



## **Empowering EFL Learners in the Digital Age: The Role of Deep Learning and Technological Integration**

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### **Abstrak**

In creating more contextual and meaningful learning, educators need to empower their technological proficiency in the teaching and learning process. The demographic bonus momentum in 2035 and the vision of Indonesia Emas 2045 present both significant challenges and great opportunities for the Indonesian education system. Realising this vision and mission, collaboration in the development of digital technology and deep learning strategies is essential to bring significant transformation in English as a Foreign Language (EFL) education. This study aims to investigate how digital tools and resources are integrated into English as a Foreign Language (EFL) education to empower EFL learners. The study employs qualitative through interviews, questionnaires, and also classroom observations in university. Classroom observations offer real-time evidence of how technology is integrated, the use of deep learning and also highlighting both its benefits and obstacles. Data is analysed using thematic analysis for qualitative, allowing for a comprehensive understanding of the role of deep learning and technology in EFL learning at the English Language Learning and Education Study Program of Politeknik Negeri Lampung. The results show that the role of deep learning empowers learning to become mindful, meaningful and joyful through using of technology which has been positively perceived by both students and lecturers, who recognize the ability to make learning more accessible, interactive, and tailored to individual needs. The integration of technology in the learning process increases student engagement and motivation while enabling more personalized learning through timely and adaptive feedback.

**Keywords:** Deep learning, technological integration, language learning technology, student engagement

## A. Introduction

The integration of digital technology into education has revolutionized the way languages are taught and learned, particularly in the field of English as a Foreign Language (EFL). Despite the widespread availability of digital tools, many EFL learners still struggle to achieve meaningful language proficiency and autonomous learning in increasingly complex digital environments.

The landscape of English as a Foreign Language (EFL) learning has undergone significant transformation, driven by rapid advancements in technology and pedagogical approaches. English proficiency remains a critical skill for global communication, academic success, and career advancement, making effective language learning strategies more important than ever. Despite widespread access to digital tools, many EFL learners still face challenges in achieving deep, meaningful learning that goes beyond surface-level knowledge.

The core problem addressed in this study is the challenge of effectively empowering EFL learners through the strategic application of deep learning (DL) and technological integration. While digital technologies offer unprecedented opportunities for enhancing language acquisition, the gap remains between the potential of these tools and their practical, pedagogically sound implementation in EFL contexts. Hence, the competence and skills of teachers and the entire educational system are crucial for the success of teaching and learning activities, particularly in incorporating multimedia technology as a supportive tool (Hy et al., 2024).

This problem is urgent due to the accelerating pace of digital transformation in education and the growing demand for learners who are not only linguistically competent but also digitally literate and capable of critical thinking. Deep learning, characterized by critical thinking, reflection, and the ability to apply knowledge in authentic contexts, has emerged as a pivotal concept in language education. Integrating deep learning strategies with modern technological tools offers promising opportunities to enhance learner engagement, autonomy, and language competence. However, while technology provides innovative platforms for language practice and interaction, its effective integration into pedagogy requires careful consideration of learners' needs, teacher readiness, and contextual factors.

'Deep Learning' in different timelines their ways, but the central sense is obvious; it defines deep learning as based on primary knowledge and a meta-cognitive process of re-constructing knowledge and cognitive strategy, which is the transfer of knowledge as a target to solve practical problems in the learning process (Lindsay & Norman, 1977; Yueyinga & Xiaodong, 2016). Many prominent scholars working in this field have defined deeper learning as a collection of student outcomes that includes mastery of fundamental academic knowledge, critical thinking and problem solving, working collaboratively and successfully, having an academic mentality, and being empowered through self-directed learning or learning how-to study (Bitter et al., 2014; Chow, 2010; Trilling, 2010).

This study aims to explore the role of deep learning and technological integration in empowering EFL learners in the digital era in term of what are the impact of using deep learning-based technologies in EFL classrooms. By examining how these elements interact to foster deeper language acquisition, this research seeks to contribute to the development of more effective, learner-centred English language teaching practices that respond to the demands of the 21st century.

