultural understanding, cross-cultural awareness, and cultural attitudes. This journal seeks to investigate the possibilities of project-based learning in using technology to improve Chinese language learning results. Project-based learning activities and inquiry-based learning activities are two teaching strategies that can assist students grasp scientific information.(Panasan et al., 2010).Project-based learning emerges as a model that meets the needs of both teachers and students in teaching and learning a foreign language effectively (Yin & Huat, 2021). The study discovered that PBL activities increased learning motivation and autonomy while also achieving learning objectives across various dimensions such as cultural knowledge, comprehension, cross-cultural awareness, and cultural attitudes. This journal seeks to investigate the possibilities of project-based learning in using technology to improve Chinese language learning results. Project-based learning activities and inquiry-based learning activities are two teaching strategies that can assist students grasp scientific information.(Nan, 2023).

Chinese language learning has gained significant importance due to the growing global influence of China in various domains such as business, culture, and international relations(Fallas Gabuardi, 2021). As a result, there is a rising demand for effective and efficient methods of teaching and learning Chinese as a second language. While traditional classroom-based instruction has been the predominant approach, the rapid advancements in technology offer promising opportunities to transform language learning pedagogy.

Despite the availability of numerous digital tools and resources, there is a gap in our understanding of how to effectively optimize the potential of technology in Chinese

language learning. Many existing studies have explored the impact of technology on language learning in general, but few have specifically focused on the integration of technology with project-based learning in the context of Chinese language acquisition(Condliffe et al., 2017).As a result, the goal of this study is to close this gap by looking into the possible benefits and problems of project-based learning as a way to improve technology-driven Chinese language learning. By investigating this issue, we hope to add to the current body of information by offering insights into the effectiveness of project-based learning techniques in the context of Chinese language acquisition, as well as the role of technology in facilitating such approaches.

However, the journal investigates how project-based learning and technology might improve learning potential and results in Chinese language education by creating a student-centered, interactive, and relevant learning environment. With this in mind, the current research seeks to answer the following three questions:

Research Questions:

1. How can project-based learning be effectively integrated with technology to optimize Chinese language learning outcomes?
2. What are the benefits and challenges of implementing project-based learning in Chinese language classrooms?
3. What are the specific technological tools and resources that can enhance project-based learning in the context of Chinese language acquisition?

2. Literature Review

2.1 Chinese Language Learning using Innovation Technology

Chinese language in Indonesia, with a rising number of individuals acquiring it, even developing the trend of the worldwide Chinese language. (Phanata, 2023) Chinese Language Learning is the process of learning information, abilities, and fluency in the Chinese language. It entails the study of Chinese vocabulary, grammar, pronunciation, writing systems (such as simplified or traditional characters), and cultural elements of the Chinese-speaking world. Individuals can study Chinese for a variety of goals, including academic, professional, cultural, and personal enrichment. As the global demand for Chinese language competence grows, language educators and academics have sought new strategies to improve students' learning experiences and outcomes. The use of technology into Chinese language learning has emerged as a viable strategy, providing new opportunities to improve the educational process.

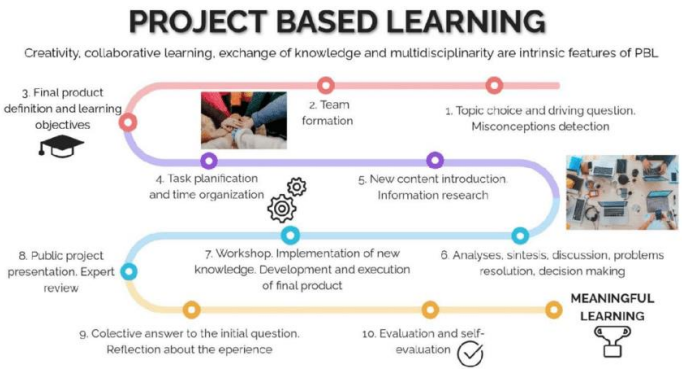
The journal Optimizing the Potential of Technology in Chinese Language Learning via Project-Based Learning investigates the use of technology and project-based learning methodologies to improve the efficacy and efficiency of Chinese language learning. It focuses on using technological tools including computer-assisted language learning (CALL) software, web resources, mobile apps, and multimedia materials to create dynamic and engaging learning environments. The magazine emphasizes project-based learning,

which is an educational strategy in which students engage on real-world projects, assignments, or questions that demand them to actively use their language skills and knowledge. By combining technology with project-based learning, the journal hopes to improve the learning experience, encourage learner autonomy, enhance critical thinking and problem-solving abilities, and give chances for genuine language usage and cultural inquiry. For example: Blended learning approaches Numerous research have looked at the efficiency of blended learning approaches, which mix traditional classroom instruction with technology-mediated components. Researchers discovered that blended learning techniques can improve language competency, boost student engagement, and provide more individualized learning experiences.(Kanwal, 2023). For example, a study by (Islam, 2020) explored the integration of mobile-assisted language learning (MALL) in a blended Chinese language course, reporting significant improvements in vocabulary acquisition and listening comprehension among students. Adaptive and Personalized Learning The integration of adaptive technologies in Chinese language learning has also gained attention. Adaptive learning systems can assess students' proficiency levels, learning styles, and progress, and then tailor instructional content and activities accordingly(Baker et al., 2018) Collaborative and Social Learning Web-based platforms and social media have been integrated into Chinese language learning to foster collaborative and social learning experiences. Such platforms enable learners to engage in peer-to-peer interactions, exchange cultural information, and receive feedback from both peers and instructors (Xiao-Desai, 2011).

The journal explores techniques, approaches, pedagogical frameworks, and case studies for integrating technology and project-based learning in Chinese language teaching. It may investigate the benefits, obstacles, and consequences of this method, as well as give insights into how educators may effectively develop, execute, and evaluate technology-enhanced project-based learning experiences in Chinese language classrooms or online learning settings.

2.2 Project Based Learning

Project-Based Learning (PBL) is an educational strategy in which students work on difficult, real-world projects or assignments to build and demonstrate their knowledge, skills, and understanding of a certain subject or topic. It is a student-centered, inquiry-based method that emphasizes active learning, critical thinking, problem solving, cooperation, and communication. Project-Based Learning (PBL) is a strategy that allows students to learn via the construction of distinct real tasks that result in projects while working cooperatively. (Fallas Gabuardi, 2021). PBL is used as a pedagogical framework to improve Chinese language learning experiences via the integration of technological tools and resources. This article explains the design principles for teachers in project-based learning to assist them establish their identities as designers and use them inside the PBL (Project-Based Learning) paradigm. (Jiang Bo & Liu Li, 2015) The journal investigates how technology may be effectively integrated into project-based learning activities to enhance language acquisition, cultural inquiry, and learner engagement. PBL originated from the progressive education movement, which pushed for more student-centered and experiential methods to education that enable "deeper learning" via active investigation of real-world issues and obstacles.(Cleeton, 2011)



Picture 1 : Step of Project Based Learning (uploaded by Miriam Andrea Hernández Del Barco)

The use of technology in PBL for Chinese language learning can take several forms, including online platforms, multimedia resources, language learning software, virtual communication tools, and digital content production tools. These electronic resources promote genuine language usage, provide access to authentic cultural materials, enable collaborative project work, and allow for self-directed learning and tailored language practice. The journal is anticipated to look into the theoretical underpinnings, practical tactics, and empirical data around the use of technology in PBL for Chinese language acquisition. It may discuss the benefits, challenges, and best practices associated with this approach, such as the development of digital literacy skills, the improvement of intercultural competence, and the promotion of learner motivation and engagement, all of which can help facilitate the implementation of project-based teaching instruction in the classroom.(Kokotsaki et al., 2016)

Table 1: Table of Learning Outcomes Assigned to Courses

Graduate Learning Outcomes	Course Learning Outcomes	Sub Course Learning Outcomes
Applying various teaching methods along with Chinese language software	1. Students are able to apply the simple theories needed in learning creative technology in Mandarin.	1. Able to implement types of simple theories on Hanzi computerized technology devices. **2.** Able to apply Chinese software applications on PC devices.
	2. Students can apply software to Chinese language teaching techniques and methods.	**3.** Able to demonstrate how to use Chinese Character-based Gamification Applications on a PC.

	4. Able to use AI application media as support for creating Mandarin learning media. **5.** Able to create simple applications (digital Mandarin dictionary).

The activities are chosen at the instructional design stage. When selecting projects, you should begin with the teaching objectives and consider how the instructional content will be used in practice. According to the "Table of Learning Outcomes Assigned to Courses," in order to attain multidimensional educational goals such as knowledge, skills, and emotions, practical applications must exhibit authenticity, conjecture, and inquiry. Authenticity motivates students' in-depth investigations of Chinese and technological knowledge. As a consequence, educational objectives and practical applications are naturally blended to help influence project selection in PBL. Based on the educational objectives of authenticity, speculation, and inquiry.

3. Methodology

This study will employ a case study approach (Priya, 2021), combining qualitative methods to explore the impact of integrating technology-enhanced, project-based learning on Chinese language acquisition and overall learning experiences.

3.1 Participants

The study's participants were undergraduate students engaged in a Chinese language and culture program at an Indonesian institution. All participants were Indonesian native speakers who were required to take a Mandarin Chinese language course as part of their degree program. The participants had various amounts of prior knowledge with the Chinese language, with some having taken Mandarin in high school and others being total novices.

The group took part in the technology-enhanced, project-based learning intervention, whereas the control group got the regular, lecture-based Chinese language teaching offered in the course. Participants were told about the study and gave their informed permission prior to the commencement of the intervention.

3.2 Data Collection

This study follows the fundamental process of PBL teaching activities, with the primary teaching linkages being introduction, teaching, planning, inquiry, communication, and reflection, as indicated in the table.

This is investigative research. Because of the study object's limited number of participants, it mostly employs qualitative research methodologies. The data obtained and its analytical techniques include the following:

Data Collection Methodologies:

1. Interviews: Conduct detailed, semi-structured interviews with the research participants. This will help you to collect rich, qualitative data about their experiences, viewpoints, and insights into the research issue.
2. Focus Groups: If possible, do small focus group talks with participants. This can give more background and facilitate interactive investigation of the study questions.
3. Document Review: Collect and examine any relevant documents, records, or archive material that may give background information and context for the study.

Data Analysis Techniques:

1. Thematic Analysis: Examine the interview and focus group transcripts for repeating themes, patterns, and insights. To organize and make sense of qualitative data, code it in a methodical manner.
2. Content Analysis: Examine any documents or secondary data sources to find relevant material, keywords, and topics to augment the initial data gathering.
3. Cross-Case Analysis: If you have several participants, compare and contrast their experiences, views, and emerging themes to uncover similarities and contrasts.

4. Discovery and discussion

4.1 Realization of Chinese Teaching Goals

As previously said, the aims of Chinese education are divided into four categories: Chinese knowledge, technological understanding, cross-cultural awareness, and project-based learning. The substance of learners' work, learning reflection diaries, and interviews show the success of instructional goals in the four aspects listed above. First, Table 2 shows the table of learning rubric/criteria Assessment aspects.

Table 2: Table of Learning Rubric/Criteria Table

No.	Assessment Aspects of Sub Course Learning Outcomes 1	Assessment Aspects of Sub Course Learning Outcomes 2	Assessment Aspects of Sub Course Learning Outcomes 3	Assessment Aspects of Sub Course Learning Outcomes 4
1	Mastery of Material Methods and Techniques for Making Radical Chinese Character Animation. (Understanding)	Appropriate use of Digital Media.	Mastery of how to use Gamification Applications based on Chinese Characters on a PC.	Video content
2	Application analysis and Applications used. (Analysis)	Classification of types of Mandarin listening and speaking learning using the Text to Audio Application.	Mastery of creating Chinese Gamification Quiz Games: 1. Worldwall	Aesthetics, Storyline

			2. Kahoot 3. Quiz 4. etc	
3	Application of digital Mandarin learning techniques. (Practical)	Mastery of Chinese digital applications.	Preparation of Reports/Tasks (Practical)	Preparation of Reports/Tasks
4	Fluency .	Preparation of Reports/Tasks (Practical)		Video Presentation

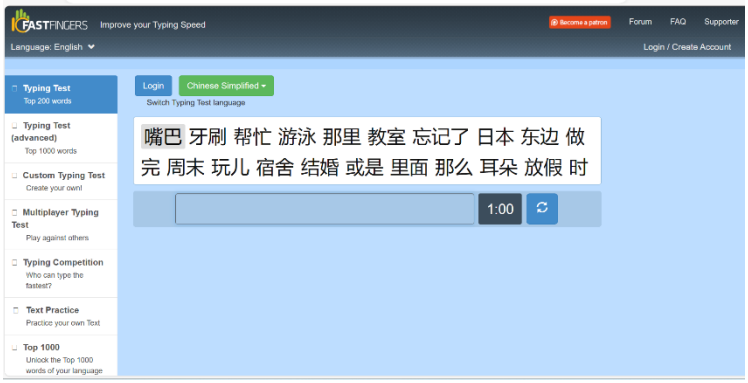
4.2 Realization of Application of digital Chinese Teaching Goals

4.2.1 Establishing Clear Learning Objectives and Outcomes

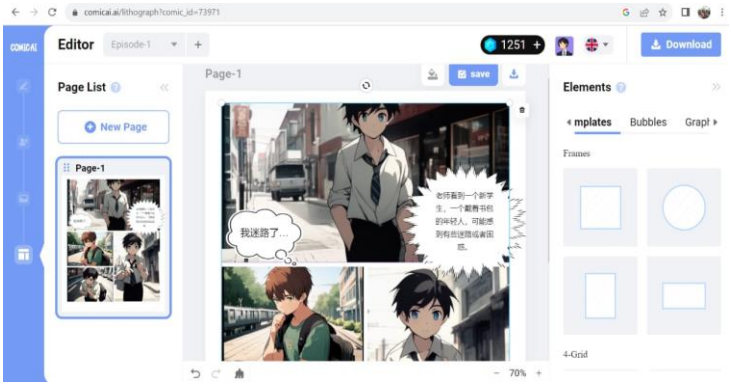
Design PBL activities that engage learners in collaborative, hands-on projects, such as: Creating a short film depicting Chinese cultural traditions. Developing a mobile app to teach basic Chinese phrases to tourists. Organizing a virtual Chinese language exchange program with a partner, Structure projects to promote the application of Chinese language skills in real-world, contextualized scenarios. Leverage digital tools and technologies (e.g., video editing software, app development platforms, video conferencing) to support various stages of the PBL process. Selecting and Integrating Appropriate Digital Tools and Technologies Evaluate and select user-friendly, mobile-friendly, and accessible digital platforms and applications, such as: Online Chinese language learning platforms (e.g., ChinesePod, Yoyo Chinese)Interactive multimedia content (e.g., Chinese language learning videos on YouTube, animated grammar explanations) Virtual/augmented reality apps for cultural immersion (e.g., virtual tours of Chinese landmarks)Collaborative writing, presentation, and project management tools (e.g., Google Docs, Miro, Trello)Ensure the chosen tools and technologies align with and support the established learning objectives. Culture of Innovation and Collaboration. Encourage a collaborative environment for sharing insights and best practices, such as: Establishing a digital Chinese language learning community of practice. Organizing regular meetings or webinars to discuss program successes and challenges Continuously explore and experiment with new digital technologies and pedagogical approaches, such as: Piloting the use of AI-powered language assistants or virtual tutors. Incorporating gamification elements to enhance learner engagement.

4.3 Reflection on PBL teaching activities

The specific technological tools and resources that can enhance project-based learning in the context of Chinese language acquisition. Here are some examples of specific digital tools and technology that may be included into a digital Chinese language learning programmed.



Picture 2 : Students Practice Fast fingers (Type hanzi)



Picture 3: Comic maker

Picture 4: Chinese dictionary

The integration of project-based learning (PBL) activities has been a core component of the digital Chinese language learning program. Through the implementation of these hands-on, collaborative projects, we have observed several key benefits and insights:

1. Improved Learner Engagement and Motivation: PBL exercises have sparked learners' interest and passion by allowing them to use their Chinese language abilities in real-world scenarios. Learners have showed more engagement and dedication to their projects as they take ownership of the learning process and recognize the practical application of their work.
2. Improved Language Proficiency and Cultural Understanding: Participating in PBL assignments allows learners to practice their Chinese language abilities in various, contextualized contexts, leading to stronger learning results. The projects have also helped learners get a better grasp of Chinese culture by researching, incorporating, and presenting culturally significant components in their work. Collaborative Problem-Solving and Critical Thinking: The collaborative nature of the PBL activities has fostered the development of essential 21st-century skills, such as teamwork, communication, and problem-solving. Learners have demonstrated the ability to think critically, analyze information, and make decisions to successfully complete their projects.
3. Versatility and Adaptability of Digital Tools: Integrating digital tools and technologies supports the PBL process, from research and ideation to project management and presentation. Learners have demonstrated the ability to effectively use a variety of digital resources to improve project quality and effectiveness. Instructor Support and Feedback: The role of instructors has evolved from traditional lecturers to facilitators, guiding and supporting learners throughout the PBL experience. Providing timely feedback and guidance has been instrumental in ensuring learners remain on track and are able to overcome challenges encountered during the project.
4. Continuous Improvement and Iteration: The program's evaluation and feedback systems help modify and develop PBL activities to meet learners' requirements and adapt to the changing digital ecosystem. Instructors have actively integrated learner input and shown a willingness to experiment with new ways, promoting an environment of creativity and continual improvement.

Overall, the integration of PBL activities within the digital Chinese language learning program has been a resounding success, empowering learners to develop both linguistic and 21st-century skills while fostering a more engaging and meaningful learning experience. Going forward, we will continue to refine and enhance these PBL-based teaching approaches to optimize the potential of technology in Chinese language education.

5. Conclusion

Project-based learning, which incorporates technology into Chinese language study, has the potential to improve students' learning experiences and outcomes. Students can engage in dynamic and immersive learning experiences that encourage active involvement, critical thinking, and creativity by utilizing technological tools such as language learning applications, online resources, and collaborative platforms. Project-based learning gives students the opportunity to use their language abilities in real-world situations, developing significant links between language study and practical application. Working on projects

that require study, problem solving, and teamwork allows students to have a better grasp of the Chinese language and culture.

Technology also provides tailored learning experiences, allowing students to study at their own speed while receiving quick feedback. Adaptive technology can identify students' strengths and weaknesses and adjust learning materials to their specific requirements. This customized approach improves students' motivation, engagement, and overall learning outcomes. Furthermore, technology provides access to real materials such as films, articles, and online forums, exposing students to a variety of language usage and cultural viewpoints. This exposure not only improves language skills, but also fosters cultural competency and intercultural understanding. However, it is critical to recognize that the successful integration of technology into Chinese language instruction is dependent on good pedagogical practices and enough training for both instructors and students. In conclusion, by leveraging technology in conjunction with project-based learning, Chinese language educators can harness the full potential of these approaches to create engaging, personalized, and culturally enriching learning environments for their students.

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多语码汉语教学课堂中的话者分离与文本转录
—Whisper 和 Pyannote.audio 的应用研究
(Speaker Diarization and Text Transcription in Chinese Classrooms Containing Multilingual Code-Switching: Applied Study of Whisper and Pyannote.audio)

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摘要：本文报告了一项实证研究成果：利用 Whisper 和 Pyannote.audio 进行汉语课堂中教师与学生的话者分离（Speaker Diarization），旨在提升多语码外语课堂文本转录的水平。在日本的大学 L2 汉语教学课堂上，中文母语教师的汉语使用比例极低。通过使用人工智能（AI）工具，教师能够监测到课堂中 L2 的使用率以及与学生互动的情况，从而改进从日语到汉语的切换方法，以获得更为有效的 L2 呈现方式。融合了生成式人工智能的自动语音识别（Automatic Speech Recognition）技术正在取得突破性进展，然而，在类似日本这样的初级汉语课堂中，频繁发生语码转换（Code-switching）的情况下，提升语音自动识别的精度仍面临一些挑战。我们已证实，利用转录数据的合成语音能够有效提高自动识别的精度。最后，对于未来使用更为通用的生成式人工智能进行课堂中师生发言比重和内容的监测与分析，我们提出了一些构想。

Abstract: This report presents the results of an empirical study on the use of Whisper and Pyannote.audio for speaker diarization involving teachers and students in Chinese language classrooms, aimed at enhancing the quality of transcription in multilingual foreign language classrooms. In university L2 Chinese language teaching classrooms in Japan, the use of Chinese by native-speaking teachers is exceedingly low. By employing artificial intelligence (AI) tools, teachers can easily monitor the rate of L2 usage and their interactions with students in the classroom. This enables them to refine the method of switching from Japanese to Chinese, thereby achieving a more effective L2 presentation. The integration of generative AI with automatic speech recognition (ASR) technology is undergoing significant advancements. However, in beginner-level Chinese classrooms in Japan, where code-switching is common, enhancing the accuracy of automatic speech recognition remains challenging. We have confirmed that using synthesized speech from transcription data can significantly improve the accuracy of automatic recognition. Lastly, we propose several ideas for

future applications of more generalized generative AI to monitor and analyze the proportion and content of teacher-student speeches in classrooms.

