Elevating Language Acquisition through Deep Learning and Meaningful Pedagogy in an AI-Evolving Educational Landscape

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Article

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Abstract: In an ever-evolving landscape of higher education, this study delves into the transformative potential of merging deep learning principles and meaningful pedagogy in language acquisition, aided by artificial intelligence (AI) technologies. Drawing from a qualitative research design, it navigates the post-pandemic educational landscape, examining shifts in language education, student perspectives, and adaptations. Through comprehensive data collection methods, including literature review, interviews, and classroom observations, the study presents insights from 30 participants from SMC. The qualitative findings reveal emerging themes related to deep learning, meaningful learning, AI integration, and language acquisition, underscoring their profound impact on teaching methods and student engagement. This research contributes to the field by shedding light on innovative approaches that elevate language acquisition in an AI-evolving educational environment. The study concludes with implications for school administrators, teachers, and students, offering recommendations for future research directions, ultimately striving to enhance language education in the modern era.

Keywords: AI-evolving educational landscape; deep learning; language acquisition; meaningful pedagogy

I. Introduction

In July 2022, against the vibrant backdrop of St. Michael's College (SMC) in Iligan City, Philippines, this study ventured into uncharted territory to explore the transformative potential of Deep Learning and Meaningful Pedagogy within an ever-evolving landscape of Artificial Intelligence (AI) in education. St. Michael's College, renowned for its commitment to innovative teaching approaches (SMC Legacy Lingers, 2015), has a rich history of fostering educational excellence. This institution provides an ideal setting for investigating the integration of advanced AI-driven techniques with pedagogical practices to elevate language acquisition.

Significance of the Study: This study's significance resonates profoundly with various stakeholders within the educational ecosystem. For school administrators, it offers insights into harnessing AI-driven strategies for optimizing language acquisition. Educators stand to benefit by gaining a deeper understanding of how to integrate meaningful pedagogy with AI tools to enhance their teaching methods. Students, the ultimate beneficiaries, will experience enriched language learning experiences that align with the demands of the modern world. Furthermore, this study paves the way for future researchers, offering a foundational framework for delving deeper into the dynamic interplay between AI, pedagogy, and language acquisition (McPhail, 2021; Winje & Løndal, 2020).

Research Gaps: While AI's integration into education has shown immense potential, research gaps exist regarding the effective fusion of deep learning and meaningful pedagogy to elevate language acquisition. Bridging these gaps is crucial, as it addresses the imperative of providing students with holistic language education in an AI-driven world. The work of Han (2022) sheds light on deep learning models in college English based on multimodal learning methods, while McPhail (2021) emphasizes the search for deep learning and the importance of curriculum coherence. Winje and Løndal (2020)

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provide a systematic mapping review of decades of research in primary and secondary education, focusing on deep learning, and their findings contribute to the context of this study.

The Need to Adapt for Deep Learning and Meaningful Pedagogy in an AI-Evolving Educational Landscape: In the era of AI, it is imperative that educational institutions adapt to remain relevant. Deep Learning, with its capacity to process and analyze vast amounts of data, and Meaningful Pedagogy, grounded in constructivist and socio-cultural theories (Piaget, 1950s; Vygotsky, 1930s), hold the keys to unlocking students' linguistic potential. As noted by Barron et al. (n.d.), meaningful learning is facilitated through inquiry-based and cooperative learning approaches, aligning with our pursuit of language acquisition enhancement. The study by Cebrián, Palau, and Mogas (2020) emphasizes the development of methodologies within the smart classroom, resonating with the need for educational adaptation.

Objective and Research Questions:

The primary objective of this study is to investigate the synergistic potential of Deep Learning and Meaningful Pedagogy in elevating language acquisition. To achieve this objective, five key research questions guided the researcher's exploration:

1. How can deep learning be effectively employed to enhance language acquisition?
2. What role does meaningful pedagogy play in creating a conducive learning environment for language acquisition?
3. In what ways can educators incorporate AI-driven insights into their teaching methods for language acquisition?
4. How do students perceive and engage with AI-assisted language learning experiences?
5. What ethical considerations must be taken into account when integrating AI into language education?

Scope and Limitations:

This study primarily focuses on language acquisition within the context of English as a Second Language (ESL) at St. Michael's College. While it provides valuable insights, the findings may not be universally applicable. Limitations may arise from the study's timeframe and resource constraints (Su, 2022; Aljawarneh, 2020).

Theoretical Framework:

This research draws upon three foundational theories: Constructivism (Piaget, 1950s), Socio-cultural Theory (Vygotsky, 1930s), and Connectivism (Siemens, 2004). These theories, when interconnected, provide a holistic framework for understanding how learners engage with AI-enhanced language acquisition. The study by Sun, Anbarasan, and Praveen Kumar (2021) explores the design of online intelligent English teaching platforms based on AI techniques, reinforcing the relevance of the paper's chosen theoretical lenses.

Constructivism (Piaget, 1950s): In the backdrop of language acquisition through deep learning, constructivism plays a vital role. This theory emphasizes the active role of learners in shaping their knowledge. In this study, constructivist principles guide the development of AI-enhanced language learning tools. These tools are designed to be interactive and adaptable, enabling learners to actively engage in constructing their understanding of language. By integrating constructivism, the study ensures that AI-driven pedagogy aligns with the idea of empowering learners to actively participate in their language acquisition journey within an evolving educational landscape dominated by AI.

Socio-cultural Theory (Vygotsky, 1930s): This theory accentuates the influence of social interactions and cultural contexts on cognitive development. In the context of language acquisition through deep learning, this theory becomes highly relevant. It underscores the importance of social engagement facilitated by AI in language learning. This study examines how AI-driven language learning platforms can create virtual communities and promote peer collaboration, reflecting the socio-cultural dimension of language development. By incorporating socio-cultural theory, the research recognizes the pivotal role of social interactions in creating meaningful language pedagogy within an AI-evolving educational landscape.

Connectivism (Siemens, 2004): Connectivism, which views learning as a networked process, becomes the linchpin in this theoretical framework. It accentuates the role of technology, especially

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AI, in connecting learners to a vast network of language resources and expertise. In the context of this study, connectivism guides the exploration of AI as a bridge that connects learners to diverse language learning opportunities. It investigates how AI recommends relevant language content, fosters connections to online language communities, and enables interactions with native speakers, thereby creating a dynamic and connected language learning environment. By embracing connectivism, the research aligns with the idea of leveraging AI to facilitate deep and networked language acquisition.

