ISSN 1799-2591
Theory and Practice in Language Studies, Vol. 15, No. 4, pp. 1166-1177, April 2025
DOI: https://doi.org/10.17507/tpls.1504.15

Engagement Dynamics in a Speaking Task: Insights From Survey, Brain Waves, and Interviews in a Thai EFL Context

Jeffrey Dawala Wilang
School of Foreign Languages, Suranaree University of Technology, Thailand

Ittipon Fongkaew
School of Physics, Suranaree University of Technology, Thailand

***Abstract*—This study adopts a multi-method approach to examine Thai EFL learners' cognitive and affective engagement in response to questions of varying difficulty during a speaking task. Using an engagement survey, brain waves, and semi-structured interviews, the study involved 41 Thai university students with low and intermediate English proficiency. Survey results revealed moderate engagement among low-proficiency learners and high engagement among intermediate learners. Brain waves data showed higher cognitive engagement for low-proficiency students with easier questions, while intermediate students displayed consistent engagement. Affective engagement was greater for both groups when tasks matched their comfort zones. Content analysis of interviews highlighted five engagement factors: emotional response, task familiarity, prior experiences, teacher feedback, and task relevance. The findings emphasize the need to address both cognitive and emotional demands in speaking tasks to enhance learner engagement.**

***Index Terms*—brain waves, engagement, interview, survey, Thai EFL context**

I. Introduction

Students often face significant challenges in speaking tasks due to the high cognitive load imposed by second or foreign-language use. For students with low proficiency, this cognitive strain is exacerbated, leading to increased anxiety, reduced fluency, and difficulty maintaining focus. Speaking tasks of higher complexity can overwhelm these learners, causing disengagement and frustration. In contrast, intermediate students may handle such tasks better, but even they require strategies to balance cognitive and affective demands. Understanding these challenges is critical for designing effective language instruction that addresses the diverse needs of EFL learners.

Using a multi-method approach, this study investigates the patterns of cognitive and affective engagement among engineering students with low and intermediate English proficiency levels when exposed to questions of differing difficulty levels during a speaking task. Cognitive engagement involves sustained attention, mental effort, and active participation in learning activities, which are essential for language acquisition (Helme & Clarke, 2001). Students with low proficiency often engage more deeply with easier tasks, as these demand less cognitive effort and help reduce anxiety (Fredrickson, 2001; Chi & Wylie, 2014). Conversely, more difficult tasks may overwhelm them, leading to reduced engagement. For intermediate students, their ability to employ metacognitive strategies like self-regulation and critical thinking enables them to engage more consistently across tasks of varying difficulty levels (Bandura, 1997; Pekrun & Linnenbrink-Garcia, 2012).

Affective engagement, which includes emotional responses to learning tasks, is equally crucial. High affective engagement is often linked to positive emotions, intrinsic motivation, and a conducive learning environment that supports cognitive engagement (Fredrickson, 2001; Pekrun & Linnenbrink-Garcia, 2012). Students with high affective engagement are more likely to perceive challenging tasks as opportunities for growth, sustaining their cognitive effort even when confronted with difficulties (Dewaele & MacIntyre, 2014). However, EFL students' affective engagement can waver due to task difficulty and perceived competence, making it essential to understand the interplay between cognitive and emotional factors in language learning.

Traditional methods often fall short of capturing the real-time dynamics of cognitive and affective engagement. Advanced tools, such as electroencephalograms (EEGs), offer deeper insights by measuring brain wave activity. For example, gamma waves in regions like AF3 and AF4 within the temporal lobe can indicate levels of cognitive engagement, revealing the depth of mental processing and attention during language tasks (Başar-Eroğlu et al., 1996; Jensen et al., 2007). Similarly, beta wave activity provides valuable information about students' affective states, including their emotional responses to speaking tasks (Ray & Cole, 1985). Combining brain wave analysis with self-reported measures enables a comprehensive understanding of engagement patterns, highlighting the dynamic interplay between cognitive load and emotional responses.

This study addresses three key questions: (1) What are the cognitive and affective engagement levels among students with low and intermediate English language proficiency? (2) What are the cognitive and affective engagement patterns among students with low and intermediate English proficiency when exposed to questions of differing difficulty levels during a speaking task? (3) What factors influence the engagement of low and intermediate-proficiency students in a speaking task? The findings aim to inform instructional practices, emphasizing the importance of tailoring tasks to students' proficiency levels while fostering both cognitive and affective engagement to enhance language learning outcomes.

A. Engagement in Language Learning

Engagement in language learning includes four dimensions: behavioral, emotional, cognitive, and agentic engagement (Reeve & Tseng, 2011). Behavioral engagement involves students' participation and effort in academic activities, while emotional engagement encompasses their affective reactions, such as interest or anxiety. Cognitive engagement pertains to using deep learning strategies, and agentic engagement refers to students actively influencing their learning process by expressing preferences and seeking feedback. In this study, only emotional (affective) and cognitive dimensions are included as they can be measured by the electroencephalogram tool along with self-reported measures.

Recent research on cognitive and affective engagement in language learning, particularly in speaking tasks, has provided significant insights into language acquisition and performance dynamics. Reeve and Tseng (2011) introduced the concept of agentic engagement, demonstrating that students who actively participate in shaping their learning experiences show higher cognitive and affective engagement, leading to improved language learning outcomes. Similarly, Pekrun et al. (2017) emphasized the critical role of emotions in academic settings, revealing that positive emotions like enjoyment and interest enhance cognitive engagement, while negative emotions such as anxiety can hinder it.