Yet, many EFL classrooms still face barriers such as insufficient teacher training in digital literacy, unequal access to technology, and a lack of frameworks that integrate deep learning principles with language instruction. Without addressing these issues, EFL education risks falling behind in equipping learners with the skills necessary for success in the digital age. Existing literature has explored various dimensions of technology use in language learning, including the benefits of mobile apps, online platforms, and AI-powered tools for vocabulary building, pronunciation, and interactive communication (Zhou & Hou, 2024; Brocca et al., 2024). However, much of this research focuses on surface-level technology adoption rather than the deeper cognitive and motivational impacts of digital integration. Deep learning, which encompasses critical thinking, problem-solving, and learner autonomy, remains underexamined in the context of EFL digital education. This article situates itself within this research gap by investigating how deep learning frameworks can be combined with technological tools to empower EFL learners, fostering not only language skills but also digital competence and lifelong learning habits.

The originality of this study lies in its comprehensive approach that bridges educational technology, language pedagogy, and cognitive science. Unlike prior studies that often isolate technology as a tool or focus narrowly on specific applications, this research emphasizes the holistic integration of deep learning principles with digital resources to transform EFL

instruction. It also critically examines the challenges and opportunities presented by this integration, including infrastructural disparities, teacher preparedness, and the risk of technology overuse diminishing interpersonal communication (Rahimi, 2024a; Hoang, 2024). By doing so, the article contributes a nuanced perspective that balances enthusiasm for digital innovation with pedagogical caution and equity considerations.

The discussion unfolds by first reviewing key studies on digital literacy development among EFL teachers and learners, highlighting how enhanced digital skills correlate with more effective and creative instructional practices (Aslam et al., 2021; Jang et al., 2021). It then explores empirical findings on the motivational and cognitive benefits of technology-enhanced language learning, such as improved reading comprehension, vocabulary retention, and learner engagement through interactive multimedia (Kang & Kim, 2024; Derakhshan & Ghiasvand, 2024). Subsequently, the article addresses the persistent challenges faced by educators, including managing digital platforms, adapting to rapid technological changes, and ensuring equitable access for all learners (Yang & Wang, 2024).

The purpose of this study is to provide actionable insights and a theoretical framework that educators, curriculum designers, and policymakers can use to harness deep learning and technology integration effectively. By focusing on learner empowerment, the article aims to shift the paradigm from technology as a mere supplement to language teaching toward technology as a catalyst for transformative learning experiences. This scholarly contribution is timely and significant, given the ongoing digital evolution in education and the critical role of English proficiency in global communication.

This study has led to insights for developing effective learning Universitas Negeri Lampung. The investigation scope is broad; it looks into general teaching strategies, deeper learning skills, integrated teaching methods, and curriculum effectiveness rather than limiting it to certain aspects of English language education. As a result of the study's theoretical and practical implications, it can help to advance teaching theories of deeper learning, particularly in higher education. On the other hand, it can guide other researchers who want to conduct similar research related to cutting-edge teaching and learning strategies. Practically, the paper helps the teachers improve the students' deeper learning skills using various tools and techniques.

This article addresses a pressing educational challenge by investigating the intersection of deep learning and technological integration in EFL contexts. It offers an original, research-based perspective that advances understanding of how digital tools can be leveraged to empower learners, enhance pedagogical practices, and bridge gaps in digital literacy. The findings and recommendations presented here are crucial for shaping the future of EFL education in the digital age, ensuring that learners are equipped not only with language skills but also with the digital competencies essential for success in a connected world.

## **B. Methodology**

This study employed a qualitative research design to explore the impact of using deep learning-based technologies in EFL classrooms. A qualitative approach was selected to provide a rich and in-depth understanding of the participants' experiences, ethical concerns, and classroom practices.

### **Participants**

30 EFL students were recruited as participants using purposeful sampling techniques. They were undergraduates enrolled in the English study program at one of the state universities located in Lampung, Indonesia. They were in their third year and were chosen because they had completed writing course or subject that contain critical analysis and also include technology integration of the course. Before answering the questionnaire, students were requested to read the purpose section on the first page to provide their approval to participate in this study. 3 lecturers were contributed in interview. Purposeful sampling is required because it allows researchers to select people who can provide the most precise information about the phenomena and contribute to a thorough understanding of the case. Furthermore, all participants gave verbal and written approval to participate voluntarily, record interviews, and exhibit excerpts. The researchers outline the purpose and techniques of this study. To protect the participants' privacy, the researchers did not reveal their true names (pseudonyms).