This theoretical framework forms the backbone of the study, shaping its methodology, data collection, and analysis. By interweaving these three foundational theories, the research aims to contribute to a profound understanding of how deep learning and meaningful pedagogy, driven by AI, can enhance language acquisition in an ever-evolving educational landscape. It recognizes the pivotal role of learners as active participants, the significance of social interactions, and the power of networked learning opportunities.

Thesis Statement:

This study seeks to demonstrate that the integration of Deep Learning and Meaningful Pedagogy in language education at St. Michael's College can significantly enhance language acquisition in an AI-evolving educational landscape.

II. Literature Review

This section embarks on an extensive exploration of the existing body of knowledge pertinent to the study's subject matter. Drawing upon an array of reputable sources and scholarly works, this part of the paper offers an in-depth synthesis of previous research and theoretical foundations related to language acquisition, deep learning, meaningful pedagogy, and the integration of AI in education. By analyzing and synthesizing these sources, the researcher sets the stage for a comprehensive understanding of the context in which this study is situated, highlighting key gaps and informing the subsequent research framework. The culmination of this review contributes to a sound conceptual foundation for the ensuing discussion and analysis.

Deep Learning in Theory and Actual Application in Higher Education: Deep learning, a subfield of machine learning, has gained significant attention in recent years for its potential to revolutionize higher education (Mystakidis, 2021). The theoretical underpinnings of deep learning involve neural networks that mimic the structure and functioning of the human brain (Matsushita & Vargas-González, 2022). In practical application, deep learning algorithms excel in processing vast datasets, identifying patterns, and making predictions (Matsushita & Vargas-González, 2022). In higher education, deep learning models have been applied in diverse ways, from personalized learning pathways to content recommendation systems (Hanani, 2020). For example, Matsushita, Matsushita, and Hasebe (2018) explored the concept of deep active learning, where AI-driven algorithms actively engage students in the learning process, providing tailored feedback and exercises.

Meaningful Learning Principles in Higher Education: Meaningful learning principles, rooted in constructivist and socio-cultural theories (Piaget, 1950s; Vygotsky, 1930s), emphasize the importance of creating meaningful and context-rich learning experiences (Agra et al., 2019). In higher education, these principles underscore the need for active engagement, problem-solving, and authentic tasks that connect learning to real-world applications (Vargas-Hernández & Vargas-González, 2022). The integration of meaningful learning principles fosters critical thinking and deeper understanding among students.

AI Integration in Higher Education and its Synergy with Deep and Meaningful Learning: The integration of Artificial Intelligence (AI) in higher education holds immense promise for deep and meaningful learning (Miller, 2023). AI-powered tools can analyze student data to tailor instruction, offering personalized learning experiences that align with the principles of deep learning (Chen et al., 2022). Moreover, AI can facilitate collaborative and interactive learning environments, promoting meaningful interactions among students and educators (Skrabut, 2023). AI-driven content recommendation systems can ensure that learning materials are not only personalized but also relevant and engaging, reinforcing the principles of meaningful learning (Wang et al., 2020).

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Language Acquisition in the Post-Pandemic Context: The post-pandemic context has underscored the significance of language acquisition in higher education (Al-Nofaie, 2023). With increased reliance on remote and online learning, effective language acquisition strategies have become paramount (Pantelimon et al., 2021). Deep and meaningful learning approaches provide a framework for developing language skills that extend beyond rote memorization, emphasizing comprehension, communication, and application (Rose et al., 2021). The pandemic has accelerated the adoption of digital resources, making it essential to leverage AI-driven language learning tools to enhance language acquisition in a digital and remote environment (OpenAI, 2023).

Revisiting Theoretical Frameworks and Prior Research: Theoretical frameworks of constructivism, socio-cultural theory, and connectivism remain foundational in understanding how learners engage with AI-driven deep and meaningful learning (Clark, 2023). These theories highlight the importance of social interaction, context, and the role of technology in shaping modern education (Novak, 2020). Prior research, such as Han's investigation into deep learning models in college English (2020) and McPhail's curriculum coherence model (2021), provides valuable insights into the potential synergies between deep learning, meaningful learning, and AI integration in higher education.

Deep and Meaningful Learning in the Post-Pandemic Context: In the post-pandemic higher education landscape, the interweaving of deep and meaningful learning with the assistance of AI holds great promise (Godwin-Jones, 2021). Deep learning concept can adapt to students' individual needs, providing personalized pathways to language acquisition (Medina, 2021). Meaningful learning principles guide educators in designing authentic and engaging language learning experiences, even in remote settings (Al-Nofaie, 2023). The integration of AI facilitates collaboration, enhances content relevance, and offers real-time feedback, creating an ecosystem where deep and meaningful learning thrive (Skrabut, 2023).

Overall, the evolving landscape of higher education in the post-pandemic era demands a reevaluation of pedagogical approaches. Deep and meaningful learning, when interwoven with AI, not only addresses the challenges of language acquisition but also empowers students with the skills and knowledge necessary for success in an increasingly digital and interconnected world.

III. Methods

In this section, the researcher delineates the robust methodological framework employed in the study. This methodological approach encompasses qualitative research design, data collection methods, and analytical techniques that have been meticulously selected to address the research questions and objectives. Through a purposeful sampling strategy, data was collected from diverse sources, including a comprehensive literature review, targeted interviews, and classroom observations, resulting in rich and varied insights. Subsequently, thematic analysis was applied to unearth recurring themes within the data, providing a deeper understanding of the central phenomena. Furthermore, this section sheds light on the steps taken to ensure the validity and reliability of the research process.

Research Design: In this research, a qualitative research design is employed to delve deeply into the integration of deep learning principles, meaningful learning practices, and AI technologies within higher education. Qualitative research offers a suitable approach for in-depth investigations of multifaceted phenomena (Creswell, 2013; Creswell & Creswell, 2017).

Data Collection Methods: To lay a strong foundation for the study, an extensive literature review is undertaken. This review spans critical aspects related to deep learning, meaningful learning, the infusion of AI into education, and language acquisition in the post-pandemic landscape (Snyder, 2019; Munn et al., 2018). Additionally, it serves the purpose of identifying gaps in existing research, a vital step in formulating meaningful research questions (Chigbu et al., 2023).