Dewaele and MacIntyre (2014) examined the interplay between foreign language enjoyment and anxiety, finding that positive emotions significantly contribute to cognitive engagement and overall language proficiency, whereas anxiety detracts from both. This relationship was further explored by Hiver et al. (2024), who conducted a meta-analysis confirming that both cognitive and affective engagement are crucial for successful language acquisition. They concluded that positive emotional states are linked to higher engagement and better learning outcomes. Lambert and Zhang (2019) also studied Chinese EFL learners, discovering that emotional engagement, particularly feelings of enjoyment and interest during speaking tasks, was positively correlated with cognitive engagement and speaking performance.

Amoah and Yeboah (2021) investigated the role of teacher feedback in enhancing cognitive and affective engagement among EFL students, finding that constructive feedback significantly boosts students' confidence and willingness to engage in speaking tasks. Daubney et al. (2017) analyzed language anxiety and its impact on engagement, concluding that strategies to reduce anxiety, such as creating a supportive classroom atmosphere, can enhance cognitive and affective engagement. These findings are consistent with those of MacIntyre and Gregersen (2012), who demonstrated that positive teacher-student interactions and using humor in the classroom can reduce anxiety and promote a more engaging learning environment.

Further supporting these insights, studies by Wang et al. (2023) and Liu and Jackson (2008) showed that students with higher self-efficacy and lower anxiety levels exhibited greater engagement in speaking tasks. Additionally, Dörnyei (2001) emphasized the importance of motivational strategies in maintaining high cognitive and affective engagement levels, suggesting that goal-setting and self-regulation techniques can significantly enhance language learning outcomes. These studies highlight the multifaceted nature of engagement in language learning, emphasizing the need for a holistic approach that addresses cognitive and affective dimensions to optimize student performance in speaking tasks.

B. Understanding Brain Waves in Language Learning

Gamma waves, typically ranging from 30 to 100 Hz, are integral to higher cognitive functions such as attention, memory, and learning. These waves are prominent in the AF3 and AF4 regions, which are part of the prefrontal cortex and are crucial for executive functions, decision-making, and memory. Monitoring gamma wave activity in these regions provides insights into students' cognitive engagement during language learning tasks. Enhanced gamma activity is linked to improved attention, memory encoding and retrieval, and complex problem-solving (Başar-Eroğlu et al., 2001; Jensen et al., 2007; Howard et al., 2003). Thus, these measures help understand how students engage cognitively with learning materials, herein, the speaking task.

Beta waves range from 13 to 30 Hz and are associated with active thinking, focus, and emotional engagement. These waves are typically observed in the frontal lobes and are linked to various affective states, including stress, anxiety, and overall emotional engagement. High beta wave activity indicates increased emotional arousal, which can be positive, such as excitement, or negative, such as anxiety (Ray & Cole, 1985; Arnsten, 1998). By monitoring beta waves, researchers can gain insights into students' affective engagement during language learning tasks, helping to identify emotional barriers and support student motivation and interest (Schmidt & Trainor, 2001).

II. Materials and Methods

A. Research Setting and Participants

This study was conducted in northeastern Thailand's top-ranked science and technology university. Forty-one students in an intact English foundation course consented to be part of this study. Using the Common European Framework (CEFR), nineteen students indicated themselves as beginners (A1-A2) and twenty-one as intermediate (B1-B2). Students with C1-C2 levels are exempted from studying English foundation courses in this university. The English course required students to attend a speaking task – an individual mock job interview.

The participants took part in a mock job interview that included a range of questions of varying difficulty: easy (e.g., "Tell me about yourself"), moderate (e.g., "Describe a time when you had to overcome challenges in your studies"), and difficult (e.g., "Describe a situation where you handled a disagreement with a team member"). Each participant was given one minute to prepare and one minute to respond to each question. In total, each participant spent six minutes completing the speaking task. This setup aimed to replicate the conditions of an actual job interview and assess their cognitive and affective engagement.

B. Engagement Survey Questionnaire

The 6-point Likert scale engagement survey questionnaire adapted from Reeve and Tseng (2011) focused on assessing students' affective and cognitive engagement and was used before the speaking task in class. The affective engagement section includes, i.e., "I enjoy any speaking task in class," measuring the positive emotions and interest students experience during speaking activities and the absence of anxiety. The cognitive engagement section, comprising eight items, evaluates the mental effort and cognitive strategies students employ during speaking tasks. For example, "When doing a speaking task, I try to relate what I'm learning to what I already know." The items assess how students engage cognitively by connecting new information with prior knowledge, organizing and integrating ideas, self-monitoring, and adjusting learning strategies as needed. Previously, it demonstrated strong internal reliability with a Cronbach's Alpha of .82.

C. Electroencephalogram (EEG) Tool

During the speaking task, an electroencephalogram tool, the Emotiv Insight (see Figure 1), was the primary instrument for measuring cognitive and affective engagement. It is a high-resolution, multi-channel EEG headset designed to monitor brain activity. It features five channels (AF3, AF4, T7, T8, and Pz) and two reference sensors (see Figure 2), providing comprehensive brain activity coverage. This wireless device is designed for ease of use in various settings, making it suitable for classroom environments (Xu & Zhong, 2018).