## Instruments

This study relied on two main instruments: questionnaires and semi-structured interviews. The questionnaire was adapted from incorporating correlative SLA theories which developed also by Jiang (2022) and consisted 4 dimensions: (1) the motivation of deep learning, (2) the strategy of deep learning, (3) the engagement of deep learning, and (4) the directional competence of deep learning. The dimensions have 30 items on a 4-point Likert scale (strongly disagree to strongly agree) was found to be highly reliable ( $\alpha = 0.95$ ). Semi-structured interviews were conducted to gain a deeper understanding of deep learning and technology integration. The interview guide was validated by experts before being used in the study.

## Data Collection

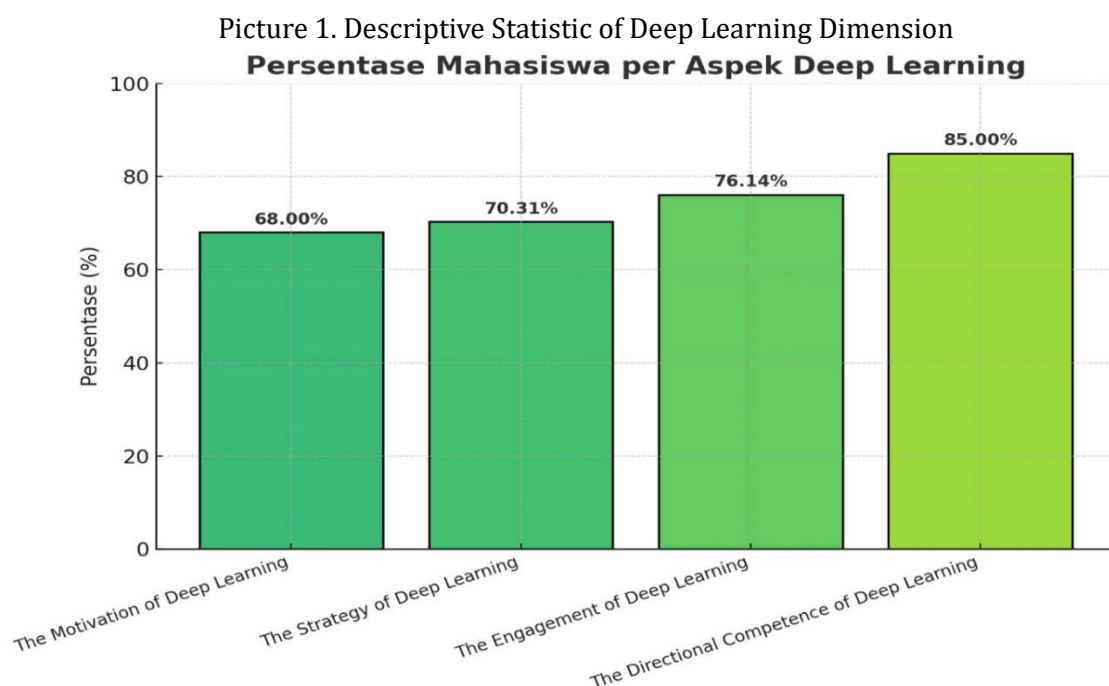
Data in this study were collected using an open-ended electronic questionnaire designed with Google Forms. This method was selected for its practicality and wide reach, enabling efficient data collection from participants located across different provinces in Indonesia. The questionnaire link was distributed through personalized WhatsApp messages, allowing for direct communication and improving the likelihood of response.

## Data Analysis

The quantitative data from the questionnaires were analysed using descriptive statistics to determine the overall pattern. The mean scores for each dimension were calculated using a 4-point Likert scale: very low, low, high, and very high (Eltahir et al., 2021). These findings provide an initial indication of how frequently certain strategies are used by participants. Thematic analysis was used to examine qualitative data collected through semi-structured interviews. Interview transcripts were coded based on the deep learning indication. To ensure the trustworthiness and validity, quantitative and qualitative data were compared during the interpretation stage. The study gained a deeper and more valid understanding the role of deep learning and technological integration by comparing and corroborating data from all three sources (questionnaires and interviews) (Patton, 2002; Taylor et al., 2016).

## Findings

Addressing the research questions the result of the data analysis, the results were derived from questionnaires distributed to learners and lecturers. The result of this study addressed by the aim of the research which focused on investigates how digital tools and resources are integrated into English as a Foreign Language (EFL) education to empower EFL learners. This section presents the findings of the study, structured thematically in alignment with the research objectives and the categories derived from the Likert Scale. Drawing from the responses of 30 learners and 3 lecturers, the findings highlight a diverse range of perspective on the role of Deep learning and technology was integrated. This study used questionnaires from Jiang (2022) related to Deep Learning, which were distributed to participants to collect in-depth information.