In parallel, informal interviews, conducted with educators, students, and administrators, are a cornerstone of this research. Purposeful sampling ensures the selection of participants possessing expertise and experiences closely tied to the research objectives (Palinkas et al., 2015; Benoot et al., 2016). The design of interview questions is thoughtfully constructed to elicit rich, context-specific responses (Bengtsson, 2016).

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Further enriching the data collection process, classroom observations are employed. These observations provide firsthand insights into the practical application of deep and meaningful learning principles enhanced by AI technologies within the educational setting (Smit & Onwuegbuzie, 2018). They offer a real-time window into the dynamics of pedagogical approaches and student engagement.

Data Analysis Techniques: To analyze the qualitative data obtained from interviews and classroom observations, this study employs thematic analysis—a systematic methodology renowned for its effectiveness in data coding, categorization, and the identification of recurring themes and patterns (Braun & Clarke, 2006). This methodical approach facilitates a comprehensive exploration of participants' experiences and perspectives. Notably, data analysis reached its saturation point upon completion of interviews with the purposefully selected 30 participants.

Sample Size Justification: The selection of an optimal sample size for interviews and observations in this study is the product of a rigorous, systematic analysis. This approach ensures that the chosen sample size aligns with the principles of saturation and sufficiency, thereby assuring the capture of a comprehensive range of insights crucial for fulfilling the research objectives (Vasileiou et al., 2018). In this study, a cohort of thirty (30) participants, comprising school administrators, teachers, and students, designated as "Par 1" through "Par 30," was thoughtfully employed to achieve this purpose.

Validity and Reliability Considerations: To bolster the validity and reliability of the study, multiple strategies are employed. Triangulation, a technique involving the use of multiple data sources, including literature review, interviews, and observations, is implemented to validate findings and enhance the credibility of the study (Creswell & Creswell, 2017). Furthermore, member checking offers participants the opportunity to review and validate the interpretation of their responses, fortifying the trustworthiness of the findings (Creswell & Creswell, 2017). Lastly, meticulous documentation of research procedures, data collection, and data analysis practices is upheld, ensuring transparency and enabling the potential replication of the research (Creswell, 2013).

Overall, this research method embraces qualitative research principles and aligns with the referenced works, guaranteeing a systematic and rigorous exploration of the integration of deep and meaningful learning with AI within the higher education domain. It emphasizes the significance of transparency and validity in qualitative research practices.

IV. Corpus Discussion

In this section, the researcher conducts a comprehensive examination and discussion of the corpus. This corpus encompasses qualitative data gathered from various sources, including a literature review, interviews, and classroom observations. The primary objective is to provide an in-depth analysis of the emerging themes associated with deep learning, meaningful learning, artificial intelligence (AI), and language acquisition. These themes have been identified through the voices of 30 randomly selected participants. By presenting and interpreting these findings, this discussion illuminates the intricate landscape of language education in the post-pandemic era, considering the role of AI and meaningful pedagogy within this evolving educational context. Furthermore, relevant scholarly literature is drawn upon to augment and contextualize the qualitative findings, offering a comprehensive perspective on the subject matter.

Deep Learning and Meaningful Pedagogy in Language Acquisition:

1. Enhancing Language Learning in Higher Education through Deep Learning Principles:

   Deep learning principles have the potential to significantly enhance language acquisition in higher education by leveraging advanced technologies and innovative teaching methodologies (Han, 2022; Matsushita et al., 2018; OpenAI, 2023). This aligns with the idea that education should focus on meaningful learning experiences (Vargas-Hernández & Vargas-González, 2022).

   - Personalization: Deep learning can analyze individual students' learning patterns and adapt the curriculum accordingly (Han, 2022). In language education, this means tailoring language exercises, vocabulary building, and content to each student's proficiency level and learning pace.

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- Real-time Feedback: AI-driven language learning platforms can provide instant feedback on pronunciation, grammar, and vocabulary usage (Wang et al., 2020). This immediate feedback allows students to correct mistakes and reinforce correct language skills, leading to more effective learning.
- Natural Language Processing (NLP): Deep learning models, particularly those based on NLP, can assist language learners in understanding and generating human-like language (Mystakidis, 2019). These models can facilitate contextual comprehension, improving students' ability to engage in meaningful conversations and comprehend real-world language usage.
- Multimodal Learning: Deep learning can enable the integration of various modalities, such as text, speech, images, and videos, into language learning materials (Han, 2022). This multimodal approach enhances engagement and comprehension, making language acquisition more effective and enjoyable.

2. Application of Meaningful Learning Principles in Language Education in Higher Education:

Meaningful learning principles, which emphasize comprehension, relevance, and integration of new knowledge with existing concepts, are highly applicable to language education at the higher education level:

- Contextual Relevance: Language courses can be designed to incorporate real-life scenarios and contexts, making the language learning experience more meaningful (Oxford Learning, 2017; Novak, 2020). For instance, instead of isolated vocabulary lists, students can learn words and phrases in the context of conversations, stories, or professional scenarios.
- Problem-Based Learning: Integrating problem-solving tasks into language courses can engage students in meaningful learning experiences (Agra et al., 2019; Barron et al., n.d). These tasks may involve writing essays, conducting research, or participating in debates in the target language, encouraging students to apply language skills in practical contexts.
- Reflective Practice: Encouraging students to reflect on their language learning journey promotes meaningful learning (Novak, 2020; Agra et al., 2019). Students can journal their language progress, set goals, and identify areas for improvement, fostering a sense of ownership and motivation in their language acquisition.

3. Examples Illustrating Effective Practices:

- Project-Based Language Learning: Language courses can incorporate project-based learning, where students work on real-world projects using the target language (Mystakidis, 2019). For instance, students studying "Bisaya" could collaborate on a project to create a travel guidebook for "Bisaya-speaking" destinations, applying their language skills to practical tasks.
- Flipped Classroom Model: In a flipped classroom, students engage with course content before class and use class time for discussions and interactive activities (Han, 2022). In language education, students can watch language tutorials or complete exercises online before class, allowing instructors to focus on meaningful discussions and language practice during class sessions.
- Language Exchanges and Tandem Learning: Partnering with native speakers or peers proficient in the target language for language exchange or tandem learning is a highly effective practice (Mystakidis, 2019; Agra et al., 2019). It provides authentic language practice and cultural insights, making language acquisition more meaningful.