Figure 1. Emotiv Insight

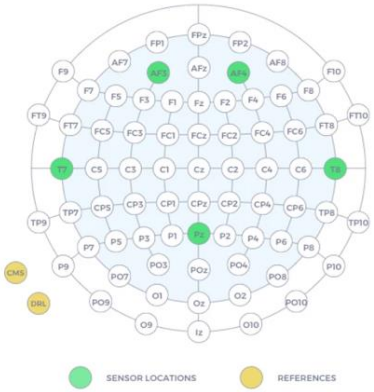

Figure 2. Sensor Locations

D. Semi-Structured Interview

Following the speaking task, semi-structured interviews were conducted with the participants to gain deeper insights into their cognitive and affective engagement. These interviews were designed to last approximately 3-5 minutes and were conducted in Thai to ensure that participants could express themselves comfortably and accurately. The interviews were recorded and subsequently transcribed for analysis.

The interview questions were structured to explore various dimensions of engagement during the speaking tasks. Participants were asked to describe moments when they felt particularly engaged, specifying the aspects of the task that contributed to this engagement. They were also queried about instances when their focus or interest waned and the reasons behind these fluctuations. Additional questions probed into factors that enhanced their emotional investment in the tasks and how their emotions evolved throughout the activity. Finally, participants were asked to reflect on the cognitive demands of the speaking task and how it required their attention and focus.

E. Data Collection Procedures

Before the speaking task, participants were asked to scan a QR code link to the 12-item engagement survey questionnaire.

Afterward, each participant was fitted with the Emotiv Insight headset and calibrated according to the manufacturer's instructions to ensure accurate readings. Participants were seated in a quiet room to minimize external distractions and instructed to relax while the initial baseline measurements were recorded. During each task, the Emotiv Insight recorded EEG data from the five channels, focusing on gamma wave activity from the AF3 and AF4 regions to assess cognitive engagement and beta wave activity to evaluate affective engagement. The data was transmitted wirelessly to a computer for real-time monitoring and recording using Emotiv's software suite.

Following the EEG data collection, each participant was ushered to a room where semi-structured interviews were conducted to gain deeper insights into their experiences and self-reported engagement levels.

F. Data Analysis

The survey data was analyzed using descriptive statistics – mean and standard deviations. The 6-point Likert scale was interpreted into three ranges: 1.00 – 2.66, Low engagement; 2.67 – 4.32, Moderate engagement; and 4.33 – 6.00, High engagement (Daskalovska et al., 2023).

The EEG data was analyzed using Emotiv's proprietary software to extract gamma and beta wave activity levels during the speaking task. As indicated earlier, gamma wave activity in the AF3 and AF4 regions indicated cognitive engagement, while beta wave activity was used to assess affective engagement. The EEG data was then correlated with the survey and interview responses to validate self-reported engagement levels and identify cognitive and affective engagement patterns across proficiency levels and question difficulties.

Content analysis was used to systematically analyze the transcribed interviews with students after their speaking tasks. The interviews were transcribed verbatim in Thai, translated into English, and analyzed using a coding scheme based on cognitive and affective engagement themes. This approach involved categorizing and quantifying the presence of specific words, themes, or concepts to identify patterns in the data, providing insights into their experiences (Krippendorff, 2018). Two PhD candidates in applied linguistics validated the patterns elicited from the data and reached 100 percent agreement.

III. Results and Discussions

A. What Are the Cognitive and Affective Engagement Levels Among Students With Low and Intermediate English Language Proficiency?

TABLE 1
LEVELS OF COGNITIVE AND AFFECTIVE ENGAGEMENT AMONG THE STUDENTS

Students	Aspect of Engagement
	Level of Cognitive Engagement
Low proficiency (*n*=19)	*M*=3.69, *SD*=0.59; Moderate engagement
Intermediate proficiency (*n*=22)	*M*=4.26, *SD*=0.50; High engagement
	Level of Affective Engagement
Low proficiency (*n*=19)	*M*=3.62, *SD*=0.55; Moderate engagement
Intermediate proficiency (*n*=22)	*M*=4.38, *SD*=0.75; High engagement

From the survey, the table above indicates that students with intermediate English proficiency exhibit higher cognitive and affective engagement levels than those with low proficiency. Specifically, intermediate proficiency students have a mean cognitive engagement score of 4.26 (SD=0.50), indicating high engagement, whereas low proficiency students have a mean score of 3.69 (SD=0.59), indicating moderate engagement. This suggests that as students' language proficiency improves, their ability to engage cognitively with learning tasks increases, likely due to a better understanding and application of the material (Chi & Wylie, 2014). Regarding affective engagement, intermediate proficiency students show a mean score of 4.38 (SD=0.75), signifying high engagement, while low proficiency students have a mean score of 3.62 (SD=0.55), indicating moderate engagement. Higher affective engagement among intermediate students suggests they

experience more positive emotions and motivation toward learning, which can further enhance their engagement and performance (Fredrickson, 2001; Deci & Ryan, 2000).

B. What Are the Cognitive Engagement Patterns Among Students With Low and Intermediate English Language Proficiency When Exposed to Questions Of Differing Difficulty Levels During a Speaking Task?