Based on the picture percentage, the directional competence of deep learning dimension is positioned at first determined by the average score (85%) and the engagement of deep learning dimensions is in second place (76,14%). However, the average score for the strategy of deep learning dimensions is at moderate (70,31%) and score for the motivation of deep learning dimensions is at its lowest (68%).

The data which provided, here are the aspects of Deep Learning measured from the students along with their percentages. From this data, it can be concluded that the number of students who agreed with each aspect was calculated based on the percentage out of a total of 30 students. The percentages indicate the level of agreement or acceptance of the students towards certain aspects of Deep Learning. The aspect "The Directional Competence of Deep Learning" has the highest approval rate (85%), followed by "The Engagement of Deep Learning" (76.14%), "The Strategy of Deep Learning" (70.31%), and "The Motivation of Deep Learning" (68%). These aspects generally reflect important components of the deep learning process in an educational or student learning context, which may include learning motivation, learning strategies, engagement, and specifically directed competencies. For more details, it describes from the table below

Table 1. the descriptive of students for each dimension

Aspect of Deep Learning	Jumlah Mahasiswa	Persentase (%)
The Motivation of Deep Learning	20	68%
The Strategy of Deep Learning	21	70,31%
The Engagement of Deep Learning	23	76,14%
The Directional Competence of Deep Learning	26	85%

The data above explained that the highest aspect of deep learning came from the aspect of the directional competence of deep learning got 26 learners agree that comprehensive proficiency in mastering English, including theoretical knowledge, practical language use, critical thinking skills, self-directed learning, and digital information processing skills are more important and assist them to learn English. The aspect of engagement of deep learning got 23 learners agree that Pre-class engagement, in-class engagement, and after-class engagement are one of assistance for guide learner to improve their positive academic outcome in learning process. The lower score came from the strategy and the motivation of deep learning with the 21 learners and 20 learners. Most of them used Strategies used by learners to deeply engage with and understand complex cognitive processes involved in language learning and also Learners' great interest in the language being learned, have a willingness coming from within the learner to learn, not just because of external pressure and have a strong sense of identity related to what they want to achieve or their passion, which can be integrative (such as wanting to integrate with the language's culture) or instrumental (such as for career or academic purposes). All these factors motivate learners to engage in language learning more seriously and deeply, making the learning process more meaningful and effective.

For more clearly, it can be seen on data below, the aspect of deep learning refers to some components that can be used as the parameters of the data above.

Tabel 2. The four dimensions of the deep learning models in the EFL teaching context

<b>Dimensions</b>	<b>Definitions</b>	<b>Components</b>
<i>The motivation of deep learning</i>	Learners' strong interests, subjective willingness to learn, and a strong sense of identity around goals or passions, integrative or instrumental, directed to deep language learning	Integrative motives and instrumental motives
<i>The strategy of deep learning</i>	Deep language learning strategies deployed by learners to access deep language cognitive process	Cognitive strategies, metacognitive strategies, and social strategies

<b>Dimensions</b>	<b>Definitions</b>	<b>Components</b>
<i>The engagement of deep learning</i>	Learners' concrete involvement and learning behaviours aiming to attain positive academic outcomes and avoid alienation at three stages in online EFL teaching	Pre-class engagement, in-class engagement, and after-class engagement
<i>The directional competence of deep learning</i>	The ultimate advanced language competences nurtured in deep language learning	In-depth mastery of language knowledge, language application skills, English critical thinking, problem-solving capacity, learning autonomy, and online English information processing capacity

The data also was supported from reliability statistics alpha Cronbach. The data can be seen from the table below.

**Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.974	.973	30

Based on the reliability test results in the table above, a Cronbach's Alpha value of 0.974 was obtained for 30 statement items. This value is well above the commonly accepted minimum threshold of 0.7, indicating that the research instrument has a very high level of internal consistency. Therefore, all items in the questionnaire are considered reliable and suitable for data collection in the study, without the need for significant deletion or revision of the statement items.