Overall, the integration of deep learning principles and meaningful pedagogy in language acquisition in higher education holds immense potential for more effective and engaging language learning experiences. By leveraging AI, personalized learning, and real-world application, educators can create meaningful language courses that empower students to become proficient communicators in their chosen languages.

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V. AI Integration in Language Education

AI technologies used in language instruction in higher education: In higher education, AI technologies are increasingly being integrated into language instruction (Estrellado & Miranda, 2023; OpenAI, 2023). These technologies encompass language learning apps, chatbots, virtual classrooms, and AI-driven language assessment tools (Bizami, Tasir, & Kew, 2023). Language learning apps, such as Duolingo and Rosetta Stone, employ AI algorithms to personalize lessons based on individual learner progress (Ronda & Mateo, 2023). Chatbots facilitate real-time language practice and conversation (Mosher et al., 2021), while virtual classrooms powered by AI enable remote language instruction with interactive features (Scully, Lehane, & Scully, 2021). AI-driven assessment tools evaluate students' language skills efficiently (Shaaban, 2020).

Benefits and challenges of AI in language learning in higher education: The adoption of AI in language learning offers several advantages. AI provides personalized learning experiences, adapts to students' needs, and offers instant feedback (Ng et al., 2023). It enhances accessibility, making language learning available to a wider audience (Mustadi, Annisa, & Mursidi, 2021). AI can also analyze vast amounts of data to identify trends and areas where students struggle (Gruber, Matt, & Leier, 2023). However, challenges include the need for substantial initial investments, potential privacy concerns, and the risk of depersonalization in education (Moser, Wei, & Brenner, 2021). Moreover, not all students have equal access to technology, potentially creating disparities in language learning outcomes (Zhang & Wu, 2022).

Impact of AI on teaching methods and student engagement in higher education: AI has transformed teaching methods in higher education (Garg, 2020). It enables educators to track student progress more effectively and tailor instruction accordingly (Ng DTK et al., 2023). AI-driven tools also free up instructors' time for more personalized interactions with students (Sheguf & Alhaj, 2022; OpenAI, 2023). Additionally, AI enhances student engagement through gamification, chatbots, and immersive experiences (Su, 2022). However, educators must strike a balance between AI-assisted learning and human interaction to ensure that students receive the best of both worlds (Scully et al., 2021). Ultimately, AI's impact on teaching methods and engagement varies based on how it's integrated into the curriculum and the institution's specific goals (Estrellado & Miranda, 2023).

VI. Language Acquisition in the Post-Pandemic Educational Landscape

In the aftermath of the COVID-19 pandemic, the landscape of language acquisition within the realm of higher education has undergone significant transformation. These changes have been extensively discussed in recent research (Garg, 2020; Gruber et al., 2023; Ng et al., 2023; Bizami et al., 2023), shedding light on the profound impact of the pandemic on language education.

Artificial Intelligence (AI) and technology have played a pivotal role in reshaping higher education, including language acquisition. Researchers like Garg (2020) have emphasized the role of AI in post-COVID higher education, highlighting its potential to enhance language learning. AI-driven language learning platforms and chatbots have enabled personalized and adaptive language instruction, catering to individual student needs and learning styles (Gruber et al., 2023). Such technological tools have proven to be valuable assets for educators and students alike.

Furthermore, the pandemic has accelerated the integration of online and blended learning approaches in language education. Ng et al. (2023) conducted a comprehensive analysis of online learning in management education during the pandemic and found that educators increasingly leveraged technology to deliver language courses. Blended learning models, incorporating online resources and virtual classrooms, have provided educators with the flexibility to adapt to evolving circumstances while ensuring language acquisition continues. These pedagogical innovations have facilitated the transition from traditional to digitally enriched language education environments (Bizami et al., 2023).

However, it is important to note that while AI and technology have enriched language education, experts caution against the idea that AI will entirely replace teachers in education (Ronda & Mateo, 2023). Educators remain essential in guiding, motivating, and providing valuable feedback to students. The partnership between AI-driven tools and human educators in language acquisition

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is a testament to the evolving landscape of language education, where technology complements and enhances traditional teaching methods (Estrellado & Miranda, 2023).

Overall, post-pandemic language acquisition in higher education has experienced a paradigm shift, marked by the increasing integration of AI and technology, the emergence of blended learning models, and the evolving role of educators in harnessing these technological advancements. These transformations underscore the resilience and adaptability of language education in responding to the challenges posed by the global pandemic and chart a course toward more flexible, personalized, and effective language instruction.

VII. Qualitative Findings

The qualitative data in this study is derived from a multifaceted approach, including an extensive literature review, in-depth interviews, and on-site classroom observations. To illuminate the richness of the findings, direct quotations from a cohort of 30 participants, referred to as "Par 1" to "Par 30," are featured in the succeeding discussion, allowing the researcher to exemplify crucial discoveries.

The participants' perspectives and insights offer a holistic understanding of the post-pandemic educational landscape.

"Par 11", a faculty member, *emphasized that deep learning transcends the rote memorization often associated with education, instead emphasizing comprehension and practical application*.

"Par 23", a language teacher, *articulated the concept of meaningful learning, emphasizing its requirement for students to connect novel information with their preexisting knowledge base.*

"Par 3", a foreign language teacher, expressed, *"AI has the potential to revolutionize how we teach languages. It can adapt to each student's pace, making learning more effective."*

"Par 14", a school administrator, *voiced a recurring concern among the participants—the need to strike a balance between the integration of AI technology and the preservation of the indispensable human element in teaching.*

"Par 5", a literature teacher, reflecting on classroom observations, stated, *"I noticed that students are more engaged when they interact with AI-powered activities. It's a game-changer."*

Emerging Themes form the interviews:

Through an intricate analysis of the qualitative data, several overarching themes emerged. These themes provide invaluable insights into deep learning, meaningful learning, the role of AI, and language acquisition.

Theme 1: Understanding Over Memorization: Participants, exemplified by *Par 17*, consistently emphasized that deep learning signifies more than mere memorization. It centers on a profound understanding of concepts, representing a shift from conventional pedagogical approaches.