关键词：汉语课堂行动研究、语码转换、自动语音识别、文本转录、话者分离

Keywords: Chinese language class action research, Code-switching, Automatic speech recognition, Text transcription, Speaker diarization

1. 研究目的

课堂行动研究（Class Action Research）常被作为外语教师了解和反思自己的教学内容并改进教学方法的一种手段。教师与学生之间进行口头互动（Oral interaction）的音频数据对课堂行动的研究至关重要。这一过程中不可或缺的是音频到文字（speech-to-text）的转录（transcription）工作。而手工转写需要花费大量时间并且需要相关语言的专业知识。使用可以自动进行文本转录的工具，可以快速且低成本地将课堂口头互动的发言转化为文本。这将极大促进外语课堂会话语料库数据的构建（Hollands et al, 2022; Katagiri, 2023; Ohashi et al, 2022）。

近年来，自动语音识别（Automatic speech recognition：ASR）技术已取得飞跃性进展，过去需要人工完成的音频转写工作现已能够被机器大部分替代（Alexey et al, 2023; Radford et al, 2022）。然而，在课堂教学中，教师与学生的发言频繁交叉，加之外语课堂中目标语言（L2）与学习者的母语（L1）频繁交替和切换，即语码转换（Code-Switching：CS）（砂岡，王，杉江 & 徐，2023）。对包含噪音的多语言、多人的自然发言进行语种和话者分离的自动语音识别面临诸多挑战。在像日本日常几乎不使用中文的环境中，中文作为外语（Chinese as a Foreign Language：CFL）在课堂上学习时，教师和学生都倾向于依赖传播效率最高的母语，并且频繁进行短时间的 Code-Switching，这使得中日双语的语块变得碎片化，进一步增加了自动语音识别的难度（砂岡，譚 & 向，2023）。本研究以日本的大学初中级汉语课的口头互动数据为研究对象，使用一种新兴的 ASR 技术——Whisper 进行转写，并使用 Pyannote.audio 进行话者分离（Speaker Diarization），旨在解决包含多种语言代码的音频自动转写的挑战。

2. 相关研究

在日本，将口头互动数据进行转录并将其用于分析课堂行动的研究非常活跃（Iikubo et al, 2023; Ohashi et al, 2022）。CEFRE-J 研究小组建立英语课的口头互动数据语料库，并通过词汇的定量分析进行了教师的课堂行动研究（Tono, 2024; Katagiri, 2023）。在日本的英语教育中，从小学低年级开始，到高中和大学入学，学生分别积累了 7 年及 10 年以上的英语学习经历。因此，日本的高中和大学英语

课堂原则上使用英语。研究者可以使用一些常用的 ASR 工具（如，Microsoft Word、Google Docs 等）将英语课堂的口头互动进行转录并识别为以英语为主的语种。

Google Chrome、Microsoft Office 或 Word 可通过 Speech Recognition 对语音进行文本转录。它们是易于使用的大众工具，可以通过 ChatGPT 运行，分析效率很高，并且可以通过一个接口处理不同的音频识别服务。缺点在于 Speech Recognition 无法对音频进行话者分离，但因为口头互动材料中，英语约占 90%，手工分离问题不大（Katagiri, 2023）。如果需要进行话者分离，那么可以使用 PyAudio Analysis 进行处理，这种工具功能多样，包括说话人分离、声音活动检测、音频分类等，适用于广泛的音频处理任务。但其在实时处理和大规模数据集处理上的可扩展性有限（砂岡 & 徐，2023；徐 & 砂岡，2024）。

相比之下，日本的中文教育定位为在大学入学后才开始学习的第二外语。如前所述，课堂教学中常出现多语言交融的情况，包括日语、中文，甚至英语等，并且频繁发生语言间的语码转换。然而，前述的通用音频识别工具在处理包含多语言的音频时表现不佳，因此需要采用更为高级的音频识别工具。基于此考量，我们决定采用 Whisper 和 Pyannote.audio 等工具，因其更适用我们的需求。3.1 和 3.2 对这两种工具进行了详细的介绍。

3. 研究方法

本研究的语料来自日本初、中级汉语教学课堂的录音。Whisper 的 Large-v3 模型对音频进行语音识别和文本转录，而 Pyannote.audio 对音频进行话者分离。

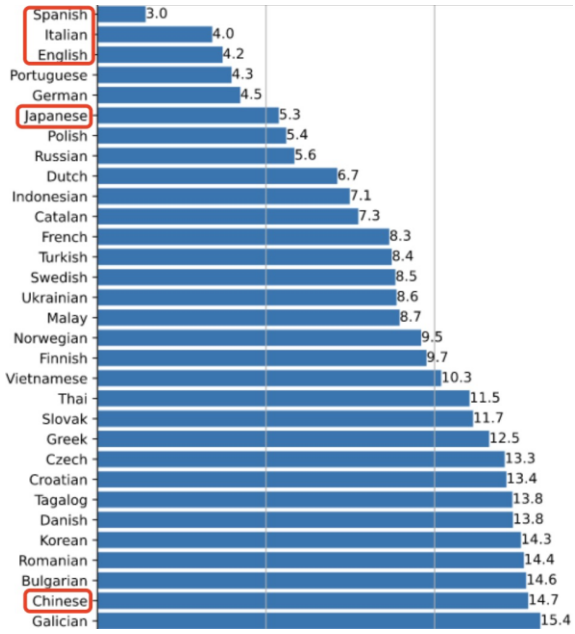
3.1 Whisper 自动语音识别系统

Whisper 是 OpenAI 于 2022 年 9 月发布的一个自动语音识别（Automatic Speech Recognition，以下简称 ASR）系统。它经过了 68 万小时的多语种和多任务监督数据的训练，可进行多语言 ASR[1]。Whisper 的模型有五种，从小到大依次为 tiny、base、small、medium 和 large，模型越大，效果越好，但所需的内存和运行时间也会越多[2]。在指定模型下，Whisper 通过转录（transcribe）方法来读取音频文件，并基于音频的前 30 秒来识别语言的类型。Whisper 的优点在于音频识别的准确性极高，且支持多种语言转录。然而，其缺点在于通常需要互联网连接，消耗大量计算资源，因此需要使用者配备高性能的硬件设备。另外，商业使用需获得开发商的许可。

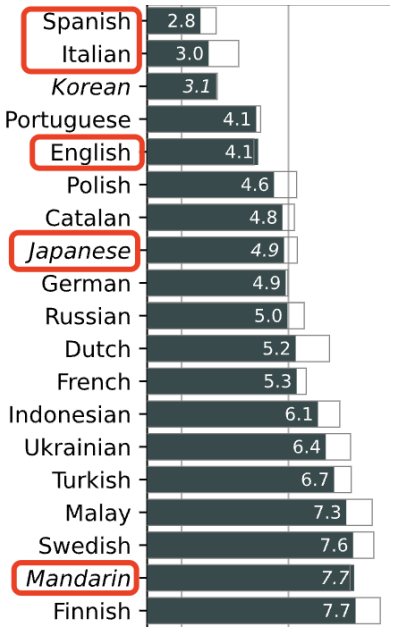
2022 年 12 月，OpenAI 发布了 Whisper-Large-v2 模型的开源版本，并在 2023 年 11 月开源了 Whisper-Large-v3 模型。OpenAI 使用 Fleurs（涵盖 102 种语言）数据集对这两种模型的性能进行评估后的结果显示，Whisper 的性能虽因语言而异，但与 Large-v2 相比，Large-v3 模型的 ASR 性能有了显著提升。具体而言，Large-v3 模型的单词错误率（WER: word error rates）或字符错误率（CER: character error

[1] https://openai.com/index/whisper
[2] https://github.com/openai/whisper

rates）优于 Large-v2。例如，西班牙语、意大利语和英语的 WER 分别从 Large-v2 模型的 3.0%、4.0% 和 4.2%降低到 Large-v3 模型的 2.8%、3.0% 和 4.1%；日语和汉语的 CER 分别从 large-v2 的 5.3% 和 14.7% 下降到 large-v3 的 4.9% 和 7.7%（图 1）。此外，我们利用日本初级汉语课堂录音验证了 large-v3 在含有中日语码转换的多语言 ASR 上的表现优于 large-v2（徐 & 砂岡，2024）。



Large-v2: Fleurs 上的 WER（%）[3]



Large-v3: Fleurs 上的 WER 或 *CER*（%）[4]

图 1：Large-v2 和 Large-v3 在不同语言上的性能对比（一部分）

3.2 Pyannote.audio 的话者分离

Whisper 的 ASR 功能可实现语音到文本的高精度转写，但目前尚未实现区分说话人的话者分离式 ASR。而 Pyannote.audio，一个基于 PyTorch 机器学习框架编写的开源工具包，通过提取音频中的发音特征来检测和切分说话人的发言起始时间，从而实现话者分离。Pyannote.audio 主要用于音频中的人物识别，包括说话者分离、识别和追踪。其优点在于能够以非常高的准确性进行说话人分离和追踪。然而，其缺点在于学习曲线陡峭，配置和使用可能较为复杂。由于它专注于特定任务，其通用性较低。虽然部分过程可能需要手动分析和编写，但其主要功能包括自动处理，通常需要互联网连接。Pyannote.audio 是开源的，可以通过其 GitHub[5]页面获取（Sanchit-Gandhi, 2022）。然而，Pyannote.audio 并不包含语音转文字的功能。本

[3] 图片引用自 https://www.graphcore.ai/posts/how-to-use-openais-whisper-for-speech-recognition
[4] 图片引用自 https://github.com/openai/whisper
[5] https://github.com/pyannote/pyannote-audio

研究尝试将 Whisper large-v3 的 ASR 功能和 Pyannote.audio 的话者分离功能相结合，对包含中日语码转换的汉语教学课堂录音进行话者分离式的文本转录。

4. 分析材料

4.1 课堂录音 1

音频 1 来自一位汉语教师（女性，日语母语者）在日本某大学初级汉语课上的教学录音。因篇幅所限，表 1 仅列出了该教师在讲解汉语单词时与一位学生（女性，日语母语者）的问答音频（时长约 1 分 30 秒）的文本转写结果。Whisper 对该段音频的 ASR 识别出 182 字，其中日语部分为 146 字，汉语部分为 36 字，Whisper 的 ASR 结果表明该段音频中日语和汉语的 CS 语言分配之比约为 4:1。而人工校正的结果表明，该段录音说话内容的实际总字数共 200 字，其中日语部分为 147 字，汉语部分为 53 字，日语和汉语的 CS 语言分配之比约为 3:1。

Whisper 对该段音频的 ASR 识别率约为 90%，但也存在识别错误之处（如，学生发音的“大家”和“高兴”被识别为“大蛇”和“高欣”），以及未能识别的部分（例如，“大熊猫”和“嗯 高兴”），还有繁简体不分的问题（如，“认识”和“书包”被转写为“認識”和“書包”）。此外，还存在将简短的汉语发音自动翻译为日语的情况（如，学生发音的“什么”被误译为日语的“何”）。这些问题部分源于音频中的发音不清晰或不标准，同时也与 Whisper 的 ASR 性能有关。

表 1：课堂录音 1：文本转录及人工校正的结果

音频时长：1 分 30 秒（总字数：200；汉语字数：53；日语字数：147） *次の人続けて* *第２回(回→課)はどれを読んだか* **大蛇** *(*大蛇→**大家**） *はい* **大家** *みなさん* **大熊猫** **大熊猫** *パンダね* *ジャイアントパンダ* **高欣** *(*高欣→**高兴**） **嗯** **高兴** **高** *一世ね* *嬉しいね* *はい* **狗** **狗** **狗***は三声だから低く押さえますね* *犬* *それから* **叫** **叫** *そう* *あの* *名乗るときね* *と申します* *という名前です* *はい* **名字** **名字** *いいね* *名前ね* *はい* **朋友** **朋友** *友達ね* **認識** **認識** *この辺までにしますか* *はい* *じゃあ次の人* *残り何でしたか* *日本人* *はい* *日本人* *日本人ね* *何(何→***什么**） **什么** *何ですね* **書包** **書包** *はい* *カバン* **学生** *そう* **学生** *皆さんね学生* **中国**

注：下划线部分为教师发言、无下划线部分为学生发言。*斜体*部分为*日语*，**加粗**部分为**汉语**。红色部分为人工校正添加的 Whisper 未能识别的内容。括号内为人工校正的正确内容，如 Whisper 识别的“大蛇”实际应为“大家”。下同。

我们使用 Pyannote.audio[6] 尝试对该段录音进行了话者分离，但只识别出了一个说话者。这或许是因为教师与学生均为女性，声音特征相似，并且学生的发音部分均为简短的汉语单词，因此被错误地识别为同一个人。

4.2 课堂录音 2

[6] https://pypi.org/project/pyannote.audio/2.1.1/

音频 2 为日本某私立大学汉语中级会话课之教师（女性，汉语母语者）与学生（女性，日语母语者）的互动录音。我们使用 Whisper 的 Large-v3 模型对该段录音进行了转写。因篇幅有限，表 2 仅显示了时长为 1 分 30 秒的转录结果，实际的说话内容共 180 字，其中日语约占 14%，汉语约占 86%。Whisper 对该段音频的 ASR 识别率超过 70%，但也有一些内容未能被正确识别出来，例如，师生发言中的填充词（filler）或单字（例如，“嗯”、“贵”）和日语专有名词（例如，人名“優月”、地名“福井”）。

表 2：课堂录音 2：文本转录及人工校正的结果

音频时长：1 分 30 秒（总字数：180；汉语字数：155；日语字数：25）

好的　好的　那我们开始上课吧　同学们早上好　早上好　那我们先做一下口语练习　*まずは会話の練習をやっていきましょう*　中村優越(越→月)　到　中村優越(越→月)　你的毛衣真好看　你的毛衣真好看　你的衣服真好看　哪里哪里　你在哪儿买的　我在　我在　福井　*福井*　啊　福井　*福井ですか*　我在福井买的　贵吗　贵吗　贵　贵　很贵　今天天气怎么样　今天天气很好　很好　嗯　很好　好的　中村優越(越→月)　问我一个问题　问我一个问题　噢　你　你的衣服很漂亮　谢谢　谢谢你　你的衣服也很漂亮　谢谢

本研究使用 Pyannote.audio 对该段音频进行话者分离，识别出了三个说话者（表 3）。经过人工校对后发现，SPEAKER_01 和 SPEAKER_02 为教师，而 SPEAKER_00 为学生。在音频的后半部分时，出现了话者分离混乱的情况，例如，最后的“谢谢”为学生的发言，但被错误地标记为 “SPEAKER_02”。

表 3：课堂录音 2：话者分离的转写结果

start	end	speaker	text
1.988	4.559	SPEAKER_02	好的, 那我们开始上课吧
5.146	5.916	SPEAKER_02	同学们早上好
6.665	6.949	SPEAKER_00	早上好
8.865	11.459	SPEAKER_02	那我们先做一下口语练习
11.801	11.821	SPEAKER_02	まずは会話の練習をやっていきましょう
22.798	23.340	SPEAKER_02	中村優越
28.438	28.719	SPEAKER_01	中村優越
29.424	30.498	SPEAKER_01	你的毛衣真好看
32.284	33.668	SPEAKER_01	你的衣服真好看
40.545	41.789	SPEAKER_00	你在哪儿买的
46.341	51.609	SPEAKER_00	我在福井买的
59.122	59.331	SPEAKER_02	贵吗
61.437	61.619	SPEAKER_02	贵吗
63.537	63.799	SPEAKER_00	很贵
64.949	66.039	SPEAKER_01	今天天气怎么样
67.810	69.299	SPEAKER_00	今天天气很好
69.625	69.875	SPEAKER_01	很好
70.506	70.931	SPEAKER_00	好的
72.047	72.374	SPEAKER_01	中村優越
73.510	74.158	SPEAKER_01	问我一个问题
75.068	75.856	SPEAKER_01	问我一个问题
81.073	83.499	SPEAKER_00	你的衣服很漂亮
85.374	85.938	SPEAKER_00	谢谢
86.140	87.118	SPEAKER_02	谢谢你
87.746	89.020	SPEAKER_02	你的衣服也很漂亮
89.222	90.379	SPEAKER_02	谢谢

表 4：课堂录音 2：各发言者的发言次数及字数统计

	基于 pyannote.audio 的话者分离		基于人工校正后的话者分离	
	说话次数	说话内容的总字数	说话次数	说话内容的总字数
学生	8	33	11	40
教师	18	109	21	140
小计	26	142	32	180

如表 3 所示，ASR 和话者分离技术可识别出课堂上教师和学生的说话内容。在此基础上，本研究通过 Python 编程统计了教师和学生的说话次数以及师生说话内容的总字数（表 4）。Pyannote.audio 和人工校正这两种情况下的话者分离结果表明，音频 2 中的师生说话内容字数之比约为 4: 1，说话次数之比约为 7: 3。结合说话的内容可知，该课的教师说话次数和说话内容的总字数远高于学生，其原因在于教师与学生进行互动时，教师重复学生的回答并给予了积极反馈。上述结果表明，ASR 和话者分离技术可成为观测外语教学课堂中师生说话内容、说话比重的有力工具。

然而，Pyannote.audio 将该段语音中教师的发音部分识别为两个说话者，这可能与教学课堂中的噪音有关。另外，结合音频 1 的话者分离结果，我们发现，Pyannote.audio 对性别相同的说话者的分类效果不佳。在 4.3，我们将使用包含不同性别说话者的音频以及无噪音音频进行验证。

4.3 课堂录音 3

音频 3 是与音频 2 相同的教师和另一名学生（男性，日语母语者）的互动录音。表 5 为转写结果，表 6 为 Python 对每位说话者的发言句数和字数的统计结果。本段音频的发言内容总字数为 142 ，其中日语约占 13%。Whisper 对该段音频的文本转写率约为 80%， 它未能识别出教师或学生的零散日语表达（例：“髪の色”）。另外， 除了“哦”和 “嗯”等填充词外，其他汉语词汇均被 Whisper 正确识别。

表 5 课堂录音 3：文本转录及人工校正的结果

音频时长：1 分 29 秒（总字数：142；汉语字数：122；日语字数：19）

下一位 奥村 奥村 你头发的颜色真不错 *髪の色* 对 *グッド* 你头发的颜色真不错 谢谢 不客气 你觉得今天天气怎么样 很好 很好 那昨天怎么样 很好 哦很好 那你问我一个问题 *質問* 你昨天晚上吃了什么 我昨天晚上吃了便当 你昨天晚饭吃了什么 *唐揚げ 唐揚げ* 嗯 肉 肉 *肉ですか* 肉 肉 肉 肉 你再说一遍 你昨天晚上吃了什么 我昨天晚上吃了肉 肉 很好 肉

表 6 课堂录音 3：各发言者的发言次数及字数统计

	基于 pyannote.audio 的话者分离		基于人工校正后的话者分离	
	说话次数	说话内容的总字数	说话次数	说话内容的总字数
学生	4	14	10	43
教师	18	106	15	99
小计	22	120	25	142

表 7 课堂录音 3：话者分离的转写结果

start	end	speaker	text
0.667	1.677	SPEAKER_00	下一位, 奥村。
6.724	9.116	SPEAKER_00	奥村, 你头发的颜色真不错。

20.503	22.416	SPEAKER_00	你头发的颜色真不错。
24.163	24.327	SPEAKER_01	谢谢。
25.000	25.163	SPEAKER_00	不客气。
26.262	28.658	SPEAKER_00	你觉得今天天气怎么样?
31.010	31.253	SPEAKER_01	很好。
32.061	33.879	SPEAKER_00	很好。那昨天怎么样?
37.224	37.633	SPEAKER_01	很好。
38.202	40.000	SPEAKER_00	很好。那你问我一个问题。
47.784	50.457	SPEAKER_00	我昨天晚上吃了便当。
52.705	54.477	SPEAKER_00	你昨天晚饭吃了什么?
60.000	73.658	SPEAKER_01	我昨天晚上吃了肉。
75.347	75.367	SPEAKER_00	肉。
76.694	76.714	SPEAKER_00	肉。
77.735	77.755	SPEAKER_00	肉。
78.041	78.061	SPEAKER_00	肉。
79.082	79.102	SPEAKER_00	肉。
81.000	83.658	SPEAKER_00	你再说一遍。你昨天晚上吃了什么?
84.383	86.960	SPEAKER_00	我昨天晚上吃了肉。
87.223	88.134	SPEAKER_00	肉。很好, 肉。

Pyannote.audio 对该段音频的话者分离（表 7）识别出两个说话人，即 SPEAKER_00（教师）和 SPEAKER_01（学生）。录音前半段中的说话人均被正确识别，但到了录音的后半段，有五处的话者识别出现了混乱。该段音频的话者分离的准确率约为 77%。另外，话者分离所得到的师生说话内容字数之比约为 9:1，与实际的师生说话内容字数比率 7:3 存在偏差（表 6）。

话者分离所得到的师生说话比重偏离实际值的一个原因可能在于原始语音中的噪声污染。为进行验证，本研究使用 Python 的语音合成包 Edge-TTS[7]，基于表 5 的说话内容设置女性和男性的声音参数，合成了一个无噪音的语音文件。再通过 Whisper 和 Pyannote.audio 对合成的语音文件进行 ASR 和话者分离（表 8），识别出了两个说话人： SPEAKER_00（教师）、SPEAKER_01（学生）。合成语音的后半部分有三处的话者识别出现混乱，但其他部分的说话者均被正确识别。Pyannote.audio 可能存在随着音频时长增加而递减的数据处理能力问题，然而这一猜想仍需在未来的研究中进行进一步的验证。

表 8 合成语音：话者分离的转写结果

start	end	speaker	text
0.303	1.495	SPEAKER_00	下一位, 澳村
2.501	4.937	SPEAKER_00	澳村, 你头发的颜色真不错!
6.022	6.042	SPEAKER_01	髮色?
8.624	8.645	SPEAKER_00	对!
9.843	10.232	SPEAKER_01	很好!
11.941	13.576	SPEAKER_00	你头发的颜色真不错!
14.845	15.090	SPEAKER_00	谢谢!
17.143	17.713	SPEAKER_00	不客气!
18.701	20.617	SPEAKER_00	你觉得今天天气怎么样?
21.861	22.269	SPEAKER_01	很好!
24.223	24.570	SPEAKER_00	很好!

[7] https://pypi.org/project/edge-tts/

25.542	26.495	SPEAKER_00	那昨天怎么样?
27.743	28.151	SPEAKER_01	很好!
30.122	31.014	SPEAKER_00	哦, 很好!
31.922	33.056	SPEAKER_00	那你问我一个问题!
34.529	34.549	SPEAKER_01	请問!
36.962	38.577	SPEAKER_01	你昨天晚上吃了什么?
40.621	42.237	SPEAKER_00	我昨天晚上吃了便当。
43.221	44.797	SPEAKER_00	你昨天晚饭吃了什么?
45.882	46.086	SPEAKER_01	炸鸡!
48.202	48.406	SPEAKER_01	炸鸡!
50.723	50.743	SPEAKER_01	嗯!
52.203	52.224	SPEAKER_01	肉!
53.743	53.763	SPEAKER_01	肉!
56.122	56.346	SPEAKER_01	肉吗?
58.305	58.326	SPEAKER_01	肉!
59.665	59.685	SPEAKER_01	肉!
61.703	61.724	SPEAKER_01	肉!
63.022	63.043	SPEAKER_00	肉!
65.402	66.255	SPEAKER_00	你再说一遍!
67.161	68.677	SPEAKER_00	你昨天晚上吃了什么?
69.921	71.496	SPEAKER_01	我昨天晚上吃了肉!
73.501	74.455	SPEAKER_00	肉, 很好!
75.424	75.445	SPEAKER_00	肉!

与有噪音的原始语音相比，对无噪音的合成语音进行话者分离的准确率提高到91%左右。学生和教师说话内容的总字数分别为 39 和 97。合成语音的话者分离所得到的师生说话内容字数之比约为 7 : 3，该结果与原始录音的实际值相近，这证明无噪音的合成语音提高了 ASR 的识别率。但在另一方面，Whisper 的 ASR 具有将零散的日语表达自动翻译为汉语的倾向（例：日语“唐揚げ”和“肉ですか”被自动翻译成汉语的“炸鸡”和“肉吗”）。

5. 小结

本研究使用 Whisper 和 Pyannote.audio 等工具，对包含多语言 CS 的汉语教学课堂录音进行了话者分离式的文本转写。基于转写结果，我们通过 Python 编程进行了师生说话内容和说话量的统计。此外，通过使用 Edge-TTS 合成无噪音的音频文件进行文本转录，发现无噪音的音频可以提高 ASR 的识别率。

目前，虽然各工具的性能仍有进一步改进的空间，但将 Whisper 的 ASR 文本转录功能与 Pyannote.audio 的话者分离功能结合使用，将有助于教师了解外语课堂多语言 CS 环境中师生的说话内容以及说话比重。因而，外语教师可以将其作为了解课堂中 CS 语言分配情况和说话量的工具，以便对课堂教学进行改进，从而提高教学效果。

今后，除了需要进一步提高 Whisper 对多语言 CS 的识别性能外，还需要解决 Pyannote.audio 在说话者数量增加时可能出现的话者分离功能混乱，以及随音频时间增加而递减的数据处理能力问题。本研究将以这些初步实验为基础，致力于开发可自动显示 CS 语言分布、说话内容以及说话比重的程序。

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淺談數字時代下線上團體中的社交文字表達認知
(A Brief Discussion on Perceptions of Social Text in Digital Age Online Groups)

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摘要：近年來，文字聊天在線上會議和課堂中起著重要的即時交流作用。本研究旨在分析和探討不同語言背景的參與者如何通過文字聊天來表達認知社交信息。具體是基於共有 7 萬字符以上的中、日文線上會議聊天記錄，對比分析它們在文字聊天中的情感表達特點及其在線上團體中的社交功能。

研究結果發現，中、日文線上會議的參與者都十分積極使用文字聊天進行信息交流，「信息交流」類別的發言分別占比 24%和 30%。這表明在不同語言的線上團體中，文字聊天不僅是社交工具,也是參與者交換信息的一個重要的互動工具。另一方面，兩個會議在情感表達方式上展現出了不同的特點。中文會議主要以文字信息為主，而日文會議則有近 80%的發言透過使用表情符號進行，且種類多於 100 種。這顯示出在日文會議中表情符號的多樣性和廣泛性。此外，在表達「感謝・讚美」時，中文會議傾向使用固定慣用語，而日文會議則有 97%是各類表情符號。基於以上差異，本報告還將進一步探討兩種語言在社交文字表達認知過程中產生差異的原因。

Abstract: In recent years, text chat has played an important role in real-time communication in online meetings and classrooms. The purpose of this study is to analyze and investigate how participants from different language backgrounds express cognitive social messages through text chat. In particular, using over 70,000 characters from Chinese and Japanese online chats, we analyzed their emotional characteristics in text chat and their social functions in online communities.

The results of the study show that both Chinese and Japanese online conference participants actively use text chat to exchange information, accounting for 24% and 30% of the "exchanging information" category, respectively. This indicates that text chat is an important interactive tool in online groups of different languages. On the other hand, the two conferences showed different characteristics in the way they expressed their emotions. While the Chinese conferences are mainly text-based, nearly 80% of the

conversations in the Japanese conferences are through emoji. There are more than 100 kinds of emoji. This shows the diversity and wide range of emoji in Japanese conferencing. In addition, when expressing "thank you and compliment", the Chinese conferences tend to use fixed expressions, while 97% of the Japanese conferences use various types of emoji. Based on these differences, this report will further explore the reasons for the differences between the two languages in the cognitive process of social text expression.