In addition, to answer the research question, the data were gathered through interviews and then presented as a narrative describing how lecturers play a role of deep learning and technology integration. The data can be showed below

No	Name	University
1.	Mrs. Sylvia	Politeknik Negeri Lampung
2.	Mrs. Rizka Permata	Politeknik Negeri Lampung
3.	Mrs. Atika Arpan	Politeknik Negeri Lampung

Based on the interview from Ms. Sylvia said that

"Mrs. Sylvia uses a language learning approach that integrates technology with the principles of deep learning for students in the TRPL Study Program. She emphasizes the importance of material relevant to students' lives and active engagement through digital media such as YouTube Shorts, podcasts, and AI chat features. Weekly challenges in the form of creative "missions" are also given to maintain students' enthusiasm for learning. Technology helps make the material more memorable according to students' learning styles (audio, visual, kinaesthetic). The contextual and personalized approach makes learning fun and non-monotonous. Mrs. Sylvia connects the material with learners' interests like music and games, which increases their motivation. The strategy used is more communicative and prioritizes active learning such as role-play. Students who actively use technology creatively show better improvement compared to passive users. To maintain focus in online learning, Mrs. Sylvia uses short sessions, interactive quizzes, and small group discussions. Learner motivation is sustained with material teasers and light assignments relevant to their daily lives".

Overall, the use of technology in language learning improves learners' listening, reading, and speaking confidence. This humanistic, creative, and contextual approach is effective in supporting meaningful and sustainable language learning.

Another interview from Mrs. Riska said that

"The interview findings highlight that a critical factor in the successful implementation of deep learning in language acquisition is the contextualization of language materials within the students' technical domain. A collaborative and contextual approach—such as engaging students

in the creation of technical documentation and application presentations—effectively fosters stronger intrinsic motivation. The integration of familiar technologies, including Google Classroom and quiz applications, facilitates a more natural and relevant absorption of language content, closely aligned with students' everyday activities.

Learning strategies that emphasize practice through authentic, task-based assignments contribute to the development of profound understanding rather than superficial memorization. Additionally, reflective practices incorporated into the learning process enable students to identify their weaknesses and independently refine their learning strategies. This approach aligns with the core principles of deep learning, which necessitate active cognitive and metacognitive engagement.

Student engagement in online learning environments can be significantly enhanced by making instruction more dynamic and interactive—for example, through structured group discussions, the assignment of moderator roles, and creative projects such as video production. Consistent and approachable communication before, during, and after classes helps mitigate feelings of isolation and promotes sustained learner participation. However, challenges such as multitasking, which impairs focus, and ineffective utilization of technology remain areas requiring ongoing attention.

The adoption of technology has demonstrated a notably positive impact on students' listening and reading competencies; nevertheless, writing and speaking skills still warrant further guidance and support. Consequently, technology should be perceived not merely as a tool for task completion but as an enabler of a humanistic learning process that adapts to individual learner needs.

These findings underscore the importance of designing language instruction that is contextual, humanistic, and technology-integrated, thereby holistically enhancing students' motivation, learning strategies, engagement, and overall competencies in deep learning-based language education.”

And the last but not the least interview from Mrs. Atika Arpan said that

“The interview with Mrs. Atika Arpan revealed various strategies employed to motivate and guide students in learning foreign languages through the interactive and contextual use of technology. The lecturer utilizes popular digital applications and platforms such as Duolingo, Quizizz, Kahoot, and social media to make learning enjoyable and relevant to students' interests. Creative activities, including the production of short videos, simple podcasts, and collaborative online projects, serve as particular methods to boost students' enthusiasm for learning. Additionally, weekly technology-based challenges, such as creating vlogs in a foreign language or participating in international discussion forums, are presented to make the learning experience tangible and engaging.

According to Mrs. Atika, the use of gamification-based technology and flexible learning that accommodates individual rhythms helps students engage with language materials more effectively. Instant feedback and repetitive practice within learning applications facilitate mastery of vocabulary, grammar, and pronunciation. Actively engaged students report learning the language out of personal interest, such as watching films without subtitles or interacting with international peers. To stimulate this interest, learning materials are linked to things they enjoy—such as songs, films, and popular culture—and students are given the freedom to select relevant projects, making the learning process more personalized and enjoyable.

From a strategic perspective, Mrs. Atika applies an approach that emphasizes contextual understanding and direct practice. Students are encouraged to use language in authentic contexts through discussions, role-plays, foreign language video analysis, and personal reflective writing. The simultaneous integration of listening, speaking, reading, and writing skills makes the learning process active and profound. This approach supports natural and meaningful language acquisition rather than passive memorization.