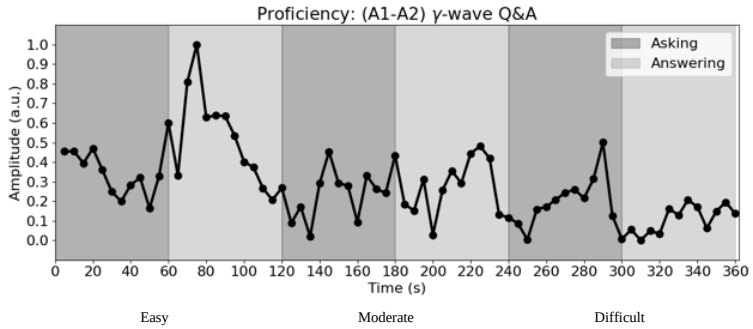

Figure 3. Cognitive Engagement (AF3 Region) of Low-Proficiency Students

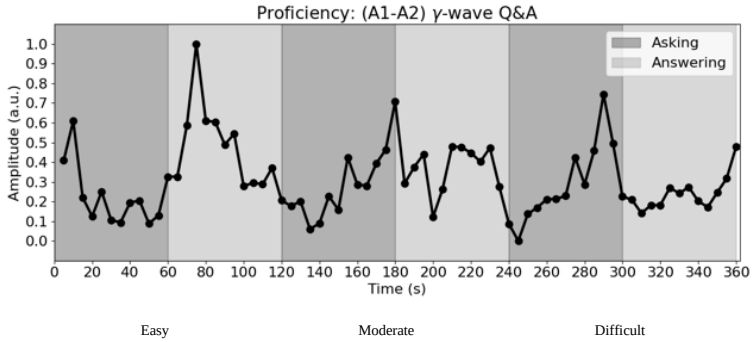

Figure 4. Cognitive Engagement (AF4 Region) of Low-Proficiency Students

Using EEG, the findings from Figures 3 and 4 reveal key patterns in cognitive engagement among low-proficiency students during tasks of varying difficulty levels. Both figures show that engagement peaks during the answering phase of easy questions (around the 80-second mark), reflecting the comfort and confidence students experience when tasks align with their current proficiency levels. These tasks are within their comfort zone, promoting higher cognitive engagement with minimal cognitive load. During moderate questions, engagement fluctuates, with peaks around the 150- and 180-second marks, indicating the students' active efforts to process and respond to moderately challenging tasks. This fluctuation suggests an adjustment period where learners align their abilities with task demands, sustaining engagement despite the increased complexity. However, engagement during difficult questions reveals a significant peak during the asking phase (around 290-300 seconds), followed by a gradual decline, which highlights the cognitive effort required to understand and respond to complex tasks and the eventual onset of cognitive fatigue or overload. These patterns emphasize that engagement is highest when tasks are manageable and aligned with the students' current abilities, and moderate tasks sustain engagement by challenging learners within their zone of proximal development. The decline in engagement during difficult tasks underscores the importance of scaffolding and gradually increasing task difficulty to maintain engagement and prevent overload.

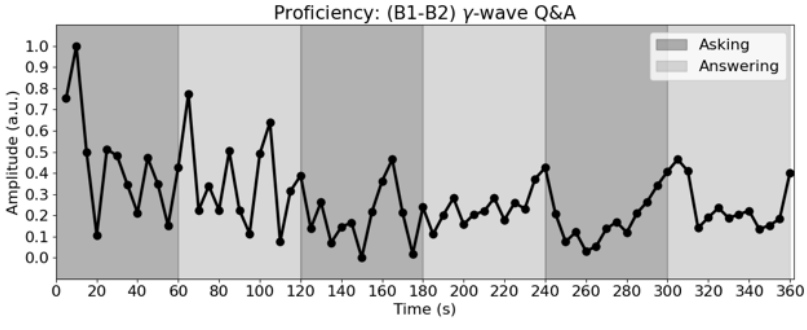

Figure 5. Cognitive Engagement (AF3 Region) of Intermediate-Proficiency Students

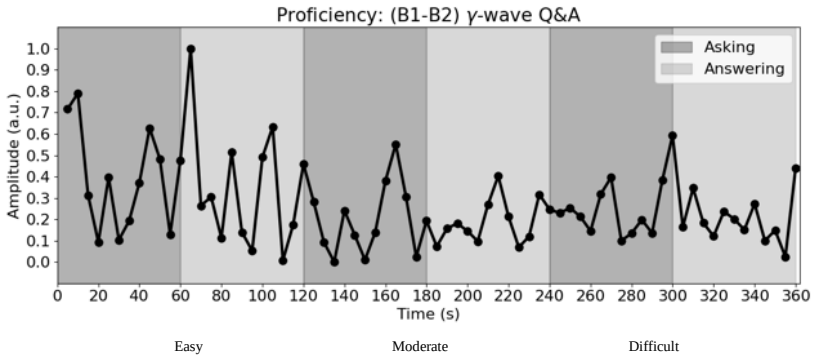

Figure 6. Cognitive Engagement (AF4 Region) of Intermediate-Proficiency Students

The data from brainwaves as shown in Figures 5 and 6 provide insights into the cognitive engagement of intermediate-proficiency students during tasks of varying complexity, highlighting notable patterns. For easy questions (0-120 seconds), both AF3 and AF4 regions exhibit high initial peaks around the 10-second mark, followed by fluctuations and additional smaller peaks (e.g., 50- and 80-second marks). These indicate rapid engagement and sustained mental effort as students process tasks within their comfort zone. This suggests that intermediate students can quickly engage with and maintain cognitive effort on tasks aligned with their current proficiency level. Transitioning to moderate questions (120-240 seconds), the engagement patterns show noticeable peaks around 130-140 seconds and 160 seconds, followed by brief dips, indicating moments of cognitive adjustment as students respond to more complex questions. These patterns reflect the students' ability to sustain engagement and manage the increased cognitive load, even as task complexity rises. In the final interval (240-360 seconds) with difficult questions, significant peaks (e.g., around 300 seconds) highlight intense cognitive effort during the answering phase, followed by fluctuations and a rise toward the end, which suggests continued engagement despite the challenges posed by high task difficulty.