关键词：線上參與、文字聊天、表情符號、情感表達、表達感謝

Keywords: Online Participation, Text Chat, Emoji, Emotional Expressions, Express Gratitude

1. 研究背景與目的

受新型冠狀病毒肺炎疫情及學生運動等非常時期的推動，線上課堂和線上會議的使用頻率急劇上升。這種形式具有不受物理空間限制的便利性，並已獲得廣泛認可。然而，線上模式下的交流互動不足亦日益凸顯為主要問題。崔希亮（2021）指出，雖然當前的網絡技術已可支持屏幕間直接的交流，但網絡交流與面對面交流之間仍存在顯著差異，這限制了網絡課堂中師生以及學生間的互動。Yu 和 Xu（2022）報告顯示，師生及生生之間的互動不足對學生的學習成效造成了負面影響。此外，多項研究表明，參與者之間的集體意識和共同行動起著加強彼此間互動紐帶的重要作用（砂岡和子，2022；砂岡和子，2024；佐藤德，2016；Gallotti & Frith，2013；Sunaoka & Tam，2022）。然而，在線上課堂或會議中，由於參與者角色意識的差異、語言表達特性的多樣性以及聊天工具的多元使用目的，促進交流的共同行動策略可能亦各不相同。因此，本研究旨在分析和探討不同語言背景的線上參與者如何通過文字聊天來傳遞認知社交信息，以促進有效互動。

2. 數據分析

2.1 研究對象和數據收集

中文線上會議聊天紀錄（以下簡稱「中文聊天」）來源於 2020 年至 2021 年間，由北京語言大學及其出版社共同舉辦的六次線上研討會系列 [1]。這些會議均通過 Zoom 平台舉行，除了主辦方和主講嘉賓外，其他參與者均被禁止開啟視訊鏡頭與麥克風，因此所有的交流僅能通過聊天功能進行。會議主要以中文進行，參加者多

[1] 本研究中所使用的中文數據來自於北京語言大學漢語國際教育學部與北京語言大學出版社共同搭建的全球中文教學線上交流平台。數據收集自 2020 年至 2021 年期間舉辦的「新形勢下的全球中文線上教學反思與展望」系列公益研討活動。有關該平台的更多資訊，請參見：https://app.readoor.cn/app/dt/pd/1564663415/1?s=1。

為華人，也包括少數以非漢語為母語的學生和研究人員。我們從中抽取了大約 27,000 字符的中文聊天記錄，用作此次分析的數據。

日文線上會議聊天紀錄（以下簡稱「日文聊天」）則源自於 2023 年日本語言處理學會年會中的一個工作坊 [2]。會議主要以日文進行，參與者大多為研究信息處理的日語母語者學生和研究人員，也包括少數非日語母語者。我們從中抽取了約 50,000 字符的日文聊天記錄作為分析數據。此外，會議採用線上線下混合模式，線上交流同樣透過 Zoom 平台進行。儘管參與者可於現場提問，但由於現場發問時間有限，且約一半的參與者選擇線上參加，因此實際上大部分發言都是在線上進行。所有線上交流均透過名為 Slack 的聊天工具進行。

2.2 數據處理

中文聊天是通過 Zoom 平台的會議聊天記錄保存功能獲得的，初步以 csv 格式存儲，隨後轉換成 Excel 格式進行數據整理。日文聊天則是從 Slack 中複製到 Word 文檔，之後也被轉換並整理到 Excel 格式。在初步整理後，數據按照發言者身份及其發言內容進行了人工分類。如表 1 的示例所示，發言者根據其身份被分為「主辦方」、「嘉賓」和「參加者」三個類別；發言內容則根據交流目的劃分為「提問」、「請求」、「信息交換」、「感謝・讚美」和「回應」五種類型（砂岡和子，2022）。由於中、日文兩個聊天中，「信息交流」和「感謝・讚美」兩個類別的總發言次數都各佔總發言次數的一半以上（見表 2），因此本研究主要關注這兩類發言。此外，考慮到本次分析的目的，我們排除了那些嵌入於文字發言中的表情符號。最後，所有選定作為分析對象的表情符號均按其在 Slack 中的文字描述轉化為文字形式，以便於進行統計分析。

表 1：聊天分類示例

發言人*	發言人身份	發言內容	發言類別
志明	參加者	請問漢語中介語語料庫可以下載口語語料嗎？	提問
小美	主辦方	請大家針對沈老師的講座內容提問	請求
大文	參加者	有聲音，您可以檢查一下網絡	信息交流
一心	參加者	謝謝老師！	感謝・讚美
允行	嘉賓	謝謝！暫時不會發展成 app	回應

*註：為保護隱私，發言人的姓名均為化名。

2.3 統計分析及結果

2.3.1 文字發言數量

[2] 本研究所用的日文數據來源於日本語言處理學會主辦的第 29 屆語言處理協會年度大會，具體是在「建設日語資源並提高其可獲取性」工作坊中，對「建設多語言和多學科語言資源」主題的討論。有關該工作坊的更多資訊，請參見：https://jedworkshop.github.io/JLR2023/。

統計分析採用了 Excel 和 Python 進行。首先，分別對兩個聊天的發言總數、「信息交流」和「感謝・讚美」類別的發言數量及所佔百分比進行統計（見表 1）。中文聊天的發言總數為 1,251 次，其中「信息交流」類別發言 300 次（24%）；「感謝・讚美」類別發言 604 次（48%）。日文聊天的發言總數為 1,975 次，其中「信息交流」類別發言 597 次（30%）；「感謝・讚美」類別發言 454 次（23%）。可以看到，在中、日文聊天中，「信息交流」和「感謝・讚美」類別的發言次數均佔發言總次數的一半以上。具體來說，日文這兩類別的總發言次數佔 53%，中文佔 72%，即約四分之三。其中，中文聊天中「感謝・讚美」的發言次數接近總發言次數的一半（48%），而日文聊天中「信息交流」的發言數量則更為顯著（30%）。

表 2：中日聊天發言次數

內容	發言次數總數	「信息交流」發言次數	「感謝・讚美」發言次數
中文聊天	1251	300（24%）	604（**48%**）
日文聊天	1975	597（**30%**）	454（23%）

其次，分別統計了兩個聊天中「信息交流」和「感謝・讚美」類別的各發言人的發言次數（見表 3）。在「信息交流」類別中，中文聊天的主辦方、嘉賓和參加者的發言次數分別為 47 次（15.7%）、4 次（1.3%）和 249 次（83.0%）；日文聊天的相應次數為 75 次（12.6%）、102 次（17.1%）和 420 次（70.4%）。在「感謝・讚美」類別中，中文聊天的主辦方、嘉賓和參加者發言次數分別為 8 次（1.3%）、4 次（0.7%）和 592 次（98.0%）；日文聊天的相應次數為 24 次（4.0%）、106 次（17.8%）和 324 次（54.3%）。由此可知，在中文聊天中，參加者主動發起的發言佔絕大多數，特別是在「感謝・讚美」類別中，幾乎 100%的發言是由參加者發出。相對而言，在日文聊天中，除了參加者外，主辦方和嘉賓在兩個類別的發言中都貢獻了約 30%的發言。

表 3：「信息交流」和「感謝・讚美」中各發言人的發言次數

發言人身份	「信息交流」類別		「感謝・讚美」類別	
	中文聊天	日文聊天	中文聊天	日文聊天
	發言次數	發言次數	發言次數	發言次數
主辦方	47（15.7%）	75（12.6%）	8（1.3%）	24（5.3%）
嘉賓	4（1.3%）	102（17.1%）	4（0.7%）	106（23.3%）
參加者	249（**83.0%**）	420（**70.4%**）	592（**98.0%**）	324（**71.4%**）

2.3.2 表情符號發言數量

接著，統計了兩個聊天中使用表情符號進行發言的總次數，同時詳細統計了「信息交流」和「感謝・讚美」兩個類別中使用表情符號的發言次數及其在各類別中所佔的百分比（見表 4）。中文聊天中表情符號發言的總次數為 13 次，佔總發言次數的 1%；而日文聊天的表情符號發言總次數為 1552 次，佔 78.6%。由此可見，

在中、日文聊天中使用表情符號的發言次數存在顯著差異。具體到「信息交流」類別，中文聊天中表情符號的發言次數為 0，日文聊天則為 330 次，佔該類別總發言次數的 55.3%。在「感謝・讚美」類別中，中文聊天的表情符號發言次數為 12 次，佔 2.0%，日文聊天則為 442 次，佔 97.4%。根據此統計結果可知，日本人使用表情符號主要用於「感謝・讚美」，其次為「信息交流」。

表 4：表情符號的發言次數

內容	表情符號 發言次數	「信息交流」表情符號 發言次數	「感謝・讚美」表情符號 發言次數
中文聊天	13（1.0%）	0	12（2.0%）
日文聊天	1552（**78.6%**）	330（**55.3%**）	442（**97.4%**）

最後，統計結果顯示，中文聊天中使用的表情符號種類為 2 種，而日文聊天中使用的表情符號種類總數達到 107 種。由於中文聊天中的表情符號發言次數甚少，下面只對中文文字和日文表情符號進行對比討論。我们分別對兩個聊天中「感謝・讚美」類別的前 10 個最頻繁出現的詞彙或表情符號進行了統計（見表 5）。中文聊天中，最常出現的詞彙依次為「老師」、「謝謝」、「感謝」、「分析」、「精彩」、「辛苦」、「北語」、「平台」、「主持」和「好」。日文聊天中，最常出現的表情符號依次為：「:ii-shiteki:（說得好）」、「:祈る:（祈禱）」、「:拍手:（鼓掌）」、「:wakaru_takkkan:（明白_洞察）」、「:バンザイ:（萬歲）」、「:おじぎ:（鞠躬）」、「:igyo:（偉業）」、「:おじぎ_男性:（鞠躬_男性）」、「:arigatou_gozaimasu:（謝謝）」和「:kansha:（感謝）」（括號內為中文翻譯）。統計結果顯示，在「感謝・讚美」類別的發言中，中文聊天中似乎傾向於使用大量直接表達感謝的語句，而日文聊天則傾向於使用帶有讚揚或肯定含義的表情符號。

表 5：「感謝・讚美」中最頻繁出現的詞彙或表情符號

次序	中文聊天	出現次數	日文聊天		出現次數
			表情符號	名稱中文翻譯	
1	老師	390		說得好	48
2	謝謝	347		祈禱	48
3	感謝	90		鼓掌	34
4	分享	66		明白_洞察	27
5	精彩	42		萬歲	25
6	辛苦	31		鞠躬	24
7	北語	24		偉業	24
8	平台	24		鞠躬_男性	17

9	主持	21		謝謝	16
10	好	20		感謝	14

3. 討論

本研究旨在透過分析中、日兩種語言的線上會議聊天紀錄，探索不同語言背景的線上參與者如何透過文字聊天傳遞認知社交信息，以促進有效互動。經過統計分析，發現如下幾個特點：

3.3.1 聊天旨在「信息交流」

兩種語言在「信息交流」類別的發言比例相似，顯示出相近的交流活躍度。雖然表面上看似普通聊天，實際上這些交流並非無目的的社交活動，而是旨在積極交換信息以解決具體問題。通過分析中文聊天，可以發現該類別的發言不僅包括對講座內容的討論，亦涉及解決網絡通訊問題的對話。例如，如表 1 第三行所示，參加者大文的發言：「有聲音，您可以檢查一下網絡」。此發言的目的是在於為那些因網絡問題而無法聽到嘉賓發言的參加者提供解決方案。實際上，中文聊天中關於互相幫助解決問題的「信息交流」類發言占了大多數。即使是非參加者角色的責任範疇，參加者們也願意跨越自身角色積極參與，共同解決問題，從而形成了強烈的集體意識（砂岡和子，2022；Sunaoka & Tam，2022）。日文聊天中亦觀察到類似現象，但不如華人那樣以聊天幫他人解決問題, 日本人大部分發言圍繞不同報告的專業討論, 提出個人求救的很少.

3.3.2 文字聊天促進情感表達

如上所述，在中日文聊天中,「感謝・讚美」類別的發言次數較高，這表明這些平台的文字聊天功能便與參與者表達情感。特別是，中文聊天中此類別的發言數量是日文聊天的兩倍以上。我們觀察到中、日兩種語言背景下的情感表達存在顯著差異。具體來說，在中文聊天中，表達主要依靠文字，幾乎不使用表情符號。從高頻詞分析可見，中文參與者常用如「謝謝老師」、「感謝北語」、「精彩分享」、「辛苦了」、「祝平台越辦越好」等固定慣用語表達感謝和讚美。這顯示華人習慣使用傳統文字方式表達道謝和讚美（砂岡和子，2022；Sunaoka & Tam，2022）。

3.3.3 華人偏好文字表達，日本人偏好表達符號

相比之下，在日文聊天中，儘管參與者可以使用日文文字來表達感謝，他們的文字發言相對保守，更傾向於使用表情符號來表示感謝和讚美。我們觀察到日文聊天中表情符號的使用非常活躍，占所有發言的約 80%。同時， 日本人更喜歡含蓄的表情符號, 而直接表達感謝的表情符號屬於次位。這種現象反映了日本人在口頭表達感謝時的羞澀。此外，本次會議的參與者中，大多數為男性，只有少數女性參加，這也可能影響了表達方式。張琦（2019）指出，日本人傾向於避免直接使用感謝表達，以減輕對對方造成的心理負擔，這種傾向又以男性尤為顯著。因此，使用表情符號作為一種含蓄的表達方式，對日本人來說是一個有效的策略。這一現象很可能得益於表情符號在表達情感和促進互動方面的高功能性和高效率（Li & Yang，2018）。Slack 的反應表情符號功能允許用戶在不發送新消息的情況下，在消息的

右下角直接添加表情反應，這既不阻礙其他發言的進行，同時能迅速及時地回應他人。顯然，這一便捷功能激發了所有參與者在日文聊天中更積極地使用表情符號。而 Zoom 在 2023 年也推出了類似功能，但由於本次收集的中文數據是在此功能推出之前完成的，這可能解釋了為何中文聊天中表情符號的使用率相對較低。建議未來研究應收集更新的數據以重新評估這一趨勢。

3.3.4 恪守本分與全體互動的參與差异

通過觀察中文聊天中不同身份發言者的發言比例，我們發現「參加者」通常更積極地參與討論以活躍氣氛。而「主辦方」和「嘉賓」的發言相對較少。這主要是因為他們都專注於履行當天的職責, 即恪守本分。相比之下，在日文聊天中，尤其是在「感謝・讚美」類別中，主辦方和嘉賓的積極參與顯著增加了互動，與中文聊天中主辦方和嘉賓相對保守的發言形成了對比。

4. 結語

透過分析和比較中文與日文的聊天紀錄，本研究發現聊天工具在線上課堂和會議中扮演著促進交流與活躍氛圍的關鍵角色。即時線上會議中大部分參與者彼此陌生，文字聊天功能也有助於營造出一個活躍的交流氛圍。然而，需注意文字聊天功能僅是 Zoom 線上會議討論的一種輔助工具。若要把文字聊天平台作為學習場所，應事先考慮以下問題：①文字聊天的互動不及教室或會議場所的多模態信息交流；②文字聊天適用於開放式對話，不適合任務導向的個別學習（Jeon，2024）。此外，本研究指出恰當使用表情符號可有效增進互動。同時，主辦方和嘉賓的積極參與不僅增強了交流的質量，也激勵了其他參與者更加積極地加入討論。通過這一比較研究，我們進一步了解了不同語言背景的參與者在使用不同線上平台時的交流行為和互動模式。為了充分發揮聊天功能，我們需要根據使用目的以及參與者的特點選擇合適的聊天工具和設計。

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ChatGPT 輔助科技華語教材編寫
——以單班課師生協作模式為例
(Utilizing ChatGPT in the Development of Science and Technology Chinese Textbooks: a Case Study of Teacher-student Collaboration in a One-on-one Classroom)

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摘要：人工智能的快速發展給第二語言教學帶來了新的思考和挑戰。隨著學習新興科技的學生數量日益增加，科技華語作為專業華語課程（CSP）的需求也隨之增長。本研究使用大型語言模型 ChatGPT 生成科技專業華語教材，目的是解決專業華語教材編寫的困難，並採行動研究方法進一步探討人工智能輔助教材編寫和教學設計的可能模式。本文提出使用 ChatGPT 生成華語教材的難易度控制和語體調整方案，指出現有人工智能輔助生成華語教材的限制，亦展示了大型語言模型在語言教學領域的發展前景，以及師生協作生成專業華語教材的機會。

Abstract: The rapid advancement of artificial intelligence presents new considerations and challenges for second language teaching. As more students learn emerging technologies, there's a growing demand for technology-focused Chinese for specific and professional courses (CSP). This study uses the large language model tool ChatGPT to create technology-specific Chinese teaching materials, aiming to tackle the challenges of compiling professional Chinese teaching resources. We use an action research method to explore potential models for AI-assisted textbook creation and instructional design. This paper suggests methods for managing difficulty levels and adjusting styles when using ChatGPT to create Chinese teaching materials. It identifies the current limitations of AI-assisted Chinese teaching material generation and showcases the future potential of large language models in language teaching. It also highlights opportunities for teacher-student collaboration in generating professional Chinese teaching resources.

關鍵詞：人工智能、ChatGPT、專業華語、科技華語教材

Keywords: Artificial Intelligence, ChatGPT, Chinese for specific and professional purposes (CSP), Science and technology Chinese textbooks

1. 引言

自 2022 年 11 月 OpenAI 推出 ChatGPT 以來，第二語言教學界經過一年多的震盪與探索。目前二語教學的研究焦點主要集中在如何利用 ChatGPT 開發聽說讀寫教學應用和個人化教學與學習經驗。本文即在此脈絡下，開啟了專業華語課程設計的研究契機。

2. 研究背景

近年來，專業華語課程（CSP）或內容和語言整合學習（CLIL）在教材製作、課程設計、師生角色和評量方式等方面引起廣泛討論（黃子純，2019）。特別是專業華語教材是否能滿足學習者需求、教學資源是否足夠支持教師、教師備課工作量等問題，都成為專業華語課程發展時無法忽視的議題。

在數位化時代，語言學習者往往比語言教師更具熟稔數位輔助工具的能力與動機。此現象使得語言教學領域需要探索新的教學模式，以滿足學習者對數位化和個性化教學的需求（蔡薇, 2023; Xiao&Zhi, 2023）。特別是專業華語課程當中，如何提供適合學習者需求的專業教材成為一大挑戰。尤其是語言教師若不具備相關專業背景，教學單位是否能提供足夠的教學資源來支持教師也是一個關鍵問題。

ChatGPT 作為一種生成式大型語言模型，其強大的文本生成能力為語言教學提供了新的可能性。本文利用 ChatGPT 生成科技專業華語教材，冀能探索人工智能輔助專業華語教學的效果及其影響。

3. 研究方法

3.1 行動研究法

行動研究法（action research）是一種基於實際問題解決的研究方法，強調立即實用性與應用性。本研究將透過計畫、行動、觀察和反省四個步驟進行，觀察教師與學生的行動修正，並提出解決方案，旨在深入了解此模式下華語教材研發的歷程。

3.2 研究步驟

3.2.1 計畫階段

本研究的準備階段自 2023 年 11 月 13 日至 24 日，針對專業華語課程教材體例、生成的專業華語內容、課程大綱設計及教案設計進行準備。主要研究者與協同研究

者練習如何向 ChatGPT 下達指令（prompts）及研究何種指令語言和模式能達到最佳效果。

為了進行研究內容的前導研究（pilot study），學習者生成了一本模擬教材，內容包括多篇與中國與非洲貿易往來相關的新聞課文和科普文章。

3.1.2 行動階段

實施階段自 2023 年 11 月 27 日至 12 月 8 日，研究參與人數共三人，包括兩名華語教師和一位學習者。主要研究者依據研究流程及教學計畫進行教學實踐，蒐集研究相關資料。協同研究者按照學習興趣和專業生成相關主題的課文、生詞表、語法結構表及課後問題討論，並每日與主要研究者和協同授課教師討論教材新生成的內容和指令。

3.1.3 觀察與反思階段

在教學實踐階段觀察教師和學習者的行動，並進行反思與討論。主要研究者和協同研究者分析並彙整研究資料，取得研究結果，並撰寫研究論文。

4. 研究內容

4.1 科技華語教材編寫體例

本研究生成的科技華語教材其體例與介紹如下：

教材結構：每一課包含兩篇課文：第一篇為科技新聞報導，第二篇為科技文章。每篇課文均包含生詞表與語法結構表，每一課最後有綜合討論題。

課文：每一課課文的長度約為 600 字至 800 字。第一篇課文的語體為新聞報導語體，第二篇課文為科普文章類的書面體。

生詞：每一課課文平均選取生詞約為 50 至 80 個，以台灣華語文能力基準（Taiwan Benchmarks for the Chinese Language，TBCL）四級以上為主，並選取出課文當中出現的所有的專有名詞，在教材內選取出較一般課文為多的生詞量，是由於對 ChatGPT 生成方式及編輯上的考量。生詞表皆附上漢語拼音和對應的英文翻譯。

句法結構：每一課的兩篇課文各選擇句法結構約為四至八個，包含了新聞語體和正式書面體常用的定式結構，或是在中級水平口語語體或書面語體應用頻率高的句型。使用 ChatGPT 生成句法結構或定式時遭遇到較大的挑戰和困難。

綜合討論題：結合科技新聞和文章裡討論的主題，深化科技與社會、人文、倫理等連結，生應用所學課文生詞、句型，生成四至八個引發思考的討論題。

4.2 科技華語教材生成與教學實踐

在教學實踐階段中，師生共改編了十四篇課文，課本題目暫定為《科技浪潮中的人文對話》（課文例文見附錄一）。教師和學習者使用谷歌文件在線上同步討論、修改並備課。生成的課文需進行二次加工，調整語體、詞彙選擇、語句通順和篇章邏輯。教師在教學實踐期間需保持密切合作，反思並修正教材生成的問題。

師生在生成教材時發現，若能在生成教材的前置作業時設定準確，建立起課本的體例及模組，再進行編寫流程，則能迅速生成品質高的課文，教師也毋需在生成文本之後，大幅修改語體、詞彙選擇、增刪生詞、增刪語法結構和修改討論問題等。

換句話說，縱使像 ChatGPT 等人工智慧生成工具能接受下達的指令如：「生成一篇中級課文」或是：「生成一篇中級的科技華語課文。」但以這樣無明確目標和條件設定的指令得出的成果總是差強人意，主因在於編寫者並未將「課文」的組成要素清楚分開（如文本、生詞表、語法結構和問題討論等），難以讓 ChatGPT 依據不同要素的設定條件逐一生成；此外，若僅輸入「等級」或「水平」的指示，如：「生成一篇 HSK 五級的新聞課文」或是「生成 TOCFL 高階級的課文」，卻未上傳難易度的說明或分級相關資料，也容易會導致生成的課文出現過難、過易、語體混亂等品質不彰的結果。

生成課文時的難易度控制具體包括：生詞、語法結構和問題討論。為了精準控制生詞和語法點的難易度，需根據教材發展的預期水平提供 ChatGPT 詞彙和語法點等級大綱文件，而問題討論生成話題的在語言難易度的控制則在於問題的陳述所使用的詞彙和語法是否合乎等級，亦可以通過詞彙和語法點等級大綱來調整。

在本次研究師生協作的歷程中，需花最多時間調整與討論的部分在於，指令需不斷優化，藉以調整適切的課文語體、通順無翻譯腔的語句、篇章的邏輯不自相矛盾、能引發學習者興趣與思考的問題討論等（Williams, 2024）。

4.3 科技華語教材的內容與定位

本研究生成的科技教材的對象與目標針對華語水平中級以上，對新興科技有興趣或是初步了解、有科技中文等相關主題需求的學習者。並根據學習者需求制定專業華語教材的預期教學和學習目標。以本研究的學習者為例，授課教師設定的教學目標有二：一為協助學習者熟稔探討新興科技相關話題的語言內容，並進一步連結到社會脈絡、科技倫理、哲學思考等人文對話；二為透過目標導向的主題，強化對中級以上書面和口語語體、說法、句構和生詞的掌握等。

科技專業華語教材主題設計有別於一般性華語教材，也鮮見於其他專業華語教材，如商業華語、（綜合或財經）新聞華語、觀光華語等。根據華盛頓郵報 2023 年 5 月 20 號的報導，自 2017 年至 2022 年止，美國四年制大學主修科技專業的學習者增加了 34%。研究者在實際教學當中，亦發現越來越多學習者表示，對如何使用中文目標語來探討新興科技如 ChatGPT 等大型語言模型、腦機接口技術

（brain-computer interface）、擴增實境（augmented reality）、虛擬實境（virtual reality）、AI 倫理等議題有興趣。從學習者需求的角度來看，科技專業華語教材的編寫有其急迫性和必要性。

本研究的教材研發由學習者決定科技主題、生成並編寫，亦藉由編寫教材的歷程發展其後設認知能力，後設認知能力指的是後設認知知識與後設認知經驗（Flavell, 1985），包括對教材的體例和內容的知識，以及程序性知識，如運用指令和新的策略，解決教材的問題，並根據學習者的自我評估，在此學習和研究任務結束後得到理性與感性的綜合學習經驗。本教材利用 ChatGPT 生成科技教材，其編寫與教學模式符合創新的時代原則，且教材課文談及的科技新知與人文探討為當前的熱門議題，並發展了師生協作專業華語教材的新模式。