Theme 2: Connecting New Knowledge: The theme of meaningful learning, as elucidated by *Par 29*, places a strong emphasis on the integration of new information with a student's preexisting knowledge base. This fosters a deeper, more interconnected comprehension of the subject matter.

Theme 3: AI Personalization: Participants, as highlighted by *Par 13*, recognized AI's potential to revolutionize education by tailoring language instruction to the individual learning preferences and capabilities of each student. Personalization emerges as a central theme with significant implications.

Theme 4: Balancing AI and Human Interaction: Par 18 echoed a recurring concern among the participants—the delicate equilibrium required between AI integration and the preservation of essential human interactions in the educational process. Ensuring that AI enhances rather than replaces educators remains a pressing consideration.

Theme 5: Enhanced Student Engagement: Based on classroom observations represented by *Par 5*, AI-driven interactive activities appeared to catalyze heightened student engagement. This theme underscores AI's potential to revitalize pedagogical practices and foster more interactive learning environments.

Deepening the Discussions:

To augment the comprehension of these emergent themes, it is essential to incorporate insights gleaned from established scientific literature. For instance, the research conducted by Moser, Wei,

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and Brenner (2021) aligns with Theme 1, emphasizing that deep learning encompasses understanding and application over rote memorization. Furthermore, Estrellado and Miranda (2023) and Garg (2020) explore AI's capacity for personalizing education, aligning with Theme 3. These findings substantiate the participants' perspectives and affirm the significance of the identified themes.

Overall, the qualitative data synthesized from extensive sources—literature review, interviews, and observations—has elucidated pivotal themes relating to deep learning, meaningful learning, AI, and language acquisition. These revelations provide a comprehensive view of the transformed educational landscape in the post-pandemic era, accentuating the importance of comprehension, personalization, and AI's potential to invigorate pedagogical methods.

VIII. Analysis

The analysis section of this paper presents a comprehensive examination of the key findings and their implications. It addresses the research questions, interprets the qualitative findings, highlights emerging themes, and provides recommendations for various stakeholders.

Research Questions Summary:

1. On Enhancing Language Acquisition with Deep Learning: Deep learning can effectively enhance language acquisition through natural language processing (NLP) models (Matsushita, Matsushita, & Hasebe, 2018). These models provide personalized language learning experiences, adaptive content, and instant feedback, allowing learners to practice and improve their language skills more effectively.
2. On The Role of Meaningful Pedagogy: Meaningful pedagogy plays a pivotal role in creating a conducive learning environment for language acquisition (Vargas-Hernández & Vargas-González, 2022). Tailoring instruction to students' needs, focusing on real-world applications, and fostering engagement are essential aspects of this approach. When combined with AI, pedagogical approaches can be personalized to each student's learning style and pace (Hanani, 2020).
3. On Incorporating AI-Driven Insights: Educators can incorporate AI-driven insights by using data analytics to track student progress and customize content accordingly (Winje & Løndal, 2020). AI can also assist in automating administrative tasks, allowing educators to allocate more time to teaching and mentoring (Miller, 2023).
4. On Student Perception and Engagement: Students generally perceive AI-assisted language learning experiences positively when they receive immediate feedback and have access to interactive, engaging content (Mystakidis, 2019; OpenAI, 2023). AI can make learning more enjoyable and tailored to individual preferences, increasing overall engagement.
5. On Ethical Considerations: Integrating AI into language education requires careful consideration of ethical issues (Holmes & Porayska-Pomsta, 2022). These include data privacy and security concerns, potential bias in AI algorithms, and ensuring that AI tools are used to enhance, not replace, human educators. Ethical guidelines and transparency in AI usage are essential to address these concerns (Miao et al., 2021).

Educators and students had varying perceptions of AI integration. While some viewed it as a valuable tool, others raised concerns about privacy, dependence, and potential dehumanization of the learning process.

Interpretation of Qualitative Findings:

The qualitative findings from literature reviews, interviews, and observations provide a nuanced understanding of the post-pandemic language education landscape. Students and educators adapted to new modes of instruction, with technology playing a pivotal role. Despite challenges, students demonstrated resilience and adaptability.

Implications of the Research:

The research highlights several implications for language education in the post-pandemic era. It emphasizes the need for continued investment in digital infrastructure, faculty training, and pedagogical innovation. Additionally, the study underscores the importance of maintaining a balance between technology and human interaction in language education.

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Salient Themes from Qualitative Findings:

1. Digital Transformation: The digital transformation of language education emerged as a prominent theme, reflecting the widespread adoption of online and blended learning.
2. Student Adaptability: Students demonstrated remarkable adaptability to the new educational landscape, showcasing their resilience.
3. AI Integration: The integration of AI in language education positively impacted learning outcomes, providing personalized experiences.
4. Deep Learning: Deep learning principles facilitated more meaningful language acquisition experiences, promoting comprehension and retention.
5. Educational Technology: The role of educational technology in facilitating language instruction was significant, offering innovative tools and platforms.
6. Human Interaction: The importance of maintaining human interaction in language education was emphasized, balancing technology with personal connections.
7. Challenges: Participants acknowledged challenges such as digital inequity, privacy concerns, and potential overreliance on technology.
8. Pedagogical Innovation: Pedagogical innovation was highlighted as crucial for effective language instruction in the digital age.
9. Faculty Training: Faculty training in digital pedagogy and AI integration emerged as a critical aspect of successful language education.
10. Future Research: Participants expressed interest in further research on the evolving landscape of language education.

Discussion of Themes:

In the context of language education in the post-pandemic era, a constellation of themes emerges, each bearing significant implications. The rapid digital transformation, prompted by the COVID-19 pandemic, has brought about a landscape where online platforms, digital resources, and technology-driven tools have become central in shaping language acquisition, reflecting the overarching theme of "Digital Transformation." This transformative shift is particularly evident in institutions like St. Michael's College in Iligan City, Philippines, where educators have adapted to the changing educational landscape.

Concurrently, "AI Integration" stands as a pivotal theme, revolutionizing language learning by offering personalized learning experiences and immediate feedback to students, as underscored in the work of Miao et al. (2021) and increasingly relevant to institutions like St. Michael's College.

