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Learning Languages in "Smarter" Ways: Theory-Informed Utilization of Smart Technologies in Contextualized, Authentic, and Communicative Language Learning

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Abstract: This panel discussion explores the theory-informed utilization of smart technologies in language learning, focusing on contextualized, authentic, and communicative approaches. Integrating advanced smart technologies such as Artificial Intelligence, Augmented Reality, Virtual Reality, learning analytics, and robotics into language education offers new avenues for enhancing learner engagement and outcomes. Panelists will present and discuss studies involving various pedagogical strategies that align with contemporary language learning theories. Case studies and research findings will illustrate effective smart technology integration in language classrooms and beyond, addressing practical considerations, challenges, and strategies for leveraging these tools to support second language acquisition and other language learning contexts. The panel aims to provide a comprehensive understanding of how to harness smart technologies to create engaging, effective, and theory-aligned language learning experiences, contributing to the academic discourse on the transformative potential of these tools in fostering meaningful language education.

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1. Introduction

In recent years, the integration of smart technologies in education has significantly reshaped the landscape of language learning (Shirmatov & Akhmedova, 2024). These advancements offer innovative tools and methodologies designed to enhance learner engagement and learning outcomes (Cheung et al., 2021). However, it is imperative that the adoption of these technologies be guided by pedagogical theories rather than driven solely by their technological capabilities (Daniela, 2018). This panel aims to emphasize the importance of rooting the design and application of smart language learning environments in well-established language learning theories, ensuring that their implementation truly benefits the educational process.

Smart technologies encompass a variety of advanced tools, including artificial intelligence (AI), augmented reality (AR), virtual reality (VR), learning analytics, Internet of Things, robotics, mobile and ubiquitous learning, etc. These technologies, when effectively integrated into learning environments, can create dynamic, adaptive, and immersive experiences tailored to individual learner needs. Smart learning environments leverage these tools to offer personalized learning paths, real-time feedback, and context-rich interactions (Spector, 2014).

To maximize the efficacy of these smart technologies in language learning, it is essential to ground their use in robust language learning theories (Shadiev et al., 2017).

Second Language Acquisition (SLA) Theory (Eckman et al., 2013; Krashen, 1981) emphasizes the importance of comprehensible input, meaningful interaction, and language production in the acquisition process. Sociocultural Theory (Vygotsky, 1978), with its emphasis on the social context of learning and the Zone of Proximal Development, informs the design of collaborative and interactive learning activities facilitated by smart technologies. Additionally, Constructivist Learning Theory (Narayan et al., 2013; Suhendi, 2018), which advocates for learners actively constructing knowledge through experiences, can guide the development of immersive and interactive language learning environments that promote deep understanding and practical application of language skills.

A key aspect of language learning is its contextualized, authentic, and communicative nature (Gilmore, 2019). Contextualized learning refers to instruction that connects language skills to real-world situations, making learning more relevant and meaningful (Petersen et al., 2009). Authentic learning involves using materials and activities that reflect real-life language use, enhancing learners' ability to apply their skills in practical settings (Shadiev et al., 2017). Communicative language learning focuses on interaction and communication, encouraging learners to use the language actively and purposefully (Swain & Suzuki, 2008).

Smart technologies can support these approaches by providing immersive and interactive environments that simulate real-world contexts, offering authentic materials, and facilitating meaningful communication (Shirmatov & Akhmedova, 2024). For instance, VR can create lifelike scenarios where learners practice language skills in context, while AI-powered chatbots can engage students in authentic dialogues. Learning analytics can tailor feedback to individual learner needs, ensuring that instruction is both relevant and effective.

In this panel, we will bring together scholars to share and discuss studies involving the application of smart technologies in language learning. Each panelist will present their work on how these technologies can support contextualized, authentic, and communicative language learning, guided by established pedagogical theories. Through these discussions, we aim to explore how to best leverage smart technologies to create effective, engaging, and learner-centered language learning experiences.