Mrs. Atika's observations regarding differences between highly active and less active students in technology use align well with the principles of deep learning. For example, students who regularly upload vlogs in a foreign language and actively participate in native speaker forums demonstrate notably increased speaking skills and confidence compared to those who engage minimally with assignments. This confirms that technology is a highly valuable tool when used with seriousness and deep engagement.

In online learning contexts, Mrs. Atika addresses students' focus challenges by dividing sessions into shorter segments, incorporating interactive activities such as quizzes and breakout room discussions, and fostering a relaxed and warm classroom atmosphere. Interesting

experiences—such as students accidentally forgetting to unmute their microphones—highlight the need for active guidance from lecturers to maintain effective interaction.

She also implements strategies to sustain students' learning motivation before and after class through engaging material previews, light interest-based assignments, and small group discussions and projects conducted online. This approach makes learning feel lively and continuous, rather than merely an academic obligation.

Although technology has a significant positive impact on receptive skills such as listening and reading, Mrs. Atika emphasizes the importance of guidance in developing productive skills, especially writing and speaking. The challenges posed by technology use potentially causing stress if not properly supported are acknowledged as important lessons in digital literacy and learning resilience.

Overall, this interview affirms that the integration of technology in language learning for technical students must be approached in a contextual, creative, and humanistic manner. Technology is not merely an aid but a bridge that connects language with students' worlds and interests, thereby enhancing motivation, learning strategies, engagement, and deep language mastery in line with deep learning principles. There is great hope that future language education will become more inclusive, personalized, and an integral part of students' everyday lives.

All three lecturers emphasize the importance of a contextual, humanistic, and technology-integrated approach to language learning that enhances students' motivation, engagement, and competencies in a deep and meaningful way. Linking language materials to students' technical fields and utilizing popular digital platforms (such as Google Classroom, Duolingo, Quizizz, and Kahoot) make the learning process relevant and engaging.

Recommended strategies include task-based learning, creative activities like video and podcast production, and interactive online discussions. This approach integrates multiple language skills simultaneously listening, speaking, reading, and writing and requires active cognitive and metacognitive involvement, aligning with deep learning principles.

Online student engagement can be improved through dynamic learning, consistent communication, and shorter sessions to address focus challenges. While technology effectively supports receptive skills like listening and reading, additional guidance is needed to develop productive skills such as writing and speaking for more comprehensive and personalized language mastery.

Overall, technology is viewed not merely as a tool but as a bridge connecting language learning with students' interests and real-world contexts, making language education more inclusive, meaningful, and sustainable.

### **C. Results and Discussion**

This study used to empirically validate a four-dimension deep learning model in the context of online English as a Foreign Language (EFL) teaching. The model includes motivation, engagement, strategy, and directional competence as key components of deep learning. Specifically, engagement, motivation, and strategy align with established cognitive definitions of deep learning (Marton & Säljö, 1976; Biggs, 1987). The dimension of directional competence supports the "results-oriented" aspect of deep learning, considered essential for students' success in 21st-century professional and social life (Huberman et al., 2014). Overall, this four-dimension model reflects prevailing theoretical views on deep learning, covering both cognitive and skill development perspectives. Emotion-related factors, such as interest, were implicitly part of the motivation dimension, bolstering the model's inclusion of cognitive-emotional experiences as proposed by Liu et al. (2021). Cronbach analysis showed positive interrelations among the four dimensions, with the strategy dimension displaying the strongest positive correlation with deep learning. This suggests that language learning strategies, particularly deep language learning strategies (LLS), are crucial for acquiring a second language, though the underlying mechanisms warrant further study (Dörnyei, 2006). Table 2 details definitions and components of each dimension.

Starting with motivation, it involves learners' strong interests, willingness to learn, and a pronounced sense of identity related to their goals or passions, whether integrative or instrumental in nature, all driving deep language learning. This supports general deep learning definitions (Biggs, 1987; Ryan & Deci, 2000b; Fullan et al., 2019; Esteban-Guitart & Gee, 2020) and emphasizes motivation's vital role in energizing and sustaining language learning over time (Gardner, 1985; Dörnyei, 2006; Tochon, 2013).