Moreover, the application of "Deep Learning Principles and Meaningful Learning pedagogy," encompassing advanced machine learning techniques, holds promise for refining language pedagogy, representing another transformative theme in this era. Nevertheless, these promising developments coexist with a set of challenges that demand attention. These encompass addressing issues such as equitable access to technology, ensuring the reliability and quality of AI-driven language education tools, and bridging the "Digital Divide," echoing the theme of "Challenges" (Carrillo & Flores, 2020), particularly pertinent to institutions like St. Michael's College.

While technology and AI are transformative forces, they do not supersede the intrinsic role of "Human Interaction" in language education. This fundamental theme emphasizes the irreplaceable value of real-world context and social connections in fostering language development, as highlighted by Destianingsih and Satria (2020), and remains integral to the educational fabric of institutions like St. Michael's College.

Within this dynamic landscape, "Pedagogical Innovation" emerges as a linchpin to ensure the quality of education. This theme underscores the need for educators to continually adapt to new technologies and refine teaching methods, curriculum design, and assessment strategies, aligning their practices with the evolving dynamics of language education (Maican & Cocorada, 2021), an imperative shared by institutions like St. Michael's College.

As school admicntrators recognize the ever-increasing role of AI in education, they must establish frameworks that harness its potential while preserving the essential role of human educators, exemplified in the theme of "Faculty Training" and the need for policy guidance (Alda et

al., 2020; Estrellado & Miranda, 2023), a consideration that institutions like St. Michael's College in Iligan City, Philippines, must navigate as they shape their educational approaches.

In essence, these interwoven themes collectively paint a multifaceted portrait of language education in the post-pandemic era. They illuminate the transformative promise of technology and AI, underscore the imperative to address challenges, and highlight the enduring significance of human interaction and pedagogical innovation in ensuring the delivery of high-quality language education, including institutions like St. Michael's College.

Recommendations:

In light of the evolving landscape of language education in the post-pandemic era, it is essential to provide practical recommendations that can guide institutions and educators in navigating the challenges and opportunities presented by digital transformation, AI integration, pedagogical innovation, and the principles of "Deep Learning." These recommendations aim to foster effective language acquisition while ensuring equitable access, high-quality instruction, and a balanced blend of technology and human interaction. By implementing these strategies, institutions like St. Michael's College and educators globally can enhance the language learning experience, promote deep and meaningful learnings, and prepare students for a digitally-driven future.

For School Administrators:

- Invest in robust digital infrastructure.
- Provide faculty with ongoing training in digital pedagogy.
- Foster a supportive environment for pedagogical innovation.

For Faculty:

- Embrace AI-driven tools and platforms while maintaining a human touch.
- Incorporate deep learning principles into teaching strategies.
- Engage in continuous professional development.

For Students:

- Continue demonstrating adaptability and resilience in the digital learning environment.
- Advocate for equitable access to technology and resources.
- Engage actively in language learning and seek personalized experiences.

For Future Researchers:

- Explore the evolving landscape of language education.
- Investigate the long-term impact of digital transformation on language acquisition.
- Address privacy and ethical concerns in AI integration.

Overall, this comprehensive discussion consolidates the research findings, interprets their far-reaching implications, and provides actionable recommendations for all stakeholders involved in the realm of language education. The study underscores the profound transformation brought about by technology, applauds the adaptability and perseverance of students, and underscores the vital importance of a well-balanced approach to uphold the quality and efficacy of language acquisition within the evolving post-pandemic educational landscape in SMC.

IX. Conclusion

In conclusion, this research summarizes key findings, emphasizing the transformative potential of deep learning, meaningful pedagogy, and AI integration in language education within the evolving higher education landscape. These findings contribute to the field of language education by highlighting the significance of personalized, immersive, and engaging language learning experiences facilitated by AI technologies. Meaningful pedagogy remains a crucial factor, motivating and deepening language acquisition. This study underscores the need for educators, school administrators, teachers, students, and researchers to consider these insights and continually innovate language education in SMC. It relates back to the thesis statement, tying up the main points and encouraging stakeholders to embrace these opportunities, fostering a future where language

acquisition empowers meaningful global connections, thereby leaving a lasting impact on the field of education.

References

Agra, G. et al. (2019). "Analysis of the concept of Meaningful Learning in light of the Ausubel's Theory". Revista Brasileira de Enfermagem. 72 (1): 248–255. doi:10.1590/0034-7167-2017-0691. ISSN 1984-0446. PMID 30916292. S2CID 85532164

Alda, R., Boholano, H., & Dayagbil, F. (2020). Teacher education institutions in the Philippines towards Education 4.0. International Journal of Learning, Teaching and Educational Research, 19(8), 137–154. https://doi.org/10.26803/ijlter.19.8.8.

Aljawarneh, S. A. (2020). Reviewing and exploring innovative ubiquitous learning tools in higher education. Journal of computing in higher education, 32, 57-73.

Al-Nofaie, H. (2023). A Road Map to English Language Teaching in the Post-Pandemic Era: An Adaptation of Pedagogical Authority Approach. Creative Education, 14, 213-231. doi: 10.4236/ce.2023.142015.

Anbarasan, D. et al. (2021). https://dblp.org/db/journals/ci/ci37.html#SunAK21

Design of online intelligent English teaching platform based on artificial intelligence techniques. Comput. Intell. 37(3): 1166-1180 (2021)

Barron, B. et al., (n.d). teachING for Meaningful Learning A Review of Research on Inquiry-Based and Cooperative Learning. https://files.eric.ed.gov/fulltext/ED539399.pdf

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. NursingPlus Open, 2, 8-14. https://doi.org/10.1016/j.npls.2016.01.001

Benoot, C., Hannes, K. & Bilsen, J. (2016). The use of purposeful sampling in a qualitative evidence synthesis: A worked example on sexual adjustment to a cancer trajectory. BMC Med Res Methodol 16, 21 (2016). https://doi.org/10.1186/s12874-016-0114-6 (Benoot et. al., 2016)

Bizami, N.A., Tasir, Z. & Kew, S.N.(2023). Innovative pedagogical principles and technological tools capabilities for immersive blended learning: a systematic literature review. Educ Inf Technol 28, 1373–1425 (2023). https://doi.org/10.1007/s10639-022-11243-w

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101.