2. Abstracts of Individual Panelists' Presentation

2.1 Integrating Generative AI in Second Language Learning: Practical Applications rooted in SLA Theory (Lung-Hsiang WONG)

This talk will navigate the transformative landscape of leveraging Generative AI (GAI) for second or foreign language learning, focusing on the evolving dynamics between humans and machines within the context of interweaving teaching, learning, and formative evaluation (Godwin-Jones, 2024). Rooted in SLA theories, the presentation will showcase applications of comprehensible input hypothesis, comprehensible output hypothesis, and interaction hypothesis to support classroom activities and out-of-class self-directed learning.

The use of GAI in language learning aligns closely with the principles of Communicative Language Teaching (CLT) (Littlewood, 1981), which emphasizes interaction as both the means and the goal of language learning. GAI tools, when effectively utilized, can foster meaningful student-chatbot interactions that mirror real-life communication. One powerful concept in this context is the "chain of thought" (CoT) (Wei et al., 2022) in prompt engineering, where a sequence of logically connected ideas is generated. By designing prompts that trigger the chatbot's CoT, educators can facilitate a similar cognitive process in students, encouraging deeper engagement with the language. This not only supports the development of critical thinking skills but also enhances the overall communicative competence of learners. The talk will demonstrate how even schoolteachers with basic to intermediate prompt engineering skills can design and implement these strategies, highlighting the accessibility and scalability of GAI without the need for specialized or costly smart learning environments or equipment. This democratization of smart technology use has the potential to transform language learning on a broader scale, making high-quality,

theory-informed educational experiences accessible to a wider range of language learners (Huang & Sun, 2023).

2.2 AI-powered multimodal feedback for young learners from a sociocultural lens (Yun WEN)

Given that young students and second language learners often struggle to fully grasp written feedback, multimodal feedback with audio and images can promote deeper engagement compared to text-based or unimodal feedback methods (Soria et al., 2020). The use of technology, particularly GAI, elevates personalized and multimodal feedback for learners.

This talk will discuss AI-powered multimodal feedback from a sociocultural perspective, by which feedback is seen as social interaction with relevant others or learning resources that encourage meaning-making and artifacts generation by students (Carless & Young, 2023). Feedback also acts as a mediating artifact that fosters interactions between providers and recipients (Liu & Yu, 2022) and promotes dialogues among learners in group settings. Based on this, our team designed and developed an AI-powered multimodal feedback vocabulary learning system for lower primary school students learning Chinese as a second language. The system, named ARCHe 2.0, incorporates AI-powered multimodal feedback in two main ways: (1) employing text-to-image AI technology to boost student motivation, capture attention, and facilitate group discussions; and (2) integrating fine-tuning APIs to generate comments on student-created sentences that young learners can understand.

2.3 Enhancing EFL Learning Outcomes for Low-Achieving Students in Rural Elementary Schools: The Role of Augmented Reality-Supported Experiential Learning (Vivian Wen-Chi WU)

Enhancing English as a Foreign Language (EFL) proficiency, particularly in vocabulary and phonics, presents significant challenges in rural elementary schools due to socioeconomic disadvantages and geographical isolation. These challenges are intensified for low-achieving EFL students, who often require additional remedial support. Traditional remedial education typically relies on lecture-based approach with strong teacher dominance in a decontextualization environment, thus offering limited opportunities for interactive and meaningful practice. This approach often restricts the demonstration of English proficiency to written assessments aimed solely at improving test scores. Augmented reality (AR) offers a promising solution by presenting dynamic and immersive 3D virtual context that helps students visualize and internalize English vocabulary acquisition and phonics practice, while also enhancing classroom engagement, motivation, and confidence.

This study examines the effect of an augmented reality-supported experiential learning (AR-EL) contextualized environment on 25 low-achieving EFL students, revealing improvements in learning outcomes, self-efficacy, reduced anxiety, and improved motivation. In her presentation, the researcher will detail the curriculum design and theoretical framework underpinning this study, and discuss its pedagogical implications for future research. By providing insights into how AR can be integrated successfully into EFL education, the presentation aims to inform and inspire language educators and researchers looking to address similar challenges in rural and other under-resourced educational settings.