本教材的語體依學習者需求，在每一課內佈置了兩篇課文，分屬兩種語體。第一篇為新聞語體，第二篇為正式書面語體，其文本風格偏向科學普及書籍而非科技學術論文。課文提問設計了從不同國家、區域科技發展的現狀、不同意識形態或倫理觀念對科技發展的看法等討論題，以增加討論相關話題時的跨文化理解。教材內容除了介紹新興科技發展的知識性內容以外，也取材自不同的話題與類型，以增加學習者的學習興趣和動機。如「寶可夢 go 與擴增實境」、科幻短篇小說改寫、虛擬實境的「巴黎舞會」演出介紹等題材。

本研究生成的教材內容具實際的應用性，包含科技相關新聞、科技生詞、語法結構、科普文章、課後問題討論，盡可能滿足學習者未來使用中文來討論科技主題的需求。教材文本置於雲端上的谷歌文件（google doc），教師、學習者與協同授課教師均可隨時上網增修並加入補充材料。包括：youtube 影片、播客連結、圖片、參考文章、相關新聞等立體性輔助教材。

5. 研究限制與未來展望

5.1 研究限制

本研究所發展的師生協作模式，生成科技專業華語教材並進行同步教學。授課教師和學習者均須熟稔 ChatGPT 的操作，並對相關科技應用有一定程度的了解。教材開發後除了主要研究者、協同研究者和協同授課教師外，尚未有其他師生進行試用。日後的相關研究，研究者應盡力取得對科技華語有興趣的學習者其多元觀點，拓展科技專業華語教材內容。本研究的發展亦建立在客製化單班課課型的基礎上，未來若需將此模式應用至合班課上，則應增加生生之間合作討論比重。

5.2 未來展望

增強語體適切性：進一步研究如何控制生成課文的語體和語氣，使其更符合學習者水平和教學需求。

擴展研究對象：未來研究應包括更多不同背景和水平的學習者，以檢驗生成專業華語教材的廣泛適用性。

優化生成流程：繼續優化 ChatGPT 的指令下達和生成流程，確保生成的課文質量高且難易度適中。

語言變項調整：探索以不同語言的指令生成課文，以及使用不同語言的翻譯文本改編課文的成效，以確保生成內容的準確性和多元性。

本研究初步展示了利用 ChatGPT 生成專業華語教材的潛力，提出具體的實施方案和未來研究方向。隨著大型語言模型技術的不斷進步，華語教師和研究者應密切關注人工智能在二語教學領域最新的應用發展，進一步提升教學和學習的成效。

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科技於中華文化體驗課中的應用
(Application of Technology in Chinese Cultural Experience Classes)

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摘要：一般提到傳統中華文化教學，常見書法、國畫、茶藝和武術等等活動，以課外工作坊形式穿插在中文項目的活動中出現，目的為提供中文學習者體驗傳統文化的機會，透過趣味性活動，實現做中學，吸引更多人成為中文學習者，學習中文的同時，也加強對中華文化的認識。但是，中文教師並非專業才藝老師，每項活動又都是一門專門的學問，教師如何在有限的時間準備教學內容與材料，並透過設計讓學生體驗各式各樣的文化活動，成為一項極具考驗的工作。所以，本文探索以科技輔助設計一門三學分的中華文化體驗課，以琴棋書畫，加上廚藝、茶藝和武術，共七大主題，帶領學生從做中學，除了實技操作，更近一步探討傳統文化與個人生活、現代社會及人工智慧的關聯，以及隱藏在這些主題背後共通的哲學思想。科技於本文中不只是輔助教學的工具，也是學生需要不斷反思的議題。本文將根據課程實施、學生反饋及教師反思，提出科技輔助中華文化體驗的模式。

Abstract: Teaching traditional Chinese culture often involves activities such as calligraphy, traditional Chinese painting, tea ceremony, and martial arts. These activities are typically offered as extracurricular workshops within Chinese language programs to provide learners with opportunities to experience traditional culture. The goal is to facilitate learning by doing, thereby attracting more people to learn Chinese and deepening their understanding of Chinese culture alongside language acquisition. However, Chinese language instructors are not necessarily skilled in these traditional arts, each of which is a specialized field. Preparing teaching materials in limited time frames and designing a variety of cultural activities for students poses a significant challenge for instructors.

This paper explores the design of a three-credit Chinese cultural experience course aided by technology. The course covers seven main themes: Chinese musical instruments, Chinese go and other traditional board games, Chinese calligraphy, Chinese painting, culinary arts, tea ceremony, and martial arts. It guides students to learn by doing, beyond practical skills, further exploring the connections between traditional

culture and personal life, modern society, and artificial intelligence, as well as the underlying philosophical thoughts shared by these themes. In this context, technology is not only a tool to assist teaching but also a subject for students to reflect upon continuously. Based on course implementation, student feedback, and instructor reflections, this paper proposes a model for technology-assisted Chinese cultural experience.

關鍵詞：科技輔助教學、中華文化體驗課、傳統文化教育、做中學

Keywords: technology-assisted teaching, Chinese cultural experience course, traditional cultural education, learning by doing

1. 引言

中華文化是什麼？「中華文化是由多元的文化格局所構成的文化體系。這種文化在長期的歷史發展中，形成了以漢族文化為主幹，各民族文化相互交融、共同發展的獨特格局。」是源於人類學家費孝通 1988 年提出的「中華民族多元一體格局」理論。除了費孝通以外，梁漱溟（1949），也從不同角度揭示了中華文化的核心要素和獨特特徵，強調了其歷史悠久、以倫理道德為核心、注重和諧與社會責任等方面的特點。

中華文化博大精深，而在國際中文教育的場域裡，如何去教中華文化成為了一個問題。文化的載體有多樣的形式，例如常見的文學作品，可以透過閱讀來理解文化背景、學習文化知識。然而，文化的形式多樣，不只是以文字為載體的文學作品，常見的文化教學更有書法、國畫、茶藝和武術等等活動，以課外工作坊形式穿插在中文項目的活動中出現，目的為提供中文學習者體驗傳統文化的機會，透過趣味性活動，實現做中學，吸引更多人成為中文學習者，學習中文的同時，也加強對中華文化的認識。

讓學生能在學習語言的同時也認識文化是很理想的狀態，只是中文教師並非專業才藝老師，每項活動又都是一門專門的學問，教師如何在有限的時間準備教學內容與材料，並透過設計讓學生體驗各式各樣的文化活動，成為一項極具考驗的工作。

本文集結傳統文化中的琴棋書畫，加上廚藝、茶藝和武術，共七大主題，設計一門文化體驗課，以透過做中學的方式，增強學生對中華文化的認識和興趣為出發點，探討科技輔助設計中華文化體驗課的可行性。

2. 文獻回顧

在對傳統文化教育的研究中，其研究對象多以本國學生為主，如朱萌、張立成（2011）關注當代大學生對於中國優秀傳統文化的認知不足,傳統倫理道德觀念淡

薄，著重在思想方面的教育，期能提升大學生中國優秀傳統文化教育的實際效果。在王文靜、杜霞(2020)以系統解讀了當今與中華傳統文化教育有關的重大政策、最新理論成果和現實熱點問題，重點介紹了北京、湖北和湖南三個省市的四所學校和作為區域案例的湖南省隆回縣在發展理念、育人模式、課程建設和師資培育等方面的典型經驗。就一些研究來看，對於傳統文化的關注更著重於對本國國民教育的影響，更多著墨於倫理道德及人格及思想方面養成。

從國際中文教學角度來看，過往更多關注的是在漢語教學中如何處理漢語教學與中國文化教學的問題，不過，在程程、李延林(2019) 提到，對外漢語教學過程中不可避免地滲透著文化教學，其文章分別從對外漢語教學中的文化因素，文化教學困境，以及文化教學策略等方面展開討論。其中，在對外漢語教學中的文化困境提到幾點當前現象，如：（1）當前對外漢語教學仍以語言教學為中心為任務，文化只作為語言教學的附屬品而存在。（2）課程設置具有明顯的語言基礎知識整合性特點，而文化類課程所佔比例甚微。在課時和學分安排上，文化類課程的分量過低。

傳統文化不應只關注在國內的教育層面，而在國際中文教育框架底下的文化教學，以語言教學結合文化教學是已經發展多年的走向，但除了和語言相關的文化要素融入以外，其餘和語言關聯性較低，但可透過體驗來學習的文化，也是另一個可以發展的面向，除能保存及傳播中華文化，還能提升至跨文化能力層面，將所學與自身文化對比，與社群連結，將過去與現代經驗結合。

教師本身的文化教學素養雖非短時間能養成，但拜科技與翻轉教學所賜，課堂不再是教師單方面講授知識的場所，更多可以發揮的是與學生協力，合力運用豐富的網絡資源，在教師的設計與引導下，一起應用科技去體驗中華文化。

3. 課程設計與實施

在設定課程目標方面，此次中華文化體驗課程為學生提供不僅了解而且體驗中國各種文化的機會，並透過社區參與活動，與當地社群互動建立連結。體驗式學習部分，為學生提供了「琴棋书画柴米油盐」的實踐體驗，幫助他們了解中國文化，以一種真實且更投入的方式實際體驗文化。在課程結束時，學生將能：

(1) 瞭解中國文化的各種產品、實踐和觀點。
(2) 嘗試彈奏傳統中國樂器、寫書法、下棋（和其他棋類遊戲）、學習武術、茶藝和中國菜廚藝。
(3) 在當地文化節上分享至少一項新獲得的文化知識和技能。
(4) 與當地社區的至少一個中國家庭建立聯繫。

在課程結構部分，一共由七大主題構成，分別是琴、棋、書、畫、廚藝、茶藝和武術，兩週進行一個主題，其中，一開始的四個單元琴、棋、書、畫出自文人四藝，是中國古代文人雅士追求的藝術修養與文化活動。這四項藝術不僅是個人素養和文化修養的體現，也是中華傳統文化的重要組成部分。它們代表了中國古代文人

對藝術的理解和追求，反映了中華文化中追求美、和諧、修身養性等核心價值觀。和靜態的前四項相比，接續著的廚藝、茶藝和武術，是較為動態、實作性極強的主題。

每個主題的具體教學內容依課時安排分為四次進行，整學期各主題的活動設計和評分主要涵蓋以下幾項：

（1） 課前準備作業：在 Padlet 上預覽作業，為準備課堂。這些作業通常包括根據教師分配的閱讀材料和/或影片撰寫摘要或回答問題。
（2） 課堂參與 ：鼓勵學生參加課堂並積極參與課堂討論和活動。為所有學生創造一個包容和支持的環境。
（3） 課堂小考：每個單元都會有 1-2 個小考，以測試學生是否確實為課堂做好了準備。
（4） 課後反思和練習作業：課後反思和練習的形式根據特定單元的主題和內容而變化。但一般來說，學生應該練習課堂上所學的內容。他們的練習視頻和對過程的反思將在 Padlet 上提交，供同學評論。
（5） 單元測驗：在每個單元結束後，將進行一次筆試，評估學生對該單元內容的掌握程度。還將需要一個視頻部分的測驗，以展示所學技能（如茶道、烹飪中國菜等）的掌握水平。如果測驗的時間與文化活動重合，則測驗的形式將是參與該活動並附帶反思。
（6） 期末項目：學生進行一個展示他們整個學期所學的期末項目。學生可以選擇個人或小組進行項目。所有項目將被組織成類似才藝展演或中華文化日的形式，並對社區開放，有興趣的民眾皆能參加。

科技的應用在此課程中佔據了非常重要的部分。就文化內容來說，此次七大主題的深度都各能成為一門課，但作為一門入門的文化體驗課，如何在單次性體驗和一門深入中取得平衡，選擇適合的內容材料，引導學生在體驗中也進行思考，科技的輔助極為重要，因為，在過去沒有科技輔助的情況下，單就中文教師專業，能教授其中一個主題已不容易，而七大主題所涵蓋的備課量也是極大的。這幾項傳統文化的特點，在以前的教學多是由老師當面一對一教授，如果所處之地沒有師資，就沒有機會去接觸到。如今，在速迅變化的社會上，許多傳統文化在現代都面臨被淘汰的危機，若照以往教師面授，師徒相傳的模式，很難將中華文化之美傳播出去讓更多人去理解並欣賞。不過，拜現在科技發展所賜，有了科技輔助教學的緣故，教師和學生都可以善用科技，來教/學這些以往不容易接觸到的傳統文化，就傳統文化的傳播而言，科技可以說是貢獻極大。

此次使用的科技工具和平台，主要以 Padlet 和 Canvas 為主，Padlet 主要為課前作業、練習作業及課後反思，Canvas 則為課堂小考和單元測驗。Padlet 是一個在線虛擬瀏覽版，可以讓使用者創建自己的虛擬牆面，並在其上添加各種媒體，如文字、圖片、視頻、連結等。它提供了一個直觀且易於使用的介面，使用者可以輕鬆地組織和分享信息，進行協作和互動。Canvas 是一個綜合性的在線學習管理系統（LMS），為教育機構、教師和學生提供了一個全面的教學和學習平台。它具有

豐富的功能，包括課程管理、內容管理、在線學習、評估和成績管理等，為教育教學活動提供了全方位的支持。除了 Padlet 和 Canvas 作為整學期的平台以外，如何將科技融入各個主題，其所使用的科技輔助各異，分別安排在課前、課中及課後單元測試環節，接下來於實施過程部分再就具體方法說明。

4. 實施過程

每個主題皆以課前閱讀開始，教師於課前一週提供閱讀材料或影片，學生須於課前在 Padlet 上完成課前閱讀的貼文。由於每個主題有兩週，共四次上課時間，會於第一次上課先就課前閱讀進行引導討論，再加以總結出主題課程概述，交代接下來三次課程安排。第二次上課時，著重在實際操作面，並於第二次課後佈置練習作業，要求學生在週末回家完成練習作業，並將練習作業成果上傳至 Padlet。第三次課堂在前一堂課及週末練習作業的基礎下，於課堂中接續著實際操作。第四次課堂為收尾，在總結所學之後，進行課上單元測驗，並於課後完成課後反思。

關於使用科技輔助教學的具體方法，以下分別以不同實施環節，輔以琴棋兩主題題舉例說明：

（1） 課前作業：

琴：此處所指的琴，為中國最古老的樂器之一，古琴。古琴和另一中國樂器古箏相比，較不普遍，因此，在課前作業部分，從 Youtube 選擇了兩部介紹古琴歷史及文化的影片，要求學生截圖並描述從影片中學習到了什麼新知識。第二次課前作業為學生上網搜尋自己喜歡的古琴演奏作品，分享連結在 padlet 上。第三次課程前週末觀看自得琴社新春中西樂融合影片和電影閃光少女片段，除了對比中西文化異同和關係，也引導思考傳統樂器在今日社會的現況。

棋：棋主要是圍棋，輔以象棋、麻將和五子棋的介紹。課前作業提供學生圍棋簡介及規則講解的影片和美國圍棋協會的網站，請學生看完以後，寫出至少三個學到的點，再於課上由教師帶領學生總結出圍棋的規則。

（2） 課上活動：

琴：將實體古琴帶入課堂中。不同傳統古琴教學，學生和老師一對一對面彈琴，教師於投影幕播放基本技巧示範影片，適時停頓畫面，講解手勢及技法，再依序請學生上台練習。透過大螢幕，學生能更清楚看到如何操作，也能在課後回去觀看影片複習。影片比起真人示範更好的點在於螢幕同時顯示彈奏和樂譜，動畫指引能讓學生更清楚樂譜與彈奏動作相結合。在搭配第二次課前作業，學生自選古琴曲分享，透過小組及全班討論，學生能在短時間內接觸大量古琴曲，欣賞不同風格的樂曲及主題。

棋：課上教師以線上圍棋網站做示範，搭配課前作業學到的規則，實際演練下棋的技法。線上圍棋網站不少，並有不同語言翻譯，方便教師講解和學生學習、練習。

（3） 課堂小考：

在課堂小考部分，以 Canvas 進行，有選擇題、問答題形式。在選擇題部分，以圖片、音檔及影片來呈現考題及選項都很方便，且能設定自動批改，測試學生準備程度。在問答題部分，多以開放式問題詢問學生觀看影片的相關問題，鼓勵性質為主，只要準備好課前作業，就足以應付小考，確保學生在課前能看完影片及閱讀材料，教師不在課堂時間進行知識性講解。

（4） 課後反思和練習作業：

每個主題課後都必須提交一份課後反思在 Padlet 上，幫助學生回想這個單元所學。在評分方面，除了知識性總結摘要，更要與個人，社區，社會做連結或比較。

練習作業部分，琴為彈奏出一段小旋律〈滄海一聲笑〉，學生反覆觀看網上教學影片後，於教師辦公室時間來彈琴，並錄影上傳至 Padlet。棋的部分是給予學生線上練習網站，學生必須完成指定練習作業，截圖上傳。除了圍棋，象棋和麻將也都有對應的線上網站，科技解決了傳統這類遊戲必須有兩人或以上才能實作的缺陷。此外，由於網站還設計了分級程度，學生能邊做邊學，循序漸進，持續練習，更能在課程結束後，繼續自學。

（5） 單元測驗：

琴：琴的單元測驗是開放式問題，考試前先將相關參考影片及文章放在 Padlet，請學生課前觀看準備。問題為 In your opinion, how can the Guqin survive in modern times, and are there any creative approaches to promoting and preserving Guqin culture? 提供參考的文章為一篇研究如何透過互動系統幫助大眾認識及學習古琴，在文中學生可以看到現代科技對於古琴藝術普及化的幫助，而學生們因為實際練習過古琴，對於文中所提出的幫助更能感同身受。

棋：在棋的主題裡，由於 2016 年 AlphaGo 問世對圍棋界產生了極大的影響，因此，此次考試問題為 What can artificial intelligence reveal about a 3000-year-old game? What will it teach us about humanity? 希望學生思考人工智能與圍棋的關係。

在學生參與情況方面，由於提供的都是網上的材料，學生可以很輕易在課前和課後去預習/複習課程材料。瀏覽網站和觀看影片本就是學生課後常做的事，因此，在課程參與方面，學生的參與度極高，可以從學生的貼文及小考成績看出。透過課前作業及課堂討論，一步步和學生建構出理論，再透過課上及課後的實際操作，將理論和實作結合，在最後單元測驗及課後反思時，總結所學。

5. 學生反饋與教師反思

此次修課學生共計 20 位，學期結束的匿名問卷調查一共回收了 16 份。在第一題 Please rank all the units of this semester. (a. Guqin, b. Chinese go, c. Calligraphy, d. Painting, e. cooking, f. Tea Ceremony, g. Wushu/ Kung Fu) 的結果統計上，並無一致性的回答，每位學生排序皆不相同，顯示學生興趣大相徑庭。

第二題詢問學生是否有希望增加或刪減的主題，無人提出應該刪減，但有學生提出了可以增加古詩、手工藝（如中國結）製作、羽毛球、漢服等主題。在第三題課程時間安排方面，反映出學生個人喜好，有的人希望廚藝課長一些，也有人希望書法和古琴課久一點。在第四、五和六題部分，詢問關於學生對這學期作業、小考佈置及期末展演的感想，有學生提出對各項作業的看法如下：

> *Yes, I like the assignment format assigned this semester, epecially the pre-class preparation assignments, class participation assignments, post-unit reviews. I enjoyed reading some articles or watching some videos related to each topic and sharing my thoughts on the padlet. I also enjoyed viewing our classmates' padlet posts. For practice assignments, I really enjoyed practicing Guqin, Chinese Caligraphy and painting, and Tea ceremony, etc in class. For post-class review, it is good way for me to reflect on what I've learned after each unit.*

在教師反思部分，透過閱讀學生的貼文及作答，發現只要給予學生適當指引，讓他們自由尋找分享時，學生便能挖掘出更多有趣的面向。而透過討論與引導，學生實際體驗，對於這些主題的體驗更加深刻。在雙向交流的框架之下，不但能減輕教師備課的負擔，也能透過學生視角去發現更深、更廣的層面，一起探討科技、人工智能對於傳統文化的影響，以及思考在學了這些傳統文化以後，對自己生活、同學、家人和社會有哪些影響，這些都是從學生身上學習到的。

6. 討論與結語

在此次為期一學期的課程中，這七大主題，不同於以往傳統文化的教學方式，透過科技輔助將科技與傳統文化教育融合在一起，利用科技的優勢，在海外資源取得不易的情形下，透過線上資源的應用，將傳統文化的美傳播給海外中文學習者。由於網路資源豐富，教師只要善用課程設計，將可應用的資源給與學生，搭配作業和小考等形式，便能讓學生對中華文化有更深的認識，也能透過課堂討論，去帶領一些傳統文化與現代社會、個人之間的關聯。

面臨的挑戰在於資源雖多，但教師需花費大量時間去挑選合適課時的材料，加上學生組成背景各異，有中文學習者、華裔學習者以及來自國際學生，如何滿足不同背景的學生需求，實為一挑戰。然而，經由此次學生反饋，都能看到學生都由課程中體驗並學習到了新知識，也在同學彼此之間，學習到不同的觀點與看法，更在期末展演時，將所學分享給同學、師長及社區人士，成為了中華文化的傳播者。

在此次有科技的助力之下的文化體驗課程，獲得了學生許多正面反饋，也成功透過學生們的分享，引起了其他學生們的注意，都希望未來能選修這門課，並有更多豐富多元的文化相關課程提供選擇。

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形序教学法——拼形打字驱动的中文教学
(Shape-sequence approach – Puzzle typing driven Chinese teaching)

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摘要：汉字字形复杂，难学易忘，中文教学迫切需要一种能够贯穿教学始终的、让学生经常回忆汉字字形的机制和方法。形序教学法提出了一套完整的以拼形打字驱动的教学方法以及包括汉字拼形、拼形输入法、形序字典、首字部首和识字树等方法的汉字形序方案，开拓了目前流行的音序教学法之外的基于形序的教学法，为解决汉字难及中文教学效率不高的问题提供了一个新的思路。作为该法的基础，汉字拼形注形符号（大写字母）的形状直接匹配各个汉字部件类别的主要形体特征，形象直观，规律性强。形序教学法以拼形打字驱动，从声音学习发音，辅以必要的拼音符号提示，强调字形层次结构，以字带字组，鼓励尽早查字典和自主阅读，采用智能多媒体课文。由于这是一种新的方法，学生的实验结果还只是初步的，将继续改进完善。

Abstract: The shapes of Chinese characters (Hanzi) are complex, difficult to learn and easy to forget. There is an urgent need in Chinese teaching for a mechanism and method that can run through teaching, allowing students to frequently recall the Hanzi shapes. The shape-sequence approach proposes a complete teaching method driven by puzzle typing, including various tools of Hanzi shape-sequence scheme such as Hanzi puzzling, puzzle input method, shape-sequence dictionary, first-Hanzi radicals, and Hanzi recognition tree. This method opens up a teaching method based on shape-sequence beyond the currently popular sound-sequence teaching method, providing a new approach to solving the problem of the difficulty of Hanzi and low efficiency of Chinese teaching. As the basis of this method, the Hanzi puzzling's shape symbols (capital letters) directly match the main shape characteristics of various Hanzi component categories, which are intuitive and highly regular. The shape-sequence approach is driven by puzzle typing, learning pronunciation from sound, supplemented by necessary Pinyin symbols, emphasizing the hierarchical structure of Hanzi, setting priority on Hanzi instead of Hanzi phrases, encouraging early dictionary lookup and independent reading, and using intelligent multimedia texts. Since this is a new method, the experimental results of students are still preliminary and will continue to be improved.

关键词：形序教学法、汉字形序方案、汉字拼形、拼形输入法、形序字典、首字部首、识字树

Keywords: Shape-sequence approach, Hanzi shape-sequence scheme, Hanzi puzzling, puzzle input method, shape-sequence dictionary, first-Hanzi radicals, and Hanzi recognition tree.