When comparing cognitive engagement trends between intermediate and low-proficiency students, key differences emerge. Low-proficiency students show higher engagement with easier tasks and a sharp decline with difficult tasks, highlighting the importance of tasks being aligned with their comfort zone to avoid cognitive overload. In contrast, intermediate students demonstrate consistent engagement across tasks of varying complexity, reflecting their ability to adjust to increasing difficulty and sustain mental effort. This suggests that intermediate learners may have more developed cognitive strategies and resilience in managing complex tasks.

C. What Are the Affective Engagement Patterns Among Students With Low and Intermediate English Language Proficiency Levels When Exposed to Questions of Differing Difficulty Levels During a Speaking Task?

Using EEG, the findings from Figures 7 and 8 highlight the affective engagement patterns of low-proficiency students during tasks of varying complexity. Both figures demonstrate that students exhibit high initial engagement during easy questions (0-120 seconds), with significant peaks around 40 and 80 seconds. These peaks suggest heightened emotional involvement and reduced anxiety, reflecting students' comfort and confidence in handling tasks within their proficiency level. The subsequent decline in engagement, observed in both AF3 and AF4 regions, indicates a return to a relaxed emotional state after the initial phase of task engagement. As the task progresses to moderate questions (120-240 seconds), engagement levels fluctuate with smaller peaks, particularly around 140 and 160 seconds. These patterns reflect moments of increased emotional effort and varying anxiety levels as students adjust to the more challenging questions. The consistent fluctuations suggest that students manage to maintain affective engagement despite the increased difficulty.

During the final interval with difficult questions (240-360 seconds), significant peaks are observed around 290 and 300 seconds, followed by lower engagement levels. These peaks indicate high emotional involvement and possibly heightened anxiety as students process and respond to complex tasks. The subsequent decline suggests emotional fatigue or difficulty in sustaining engagement as the task complexity exceeds their comfort zone. Overall, the data reveals that low-proficiency students are emotionally invested in easier tasks, show steady engagement with moderate tasks, and experience heightened emotional peaks followed by fatigue with difficult tasks.

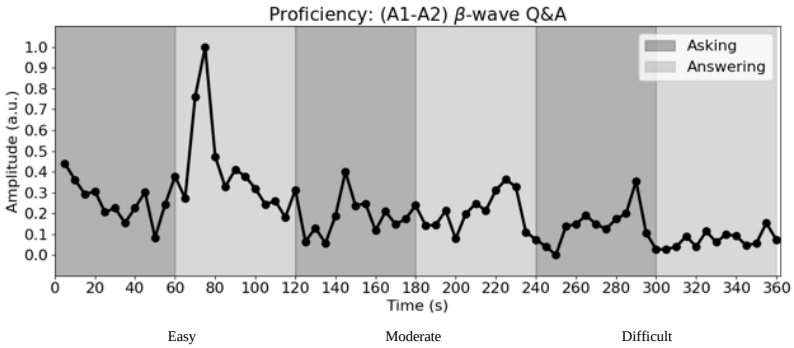

Figure 7. Affective Engagement (AF3 Region) of Low-Proficiency Students

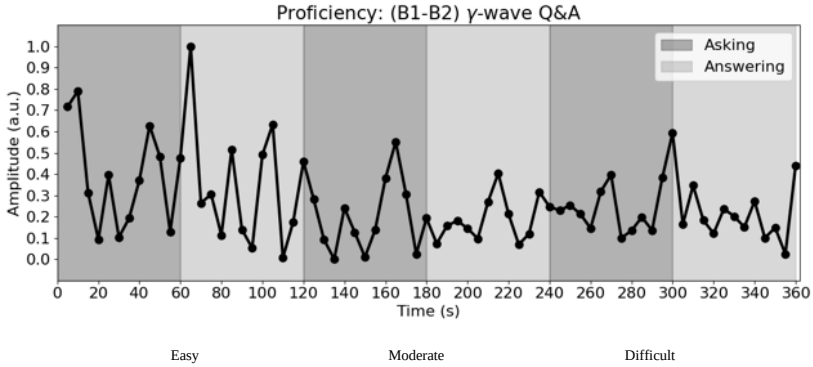

Figure 8. Affective Engagement (AF4 Region) of Low-Proficiency Students

The brainwaves, as shown in Figures 9 and 10 highlight the affective engagement of intermediate-proficiency students during tasks of varying complexity, as measured in the AF3 and AF4 regions. At the start of the task (0-60 seconds), both figures show high initial peaks around 20 and 40 seconds, indicating strong emotional engagement and confidence as students respond to easy questions. These peaks suggest that intermediate students are emotionally invested and find the tasks aligned with their proficiency level manageable and engaging. In the subsequent interval (60-120 seconds), significant peaks are observed around 80 and 100 seconds, reflecting sustained positive emotions and high confidence during the answering phase of easy questions. The fluctuations throughout this interval indicate consistent emotional involvement, showing that students maintain interest and investment in the task.