Carrillo, C., & Flores, M. A. (2020). COVID-19 and teacher education: A literature review of online teaching and learning practices. European Journal of Teacher Education, 43(4), 466–487. https://doi.org/10.1080/02619768.2020.1821184

Cebrián, G., Palau, R., & Mogas, J. (2020). The smart classroom as a means to the development of ESD methodologies. Sustainability, 12(7), 3010.

ChatGPT. (2023, September 5). AI Integration in Language Education. ChatGPT. https://www.chatgpt.com/conversation-12345

Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). Two Decades of Artificial Intelligence in Education: Contributors, Collaborations, Research Topics, Challenges, and Future Directions. Educational Technology & Society, 25(1), 28–47. https://www.jstor.org/stable/48647028

Chigbu, U.E.; Atiku, S.O.; Du Plessis, C.C. (2023). The Science of Literature Reviews: Searching, Identifying, Selecting, and Synthesising. Publications 2023, 11, 2. https://doi.org/10.3390/publications11010002

Clark, H., (2023). The AI Infused Classroom. ASIN: B0C5KLDF44. Publisher: Elevate Books Edu (May 18, 2023). ISBN-13: 979-8985137453.

Creswell, J. W., & Creswell, J. D. (2017). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE Publications.

Creswell, J.W. (2013). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 4th Edition, SAGE Publications, Inc., London.

Dan Fitzpatrick, D., Fox, A., and Weinstein, B., (2023). The AI Classroom: The Ultimate Guide to Artificial Intelligence in Education (The Hitchhiker's Guide for Educators Series). ISBN-10: 1959419110. ISBN-13 : 978-1959419112

Destianingsih, A., & Satria, A. (2020). Investigating students' needs for effective English online learning during Covid-19 for Polbeng students. ELT-Lectura: Studies and Perspectives in English Language Teaching, 7(2), 147–153.

Erarslan, Ali. (2021). English language teaching and learning during Covid-19: A global perspective on the first year. Journal of Educational Technology and Online Learning. 4. 10.31681/jetol.907757.

Estrellado, C. and Miranda, J., (2023). Artificial Intelligence in the Philippine Educational Context: Circumspection and Future Inquiries (March 9, 2023). International Journal of Scientific and Research Publications, Volume 13, Issue 5, May 2023, Available at SSRN: https://ssrn.com/abstract=4442136

Garg, S. (2020). Artificial Intelligence and its Impact on Higher Education in Post COVID Era. University News, pp. 2-6

Godwin-Jones, R. (2021). Evolving technologies for language learning. Language Learning & Technology, 25(3), 6–26. http://hdl.handle.net/10125/73443

Gruber, A.; Matt, E.; Leier, V. (2023). Transforming Foreign Language Education: Exploring Educators' Practices and Perspectives in the (Post-)Pandemic Era. Educ. Sci. 2023, 13, 601. https://doi.org/10.3390/educsci13060601

Han, X. (2022). Investigation on Deep Learning Model of College English Based on Multimodal Learning Method. Comput Intell Neurosci. 2022 Oct 7;2022:7001392. doi: 10.1155/2022/7001392. Retraction in: Comput Intell Neurosci. 2023 Aug 9;2023:9828230. PMID: 36248931; PMCID: PMC9568305.

Holmes, W. and Porayska-Pomsta, K. (2022). The Ethics of Artificial Intelligence in Education 1st Edition. Publisher: Routledge; 1st edition (August 11, 2022). ISBN-10: 0367349728. ISBN-13: 978-0367349721

Hanani, N. (2020). Meaningful Learning Reconstruction for Millennial: Facing competition in the information technology era. IOP Conference Series: Earth and Environmental Science, 469(1), 012107. https://doi.org/10.1088/1755-1315/469/1/012107

International forum on AI and education: steering AI to empower teachers and transform teaching, 5-6 December 2022; analytical report, UNESCO, (2023). https://www.unesco.org/en/digital-education/ai-future-learning

International forum on AI and education: steering AI to empower teachers and transform teaching, 5-6 December (2022). https://www.unesco.org/en/digital-education/ai-future-learning

Maican, M.-A., & Cocorada, E. (2021). Online Foreign Language Learning in Higher Education and Its Correlates during the COVID-19 Pandemic. Sustainability, 13, 781. https://doi.org/10.3390/su13020781

Mary H Howard, M, Laliberte, S., and Tim Needles, T. (2023). Artificial Intelligence To Streamline Your Teacher Life: The ChatGPT Guide for Educators. Publisher: X-Factor EDU (March 27, 2023). ISBN-10: 1990566448. ISBN-13 : 978-1990566448

Matsushita, K., Matsushita, K., & Hasebe. (2018). Deep active learning. Springer.

McPhail, G. (2021). The search for deep learning: A curriculum coherence model. Journal of Curriculum Studies, 53(4), 420-434.

Medina, S. A. L. (2021). An Online English Teaching Experience during Covid-19 Pandemic: Preliminary Findings. Lingüística y Literatura, 42, 203-220. https://doi.org/10.17533/udea.lyl.n80a13

Miao, F. et. al. (2021). AI and education: guidance for policy-makers. UNESCO [66827]. https://unesdoc.unesco.org/ark:/48223/pf0000376709

Miller, M. (2023). AI for Educators: Learning Strategies, Teacher Efficiencies, and a Vision for an Artificial Intelligence Future. ISBN-10: 1956306471. ISBN-13: 978-1956306477.

Moser, K. M., Wei, T., & Brenner, D. (2021). Remote teaching during COVID-19: Implications from a national survey of language educators. System, 97, 102431. https://doi.org/10.1016/j.system.2020.102431

Munn, Z.; Peters, M.D.J.; Stern, C.; Tufanaru, C.; McArthur, A.; Aromataris, E. Systematic Review or Scoping Review? Guidance for Authors When Choosing between a Systematic or Scoping Review Approach. BMC Med. Res. Methodol. 2018, 18, 143. [Google Scholar] [CrossRef]

Mustadi, A., Annisa, F. C., & Mursidi, A. P. (2021). Blended learning innovation of social media based active English during the COVID-19 pandemic. Elementary Education Online, 20(2), 74–88. https://doi.org/10.17051/ilkonline.2021.02.01

Mystakidis, S. (2019). Motivation Enhanced Deep and Meaningful Learning with Social Virtual Reality. [Doctoral Dissertation, University of Jyväskylä]. UJ Campus Repository. https://jyx.jyu.fi/handle/123456789/66667

Mystakidis, S. (2021). "Deep Meaningful Learning". Encyclopedia. 1 (3): 988–997.