1. 引言

汉字字形复杂，难学易忘，迫切需要一种能够贯穿教学始终的、让学生日常回忆和记忆汉字字形的机制和方法。以拼形打字作为驱动的形序教学法满足了这样一种需求。

西方语言和文字之间的关系，主要是音支配形。西文拥有复杂的语音，简单的字母字形，形随音变，字母文字只需要拼写出声音就行。比如：意大利画家的意大利语的名字是 Raffaello Sanzio，到了英文，音保持相似，但是字形则变为 Raphael Santi。

汉语和汉字之间的关系，更多是形支配音。中文拥有复杂的汉字字形，简单的单音节发音，无语境下，单个音匹配到具体字才能表义，形不变音变。同一个意大利画家拉菲尔，只有一种汉字名字，但是普通话念一个音，广东话念不同的音。

语言文字的不同特征决定了适合它的教学法。西方语言文字大多采用音序教学法，将学习时间放在声音上，学会了声音就能够容易地学会对应的文字。借助于拼音、拼音打字和音序字典，音序教学法也是目前流行的中文教学法。

2. 汉字形序方案

汉语拼音参照罗马字母的发音，利用字母给汉字注音和排序。汉字形序方案借鉴该成功经验，根据大写字母的形状与汉字部件形状的相似性用字母给汉字注形和排序，并且研发了汉字拼形，拼形输入法，形序字典，首字部首检字法，识字树等应用。

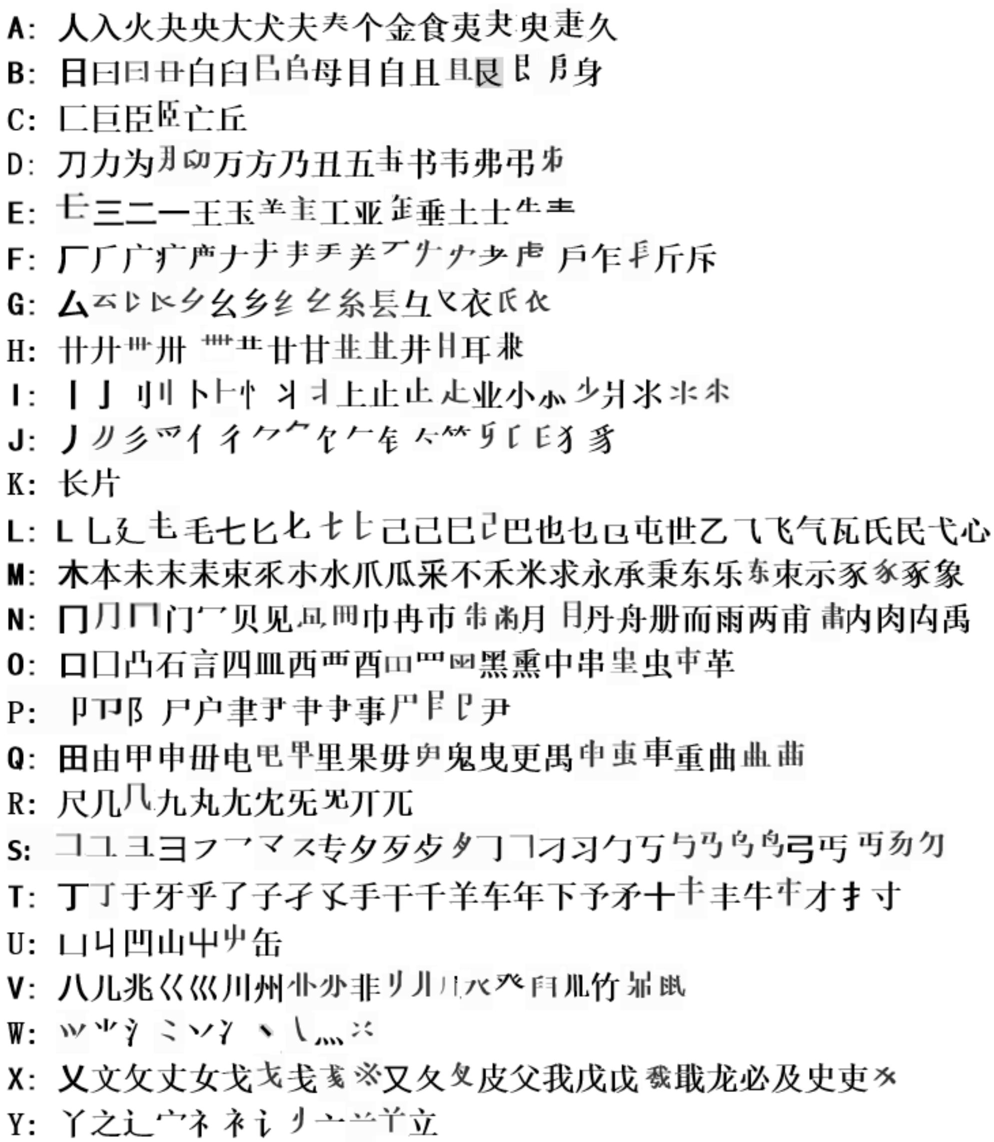
2.1 汉字拼形

汉字可以拆分为更小的单位（安子介，1987）。汉字拼形(王中琪，2022）是一种根据大写字母形状与汉字所含部件主要形状特征的相似性，用大写字母作为注形符号来标注汉字字形的方法。它采用了科学和权威的国标《信息处理用 GB13000.1 字符集.汉字部件规范》中定义的汉字基础部件。注形符号中的每个大写字母表明一类部件形状类别，它的字母组合也表示该字由哪几类部件类别组成。由于这种组合在大多数情况下是唯一的或仅有少量重合，因此它还可以间接地告诉

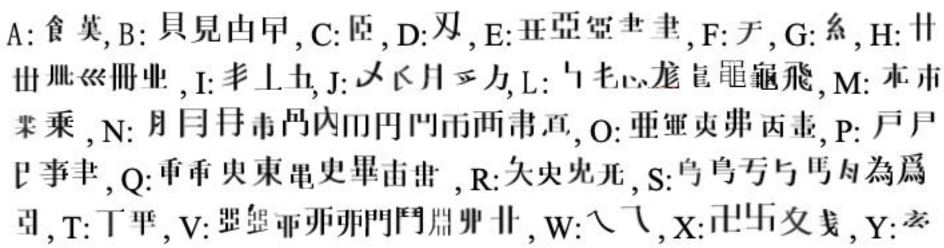
我们它所代表的是哪一个字或哪几个字。这种汉字注形方式的功能非常强大，仅用几个字母就能包含大量的信息，如下面几节所示，具有广泛的应用。

所有部件分为五组，25 个部件类别，对应 25 个大写字母，如下所示：

方向组:上开口(U),下开口(N),左开口(S),右开口(C);口类组:单口(O),上下口(B),四张口(Q);腿形组:人腿(A),交叉腿(X),左右腿(R),分开腿(V),三条腿(M);常见形组:丁形(T),刀形(D),单耳(P),厂形(F),三角形(G),草字头(H),长形(K);笔画组:横为主(E),竖为主(I),撇为首(J),单纯点(W),混合点(Y),竖折(L).



以下是仅用于繁体字或日韩汉字中的部件：



可以用以上汉字拼形注形符号来描述和标注汉字。比如：用字母’ooo’来标注“品”字的字形，其中’0’对应于‘口’。

2.2 拼形输入法

拼形输入法是以汉字拼形符号来打汉字的方法（王中琪，2021，拼形输入法；王中琪，2022）。它采用形象化的部件与键盘匹配，克服了五笔字型输入法入门难的缺点，适合普及型应用。拼形输入法打单字步骤：想法 ->（脑子里的） 声音 ->（脑子里的）汉字 -> 汉字拼形注形符号(字母) -> (可能含少量形近字)汉字。

2.2.1 部件与键盘字母匹配

图 1：拼形输入法部件与键盘匹配

2.2.2 汉字拆分规则

汉字基础部件不得再行拆分，相离和相接可拆，交重（交叉）不拆。当遇到个别的有两种或以上拆分方法时，部件数量要尽可能少，然后排在前面的部件笔画尽可能多。

2.2.3 拼形打字步骤

汉字：依序输入所含部件对应的（大写）字母。(例：口：0；品:口口口:000；噪：口口口口木：0000M）

双字字组：输入每个字的至多头两个部件。(例：老师 ： 耂匕刂一：FLVE；学生 ： 𭕄冖牛一 ： WNTE；中文 ： 中文 ： OX)

三字（及以上）字组：输入每个字的第一个部件。（例：颐和园: 匠禾口: CMO）

自带拼音反查及输入：先打‘z’再打拼音。（例：打‘王’字，打‘zwang’）

2.3 形序字典

正文按照汉字拼形辅以笔画笔顺排序的字典(王中琪，2022）。象查英文字典一样查汉字，按照汉字部件对应的字母顺序一个字母一个字母地往后查。生字或认识的字都可以查。比如： 在字典正文 ‘口 O, 哎 OHX,叱 OL,吕 OO,咽 OOA, 品 OOO, 噪 OOOOM,呻 OQ,咒 OOR,啪 OTB,固 OTO,咚 OXW’中，按照字母顺序，在‘OOA’和‘OOOOM’之间就找到了‘品’字所含部件对应的字母‘OOO’及‘品’的位置了。形序字典的排序规则同拼形打字原理几乎一样，会一种就会另一种，一举两得。

2.4 首字部首检字法

首字部首检字法是一种指定汉字所含的第一个基础成字部件（～独体字）作为该字的部首的检字方法（王中琪，2021，首字部首）。除了三个主笔画部首外，所有部首都是字，偏旁不充当部首。克服了传统的部首法中部首定义不规律以及复杂的缺点。规则简单易学，像传统的部首法一样，可以查生字。例如：查‘仅’字，由于所含的第一个字是‘又’，所以‘仅’字属于‘又’部，直接查‘又’部。查‘临’字时，由于它不含任何字，直接按第一个笔画查五个主笔画部首。首字部首检字法的规则简单，不涉及到数目庞大的偏旁，适合学生快速地通过部首查生字。与形序字典正文一起，提供了两种通过字形快速查生字的方法。

2.5 识字树

汉字有其内在的音、形、义结构（梁新哲，2002）。识字树是一棵二进制树，是一种一层一层从简单到复杂、包含所有的常用汉字、容易游览的识字方法和工具（王中琪，2021，识字树）。按照识字主路径字形顺序排列， 强化部件和字形类别概念。树内含有帮助记忆的字理或提示、句子和字的发音、汉字动画等内容。识字树中的部件名称大多来自《现代常用字部件及部件名称规范》。

3. 形序教学法

语文教育需要科学序化（戴汝潜，2016)。形序教学法是一种以拼形打字为驱动，采用汉字形序方案及原理的中文教学方法。

3.1 拼形打字驱动

键盘是一座很好的连接西方文字与中文的桥梁。学生从第 0 节课就学习拼形打字，半小时内都能学会，以后每节课打几分钟所学的字和课文，将拼形打字贯彻到整个教学过程。经过中文入门阶段的学习，大多数学生见到什么字都能够拆开打出。拼形打字带动了学生整个中文的学习。

首先是驱动汉字输出。汉字手写是很多海外中文学子的痛。幸运的是有了电脑以后，人们主要用电脑，很少手写汉字了，也没有必要花太多时间练习手写了。拼形输入法只要求知道一个汉字所含部件的形体特征类别（仅 25 个类别），而不要求知道具体部件或笔画，因此极大地降低了输出汉字的难度。

其次是驱动中文阅读。由于很早就可以用拼形输入法打出任何生字，因此学生可以从各种电子字典查生字，也可以从纸质的形序字典和首字部首查生字，因而可以较早地进行自主阅读，快速地提亮阅读与中文水平。另外，在没有语言环境的情况下，中文的字很容易忘，拼形打生字和打课文是一种有效的复习方法。

由于想打和听打从声音出发，通过拼形打字系统中的语音功能，拼形打字的过程也锻练了听力和复习了发音。在打字的过程中，学生可以一边打，一边说出打的内容，看到输出的字，在这样一种半实际的环境中锻炼听说。

3.2 从声音学习发音

直接跟着老师或电脑从句子和汉字的声音学习普通话发音。课文第一个单元只学由汉字组成的对话句子，完全不学拼音，从一开始就树立学生正确的中文汉字观。

汉字的一个特征是它的声音总是只有一个音节，非常简单，这些单音节再组成句子。有些字可以有相同的发音或相同的发音但不同的声调。由于每个汉字只有一个音节，中文会话中一个句子所含的音节数并不比一个英语单词长多少。这导致了一种有效而准确的学习普通话口语和汉字发音的方法，即尝试记住整个句子的发音，其中包含所有关于声音、声调、重音、长度、由于句子中的位置而发生的微小变化等信息。拼音注音符号是许多学生学习中文发音的工具，同时也是许多学生中文口音重的根源。

形序教学法直接通过声音学习发音，同时发挥拼音的注音与提示的辅助作用。在经过第一个单元的纯汉字的对话学习以后，后面的几个单元每课花几分钟学拼音。在学习完拼音以后，课文中的生字在其下方标出拼音，作为必要时的提示。注意拼音标在下方，尽可能不影响阅读视线。在一个单元结束前，要求将拼音关闭还能读出课文。

3.3 强调字形层次结构

汉字是复杂的，需要不断强化学生的字形结构知识来降低这种复杂性。初级课文中的每个生字都要在识字树中一层一层地从简单到复杂地走一遍，不断地复习所经过的字，同时判断其部件数及字形结构类型等内容。

3.4 以字带字组

学习的方式是句子，学习的衡量单位是汉字。课文中不单独列出字组，由学生从上下文自己体会，老师有时也可以点一下。中级以后，句子不再注解整句英文翻译，只给句子中各个字的英文翻译。

汉字是汉语的基本结构单位（徐通锵，2008），是中文的核心。学生的中文水平主要取决于知道的汉字数量。汉字对中文起着三个重要作用：书写符号/形状、说话声音和意义。学习中文的有效途径是学习汉字，通过汉字学习中文的普通话和文章。中文有 3,500 个常用的汉字，理论上说，任何两个字都可能连在一起表达某个新的逻辑意思，可以有一千多万种双字组组合，常用的字组有 50,000 多个。从字组为出发点学习中文，可以用拾了芝麻丢了西瓜来比喻。学会了 1,000 个最常用的汉字，就是一般常用字数的近三分之一，它们在阅读物中的的覆盖率可以达到 90%；而学会 1,000 个字组，仅是常用字组的 2%，其作用与 1,000 汉字相比要小很多。字组主要由三种方式组成：限定，引导和并列。大多数情况下其意自明，可以举一反三。

3.5 尽早查字典和自主阅读

阅读是学习中文的关键，会话也要结合阅读。在没有语境的情况下，普通话单音没有意义，但是如果有对应的文字的话就有意义了，就可以通过有限的 3,500 个常用字的意义及逻辑扩展来学习会话，而不用机械式地记忆数量庞大的音节组合。将一个单元内所学的课文内容累积起来，组成较长的材料供学生阅读，从一开始就养成阅读的习惯。利用拼形打字、形序字典和首字部首查生字，尽早自主阅读。

3.6 智能多媒体课文和 App

初级采用会话课文，分为单元和课。每课包含课文、识字树、字卡、拼音（第二单元开始）、打字、滚雪球课文和测验等内容。中级和高级以故事为主，突出阅读和打字输出。汉字和课文可以发音，汉字笔画和部件可以演示。随着技术的进步，采用各种高效的智能多媒体功能。

4. 结语

形序教学法提出了一套完整的从汉字字形出发的汉字形序方案和教学方法，开拓了目前流行的音序教学法之外的基于形序的教学法，符合中文字形复杂的特点，为解决汉字难及中文教学效率不高的问题提供了一个新的思路。由于这是一种新的方法，还在完善中，恳请各位老师和专家提出宝贵意见。

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Digital Humanities: Teaching C-pop "Subject Three" with Experiential Learning and Community Engagement (数位人文：中国流行文化“科目三”的体验式学习和社区参与)

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Abstract: This paper presents the incorporation of the popular C-pop dance "Subject Three 科目三" and its accompanying song into a Chinese language and culture curriculum in the digital humanities context. It will showcase an innovative way of doing so with digitalized materials that combine instructor presentation of aspects of Chinese culture with hands-on immersive experiential learning experiences, culminating with the students applying and showcasing their learning through community engagement. The goal of incorporating the Subject Three theme into the C-pop curriculum is to help students understand some fascinating aspects of Chinese pop culture through instruction as well as hands-on experiential learning and to extend the learning outcomes to community engagement. This helps make the learning experience more practical, meaningful and impactful.

摘要：本文呈现了在数位人文背景下将流行舞蹈《科目三》及其伴奏歌曲纳入中国语言文化课程里。文中将展示一种创新的方式，结合数位化教材，教师课堂教学与学生沉浸式的文化体验模式，并融合学生通过社区参与及应用来展示他们的学习成果。將科目三主题纳入流行文化教学课程，其目的是想借由教学和亲身体验的学习方式，帮助学生了解中国流行文化里的有趣面貌，并能将其所学拓展到社区参与，期以帮助学生的学习经验更加实用、有意义及有影响力。

Keywords: digital humanities, C-pop, pop songs, pop dance, Subject Three, experiential learning, community engagement

关键词：数位人文、中国流行文化、流行歌曲、流行舞蹈、科目三、体验式学习、社区参与

1. Introduction

For language learners, topics related to pop culture are among the most motivating and interesting. Pop culture artifacts can not only enhance learners' language skills but also inspire their critical thinking and creativity (Wu, 2021). In addition, songs can facilitate foreign language learning. Learning by remembering lyrics is shown to significantly increase foreign language retention (Ludke et al, 2014), and incorporating songs into grammar learning can reduce the stress felt by students while learning (Saricoban et al, 2000). This paper presents examples of using a recent Chinese pop artifact, the Subject Three 科目三 dance and its accompanying song, to empower students' language proficiency, enhance their cross-linguistic and cross-cultural analysis skills, and inspire their creativity. Moreover, the C-pop Subject Three 科目三 curriculum has pedagogical learning outcomes beyond the classroom through its positive impact in the experiential learning and community engagement context. Finally, the Subject Three curriculum also incorporates the creation of digital humanities content by leveraging technology and AI tools to create enhanced teaching materials for learning.

2. The Subject Three 科目三 Curriculum

It seems that China recently grabbed the world's attention with the Subject Three 科目三 dance, which reached over 2.6 billion views from across the globe in just a few days after going viral. This paper reports on the integration of the Subject Three dance and music into a digital humanities learning module structured with the following three major components:

(1) Language and culture knowledge learning and discussion with digitalized materials
(2) Immersive hands-on experiences
(3) Collaborative activities, projects and community engagement

With these three components intertwined, the students' learning outcomes are the following:

- Understand the Subject Three dance and its accompanying song, and appreciate their roles in Chinese Pop culture and society
- Utilize immersive learning experiences to help improve personal mindset and well-being
- Analyze various cultural aspects, practices and comparisons
- Pursue their own interests through experiential learning and share their learning outcomes with others

2.1 Pedagogical Design and Materials for Subject Three Teaching

To incorporate the Subject Three materials into language and culture teaching I have developed some new and innovative Subject Three learning materials and instructional activities, which are described in the sections below. The Subject Three

learning materials are divided into two parts: (1) The Subject Three dance, (2) Its accompanying song: Smile in the Jianghu 一笑江湖.

2.1.1 The Subject Three Dance

The Subject Three dance materials are presented with three formats:

(1) Article: A short Chinese introductory article of around 500 characters targeted at learners at the intermediate mid-high levels of proficiency. It is provided in both traditional and simplified characters to accomodate different users' backgrounds and preferences. Pinyin and English versions of the article, a vocabulary list and discussion questions for class activities are also provided. The article introduces the Subject Three popular culture dance, its accompanying song, its impact on society and related trending memes.

(2) Videos: Digitalized videos to showcase the smooth and engaging Subject Three dance moves are utilized for students' hands-on learning. Some videos from TikTok and Youtube are also presented to show the worldwide popularity of Subject Three.

(3) Hands-on practice and experience: People from all different countries have taken up the Subject Three dance challenge, with its catchy music and mesmerizing dance steps, on social media. However, the part of the dance that went viral was only a small part of the original dance. The creator of the Subject Three dance is a professional dancer and the original choreography is actually very complex and difficult for most people to learn. We chose to learn the first part of the dance with slower-motion instructional videos projected on the screen for the hands-on experience. In class, with the video and instructor's demo, students imitated and learned the steps and moves in a fun and entertaining way.

2.1.2 The Subject Three's Accompanying Song

The song, Smile in the Jianghu 一笑江湖, is the song that accompanies the Subject Three dance. It is presented with two formats:

(1) Learning the lyrics of the song Smile in the Jianghu 一笑江湖

Lyrics to the song are provided to students, along with an English translation. The song, originally written in classical Chinese, depicts some sophisticated aspects of ancient Chinese swordsmen's world and relationships, so it can be challenging for learners to understand. To help understand the theme and moods of the song, the AI tool, ChatGPT, was used to generate some images corresponding to the lyrics. For example, to begin with, we provided ChatGPT with keywords from the first three lines to generate the swordsmen's world depicted in those three lines. The keywords chosen were "江湖 (Jianghu / swordsmen's world)", "浪 (wave)", "红尘 (world of mortals)", "忘 (forget)", "往 (past)", and "何足言 (too trivial to speak of)".

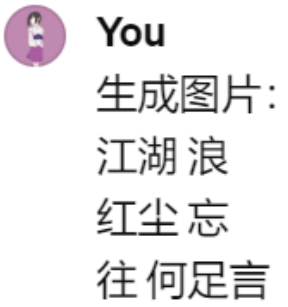

Figure 1: the keywords propmt for ChatGPT

Figure 2: the image generated by ChatGPT

We observed that we could use either keywords or full sentences to create abstract or straightforward images. Using ChatGPT to create images in this way can help convey the themes and moods of the song's lyrics.

(2) Digitalized videos and some social media artifacts were utilized to help students learn the lyrics and the song in an interestng and entertaining way.

2.2 Pedagogical Practices and Application Activities

To leverage these innovative learning materials we incorporated them into different levels of Chinese classes as part of C-pop modules. We adjusted the primary language of the content for different levels of Chinese courses. For the advanced courses 80% or more of the content was delivered in Chinese. For the intermediate courses around 50% of the content was delivered in Chinese, and for the beginning courses around 20% of the content was delivered in Chinese. For the culture course taught in English around 5% of the content, such as key words and phrases, was provided in Chinese. Below are the general in-class activities, assignments, and assessments associated with the Subject Three content:

(1) Discussions/reflections posted on Canvas
(2) In-class oral reports
(3) Preparation of discussion questions to ask in class
(4) Writing essays (e.g. In English for beginning courses; in Chinese for advanced courses)
(5) Taking tests on vocabulary items, text content and key expressions

(6) Individual oral interviews with the instructor

These learning activities help reach our learning outcomes and goals to enhance students' cross-linguistic and cross-cultural analysis skills, as they critically examine and discuss issues related to C-pop and the Subject Three dance.

3. Subject Three in Community Engagement Activities

In addition to learning about and experiencing the Subject Three dance firsthand, students in our Chinese language and culture courses also participated in community engagement activities such as cultural celebrations and events. By performing at the events and sharing their learning experiences they were able to consolidate their learning and also have some impact beyond the classroom. For example, when we first incorporated the Subject Three curriculum into courses in Spring 2024, students performed the Subject Three dance at two Chinese Lunar New Year celebrations that were attended by hundreds of people from the campus community and beyond. The performance opportunities and experiences helped motivate students learn the Subject Three curriculum well and provided them with a fun and memorable capstone experience that increased their engagement with Chinese culture in the community. After the events students wrote short reflections and reported on event highlights in oral reports delivered in class.

Students generally reported that they had fun, stepped outside their comfort zones, and enjoyed the engaging experience of learning Chinese dance and culture and then sharing it with the community. The community engagement experiences also helped reach our goals of helping students feel less stressed and more engaged in collaborative activities for learning. They were glad that they took the courses and got to participate in contributor roles in the Chinese New Year celebration events, which provided a unique opportunity for their learning to extend to Chinese cultural practices and community engagement.

Figure 3: Students performed the Subject Three dance at the Chinese New Year Gala

4. Concluding Remarks

This paper has shared a blueprint of how to incorporate pop culture artifacts into the Chinese curriculum by describing how we incorporated the Subject Three dance and song learning as part of our Chinese pop culture curriculum. The descriptions of the classroom activities, teaching materials and practices, hands-on immersive learning and community engagement activities demonstrate the Subject Three curriculum's innovativeness and impact. The paper also shares an example of how AI tools can be used to enhance the curriculum. Educators in other fields may also be interested in considering how this approach may be adapted to create digital humanities and hybrid experiential learning opportunities for their students.

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国际中文教师数字技术使用准备度研究——一项基于教师个体差异的调查

(A Study of International Chinese Language Teachers' Readiness to Use Digital Technology—A survey based on individual teacher differences)

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摘要：教育数字化转型已成为全球共同关注的热点。本文采用量化研究的方法，基于技术使用准备度模型，对 334 位国际中文教师进行了问卷调查，围绕重要性、帮助性、使用能力、兴趣程度四个维度，就教师个体特在差异展开讨论。结果表明：教师性别、年龄及教龄与教师认知具有相关性；教师数字技术使用能力与个体特征无相关性。最后，基于研究结果对教师差异化培训开展提供了建议，对未来教师发展具有一定启示意义。

Abstract: The global hotspot of worry these days is the digital transformation of education. This paper uses a quantitative research approach that is based on the readiness to use technology model to survey 334 foreign Chinese language teachers using a questionnaire. It then analyzes the variations amongst individual teachers with regard to the four dimensions of importance, helpfulness, usability, and interest level. The findings demonstrated that: instructors' perceptions were connected with their gender, age, and teaching experience; however, there was no correlation between their individual characteristics and their proficiency with digital technology. Lastly, recommendations for the creation of differentiated teacher training were made in light of the study's findings, and these will have some bearing on the advancement of teacher development in the future.