Findings indicate motivation includes both integrative and instrumental motives consistent with longstanding psychological perspectives on second language motivation (Gardner, 1985; Swann et al., 2010). Interestingly, students may be more driven by instructional motives (e.g., passing exams, enhancing competitiveness) than integrative ones during deep language learning, aligning with prior research (Chen et al., 2005; Liu, 2007; Zhan et al., 2021). This reflects how instructional motives play a major role when learners lack direct contact with native speakers, often making integrative motives less relevant (Swann et al., 2010). However, this study's exploration of motivational dynamics over time is limited and invites further investigation. The strategy dimension involves learners' use of deep language learning strategies aimed at engaging higher-order cognitive processes, contrasting with surface learning strategies which focus on mechanical processing (Marton & Säljö, 1976). Drawing on the concept of deep language learning strategies emphasizing complex skills (Tragant et al., 2013) and encompassing Oxford's six-group Strategy Inventory for Language Learning (SILL, 1996), this study considers cognitive, metacognitive, social, and emotional strategies as essential parts of the deep learning strategy component.

Align the theory of the deep learning, the implementation of deep learning does not rely solely on cognitive approaches but also involves four key components that mutually support and shape a holistic learning experience for students. These components include pedagogical practices, learning environment, utilization of digital technology, and learning partnerships.

Deep learning is always associated with understanding and applying knowledge in various contexts. As mentioned before, deep learning adheres to the principles of being mindful, meaningful, and enjoyable. Each principle contributes to providing a comprehensive and profound learning experience. Mindful learning involves the full engagement of students in the learning process, increasing awareness of their thoughts, feelings, and surrounding environment. Bentz (1992) stated that deep learning stimulates emotional, intellectual, mental, physical, social, and personal processes of learners.

Fullan et al. (2018) relate meaningful learning to the relevance of learning activities to real-world contexts, connecting students' knowledge across local, national, regional, and global contexts, and utilizing the surrounding environment for learning. Deep learning emphasizes thorough comprehension rather than mere memorization.

Deep learning becomes meaningful by enhancing motivation and being enjoyable for individuals (Kovač et al., 2023). Enjoyable learning focuses on positive emotions related to the learning process, including curiosity, enthusiasm, and motivation.

Deep learning is closely linked to constructivist learning theory, which strengthens the learning process and interaction with others (Abbott et al., 2009). Deep learning occurs when students are challenged and motivated by real-world problems that involve interdisciplinary knowledge through an inquiry-based learning approach (Bolstad et al., 2012; Scott, 2015; Fullan, Quinn, & McEachen, 2018). Deep learning is a development from various student-centered approaches such as Problem-Based Learning, Flipped Classroom, Formative Assessment, and others (Kovač et al., 2023). Hence, deep learning is an approach focused on students according to their uniqueness and characteristics.

#### **D. Conclusion**

This study made pioneering efforts to explore, understand, and advance deep learning within the context of online English as a Foreign Language (EFL) teaching and also role of deep learning empower learning to become mindful, meaningful and joyful through using of technology. It introduced a four-dimension deep learning model comprising motivation, engagement, strategy, and directional competence, which was empirically supported as a positively correlated model exhibiting strong composite reliability and good convergent validity. Additional survey results showed that role of deep learning empower learning to become mindful, meaningful and joyful through using of technology college students' deep learning levels in online EFL settings were around the median, with the highest scores in directional competence and the lowest in motivation. The findings revealed that students were driven more by instructional motives but showed less use of skill-based cognitive strategies and lacked language application and problem-solving skills. Significant differences in deep learning levels and its four sub-dimensions were observed across variables such as grade, English proficiency, EFL course type, and vision groups. Notably, students exhibited relatively low engagement regardless of their English proficiency or vision, and universally low directional competence across grade levels and courses.

Lastly, the study interpreted the key results and offered five instructional strategies to enhance students' deep learning in the online EFL environment. Overall, the research aimed to clarify theoretical confusion surrounding the concept of deep learning in language education and to demonstrate the underlying logic connecting deep learning and second language acquisition (SLA) theories. It also aspired to contribute new theoretical and empirical insights into deep learning in language education. The survey outcomes and recommended instructional strategies are intended to assist EFL teachers in providing effective, tailored online instruction that promotes deep learning and addresses the low effectiveness issues prevalent in technology-assisted EFL teaching. Furthermore, the standardized measurement tool developed in this research could be valuable for future studies in the field.

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