As the task transitions to moderate questions (120-240 seconds), engagement levels exhibit moderate fluctuations with noticeable peaks, particularly around 160 and 200 seconds. These peaks highlight moments of heightened emotional engagement as students adapt to the increased challenge of moderately difficult questions. The sustained fluctuations in both figures during this interval suggest that students remain emotionally involved, managing their anxiety and maintaining interest despite the rising complexity. Finally, during the difficult question interval (240-360 seconds), significant peaks are observed around the 300-second mark, followed by fluctuations and a rise towards the end around 340 seconds. These patterns reflect high emotional involvement during the answering phase of difficult questions and resilience in maintaining engagement despite the increased cognitive and emotional demands.

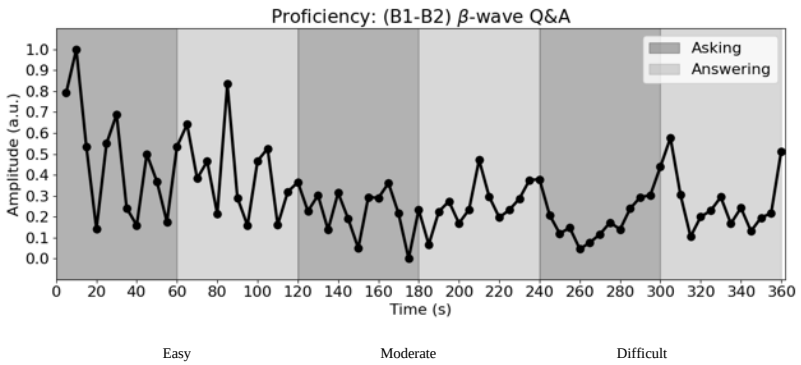

Figure 9. Affective Engagement (AF3 Region) of Intermediate-Proficiency Students

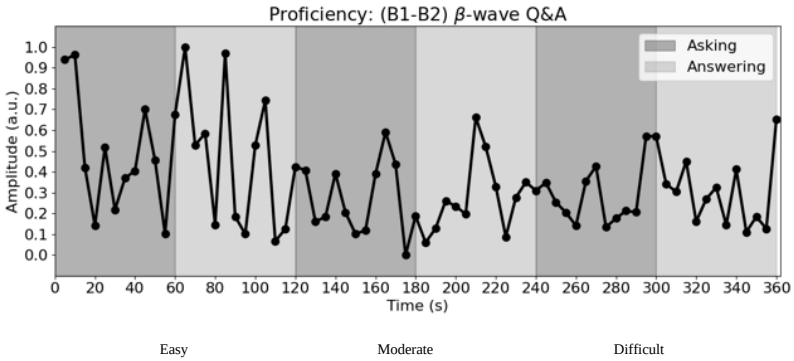

Figure 10. Affective Engagement (AF4 Region) of Intermediate-Proficiency Students

Both figures indicate that intermediate proficiency students demonstrate high initial affective engagement, with significant peaks during easy questions, steady engagement with noticeable peaks for moderate questions, and high engagement peaks for difficult questions. This pattern suggests that they are emotionally invested and capable of managing their anxiety across tasks of varying complexity. The resilience shown during difficult tasks reflects their ability to adapt to challenges while maintaining emotional engagement. However, the increased complexity may introduce stress, emphasizing the importance of task design that balances difficulty with the students' abilities.

Based on all figures (3-10), the overall patterns observed in the cognitive and affective engagement of low- and intermediate-proficiency students during tasks of varying complexity highlight the dynamic nature of engagement in response to task difficulty. Both proficiency groups demonstrate high initial engagement during easy questions, reflecting the role of task familiarity and comfort in fostering emotional investment and cognitive focus. For low-proficiency students, significant peaks in engagement during the answering phase of easy tasks suggest that tasks within their comfort zone enhance both cognitive and emotional engagement by reducing cognitive load and anxiety (Fredrickson, 2001; Pekrun & Linnenbrink-Garcia, 2012). Intermediate students, on the other hand, show sustained engagement with easy questions, reflecting their ability to remain actively involved even in less challenging tasks. This supports Csikszentmihalyi's (1990) flow theory, which posits that engagement is optimized when tasks align with a learner's skills, creating a sense of confidence and motivation.

As task complexity increases to moderate questions, both groups display fluctuating engagement levels with noticeable peaks, suggesting periods of adjustment as students respond to increased cognitive and emotional demands. For low-proficiency students, these fluctuations may indicate moments of heightened anxiety and cognitive effort as they navigate moderately challenging tasks. Intermediate students, however, demonstrate more consistent engagement patterns with moderate questions, reflecting their greater emotional resilience and cognitive strategies for managing moderately difficult tasks. This underscores the role of task complexity in promoting sustained engagement, as long as tasks remain within the learners' manageable range (Chi & Wylie, 2014).

The most striking differences emerge during the difficult questions. For low-proficiency students, engagement peaks during the asking phase of difficult tasks but subsequently declines, suggesting cognitive overload and emotional fatigue when tasks exceed their abilities (Fredrickson, 2001). This highlights the importance of matching task complexity to students' proficiency levels to prevent disengagement. In contrast, intermediate students exhibit resilience, maintaining engagement despite the heightened complexity, as indicated by peaks in both cognitive and affective engagement during the answering phase. These findings align with research emphasizing the interplay between positive emotional experiences and the ability to persist through challenging tasks (Pekrun & Linnenbrink-Garcia, 2012; Dewaele & MacIntyre, 2014).