关键词：国际中文教育、数字技术、技术准备度、个体特征、教师发展

Keywords： International Chinese language education, digital technology, Readiness to Use Digital Technology, individual characteristics, teacher development

1. 引言

当前时代背景下，教育数字化转型已成为全球范围内所共同关注的热点。[1]为确保欧盟各成员国在 2021-2027 年取得数字化转型成功，欧盟委员会特发布《数字教育行动计划（2021-2027）》[2]，详细说明了教师数字化技能对数字化转型的关键影响。2022 年，世界汉语教学学会发布了《国际中文教师专业能力标准》，对教师的数字技术能力提出了明确要求。[3]可见，提高教师的数字技术使用能力已成为推进国际中文教育数字化转型的主要任务。

为更好地评价教师数字技术使用能力，研究者多将目光聚焦在数字素养指标构建（方紫帆、徐娟，2023）、教学能力评估表开发（王帅、赵润泽 & 孙朝阳，2023）中，并在此基础上为国际中文教育的信息化发展提供了建议。事实上，教师作为数字技术应用的积极推进者、创新者和引领者（吴应辉，2022），对数字技术的某种理解和态度都会影响其在教学实践中的技术融合（Farjon et al., 2019），而这种态度又受多种外部变量影响。因此，本研究则将教师的个体特征作为变量，围绕数字技术适应准备度模型，探究教师对数字技术的认知差异，希望能为未来教师培训提出有针对性的建议。

2. 理论基础

2.1 技术接受模型

技术接受模型（The technology acceptance model, TAM）由 Davis（1989）首次提出，该模型被用来解释和预测用户对信息系统的技术程度，是信息技术接受研究领域影响最广泛的理论模型之一（Venkatesh et al., 2003）。技术接受模型包括影响用户使用动机的核心变量（即感知易用性、感知有用性、使用态度）和结果变量（使用意愿、使用行为）。其中，个体主观认为使用某一信息技术对工作带来绩效提升的感知有用性（Perceived Usefulness, PU）与个体主观认为使用某一信息技术简单容易的感知易用性（Perceived Ease of Case, PEOU）被认为是能够直接解释结果的关键变量（Marangunić& Granić, 2015）。受理性行为理论（Theory of Reasoned

1 EDUCAUSE,2021 EDUCAUSE Horizon Report (Teaching and Learning Edition), 2021 年 4 月 25 日, https://library.educause.edu/resources/2021/4/2021-educause-horizon-report-teaching-and-learning-edition, 2023 年 6 月 8 日。

2 European Commission. Digital Education Action Plan(2021-2027):Resetting education and training for the digital age[R/0L].(2020-09-30)[2022-02-12]. https://education.ec.europa.eu/sites/default/files/document-library-docs/deap-communication-sept2020_en.pdf.

3 世界汉语教学学会.国际中文教师专业能力标准[EB/0L].http://www.tbz.org.cn/upload/file120220826/637971264397801280136638 0.pdf,2020-08-26.

Action, TRA）的启发，模型的结果变量包括使用意愿行为（Intended Behavior, IB）及可观察到的实际技术使用行为（Technology Use, USE），形成最初的技术接受模型。之后，Davis（1993）对模型进行了修改，试图通过增加对用户资源和外部限制对其进行改进。改进后的外部变量包含了个体差异、环境约束及可控制的干扰三个因素（高芙蓉、高雪莲，2011），见图 1。

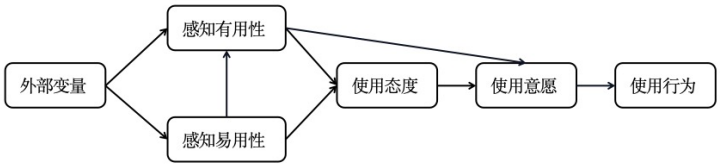

图 1：经典技术接受模型

改进后的模型被用来解释技术使用的四个阶段过程：

- 外部变量影响用户的感知有用性与感知易用性
- 感知有用性与感知易用性影响用户的使用态度
- 用户态度影响他们的使用意愿
- 用户使用意愿决定了他们的使用行为

该模型自提出以来，在不同的学科背景下得到了不断验证（Scherera, Siddiqb & Tondeurc, 2020），对使用意愿、使用行为的预测分别高达 30%与 40%（Meister & Compeau，2002）。Legris 等人（2003）分析 6 本期刊中有关技术接受模型的 22 篇研究后发现，仅有 60%的研究考虑到外部变量，说明关注 TAM 性别差异的研究还较少。Andrew & Geoffrey（2006）将个体差异作为外部变量，关注经验、学历及年龄对技术接受的影响。研究发现，经验与年龄对使用行为有直接影响，不作用于感知易用性与有用性。外语教学研究方面，蔡艳、汪泽（2022）基于感知易用性与感知有用性对中文学习者使用直播平台的学习意愿进行研究，发现性别、地域、年龄、汉语水平等因素均不会影响学习者感知差异，与徐锦芬、邓巧玲（2024）认为女生外语学习者网络自我效能感、感知有用性、使用态度和使用意向均高于男生学习者的结论有所不同。李诺恩、梁宇（2023）以教师为使用主体，发现教龄、任教身份、任教国家和数字教学环境会对数字资源的接受度产生影响，说明个体差异对教师技术接受的影响。

由上述研究可知，基于 TAM 研究虽关注了不同的目标变量，但个体差异随使用主体及中介变量的变化，均会对感知易用性与感知有用性产生直接或间接的影响。而在国际中文教育领域，以教师个体差异为外部变量探究教师技术认知的研究还比较少。本研究则以此为出发点，探究不同群体教师对数字技术的认知差异，便于日后更有针对性地开展教师培训。

2.2 数字技术准备度框架

技术准备度量表是指一种心理状态，包括促进因素和抑制因素，从而决定了用户接受和使用新技术来实现家庭生活和工作目标的倾向（Parasuraman，2000:308）。为更好地测量这种心理状态，Parasuraman 提出了技术准备度量表（Technology Readiness Index，TRI），围绕乐观主义（Optimism）、创新精神（Innovativeness）、不舒适感（Discomfort）及不安全感（Insecurity）四个维度展开。其中，乐观主义是指用户对技术持有的积极态度和信念；创新精神是指用户能够成为某项技术的引领者；不舒适感是指用户对技术缺乏控制感而产生的焦虑；不安全感是指用户对技术的不信任。

该量表一经提出，就得到了研究者的广泛关注。Ertmer 等人（2012）通过研究发现，除技术准备度量表中涉及的四项维度外，教师对数字技术的看法、认为技术在教学过程中的有用性都对实际使用行为有重要影响。也可以说，如果教师发现某项技术不能支持教学，他们就不会使用。

基于此，Martin 等人（2020）尝试性地以重要性、帮助性、使用能力和兴趣程度四个概念切入，研究教师对数字技术的感知易用性和有用性看法。Polly et al.（2023）在此基础上结合技术准备模型中的要素构建了数字技术整合准备度框架。在框架中，重要性是指某项数字技术对教师工作具有重大价值及意义；帮助性是指某项数字技术对教师工作效率的提升；使用能力指教师对某项数字技术的操作熟练程度；兴趣程度是指教师想要持续关注某项数字技术的状态。该框架虽然与技术接受模型结构或技术准备度模型所涉及的内容没有直接一致，但与两个模型中某些的特定内容相符。他们都认为，如果教师在一定程度上改变了其对于数字技术的信念和态度，就有可能促进技术的使用。

综上，本研究则基于数字技术准备度框架，结合国际中文教育的学科特点，关注教师个体差异对数字技术认知的影响。为未来教师数字教育及中文数字技术的开发带来启示，进一步促进语言数字技术与国际中文教育的深度融合。

3. 研究设计与实施

3.1 研究问题

2022 年 8 月 26 日，经世界汉语教学学会团体标准委员会审定，《国际中文教师专业能力标准》（以下简称《标准》）正式发布。《标准》围绕专业理念、专业知识、专业技能、专业实践和专业发展 5 个一级指标，16 个二级指标展开。其中，专业技能部分包含中文要素教学、中文技能教学、跨文化交际及教育技术 4 个二级指标。本文则聚焦于教师的数字技术认知与能力，参照教育技术二级指标下的具体要求，结合技术准备度框架，关注技术接受模型中的涉及的外部因素，以国际中文教师数字技术准备度模型（图 2）为依据，提出以下 2 个问题：

1）教师个体特征与数字技术认知是否具有相关作用？

2）不同特征群体对于数字技术有何种认知差异？

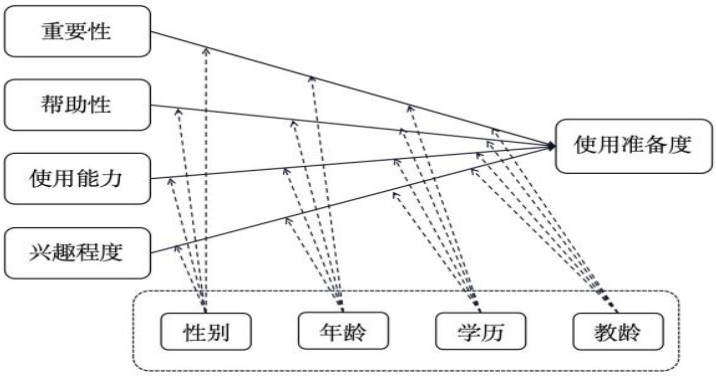

图 2：国际中文教师数字技术准备度模型

3.2 问卷设计与调查

本文采用问卷调查法，自 2023 年 9 月至 11 月起持续三个月左右，通过网络招募及滚雪球的方式，邀请有教学经验的国际中文教师及志愿者参与填写。问卷内容分为两部分：第一部分是调查对象的基本信息，包括性别、年龄、学历、教龄 4 个题项；第二部分采用接受度为 1-5 的里克特（likert）量表，结合 New Media Consortium[4]在 2017 年发布的有关教育技术趋势相关的报告总结出的 14 种数字技术（见表 1），从技术的重要性、对教学的帮助性、教师的使用能力及对技术的感兴趣程度展开，从而每一分类产生 4 个 Likert 项，总计 56 个题项。

表 1：数字技术分类框架

数字技术类型	具体使用功能
个性化学习工具	根据学习者的表现，对其进行个性化和区分教学。
课堂反应系统	允许学习者立即做出反应，并允许教师查看，帮助教师进行数据收集和参与形成性评价。
协作工具	允许多个用户同时处理一个文档或文件。
创作工具	用于创建网站、幻灯片制作及其它多媒体产品。
游戏工具	通过游戏进行环境模拟。
交互式工具	供学习者进行练习、操作。
学习管理系统	课程内容访问、合作学习、上交/批改作业、辅助教师进行课堂管理。
移动学习程序	辅助课堂教学，供学习者课后进行自主学习。
在线会议工具	共享屏幕：展示与课堂有关的图像和文本。
课程储存工具	用于课堂资源储存及课程回放。
播客工具	播放课堂所需的音频。

4 New Media Consortium. (2017). Horizon report: K-12 edition. Retrieved from https://www.nmc.org/publication/nmccosn-horizon-report-2017-k-12-edition/

社交媒体工具	进行在线信息共享、交流互动。
视频播放工具	播放课堂所需的视频。

3.3 样本情况

本研究在问卷正式发放前，先对 60 位国际中文教师进行了预测试，并运用 SPSS29.0 对量表进行信度和效度检验。预测试结果表明，重要性、帮助性、使用能力、兴趣程度四个维度的内部一致性系数（Cronbach’s α）分别为 0.866、0.874、0.896、0.867，问卷总 Cronbach’s α 值高于 0.6，说明测量工具的信度在可接受的范围内。后对题项进行探索性因子分析，所得 Bartlett 近似卡方为 14084.053，KMO 值为 0.947，显著性概率 p<0.001，表明样本数据适合因子分析。

问卷正式发放后，共回收来自亚洲、非洲、大洋洲、南美洲、欧洲及北美洲的 55 个国家教师及志愿者填写的问卷 335 份，剔除作答时间小于 100 秒的问卷 1 份，有效问卷 334 份，有效回收率为 99.70%。其中，女性教师占大多数（70.96%），年龄多集中在 18-30 岁（占比 50.9%、42.22%），具有硕士在读、硕士研究生学历及以上者超过被试总数的 85%。被试呈现出女性群体占比高、中青年程度占比高、受教育程度高等特点。基本信息见表 2。

表 2：被试者基本信息统计表（n=334）

变量	选项	频数	百分比(%)	累计百分比(%)
性别	男	97	29.04	29.04
	女	237	70.96	100.00
年龄	18-25 岁	170	50.90	50.90
	26-30 岁	141	42.21	93.11
	31-40 岁	18	5.39	98.51
	41-50 岁	5	1.50	100.00
学历	学士及大学本科生	46	13.77	13.77
	硕士及硕士研究生	255	76.35	90.12
	博士及博士研究生	32	9.58	99.70
	其它	1	0.30	100.00
教龄	1 年以内	108	32.34	32.34
	1-5 年	198	59.28	91.62
	6-10 年	21	6.29	97.91
	10 年以上	7	2.10	100.00

4. 数据分析

4.1 量化数据总体特征

首先对国际中文教师数字技术使用准备度的四个不同维度进行描述性说明，具体数据如下表。

表 3：国际中文教师数字技术使用认知情况

	均值 M	标准差 SD	最大值 Max	最小值 Min	信度系数 Cronbach α
重要性	3.872	. 685	5. 00	1.14	.935
帮助性	3.770	. 709	5. 00	1.00	.933
使用能力	3.455	. 674	5. 00	1.14	.917
兴趣程度	3.682	. 712	5. 00	1.21	.918

由上表可以看出，国际中文教师对数字技术使用认知的各个维度均值都高于临界值 3。可见，教师对于四个维度的认知情况略有差异，但总体水平良好。各维度的均值大小依次为：

重要性>帮助性>感兴趣程度>使用能力。

4.2 个体特征与维度间相关性分析

国际中文教师数字技术准备度模型除受内部因素相互作用、影响外，外部个体差异也可能会产生作用。为探究国际中文教师个体差异与认知维度的相关性，本研究采用 Pearson 相关及 Spearman 相关检测，围绕教师性别、年龄、学历、教龄 4 个个体特征差异进行相关性分析，见表 4。

表 4：个体特征与维度间相关性分析

变量	重要性		帮助性		使用能力		兴趣程度	
	r 值	Sig.	r 值	Sig.	r 值	Sig.	r 值	Sig.
性别	.243**	<.001	.262**	<.001	.031	.568	.189**	<.001
年龄	−.190**	<.001	−.229**	<.001	−.047	.395	−.108*	.048
学历	−.032	.564	−.095	.083	.021	.703	−.041	.458
教龄	−.112*	.040	−.158**	.004	.088	.107	−.076	.166

（注：*表示 p<0.05，**表示 p<0.01）

如图 3 所示，国际中文教师的性别与数字技术的重要性、帮助性、兴趣程度认知具有一定相关性（p<0.01）；教师年龄与重要性、帮助性、兴趣程度认知呈现负相关（p<0.01）；教师教龄与数字技术重要性、帮助性认知呈现负相关（p<0.05）；且数字技术使用能力与教师个体特征不具有相关性（p>0.05）。

4.3 个体特征差异

为进一步考察教师个体特征对其不同认知维度的影响，本研究在性别、年龄、学历、教龄 4 个变量上进行独立样本 T 检验及单因素方差分析，结果如表 5 所示。

表 5：不同群组间差异分析

		重要性 M±SD	帮助性 M±SD	使用能力 M±SD	兴趣程度 M±SD
性别	男	3.61±0.75	3.48±0.75	3.42±0.69	3.47±0.74
	女	3.98±0.63	3.89±0.65	3.47±0.68	3.77±0.69
	t 值	-4.234**	-4.655**	−.571	-3.512**
	Sig.	<.001	<.001	.568	<.001
年龄	18-25 岁	4.00±0.65	3.92±0.65	3.48±0.62	3.75±0.68
	26-30 岁	3.71±0.69	3.57±0.73	3.40±0.73	3.58±0.73
	31-40 岁	3.90±0.64	3.80±0.60	3.50±0.50	3.78±0.69
	41-50 岁	3.87±1.24	4.00±1.01	3.84±1.13	3.84±1.12
	F 值	4.445*	6.811**	.936	1.798
	Sig.	.004	<.001	.424	.147
学历	学士及大学本科生	3.91±0.71	3.93±0.70	3.54±0.72	3.74±0.71
	硕士及硕士研究生	3.87±0.66	3.75±0.68	3.41±0.65	3.68±0.69
	博士及博士研究生	3.80±0.86	3.68±0.90	3.63±0.76	3.63±0.89
	其它	4.357	3.71	4.07	3.71
	F 值	.373	.955	1.634	.170
	Sig.	.772	.414	.181	.917
教龄	1 年以内	4.00±0.60	3.96±0.58	3.40±0.64	3.79±0.61
	1-5 年	3.80±0.72	3.67±0.75	3.45±0.69	3.62±0.75
	6-10 年	3.74±0.69	3.60±0.71	3.60±0.66	3.64±0.70
	10 年以上	4.18±0.64	4.15±0.78	4.00±0.69	4.00±0.90
	F 值	2.730	5.075*	2.090	1.765
	Sig.	.044	.002	.101	.154

（注：*表示 p<0.05，**表示 p<0.01）

从各维度看，重要性认知受教师的性别及年龄因素影响（p<.005）；帮助性认知受性别、年龄、教龄因素影响（p<.005）；兴趣程度受性别因素因素影响（p<.001）；使用能力方面，个体特征变量并未对其产生统计学意义上的影响。另外，就个体特征因素来看，学历对教师的数字技术认知不具有显著影响。因此，本研究在此基础上，又具体分析了在性别、年龄、教龄 3 个变量在不同维度的平均分数差异：

（1）在性别差异上，由独立样本 T 检验结果可知：国际中文教师在数字技术的重要性认知（t=-4.234，p<.001）、帮助性认知（t=-4.655，p<.001）及兴趣程度（t=-3.512，p<.001）上存在非常显著差异。结合个体差异分析来看，女性教师群组对于数字技术的认知评分均高于男性教师。

（2）在年龄差异上，单因素方差分析结果表明：教师在重要性认知（F=4.445，p=0.004）、帮助性认知（F=6.811，p<.001）两个维度上呈现差异。经 LSD 事后检验发现：18-25 岁组在重要性维度、帮助性维度及兴趣程度层面与 26-30 岁组存在显著差异（p<.001）；其它年龄组间不存在显著差异（ps>0.05）。

从不同维度的认知平均分来看，18-25 岁组在重要性维度评分最高；41-50 岁组在帮助性、使用能力、兴趣程度维度的认知评分最高；26-30 岁组在四个维度中的认知评分均为最低。

（3）在教龄差异上，从单因素方差分析结果来看：教师在帮助性认知（F=5.075，p=0.002）维度存在差异。通过 LSD 事后检验可知：1 年以内教龄组与 1-5 年教龄组、6-10 年教龄组存在显著差异（p<.001，p=.031）；1 年以内教龄在帮助性维度的认知评分也高于 1-5 年教龄组、6-10 年教龄组；其它教龄组间不存在显著差异（ps>0.05）。

从不同维度的认知平均分来看，10 年以上教龄群组对数字技术的重要性、帮助性、使用能力及兴趣程度四个维度均分均为最高。

5. 讨论

5.1 教师个体特征与数字技术认知的关系

从国际中文教师数字技术使用情况认知总体（表 3）特征看，教师在重要性、帮助性、使用能力、兴趣程度四个维度的平均值分别为 3.872、3.770、3.455、3.682，均高于临界值 3，说明参与本研究的国际中文教师大体呈现正向的、积极的数字技术使用态度，但使用能力有待提高。为进一步探究影响教师使用态度的因素，本研究关注教师的个体特征差异，展开相关性分析，得出以下结论：

（1）性别因素与数字技术认知具有一定相关性。从个体特征来看，教师的性别差异对数字技术的重要性、帮助性、兴趣程度认知评分相关，并产生显著差异。结合群组间的差异分析来看，女性教师在三项维度的均值中得分都略高于男性教师，说明女性教师普遍对于数字技术的使用准备度高于男性教师。该结论与社会刻板印象中的性别数字鸿沟结果不同，女性教师的数字素养正呈现“逆袭”特征，更愿意在教学过程中使用数字技术进行辅助（刘月等，2023），较男性教师而言具备更强的使用准备度。

（2）年龄因素与数字技术认知呈现负相关，即随教师年龄的增长，其对于数字技术的重要性、帮助性、兴趣程度认知评分降低。但从群组间差异分析可进一步得知，位于被调查年龄中段的 26-30 岁教师组，对数字技术的重要性、帮助性及兴趣程度评分明显低于 18-25 岁、31-40 岁、41-50 岁年龄组，处于末尾；而 41-50 岁群组在帮助性、兴趣程度维度评分最高。结合 26-30 年龄组特点来看，他们正处于事业上升关键期，接受数字技能培训的时间较其他年龄组别稍短，因而导致数字技术认识有待提高。同时，该研究结果也在一定程度上反映出当前部分教师还并未形成科学的数字素养，难以适应数字技术在教学中的应用（周刘波等，2023）。

（3）教龄因素与数字技术重要性、帮助性认知呈现负相关。从不同教龄群组间差异可以看出，10 年以上教龄群组在数字技术重要性、帮助性、兴趣程度维度中均分均位于首位；其次为 1 年以内教龄群组；1-5 年教龄群组与 6-10 年教龄群组评分呈现 V 字型走势。该研究结果与王亚南等人（2023）针对不同英语教龄教师的信息技术接受程度现状研究及李诺恩、梁宇（2023）围绕教龄进行的数字资源接受研究结论有所不同。在国际中文教学领域，工作经验处于 1-10 年的教师群，需要

花费更多的时间和精力去适应数字技术的使用（董艳等，2023），这种将数字技术与教学相融合的新模式对他们具有一定挑战（江丰光等，2017），从而使其陷入技术认识的“倦怠期”。但随教学经验的增加、教学设计的完善，教师会重新意识到数字技术在教学中的重要价值。

5.2 教师数字技术使用能力与个体特征无相关性

由相关性分析可知，教师数字技术使用能力与个体特征因素不具有相关性，且个体特征因素并未对使用能力产生统计学意义上的影响，说明教师数字技术使用能力与使用时常及教学经验无关，与 Rubio-Gragera et al.（2023）研究结果相似。但从数字使用能力的组间评分差异中可以看出，41-50 岁、10 年以上教龄教师在使用能力均分中均位首位。可见，随教师年龄增长、学历提高、经验丰富，其对于数字技术的认知评分及使用能力评分也有所增加）。

由此可见，当前在职国际中文教师培训工作正在有条不紊地展开，且取得了一定成效。在高质量的教师培训中，教师们切实感受到数字技术对教学效率的提升，而进一步实现对数字技术的认同（石艳、崔蓓，2023）。

6. 启示与建议

基于以上结论，本研究从国际中文教师个体特征入手，为教师的数字技术培养提出有针对性的建议。

（1）对于年龄集中在 18-25 岁的职前中文教师。他们持有积极的数字素养与良好的数字技术使用意识，但由于缺乏教学经验，往往容易导致数字技术的使用能力不高，呈现将技术融入教学“力不从心”的状况。因此，职前培训应关注教师现状，着重围绕数字技术使用能力展开，降低有关数字认同在培训中的比重。另外，该年龄组教师大多处于接受学历教育阶段，面对当前国际中文教师硕士培养体系对“教育技术”课程设置的忽略情况（王帅、赵润泽 & 孙朝阳，2023），学院应适当调整课程内容设置。做到将技术类课程融入进学科内容知识、教学法知识等基础性课程中来，改变当前技术类课程独立附加的现状（刘婷婷、李洪修 & 郭梦，2022），以提升职前教师的数字技术使用能力，从而更好地实现未来国际中文教育的信息化转型 。

（2）对于年龄集中在 26-40 岁的在职中文教师。他们熟练使用数字技术的能力随教学经验而增加，但较年轻教师和职前教师而言，对数字技术的态度还有待提高。高娜、翟艳（2023）在研究中指出，该年龄组教师在职称序列上处于讲师位置，在教学科研、专业发展方面都面临了极大的压力，持较低的网课教学能力。因此，教师培训应围绕教师需求而展开，根据中青年教师专业化发展的要求，将数字技术整合至学校管理、教育教学思想及现实问题的解决中，在引导教师开展高质量数字化教学的同时，实现其自身专业发展（贾超、常永才，2023）。如此一来，不仅能

够提高教师的数字知识、数字态度及数字技能，还能够增强教学效能感。以实现提高教师的职业认同与数字技术认同，推动高素质专业化的教师队伍建设。

（3）对于年龄在 40 岁以上且教学经验丰富的中文教师。他们打破了年龄与数字技术使用能力负相关的刻板印象，具备较强的意识态度和实际操作能力。与其他群组的教师相比，该群体教师经历了数字技术从无到有的阶段，较高的评分结果也进一步说明数字技术对教学效率的提升。结合刘玉屏、李晓东、郝佳昕（2021）对 70 后教师的数字能力调查研究结果来看，教师培训可围绕其当前使用能力较弱的数字技术或兴趣程度较高的数字技术展开，实现精准化培训（王辉，2023）。作为国际中文教师群体的关键力量，未来该群体教师也可能从培训活动的参与者转变为主导者，实现数字化教学的可持续化发展。

7. 结语

本研究采用量化研究方法，围绕性别、年龄、学历、教龄四个外部变量，探讨教师个体特征对数字技术认知的影响。研究表明，教师性别会对数字技术的重要性、帮助性、兴趣程度产生影响；教师的年龄与教龄会影响他们对于数字技术的重要性及帮助性看法；教师数字技术使用能力不受个体差异的影响。在此基础上，研究结合不同群体间的评分差异，有针对性地提出教师数字技术培训建议。本文亦存在一些不足。研究仅以量化的方式对教师个体特征做了群体划分，并未准确了解差异产生的具体原因。下一阶段将有针对性地访谈具有个体差异的教师，用质的方法提供阐述与解释。国际中文教育的数字化转型任重而道远，本文仅是抛砖引玉，期待更多的学者加入到这一研究课题中来。

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Effectiveness and limitations of technology-supported peer-written feedback: What works and what doesn't?
（教育技术支持下的同伴书面写作反馈研究）

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Abstract: This study examines peer-written feedback (PWF) in an intermediate L2 Chinese classroom through Google Docs' suggesting mode. It analyzed PWF frequency, type, and effectiveness, finding a focus on language aspects, particularly grammar. While PWF effectively resolves surface-level writing issues, it is less successful for content and organization. Students generally do not find PWF face-threatening but may hesitate due to their language proficiency limitations. Mixed feelings exist about Google Docs for PWF, with some finding it flexible and others distant compared to face-to-face peer feedback sessions. This research sheds light on PWF dynamics and challenges in web-based learning environments.