Ng DTK, Ching ACH, Law SW. (2023). Online learning in management education amid the pandemic: A bibliometric and content analysis. The International Journal of Management Education. 2023 Jul;21(2):100796. doi: 10.1016/j.ijme.2023.100796. Epub 2023 Mar 23. PMCID: PMC10034476.

Ng, Tsz Kit & Leung, Jac & Su, Jiahong & Ng, Chi Wui & Chu, Samuel. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. Educational Technology Research and Development. 71. 137-161. 10.1007/s11423-023-10203-6.

Novak, J. (2020). "Meaningful Learning: The Essential Factor for Conceptual Change in Limited or Inappropriate Propositional Hierarchies Leading to Empowerment of Learners", Science Education, 86 (4): 548–571, Bibcode:2002SciEd..86..548N, CiteSeerX 10.1.1.505.2763, doi:10.1002/sce.10032

OpenAI. (2023). Exploring AI Integration in English Language Teaching.

Page, M.J.; Moher, D.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E. PRISMA 2020 Explanation and Elaboration: Updated Guidance and Exemplars for Reporting Systematic Reviews. BMJ 2021, 372, n160. [Google Scholar] [CrossRef]

Piaget, J. (1950). The Psychology of Intelligence. New York: Routledge.

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Administration and policy in mental health, 42(5), 533. https://doi.org/10.1007/s10488-013-0528-y. Palinkas, L. A et. al. (2015).

Pantelimon, F.-V.; Bologa, R.; Toma, A.; Posedaru, B.-S. The Evolution of AI-Driven Educational Systems during the COVID-19 Pandemic. Sustainability 2021, 13, 13501. https://doi.org/10.3390/su132313501

Qunfei, X., Abdullah, N., & Mustapha, S. M. (2020). The influencing factors and incentive measures of college students' online English learning motivation. Journal of Education and Social Sciences, 15(2), 74-81.

Ronda, R. and Mateo, J., (2023). AI will not replace teachers in education—expert. The Philippine Star. https://www.philstar.com/headlines/2023/08/23/2290660/ai-will-not-replace-teachers-education-expert

Rose, H., McKinley, J., & Galloway, N. (2021). Global Englishes and language teaching: A review of pedagogical research. Language Teaching, 54(2), 157-189. doi:10.1017/S0261444820000518

Rote Learning vs. Meaningful Learning | Oxford Learning (2017). Oxford Learning. 2017-03-23. Retrieved 2017-12-17.

Scully, D., Lehane, P., & Scully, C. (2021). 'It is no longer scary': digital learning before and during the Covid-19 pandemic in Irish secondary schools. Technology, Pedagogy and Education, 00(00), 1–23. https://doi.org/10.1080/1475939X.2020.1854844

Shaaban, S. S. A. (2020). TEFL professors' e-learning experiences during the Covid 19 pandemic. European Journal of Foreign Language Teaching, 5(1), 82–97. https://doi.org/10.46827/ejfl.v5i1.3202

Sheguf, E. M., & Alhaj, A. A. (2022). Cognitive skills reflection and distribution in EFL program testing. Journal of Language Teaching and Research, 13(2), 371-376.

Siemens, G. et al. (2004). "Connectivism and Connective Knowledge". Archived from the original on 2010-01-31. Retrieved 2009-01-28.

Skrabut, S., (2023). 80 Ways to Use ChatGPT in the Classroom: Using AI to Enhance Teaching and Learning. B0BVC8MXJV, Publisher: Stan Skrabut (February 10, 2023). ISBN-13: 979-8985553765

Smit, B., & Onwuegbuzie, A. J. (2018). Observations in Qualitative Inquiry: When What You See Is Not What You See. International Journal of Qualitative Methods. https://doi.org/10.1177/1609406918816766

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, Volume 104, 2019. https://www.sciencedirect.com/ science/article/ pii/S0148296319304564?via%3Dihub

Su, C. (2022). A project-based learning approach to developing English writing courses in colleges. Journal of Contemporary Educational Research, 6(4), 1-6.

Sun, Z., Anbarasan, M., & Praveen Kumar, D. J. C. I. (2021). Design of online intelligent English teaching platform based on artificial intelligence techniques. Computational Intelligence, 37(3), 1166-1180.

Valdez, P. N. (2020). Research in Critical Pedagogy: Implications for English Language Classrooms in Asia. PASAA, 60, 222-236. https://www.culi.chula.ac. Th /Publicationsonline/current_ volume_ p1. php?journal_id=74

Vargas-Hernández, José & Vargas-González, Omar. (2022). Strategies for meaningful learning in higher education. Journal of Research in Instructional. 2. 47-64. 10.30862/jri.v2i1.41.

Vasileiou, K., Barnett, J., Thorpe, S. et al. (2018). Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. BMC Med Res Methodol 18, 148 (2018). https://doi.org/10.1186/s12874-018-0594-7

Vygotsky L., (1930). Genesis of Higher Mental Functions. https://www.marxists.org/archive/vygotsky/works/1931/higher-mental-functions.htm

Wang, J., Shimada, A., Oi, M., Ogata, H., & Tabata, Y. (2020). Development and evaluation of a visualization system to support meaningful e-book learning. Interactive Learning Environments, 1–18. https://doi.org/10.1080/10494820.2020.1813178

Winje, Øystein, & Løndal, K. (2020). Bringing deep learning to the surface: A systematic mapping review of 48 years of research in primary and secondary education. Nordic Journal of Comparative and International Education (NJCIE), 4(2), 25–41. https://doi.org/10.7577/njcie.3798

Yang, G. (2022). A study on the application of digitized resources in English language teaching under a blended teaching model: exploration and reflection on online teaching in the context of the pandemic. Pacific International Journal, 5(1), 56-63.

Zhang, K., & Wu, H. (2022). Synchronous Online Learning During COVID-19: Chinese University EFL Students' Perspectives. SAGE Open, 12(2). https://doi.org/10.1177/21582440221094821