The brainwave data reinforces the importance of balancing task difficulty to optimize engagement across proficiency levels. Tasks should begin within students' comfort zones to build confidence and gradually increase in complexity to sustain cognitive and emotional involvement. This approach aligns with Fredrickson's (2001) broaden-and-build theory, which highlights the role of positive emotional experiences in enhancing learners' ability to take on new challenges and build lasting skills. Similarly, designing tasks within the learners' Zone of Proximal Development (Vygotsky, 1978) allows for scaffolded progression that fosters both engagement and learning. Educators should strive to design learning experiences that challenge students appropriately, leveraging task difficulty as a tool to promote resilience, motivation, and long-term growth (Csikszentmihalyi, 1990; Pekrun & Linnenbrink-Garcia, 2012). By maintaining a balance between task difficulty and learner proficiency, engagement can be sustained, facilitating more effective language learning outcomes.

D. What Factors Affect the Engagement of Low and Intermediate-Proficiency Students in a Speaking Task?

Five factors were elicited, such as emotional response to task difficulty, preparedness and familiarity with the topic, influence of prior experience in the classroom, teacher role and feedback, and task relevance to life experiences.

Emotional Response to Task Difficulty

Students' emotional responses to the speaking task varied significantly, often depending on the perceived difficulty of the questions (see Excerpts 1 and 2). For example, students with low proficiency frequently reported feeling nervous and anxious when faced with challenging questions, while easier questions elicited feelings of excitement and confidence.

> *I was relaxed at the beginning. I just said whatever I thought and spoke out like that, but I was very nervous as the questions become difficult." – Excerpt 1 (Low Proficiency) "I felt okay because the teacher gave me these topics in advance, so I prepared. – Excerpt 2 (Intermediate Proficiency)*

Preparedness and Familiarity with the Topic

Both low and intermediate-proficiency students highlighted the importance of being prepared and familiar with the task content ((see Excerpts 3-5). Preparation reduced anxiety and increased confidence, allowing students to engage more deeply with the task.

> *I was confident because I prepared well. I remember what I had to say because I prepared it by myself." – Excerpt 3 (Intermediate Proficiency)*
>
> *I was a bit confident because the question is about introducing myself. – Excerpt 4 (Low Proficiency)*
>
> *I might have prepared for the question, but I couldn't remember everything I prepared. – Excerpt 5 (Low Proficiency)*

Influence of Prior Experience in the Classroom

Students' prior experiences with similar tasks significantly influenced their engagement levels. Those who had previous exposure to speaking tasks or related experiences felt more confident and less anxious (see Excerpts 6 and 7).

> *I was very excited because it was my face-to-face conversation. Although, I have some experiences in presenting the projects while I was studying in the EP program. – Excerpt 6 (Intermediate Proficiency)*
>
> *I was scared and very excited for the first time. And because it was in English, it made me even more excited because I can barely communicate well in Thai. – Excerpt 7 (Low Proficiency)*

Teacher's Role and Feedback

The teacher's approach and feedback were crucial in shaping students' affective engagement (see Excerpts 8-10). The teacher's positive and supportive feedback helped alleviate anxiety and foster a sense of accomplishment.

> *I feel relieved because the teacher said it was ok. So, I'm sure I passed. – Excerpt 8 (Intermediate Proficiency)*
>
> *I was excited before entering the room, but after entering the room, the teacher asked friendly. I felt free to speak, so I wasn't very tense. – Excerpt 9 (Intermediate Proficiency)*
>
> *I am m familiar with the teacher. So, I don't feel much pressured. But if is someone else, I feel pressured. – Excerpt 10 (Low Proficiency)*

Task Relevance to Life Experiences

Tasks that students found personally relevant or connected to their own experiences elicited higher levels of engagement. Students were more motivated and invested in speaking about topics that mattered to them personally (see Excerpts 11-13).

> *I felt a lot about this question because it was a real incident I've encountered lately. So, I'm kind of excited to tell the teacher because I've just been through this. – Excerpt 11 (Intermediate Proficiency)*
>
> *The first question is, I talk about it very often, so I spoke it fluently. I prepared but was too excited, and my brain was stuck. – Excerpt 12 (Low Proficiency)*
>
> *I felt normal because with the question about failure, my experience everybody has failures and every time also in study, in work, and other things so I think these questions are normal for me. – Excerpt 13 (Intermediate Proficiency)*

Based on their insights, the engagement of students with low and intermediate proficiency levels in speaking tasks is influenced by a range of factors, which include emotional responses to task difficulty, preparedness and familiarity, prior experience, the teacher's role and feedback, and the relevance and personal connection of the tasks. Students' emotional responses significantly affect their engagement, with lower proficiency students frequently experiencing nervousness and anxiety when faced with challenging questions, while easier tasks elicit excitement and confidence. This aligns with Fredrickson's broaden-and-build theory, which suggests positive emotions enhance engagement and performance by broadening individuals' thought-action repertoires (Fredrickson, 2001). Moreover, Dewaele and MacIntyre (2014) emphasize that lower anxiety levels and positive emotional experiences are crucial for optimal engagement in language learning.