摘要：本研究通过 Google Docs 的“提出修改建议”模式，对中级汉语课堂中的同伴书面写作反馈（PWF）进行了调查。研究分析了 PWF 的频率、类型和有效性，发现学生对语言方面特别是语法方面的关注较多。虽然 PWF 有效地解决了表层写作问题，但对于文章内容和结构而言，效果并不理想。学生普遍认为提出或者收到 PWF 并不会伤害自己的面子，但由于自身语言能力的限制可能会在给予修改建议时犹豫，与此同时学生对在 Google Docs 中使用 PWF 也存在着不同的看法。这项研究揭示了网络学习环境中 PWF 的动态和挑战。

Keywords: Written feedback, Peer feedback, Technology-supported writing, Chinese as a second language

关键词：写作反馈、同伴反馈、技术辅助写作、中文二语教学

1. Introduction

Peer-written feedback (PWF) is a pedagogical tool that has become increasingly popular in L2 writing classrooms because of its various benefits. Research shows that PWF benefits L2 learners by increasing language-use awareness, promoting interaction and negotiation of meaning, and facilitating L2 development (Liu & Hansen, 2002; Storch,

2017; Tigchelaar & Polio, 2017). In recent decades, technology has been increasingly integrated into PWF activities, affording L2 learners more equal patterns of participation in peer feedback regardless of time and space constraints (Chen, 2016; Li, 2021; Zhang & Zou, 2022). Despite the generally positive attitudes L2 learners have toward PWF, some also express concerns about it, such as distrust of feedback provided by other L2 learners, concern about offending others, and skepticism about one's own language abilities to give useful feedback (Liu & Hansen, 2002; Storch, 2017, 2019; Zhang & Zou, 2022). In view of this, Storch (2017) suggested that peer feedback can be incorporated into L2 writing classrooms through collaborative writing (CW) in order to promote joint responsibility and text co-ownership, and thus facilitate the process of giving peer feedback. With the rise of technology, technology-supported CW gains popularity, enhancing peer feedback effectiveness (Li, 2018, 2021; Storch, 2017; Zhang et al., 2021). Using Web 2.0 tools such as Google Docs and Wikis, writers can not only write and edit simultaneously beyond time and space constraints but can also provide feedback to each other more efficiently through built-in features such as commenting, discussion, and tracked changes (Storch, 2017; Li, 2018).

Technology-supported PWF refers to the activity during which learners use technological tools to evaluate their peers' writing and provide feedback (Chen, 2016; Li, 2021; Zhang & Zou, 2022). Research have substantiated the efficacy to technology-supported PWF in L2 writing development. Leveraging technological tools, learners provide more feedback comments compared to traditional methods (Liu & Sadler, 2003), enriching L2 input, fostering higher-order thinking skills, and enhancing academic writing skills (Ebadi & Rahimi, 2017; Godwin-Jones, 2008; Yu & Lee, 2016). These tools also offer flexibility in editing regardless of time and space constraints (Canham, 2018; Ebadi & Rahimi, 2017), creating more equitable participation and alleviate pressure on reluctant learners, facilitating a more inclusive and effective PWF process (Chen, 2016; Ho & Savignon, 2007; Lee & Evans, 2019). Among various technological tools used in L2 writing classrooms, Google Docs has emerged as a valuable tool in L2 writing environments, particularly for PWF (Ebadi & Rahimi, 2017; Godwin-Jones, 2008; Lee & Evans, 2019). Ebadi and Rahimi (2017), for example, compared the impact of online peer editing via Google Docs with face-to-face peer editing on L2 English learners' writing skills. Their study revealed better academic writing skills among learners using Google Docs, attributing this to increased collaboration and text review opportunities. According to them, Google Docs' functionality facilitated closer text examination and peer collaboration, enhancing students' academic writing skill development.

Research and practice have underscored the positive impact of technology-supported CW and PWF on the writing skills of L2 learners, garnering increased attention in L2 writing classrooms. However, existing research has primarily focused on L2 learners providing PWF on independently drafted peers' texts, leaving a gap in understanding how L2 Chinese learners offer asynchronous PWF on texts co-constructed with peers in Google Docs. To address this gap, this study examined L2 Chinese students' use of text-editing functions in Google Docs to provide intra-group PWF during a CW project. By analyzing their text-editing behaviors, the present study investigated the nature of PWF given to peers' CW texts in terms of type, focus, and effectiveness, aiming to enhance understanding of L2 learners' PWF behaviors in CM environments.

2. Present Study

2.1 Participants and context

This study is part of a larger project investigating students' experiences in a web-based CW project within an intermediate L2 Chinese classroom. Participants were students enrolled in a third-year Chinese language course at a public university in the U.S., aiming to reach an intermediate-high proficiency level according to the ACTFL scale. The course had 14 students (eight females, six males, aged 18 to 22), all of whom had prior experience with group projects and CW using Google Docs. As part of the course, students worked in groups of 2-3 to write an article on topics of interest, aiming to develop research skills and academic writing abilities in L2 Chinese. Groups were guided through the process of formulating research questions, exploring relevant issues, evaluating sources, and presenting findings cohesively. The 14 students were divided into five groups (four groups of three students, one group of two students) based on their preferences. Each group was tasked with producing a final paper of at least 2000 Chinese characters, with two drafts and feedback sessions. Over ten weeks, students collaborated both in and out of class, using Google Docs for text co-construction.

2.2 Data collection and analysis

Throughout the project, groups followed a consistent collaboration pattern: brainstorming and planning, dividing writing tasks, and editing collectively. To facilitate interaction and address individual writing issues, the instructor organized three in-class collaboration sessions. These sessions allowed students to collectively edit their text using Google Docs. This enabled both collaborative and independent work, allowing students to progress at their own pace. By the fifth week, each group had completed their first draft, followed by a peer-editing session. Students used Google Docs' *suggesting* mode to provide PWF, making direct revisions and leaving comments on language, content, and organization. Data collection occurred following students' completion of their PWF assignment in the seventh week of the CW project. The author made copies of each student's PWF document and extracted all suggested edits and comments from Google Docs. All 14 students completed the PWF assignment on time, resulting in 14 complete sets of data without any missing cases.

All suggested edits and comments underwent scrutiny and categorization based on the types of PWF. Initial coding revealed two broad categories: content-related (e.g., idea development, organization) and language-related (e.g., word choice, grammar, spelling, punctuation). The author coded all PWF, and an external coder joined for reliability. The Wilcoxon signed-rank test evaluated differences in content-related and language-related PWF. Second-level coding subcategorized language-related PWF into lexical, grammatical, and mechanics. The author and another coder independently coded PWF into these subcategories, ensuring reliable coding. Friedman tests assessed if the focus of PWF differed significantly. The effectiveness of PWF was classified into three categories: correctly resolved, incorrectly resolved, or unresolved. The author and another coder independently coded PWF, resolving discrepancies through discussion until full agreement was reached. Friedman tests evaluated resolution differences across subcategories. Post

hoc pairwise comparisons used Wilcoxon signed-rank tests with Bonferroni corrections. Furthermore, students completed a post-PWF reflective journal to discuss their thoughts on the PWF activity. Guiding questions included, "How do you feel about providing and receiving PWF?", "What aspects do you believe were effective or ineffective during the PWF session?", and "How do you feel about offering PWF via Google Docs on your peers' writing?"

3. Results

Fourteen students provided a total of 311 instances of PWF in the current study. Language-related PWF accounted for 77.2%, with content-related PWF comprising the remaining 22.8%. The Wilcoxon signed-rank test revealed a statistically significant difference between the numbers of language-related and content-related PWF (Z = -2.276, p < .05, effect size r = .61), indicating a greater generation of language-related PWF. Within the 240 language-related PWF, 55% addressed grammatical issues, 30.8% focused on lexical aspects, and 14.2% targeted mechanics. The Friedman test result showed significant differences between the three types of language-related PWF ($\lambda^2(2) = 9.574$, p < .05). Post hoc tests indicated significantly more grammatical than mechanics PWF (Z = -2.805, p < .05, effect size r = .75), suggesting a greater emphasis on grammatical aspects. No other significant differences were observed, implying a balanced focus across different types of PWF.

When it comes to the effectiveness of students' PWF, 78.8% of addressed issues were correctly resolved, while 21.2% were deemed less helpful. Among the less helpful PWF, 10.3% were deemed incorrect from a language use perspective, and 10.9% lacked clear solutions. Friedman's test revealed significant differences in PWF resolutions ($\lambda^2(2) = 11.704$, p < .05). Wilcoxon signed-rank tests with Bonferroni correction showed significant differences between correctly and incorrectly resolved PWF (Z = -3.299, p < .05, effect size r = .88), as well as between correctly resolved and unresolved PWF (Z = -2.669, p < .05, effect size r = .71). Furthermore, the effective rate of PWF resolution varied by focus, with 85.8% of language-related PWF and 57.7% of content-related PWF deemed correct. This suggests students were more adept at addressing language issues than content-related concerns. However, they exhibited more caution when addressing content-related feedback, as evidenced by a significant portion of unresolved PWF due to vague or insubstantial feedback provided by peers, which their peer-author could not incorporate.

In the post-PWF feedback obtained from students, it was found that students generally did not view the process of providing and receiving PWF as intimidating or face-threatening. However, their hesitance stemmed from concerns about their own language proficiency, which led them to hesitate when offering feedback on aspects they felt unsure about. Moreover, students expressed mixed feelings regarding the use of Google Docs for PWF. While some appreciated its flexibility and perceived it as less intimidating than face-to-face peer feedback interactions, others found it distant and somewhat constraining in comparison to in-person feedback sessions. This mixed feedback highlights the nuanced experiences and preferences of students in utilizing technology for peer feedback in the L2 writing context.

4. Discussion and Conclusion

This study explored PWF provided by intermediate Chinese learners in an L2 Chinese classroom during a CW project. Findings revealed that students primarily addressed language-related issues rather than content-related ones in their peers' writing, consistent with previous research (e.g., Kessler et al., 2012; Liu & Sadler, 2003; Vurdien, 2013). Specifically, students focused more on lexical and grammatical aspects than mechanics, reflecting typical patterns observed in CW activities (Fernández Dobao, 2012; Storch & Wigglesworth, 2007). Moreover, when providing content-related feedback, students tended to offer vague suggestions, likely due to limited confidence in their language abilities, which aligns with previous findings (e.g., Leki, 1990; Wu et al., 2015). L2 learners are more likely to engage with surface concerns during peer reviews of vocabulary, grammar, and mechanics rather than the content. The limited language abilities of students could make it difficult for them to respond effectively to those content-related issues in their peers' writing.

The effectiveness of students' PWF varied depending on whether the feedback addressed language-related or content-related issues. Results indicated that PWF was notably effective in resolving language-related problems in peers' writing, aligning with previous research highlighting L2 learners' success in addressing language issues during CW activities (Fernández Dobao, 2012; Storch, 2017, 2019). However, PWF was less effective when addressing content-related issues, with students often providing minimal or superficial feedback that did not significantly contribute to content improvement. This discrepancy may stem from students' perceptions of their language proficiency and their perceived responsibility during peer feedback activities, consistent with prior studies (e.g., Storch, 2005; Wu et al., 2015; Zhai, 2021). Additionally, the use of Google Docs as a feedback platform may further limit students' depth of feedback due to the constraints of written comments, leading some students to find it easier to address form-focused mistakes than content-related issues. Thus, while Google Docs offers advantages, it also presents limitations in facilitating peer response activities in L2 writing classrooms.

Based on the findings of this study, several pedagogical recommendations can be proposed for integrating PWF activities into L2 writing classrooms. Firstly, teachers should assess and prioritize the focus of PWF, balancing between content-related and language-related aspects based on instructional objectives. Providing guiding questions and specific review tasks can help students offer more targeted feedback. Secondly, to address concerns about the accuracy and utility of PWF, teachers can enhance trust by reviewing and refining feedback processes, offering training to support students, and grouping students with more proficient peers. Additionally, teachers should consider the advantages and limitations of different feedback modes, such as remote versus face-to-face and oral versus written, to optimize student learning outcomes. While tools like Google Docs may excel in peer-editing and/or language-focused tasks, they may limit engagement with higher-order content and organization aspects of peer writing.

There are some limitations in this study. Firstly, the limited sample size may have impacted the statistical power and generalizability of the non-parametric test results, necessitating caution in interpreting these findings. Additionally, while peer feedback

offers benefits for both providers and receivers, this study solely focused on learners' feedback-providing behaviors. Future research could investigate how recipients incorporate feedback into revisions and how this influences text quality. Despite these limitations, this study contributes to our understanding of technology-supported peer feedback behaviors in CW activities, paving the way for further exploration of peer feedback features within CW groups to deepen insights into its function and benefits in L2 writing classrooms.

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Make LLMs Your Portable Teachers of Chinese as a Foreign Language -- Prompt Patterns of an AI-Teacher
(让大语言模型成为你的随身汉语老师——AI 教师的提示范式研究)

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Abstract: This study addresses the challenges faced by learners of Chinese as a foreign language (CFL) when using large language models (LLMs). We iteratively optimize prompts for LLMs to assist in learning Chinese near-synonyms, guiding the models to provide accurate and practical feedback. Through three experiments, we test the understanding and ability of LLMs for near-synonyms under different prompts. We find that prompts containing explanations and guidance of reasoning can significantly improve the performance of the models. Therefore, this study proposes the "Learning Teacher Prompt Pattern", which initially treats LLMs as learners for training, and then transfers the role to assist CFL learners.

摘要：本研究针对汉语作为外语的学习者在使用大语言模型时遇到的挑战，迭代优化出适用于大语言模型辅助汉语近义词学习的提示，以此引导模型给出准确且实用的反馈。通过三个实验测试了大语言模型在不同提示下对近义词的理解和使用能力，并发现包含解释和思考指引的提示能显著提高模型的表现。因此，本研究创新性地提出了"学习型教师"提示范式，即将大语言模型首先视为学习者进行训练，随后转变其角色为教师，以辅助汉语学习者。

Keywords: LLMs, prompt engineering, CFL, AI-assist learning

关键词：大语言模型、提示工程、汉语作为外语学习、AI 辅助学习

1. Introduction

Large language models (LLMs) significantly enhance learning and teaching by generating learner-centric materials, facilitate interaction, and provide personalized

feedback (Bonner et al., 2023; Dai et al., 2023; Moussalli & Cardoso, 2020). However, many learners of Chinese as a Foreign Language (CFL) face challenges in effectively using LLMs due to their limited Chinese proficiency and communicate skills (Cai, 2023). This may be due to vague prompts and imprecise responses from LLMs (Giray, 2023). Therefore, it's crucial to guide learners in interacting with LLMs (Da, 2023). Prompt engineering is a cost-effective way to improve LLMs' performance (Wang et al., 2023). Various prompt methods have been explored (Reynolds & McDonell, 2021; Ekin, 2023; Brown et al., 2020; Wei et al., 2022; Nigh, 2023). However, implementation studies for specific domains, such as second language teaching and learning, remain relatively scarce, particularly in the context of CFL.

This study focuses on prompt engineering for CFL learners to learn near-synonyms, which is a critical topic in CFL teaching (Zhang, 2007). Despite dedicated sections in resources like "HSK 标准教程" (Jiang et al., 2015) and "商务馆学汉语词典" (Lu & Lv, 2006), near-synonyms remain challenging to learners. We aim to answer two questions: what factors in prompts affect LLMs' performance in distinguishing near-synonyms? What kind of prompts are suitable for CFL learners to use to self-study near-synonyms? Based on the Input Hypothesis (Krashen, 1984), Error Analysis (Lu, 1994), and the characteristics of Chinese lexical, grammatical, and pragmatic structures, we iteratively optimized prompts in three experiments: the cloze test, discrimination of near-synonyms, and sentence construction of near-synonyms. This elicits LLMs to generate accurate word usage, applicable examples, and explanations for learners. We show that LLMs' performance does not consistently improve with the addition or replacement of prompt skills, such as few-shot (Ekin, 2023), and that more examples in prompts don't necessarily improve accuracy, but well-explained examples can boost performance. Therefore, we propose the "Learning Teacher" Prompt Pattern (LTPP), which initially treats LLMs as learners, provides examples and explanations for LLMs to learn, and then uses LLMs as teachers to assist CFL learners. This study presents an innovative approach that optimizes the use of LLMs as CFL teachers for self-directed learners.

2. Methodology

We adopted an empirical research paradigm and quantitative methodologies for data analysis. We conducted three experiments: the Cloze test, discrimination of near-synonyms, and sentence construction with near-synonyms, which evaluate the ability of LLMs to recognize and understand near-synonyms from distinct perspectives.

The dataset for Experiment 1 includes over 320 blanks collected from the HSK5 Test (汉语水平考试五级), with each short text containing 3-4 cloze blanks. The dataset for Experiment 2 consists of 400 sentence pairs collected from the "1700 Pairs of Chinese Near-synonyms" (1700 对近义词用法对比) (Yang & Jia, 2007) and the GCI corpus (Global Chinese Interlanguage corpus; 全球汉语中介语语料库). Each pair comprises a good sentence and a bad sentence with near-synonyms. For the GCI corpus data, we collect sentences that contain errors in the use of near-synonyms. Each sentence is manually cleaned in five steps. First, correct other errors in the sentences (according to the annotations) but retain the near-synonyms error. Second, delete other parts (if necessary)

that do not affect the independent meaning of the clause, as there might be ambiguous expressions that could affect the experiment's validity. Third, record the sentence that was preliminarily corrected but still contains a near-synonym error as y (bad sentence) in the dataset. Fourth, correct the near-synonyms errors in the sentence. Fifth, record the corrected sentence as x (good sentence). Given the importance of addressing common errors in Chinese language learning, this study utilizes a total of 30 pairs of misused synonyms of real student data from the GCI corpus for Experiment 3. We organize high-error-rate words and their corresponding near-synonyms into a dataset as near-synonym pairs. Additionally, it is worth noting that due to the limited amount of data, to ensure the reliability, validity, and generalizability of the experiments as much as possible, each time the model is tested via API access in Experiment 1 and 2, the random.shuffle function is used to randomize the data. When testing via the web interface, Research Randomizer is utilized for random sampling to select data for testing.

We tested three top models in the CLUE list through API and the Web interface, including GPT3.5 Turbo, ERNIE4.0, and Baichuan2-13B. The evaluation metrics include accuracy, F1 score, and internal consistency. We ran each task three times on each model in Experiment 1 and 2, and the median of the three runs was recorded as the result. After identifying the model that performs the best under the same prompt through comparison, we conducted additional prompt-optimizing tests and Experiment 3 on that model. For the sentence construction task, we invited three CFL teachers to score the sentences provided by the no-technique prompt (pre-test) and the technique prompt (post-test) using a 5-point Likert scale respectively. As learners often misuse near-synonyms due to the easily confused sense, the model's output sentences should be grammatically correct and illustrate the nuanced differences and easily confused senses between near-synonyms. To measure the suitability of the model's sentences for self-study of near-synonyms, we used three scoring standards: 1. The sentences have no grammatical and pragmatic errors; 2. The sentences are constructed with an easily confused sense of near-synonyms; 3. When the grammar and semantics are correct, whether the target word in the sentence can be replaced with a corresponding near-synonym, and whether the model explains. The experiment used the average score of three Chinese teachers as the final score for analysis.

Table 1: Examples of Prompt Templates

Id	Templates
1	你是汉语语言专家，根据搭配频率判断 {x}和{y}哪句更好。从搭配、语义轻重、使用习惯、语体、语法等方面分析句子中关键词的细微差别。
2	按照下面的步骤反思你刚才关于{word/sentence1}和{word/sentence1}的答案和解释：{E}1. 重新仔细审题并重复题目，2. 重点查看关键词所在的句子，3. 重点查看句子对应的编号，4. 阅读并重复你刚才的解释，5. 根据{1-4}步的结果，检查你前面的解释中，是否存在错误，6. 告诉我你的错误并改正

Given that both the instructional and target languages are Mandarin Chinese, the prompts used in this study will also be in Mandarin (Table1). Although auto-prompting provides efficiency (Shin et al., 2020), we adopted manually designed prompts that are more likely to match tasks at the initial stage of the study due to the varying nature of CFL learning tasks and learners. This method ensures that the prompts align precisely with each task's

specific requirements, thereby guiding LLMs to produce more accurate and contextually appropriate content. The formulation of these prompts adheres to the CRISPE framework (Nigh, 2023), which encapsulates five fundamental parts: Capacity and Role, Insight, Statement, Personality, and Experiment. This study utilizes and tests various prompt techniques such as 0-shot techniques (Reynolds & McDonell, 2021), one-shot strategies (Ekin, 2023), few-shot paradigms (Brown et al., 2020), and the Chain of Thought approach (Wei et al., 2022).

We analyze the relationship among prompt techniques, the number of questions, and the performance of LLMs using statistical description, t-test, and simple linear regression. This analysis helps us understand how different factors influence the performance of LLMs and guides us in optimizing prompts in AI-assisted CFL learning.

3. Findings

3.1 Experiment 1

When we used 13 texts, comprising a total of 49 blanks and the same prompt (zero-shot, expert role), the accuracy, F1 score, and internal consistency of ERNIE4.0 achieved 1, which is the highest among the three LLMs. Subsequently, we tested different prompt techniques on ERNIE 4.0 (Figure1). Compared to zero-shot, few-shots (Brown et al., 2020) did not significantly improve the model's answer accuracy when k=1, k=2, and k=10. The act-as-role technique (Nigh, 2023) and the "Chain of Thought" (Wei et al., 2022) guide the model's thinking and emphasize the display of the analysis and thinking process in the answer, significantly increasing the accuracy. Specifically, when we tested 20 blanks, which were randomly selected from the dataset three times on the Web interface, the mean accuracy of the answer without techniques and not showing the thinking process was 0.93. However, when we used the above techniques and emphasized the analysis and thinking process, informing the model of the key points of problem-solving, the mean accuracy of the answer to the same question reached 1. Interestingly, when guiding reflection, having the model use two roles to check and question each other did not significantly improve the accuracy of the results.