2.4 Enhancing Language Learning and Critical Thinking with AI and Interactive Technologies (Yoshiko GODA)

In this panel discussion, I will present a system design and development framework that leverages advanced AI chatbots to enhance learning experiences and foster critical thinking in global education. Building on earlier research by Goda et al. (2014), which demonstrated that even less sophisticated chatbots could raise critical thinking, this framework incorporates more advanced AI technologies, enabling more effective and nuanced conversations. These AI chatbots are now capable of engaging learners in deeper, more meaningful interactions,

significantly enhancing their critical thinking skills. For individual learning, the system integrates Socratic inquiry, facilitated by these sophisticated AI chatbots. This approach encourages learners to engage deeply with content through guided questioning, promoting self-reflection and critical analysis. The AI chatbots adapt to each learner's responses, offering personalized feedback and progressively challenging questions that help develop higher-order thinking skills. This interactive, adaptive learning environment enables learners to build confidence in their language abilities while simultaneously enhancing their critical thinking capabilities.

In group learning contexts, the system employs the Community of Inquiry (CoI) model to facilitate collaborative and communicative learning. As emphasized by Goda (2024), balancing the three presences—cognitive, social, and teaching—is essential for effective collaborative learning. The system incorporates concept mapping tools and real-time video conferencing with transcription and analysis features, allowing learners to deepen their thinking and organize ideas more effectively. Learning analytics track group dynamics and individual contributions, offering insights that help educators tailor instructional strategies.

By aligning with SLA theories such as Sociocultural Theory and the Input and Output Hypotheses, this system not only supports language acquisition but also promotes critical thinking and problem-solving skills, preparing learners for success in diverse, global contexts.

2.5 Using AI application to achieve personalized language learning (Ting-Chia HSU)

AI can dynamically adapt learning materials to suit individual learners' pace, interests, and needs, thereby creating tailored educational pathways for contextualized language learning. For example, Hsu et al. (2010) introduced a reading material recommendation system that adjusts content based on a student's English proficiency and preferences, while Hsu (2015) discussed the use of AI to personalize video content with adaptive captions. AI also facilitates more authentic learning environments. For instance, Hsu (2017) demonstrated this through AR, and Hsu et al. (2023) advanced this concept with AI-supported image recognition technologies, enabling learners to engage with language in realistic contexts that mirror everyday usage.

Furthermore, AI-driven tools are revolutionizing communicative activities in language learning by simulating real-life dialogues and providing immediate, context-sensitive feedback. This approach enhances language fluency and practical usage abilities, as seen in platforms like Taiwan's Cool English, where AI-Chatbots assess pronunciation accuracy (Tai & Chen, 2024). The integration of GAI, such as text-to-image and text-to-text generation, further enriches the learning experience by linking vocabulary with visual representations and generating diverse reading materials. These technologies not only make learning more engaging but also deepen learners' comprehension and retention by connecting words to real-world contexts and appearances, thus facilitating a more intuitive and effective learning process.

3. Discussion

The integration of smart technologies into language learning represents a significant shift toward more personalized, contextualized, and interactive educational experiences. The discussions and presentations in this panel underscore the transformative potential of these technologies when they are strategically employed in alignment with established language learning theories. By rooting the design and application of these tools in learning theories, educators can create environments that not only engage learners but also deepen their understanding and practical application of language skills.

One of the key insights from this panel is the importance of maintaining a balance between technological innovation and pedagogical soundness (Wong & Looi, 2024). While the allure of new and advanced tools is strong, it is crucial that their deployment in educational settings be guided by well-established theories. This approach ensures that smart technologies are not just novel tools but are integral components of a learning environment

that promotes deeper language acquisition and proficiency, through supporting the cyclical process of experiential learning.

Looking forward, the field of language learning stands to benefit from continued research and development in the intersection of smart technologies and learning theories. Future studies should explore the long-term impact of these technologies on language acquisition and proficiency, particularly in under-resourced settings where traditional language learning methods may be less effective. Additionally, there is a need to further investigate how these tools can be adapted to support diverse learner profiles and language learning objectives, ensuring that the benefits of smart technologies are maximized for all students.

In conclusion, the effective integration of smart technologies in language learning hinges on a deep understanding of the underlying pedagogical theories and the ability to apply these theories in innovative and practical ways. This panel has provided valuable insights into how educators can leverage smart technologies to create more engaging, authentic, and communicative language learning experiences. By continuing to bridge the gap between theory and technology, we can develop smarter, more inclusive, and more effective approaches to language education that truly meet the needs of today's learners.

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