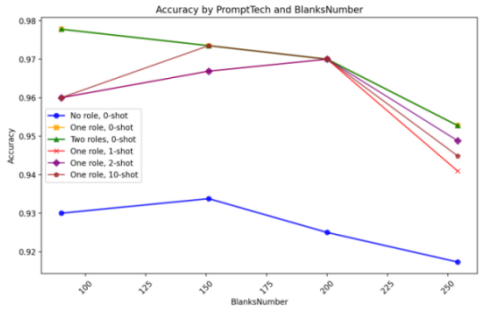

Figure 1: Accuracy of Prompt Techniques and Number of Blanks

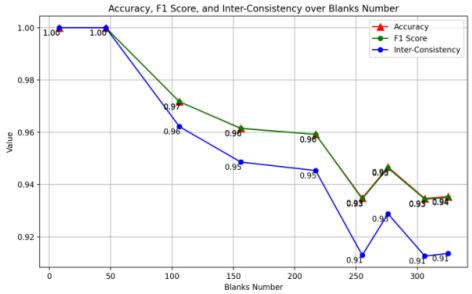

Figure 2:
Comparative Analysis of Accuracy, F1 Score, and Inter-Consistency Across Varying Blanks Numbers

* The results were kept to two decimal places in the count

In addition, we also found that the number of questions inputted at once may affect the model's performance. As can be seen from Figure 2, overall, as the volume of questions increases, the accuracy, F1 score, and internal consistency all exhibit a downward trend. In other words, the more questions given at once, the lower the potential performance score of the model. It is worth noting in this test that when the number of questions given at once is less than 250, the accuracy and F1 score are greater than 0.95. However, when the test data includes 254 questions, the accuracy and F1 score drop below 0.95. This represents a significant change.

3.2 Experiment 2

We randomly selected 50 sentence pairs to test three LLMs using the same prompt. ERNIE 4.0 performed the best with an accuracy of 0.980, F1 score of 0.990, and internal consistency of 0.960. Similar to Experiment 1, using the act-as-role technique (Nigh, M, 2023) and the CoT technique (Wei et al, 2022) in the prompt improved the model's answer accuracy. Specifically, without using techniques, the accuracy of 10 and 50 pairs of judgments was 0.6 and 0.74, respectively. However, with techniques, the highest accuracy reached 1.

We also tested ERNIE 4.0's performance with different numbers of sentence pairs inputted at once, both through API and the web interface. We found that when no more than 50 sentence pairs were given at once, the model's accuracy could reach 1. However, the accuracy quickly dropped when more than 50 pairs were given. Meanwhile, a simple regression analysis showed a significant impact of the number of sentence pairs on accuracy. The model was statistically significant with an F-statistic of 10.94 and a p-value of 0.00698, indicating a significant impact of the number of sentence pairs on accuracy. The model's intercept was 0.9517, highly significant with a t-value of 38.058. The coefficient of pair number was -0.0005, significant with a t-value of -3.308, suggesting a negative correlation between the number of pairs and accuracy. Thus, the more sentence pairs input at once, the lower the LLMs' accuracy.

3.3 Experiment 3

Without a specially designed prompt (pre-test), the model generally produces sentences with correct usage, but the sentences may not involve the easily confused sense of

near-synonyms. For instance, in the near-synonyms pair “分别/分辨”, “分别” has senses of “distinguishing, individually, and parting”, while “分辨” includes “distinction and discrimination”. From the sentence extracted from the corpus “首先要谈中国汉字发音，有四个声调，最难【分别】[Cb 分辨]的是第一和第四声.”, we see that the easily confused sense is “distinction, distinguishing” while “parting” sense of “分别” doesn’t confuse with “分辨”. Yet, without special guidance, the model’s sentences with “分别” don’t involve the easily confused sense: “分别:我们即将分别，踏上各自的人生道路，但我们的友谊将永远长存。”; “分辨：小孩子的视力还没有完全发育，有时候难以分辨远处的物体。”

To elicit LLMs to generate sentences accurately according to the learner’s confusion, we adopt three approaches to prompting (post-test). The first approach is to provide sentences with errors and let the model actively identify and learn the focus of the current task. The second approach involves giving a warning about the usage of easily confused senses in near-synonyms when the learner does not have sentences with errors, which requires the learner to point out their points of confusion. The third approach is used when the learner does not have specific confusion; we ask the model to analyze and construct sentences for each sense of the near-synonyms and the easily confused senses.

A paired-sample t-test was conducted to compare pre-test and post-test scores. There was a significant difference in scores for pre-test ($M=4.49$, $SD=0.46$) and post-test ($M=4.95$, $SD=0.09$) conditions; $t(29) = -5.85$, $p < .001$ (two-tailed). The results suggest a statistically significant increase from pre-test to post-test scores, indicating that our technique prompt significantly improved the model’s performance.

Since the ideal input should be comprehensible to learners (Krashen, 1984), sentences output by the model using higher-level vocabulary and grammar beyond learners’ language proficiency may cause additional understanding burdens. Therefore, we suggest assigning the model the identity of a second language learner and their Chinese level, limiting the sentence’s grammar difficulty and length, and asking the model to follow the i+1 principle (Krashen, 1984) to provide sentences matching learners’ Chinese level. After the model receives clear vocabulary and grammar level restrictions, there is some improvement in language difficulty matching.

4. Discussion

Through three experiments, we discovered that different LLMs perform differently on the same tasks. ERNIE4.0 tends to provide detailed explanations without requests and achieves the highest accuracy and F1 score. It excels at recognizing, explaining, and demonstrating nuances of near-synonyms from semantic and pragmatic perspectives when provided with professional instruction.

Regarding the factors that influence the model’s performance, we found that both the number of questions given at once and the prompt techniques play a role. Specifically, the number of questions given at once can affect the performance of LLMs. In our experimental data, when more than 50 or even 250 questions are given at once, the model’s

performance significantly decreases. Therefore, we do not recommend giving too many tasks at once when using LLMs.

For the design of the prompt, we first agree that the language of the prompt should convey the requirements clearly and specifically (Ekin, 2023), and the technique of "acting as a role" applies to three tasks. At the same time, we also found that simply increasing the examples may not improve the model's performance. However, providing examples while giving the model appropriate guidance, such as guidance on the order of thinking and the parts that need to be focused on, can help the model first understand our needs, arouse the model's corresponding knowledge reserves, and usually elicit the model to give answers that are more in line with user expectations.

We refer to this pattern as the "Learning Teacher" Prompt Pattern (LTPP). The essence of LTPP is to let the model first learn the user's information (identity, Chinese language level), the user's learning goals, the current task mode, the solution ideas of the current task, etc., to awaken the model's relevant knowledge. Then, the model uses its knowledge and the information just learned to generate answers for users, to achieve the purpose of assisting learners in learning Chinese.

The advantage of LTPP is that it does not need to consume a lot of computing power to retrain the model, but activates the existing knowledge and abilities of the LLMs to improve the performance of the language model in the downstream task of Chinese language knowledge tutoring. In addition, this pattern has reusability and generalizability. When learners use it, they only need to fill in their own conditions and needs in the blanks of the pattern to get a more accurate answer. It improves the efficiency of learners using LLMs and also reduces the learning cost of learners. It is expected to solve the dilemma of many learners who cannot learn anytime and anywhere from Chinese human teachers. As long as learners have a device that can access the internet, they can turn LLMs into their own portable Chinese teachers.

5. Conclusion

Our research supports the theory of Intelligent Computer Assisted Language Learning (Bull, 1993) and offers a method for implementing LLMs in language teaching and learning. It fills the research gap related to using prompt engineering with LLMs for CFL. However, our study has limitations. Due to limited data and computing power, the performance of LLMs in current tasks is unstable. Perplexity might be an appropriate metric for evaluating performance, but we cannot access the function of the three LLMs through API. Additionally, L2 learners have more learning tasks than just near-synonyms. Future research directions include how to use LLMs for more learning tasks and how to obtain more accurate answers.

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Chinese-English code-mixing among L2 Chinese leaners: A Corpus-based Study

(中文二语学习者中英混合语码：基于语料库的研究)

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Abstract: Code-mixing, particularly Chinese-English code-mixing, is commonly used by native Chinese speakers due to digital media exposure. It poses a challenge for L2 learners. There has been research on code-mixing usages in the L2 environments since the early 2000s. The previous studies focus mostly on teaching materials designed by native speakers, without looking into the behavior of the L2 learners. Our current study aims to identify the code-mixing output of L2 learners and describe their salient grammatical contexts based on examples from the Guangwai-Lancaster Learner Corpus (GWL CLC). The study reveals frequent code-mixing among L2 learners with diverse lexical forms and various syntactic structures. Pedagogically, the L2 teaching materials" vocabulary should be updated based on commonly produced English equivalents, and the established Mandarin alphabetic words should be introduced early on for effective acquisition.

摘要：语码混合，尤其是中英语码混合，因数字媒体的影响而常在中国母语者中被广泛使用。这对于第二语言学习者来说是一个挑战。自 2000 年以来，已经有关于第二语言环境中中英混合语使用的研究。先前的研究主要集中在由母语者设计的教材上，并没有探讨第二语言学习者的行为。我们目前的研究旨在识别第二语言学习者混合语码的输出，并根据广外——兰卡斯特学习者文库（GWL CLC）中的语料描述其句法背景。该研究揭示了第二语言学习者之间频繁出现各种词汇形式和不同句法结构上的语码混合现象。从教学角度来看，本文建议根据常见的英语表达方式更新第二语言教材的词汇，并在学期初期引入广泛使用的中文字母词，以便学习者有效地掌握。

Keywords: Chinese-English code-mixing, L2 Chinese, Corpus-based, Learner corpus

关键词：中英语码混合、汉语二语、基于语料库、学习者料库

1. Introduction

Code-mixing refers to the mixed usage of different languages, varieties, or orthographic systems within a single sentence (Bokamba, 1988; Muysken, 2000). It is often discussed with a broader concept known as code-switching. While code-switching typically applies to larger language units such as phrases or sentences, code-mixing specifically pertains to individual words (Muysken, 2000). Cook (2018) elucidates that, in code-mixing language, the mixed language elements are grammatically considered part of the native language (L1). Conversely, expressions in a second language (L2) that retain their internal structure based on the L2"s morpho-syntax and do not integrate into the grammatical system of L1 are called code-switching.

Following Muysken (2000) and Cook"s (2018) definition, the Chinese-English code-mixing language includes intra-sentential code-mixing expressions such as "他没有 reply?", and intra-lexical code-mixing expressions such as "AA 制", "POS 机". The latter is also known as the Mandarin Alphabetical Words (abbreviated as MAWs hereafter) (Huang & Liu, 2017; Xiang, 2020), a more advanced form of code-mixing as the two writing codes are incorporated at the lexical level.

Chinese-English code-mixing has become increasingly prevalent in Chinese society recently and can be observed in daily communication and on various platforms, including the internet, social media, newspapers, and magazines. The code-mixing language, especially MAWs, is an integral part of Chinese language use because people locate appropriate expressions when no suitable translation is available (Grosjean, 1982), for example, there"s no canonical equivalent of "B 超"; and it has pragmatic value in terms of directness and conciseness (Huang, 2003), for instance, "GPS" is more precise and simpler than "全球定位系统". The embedded English components primarily consist of idioms, high-frequency words or phrases, proper nouns, and abbreviations (Yang, 2008).

The inevitable application of code-mixing expressions poses a challenge to L2 learners. There has been some research on code-mixing usage in L2 environments since the early 2000s. For example, Yuan (2002) and Yang (2012) investigated the code-mixing words (known as lettered words) in the field of Teaching Chinese as a Foreign Language, especially in the teaching materials. They found that the code-mixing words in the textbooks increased dramatically after 2000, and they also proposed the teaching principles of code-mixing words. Su (2009), among others, also advocated taking code-mixing seriously in L2 teaching since the usage of MAWs is inevitable.

Previous studies have predominantly focused on teaching materials developed by native speakers, neglecting the examination of L2 learners" behaviour. To address this research gap, the present study aims to identify instances of code-mixing produced by L2 learners and describe their prominent grammatical contexts. The data utilised in this study is derived from examples extracted from the Guangwai-Lancaster Learner Corpus (GWL CLC). The obtained results and findings will contribute to pedagogical implications for the L2 learning and teaching environment.

2. Corpus and data extraction methods

Guangwai-Lancaster Chinese Learner Corpus (GWL CLC)[1] is the first multimodal corpus with balanced spoken and written components that can be conveniently accessed on the Sketch Engine Platform[2] (Kilgarriff et al. 2015). The corpus is freely available to the public and includes comprehensive error tagging. Table 1 presents the basic information about this corpus.

Table 1: Information of the corpus

Corpus	Learner	Size	Genre	Annotation
Guangwai-Lancaster Learner Corpus	from 107 countries studying at GDUFS	1,664,237 tokens	Spoken 48% tokens, written 52% tokens	Word segmented, POS and error-tagged

The data extraction method consists of two steps. In Step 1, a corpus query language (CQL) concordance search is applied using the expression "[word=a-z A-Z]+" to retrieve a comprehensive list of words starting with Roman letters. Step 2 involves a manual data-cleaning process aimed at excluding Chinese Pinyin syllables and several non-Roman letter symbols.

3. Data and results

3.1 The overall data

The CQL search yielded a considerable number of results, with a total of 10,903 hits of 1907 word types. The frequency of hits per million tokens is 6,551.35 occurrences for every one million tokens in the corpus. The search results account for 0.6551% of the whole corpus. After a manual data shortlisting, the word type was narrowed down to 792 English words, 46 abbreviations, and 40 single letters (including uppercase and lowercase letters). Note that, the extracted words may also be involved in code-switching sentences. Table 2 lists the top 20 words and their frequency from the CQL search.

Table 2: The top 20 words from the CQL search

Sequence	Word	Freq.	Sequence	Word	Freq.
1	OK	1098	11	my	106
2	you	196	12	to	105
3	Part	193	13	about	95
4	Yeah	188	14	a	94
5	I	164	15	A	93
6	HSK	155	16	one	92
7	yeah	142	17	Make	88

[1] https://www.sketchengine.eu/guangwai-lancaster-chinese-learner-corpus/
[2] https://www.sketchengine.eu/

8	the	132	18	USB	87
9	your	126	19	HK	86
10	sentence	117	20	One	84

The concordance result exhibits a distribution of 19 distinct POS tags, with the most prevalent being NN (common noun) at 40% and NR (proper noun) at 22%. VA (predicative adjective) accounts for 10% of the occurrences, while VV (other verbs) represents 7%. Common and proper nouns" dominance in embedded English codes underscores their pivotal role in conveying information about everyday needs and designating specific individuals. Conversely, adjectives and verbs exhibit relatively lower frequencies in code-mixing forms.

The collocations of the first Chinese word in both the left and right contexts were examined to observe the English-embedded components at the sentence level. Table 3 presents the frequencies of the first words on both sides of the embedded English words, arranged from highest to lowest.

Table 3: The first Chinese character word to the left and right

Sequence	First word to the left	Freq.	Sequence	First word to the right	Freq.
1	是	161	1	的	103
2	的	126	2	小	57
3	在	102	3	是	50
4	那个	93	4	班	48
5	个	49	5	了	35
6	去	48	6	五	32
7	了	39	7	公司	30
8	很	37	8	考试	29
9	叫	37	9	我	24
10	我	30	10	啊	24

From the co-occurring words with high frequency on both sides of the keywords, we can observe that most of the adjacent Chinese words are function words or particles, such as "是" (to be), "的" (possessive particle), "在" (in/at), "个" (general classifier), and "了" (particle indicating completed action) among others. This high integration indicates that these English words have been well integrated into the Chinese syntactic system, rather than merely staying at a superficial level of code-switching.

3.2 The grammatical contexts of code-mixing nouns

Based on the collocation results of embedded English words, Table 4 presents the predominant syntactic structures of code-mixing words as nouns.

Table 4: The syntactic roles and structures of code-mixing nouns

syntactic role	Structure	Example

subject	N 有/在/会	IKEA 在附近 / 本三 A 有很多国家 / AA 制会比较公平
object	V+N	在家里用 PS 玩足球 /含维生素 A
	V 过 N	你考过 HSK 吗 / 你参加过 HSK 考试吗？
	V 了 N	在这学了 MBA / 刚刚在广外上了 D 班
apposition	N 和 N	滴滴打车和 Uber / QQ 和微信 / 市场和巴比 Q
head noun	的 N	中国的 KTV/ 磁铁的 N 极
	Num. + CL+ N	很特别的一个 case / 只有几件 T 恤
	各种 N	您公司生产各种 USB 小产品
	很多 N	利川有很多 building
modifier	N 的	美国 3D 的电影 / B 班的作业
	N 人	我是 Congo 人 / 自己老公是 AIDS 人
	N 上	在 CCTV 上跳舞

From the examples above, the code-mixing words as nouns, including embedded English words and MAWs, have various syntactic roles, manifested in a variety of sentence structures. For instance, these nouns can appear as subjects, objects, and apposition at the syntactic level. The code-mixing words can also combine with canonical words to form compounds or phrases, where they can function as heads or modifiers within the compound.

3.3 The grammatical contexts of code-mixing adjectives

The code-mixing adjectives primarily consist of embedded English words. Table 5 presents the prevailing syntactic structures with regard to adjective code-mixing.

Table 5: The syntactic roles and structures of code-mixing adjectives

Syntactic role	Structure	Example
subject complement	很 adj.	我不是很 religious。
	越来越 adj.	我的睡眠质量就渐渐越来越 low 了。
	也 adj.	但是他们也 OK 啦。
	adj. 的话	如果成绩 OK 的话。
object complement	最 adj.	你可以变成那个最 powerful 的。
predicate complement	觉得 adj.	只要身边的人觉得 OK 就可以了。
	adj. 了/啦	考好一个大学就 OK 了。/ OK 啦。
modal adverb	那 adj.	那 OK。

Similar to traditional Chinese, the English adjectives interspersed in Chinese serve as complements with various syntactic roles including subject, object, and predicate complement. These complement roles are expressed through diverse forms with adverbs such as “很” (very), “最” (most), “也” (also), etc. and can also be followed by particles like “了”, “啦” (particle indicating completed action), “的话” (if/in case).

3.4 The grammatical contexts of code-mixing verbs

The code-mixing verbs predominantly consist of authentic English words, with only one instance of MAW: “唱 K” (to engage in karaoke singing). Table 6 presents an overview of the primary syntactic structures associated with code-mixing verbs.

Table 6: The syntactic roles and structures of code-mixing verbs

Syntactic role	Structure	Example
predicate	V+O	他们会 follow 你 / 然后他 compare 你
	V + num + CL (N)	很难 master 一种语言 / 你只要 choose 一个
	会 V	你会 pray 吗 / 吃饭都会 pray
	可以 V	我们可以 hoot / 你可以 internet
	通过 V	通过 PS，天呐更好看。
	V 过去	他就 hoop 过去
	去 V	天天跟朋友们一起去唱 K
object	做	我们要做 debate

The code-mixing verbs embedded in Chinese, as presented in Table 6, co-occur with multiple modal verbs such as “会” (will/can) and “可以” (Can). The code-mixing verbs can take bare objects as well as objects with numbers and classifiers. They can also be followed by directional complements such as “过去” (to there). Some of these verbs can act as deverbal nouns; for example, “debate” can also function as an object in a sentence, meaning “the event of debate”. Additionally, most of the verbs serve as predicates in sentences.

4. Discussion

In the L2 learner corpus, code-mixed items exhibit a range of grammatical features. Firstly, these items appear in various syntactic structures, indicating that learners are able to integrate code-mixing elements into the Chinese environment in different ways. Secondly, code-mixed items tend to co-occur with multiple function words such as “了”, “过”, “的” and Chinese classifiers. These function words play an important role in conveying meaning and nuance in Chinese grammar, and their use alongside English words suggests that learners are actively incorporating them into their communication. Thirdly, certain code-mixed terms have undergone the loss of their original syntactic markers, such as the absence of plural markers, as exemplified by phrases like “利川有很多 building” (There are many buildings in Lichuan), “可以有很多 iPad” (You can have many iPads), and “现在的泰国人有很多 single mom” (There are many single moms among Thai people). The omission of plural markers signifies that these words have been assimilated into the Chinese grammatical system which lacks a specific marker for plurality. Lastly, there is a creative utilisation of POS or a creative shift in POS categories. For instance, in the sentence “你外表也很 man 吗？” the noun “man” undergoes adjectival modification; similarly, in the sentence “所以外国人很 open”, the verb “open” functions as an adjective,

and in “你可以 internet”, the noun “internet” is transformed into a verb. The innovative employment of original English codes also exemplifies the manipulation of Chinese grammar.

Why do L2 learners engage in code-mixing? Firstly, based on corpus data analysis, it is evident that certain code-mixing words lack commonly used canonical counterparts. For example, phrases like “USB 商品” (USB product), “卡拉 OK” (karaoke), and “T 恤衫” (T-shirt) do not have direct equivalents. Secondly, the simultaneous acquisition of vocabulary and grammar may not align with learners” lack of Chinese vocabulary proficiency. For instance, expressions such as “你会 pray 吗？” (Can you pray?), “我们可以 hoot” (We can hoot), and “我们要做 debate” (We will do a debate) indicate unfamiliarity with traditional Chinese forms of words like “祈祷” (pray), “鸣笛” (hoot), and “辩论” (debate). Lastly, code-mixing sometimes serves as a language habit or trend. Examples include phrases like “OK 的话” (if it”s okay), “OK 啦” (okay then), “觉得 OK” (think it”s okay), etc., as well as constructions like “一个 baby” (one baby), “很好的一个 idea” (a very good idea), “每次上课老师都会 again and again and again” (the teacher always does it again and again during each class). The above English expressions can be effectively substituted with appropriate Chinese equivalents; however, L2 students still engage in code-mixing, possibly due to their fashionable or amusing nature. Another noteworthy aspect of this phenomenon is the excessive utilization of certain English expressions, such as “OK”, which appeared over 1900 times in the learner corpus, either in code-switching or code-mixing form. In contrast, the second most frequently employed English words comprise “you” and “I”, with an occurrence rate not exceeding 200 times. These phrases, including “OK”, “you”, and “I”, are all fundamental expressions that learners typically acquire during the initial stages of language acquisition; nevertheless, they continue to be extensively used possibly due to ingrained linguistic habits.

According to the aforementioned motivations for L2 code-mixing, from a pedagogical perspective, it is advisable to incorporate more established alphabetical words into the current vocabulary used in teaching, as many of them lack direct equivalents. Furthermore, it is crucial to identify and include more specific lexical items in teaching materials since learners often exhibit insufficient vocabulary repertoire during conversations, leading them to resort to English codes as substitutes. Additionally, there should be a cautious introduction of code-mixed language and prevention of excessive generalisation of code-mixing usage during the early stages of language learning, especially in spoken language.

5. Conclusion

The analysis reveals that code-mixing frequently occurs among L2 Chinese learners with diverse lexical forms and co-occurs with various Chinese grammatical structures and syntactic roles. This indicates that the embedded English components adhere to Chinese linguistic rules. This study has several pedagogical implications. For example, it is necessary to update the vocabulary of L2 teaching materials based on commonly produced English equivalents by learners. To incorporate code-mixed word forms into teaching

content, particularly conventionalised alphabetical words. Carefully planned early introduction of code-mixed words should facilitate lexical acquisition and prevent over-generalization of code-mixing usages.

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Appendix

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Ren Yi, UCLA

TCLT12 Plenary Speakers / TCLT12 特邀主旨演讲人

Phyllis Zhang (张霓), George Washington University
L2 汉字教学新路径：电写教学成效的回顾、思考、与展望

Yao-Ting Sung (宋曜廷), National Taiwan Normal University
Integrating advanced technologies for designing and implementing language learning platforms: Experiences and reflections

Maosong Sun (孙茂松), Tsinghua University
语言大模型："玄机"与启示

TCLT12 Workshops / TCLT12 工作坊

Workshop 1: Dongdong Chen (陈东东), Seton Hall University
Digital Humanities for Chinese Language Teachers

Workshop 2: E-writing 1
陆熙雯, Brandeis University
初级中文课堂电写练习与互动
梁宁辉, Yale University
利用电写互动提升中级班学生的读写技能

Workshop 3: 連育仁 (Lien, Yujen), 中原大學
GenAI 时代的华文教育思维与实践

Workshop 4: E-writing 2
笪骏, Middle Tennessee State University
初级班声写汉字教学设计和练习
周文英, Michigan State University
初级班线上交互式电打自测练习

Workshop 5: Zoe Jiang, Issaquah School District
Enhancing Language Learning With AI-Generated 360 Degree Images (利用 AI 生成的 360 度图像提升语言学习)