Preparedness and familiarity with the task content are critical in reducing anxiety and increasing confidence, thus facilitating more profound engagement. This finding supports Vygotsky's zone of proximal development theory, which posits that learners can achieve higher levels of understanding with appropriate scaffolding, including preparation and familiarity with the material (Vygotsky, 1978). Bandura's self-efficacy theory also supports this notion, indicating that prior preparation can significantly boost learners' confidence and engagement (Bandura, 1997). Additionally, students with prior experience in similar tasks feel more confident and less anxious, leading to better engagement. This is consistent with research by Chi and Wylie (2014), who suggest that prior knowledge facilitates comprehension and engagement.

The teacher's approach and feedback shape students' affective engagement. Positive and supportive feedback from the teacher helps alleviate anxiety and fosters a sense of accomplishment. Pekrun and Linnenbrink-Garcia (2012) emphasize the role of positive academic emotions in enhancing student engagement, while Skinner and Pitzer (2012) discuss how

supportive teacher-student relationships can significantly boost cognitive and affective engagement. Additionally, tasks that students find personally relevant or connected to their own experiences elicit higher levels of engagement. This supports the self-determination theory, which posits that intrinsic motivation and personal relevance enhance engagement and learning outcomes (Deci & Ryan, 2000). When students find tasks meaningful and relevant to their lives, they are more likely to be motivated and invested in the learning process.

IV. Conclusions and Implications

The comparison of data from the survey, brain waves, interview provides a better understanding of cognitive and affective engagement among students with varying proficiency levels. The brain wave data revealed distinct peaks in cognitive and affective engagement during different phases of the speaking tasks, indicating moments of heightened mental effort and emotional involvement. For instance, significant peaks were observed in the answering phases of easier questions, reflecting increased cognitive engagement when tasks were manageable and aligned with students' proficiency levels. Similarly, affective engagement was notably higher during tasks perceived as less challenging, highlighting the importance of reducing anxiety to foster positive emotional experiences.

The survey results align with these observations, showing that intermediate-proficiency students reported higher cognitive and affective engagement levels than low-proficiency students, who showed moderate engagement in both cognitive and affective aspects. These findings are corroborated by interview themes that emphasize the impact of emotional responses to task difficulty, the importance of preparedness, prior experiences, teacher feedback, and the relevance of tasks. Students felt more engaged and confident when tasks were within their comfort zones and adequately prepared, highlighting the positive impact of supportive teacher feedback and the personal relevance of tasks on engagement levels.

Using a multi-method approach in this research, combining brain wave analysis, semi-structured interviews, and survey data, offers several benefits. This comprehensive approach allows for a deeper understanding of engagement by capturing the physiological and psychological dimensions of students' experiences. Educational technology, such as brain wave monitoring, provides objective data on cognitive and affective engagement, validating and enriching qualitative findings from interviews and surveys. This data triangulation enhances the reliability and validity of the research findings, offering a robust and nuanced view of student engagement.

A. Implications to Research

Moreover, employing educational technology in language research aids perceptions by providing real-time, quantifiable measures of engagement, informing instructional design and intervention strategies. Educators can identify specific high or low-engagement moments and tailor their teaching methods accordingly. Conversely, qualitative methods like interviews and surveys offer insights into students' subjective experiences, motivations, and emotions, which are critical for understanding the context and meaning behind physiological data. Integrating educational technology, interviews, and surveys in language research provides a holistic view of student engagement, offering actionable insights for educators to enhance learning outcomes. This multi-method approach validates findings across different data sources and enriches understanding of complex educational phenomena by capturing the nuanced interplay between cognitive and affective factors.

B. Implications to Teaching

The findings highlight that students with low and intermediate English proficiency demonstrate varying levels of cognitive and affective engagement depending on the alignment of task difficulty with their proficiency level. To address this, teachers should design speaking tasks that are appropriately challenging for each proficiency group. For low-proficiency students, starting with simple questions and progressively increasing difficulty helps build confidence and sustain engagement. For intermediate students, tasks should incorporate a range of difficulty levels—easy, moderate, and challenging—to encourage consistent cognitive effort and avoid disengagement.

In mixed-ability classrooms, differentiating speaking tasks is crucial to address the diverse needs of students. One effective approach is to group students with similar proficiency levels during certain activities, allowing the task difficulty to align with their abilities. Alternatively, tiered questioning, where all students begin with simpler questions and progress to more complex ones based on their responses, ensures that everyone is appropriately challenged. This strategy promotes inclusivity and allows all students to experience success and stay engaged.

To manage cognitive engagement effectively, tasks should be designed within the student’s optimal challenge range, avoiding overly simple or overly difficult questions. Including a variety of question types and difficulty levels ensures ongoing mental stimulation. Educators can also encourage the use of metacognitive strategies, such as self-monitoring and reflective practices, to help students stay engaged by thinking critically about their learning processes. Providing timely and constructive feedback is another essential step, as it helps students recognize their progress and identify areas for improvement, further supporting cognitive engagement.

For affective engagement, creating a positive and supportive classroom environment is key. Teachers should aim to reduce anxiety and foster emotional involvement by promoting a culture where mistakes are viewed as learning opportunities and all efforts are valued. Tasks that offer students choices and incorporate topics of interest can boost

emotional investment. Collaborative activities, such as pair or group work, can also enhance affective engagement by providing social support, making learning more enjoyable, and reducing intimidation. A focus on both cognitive and emotional aspects of engagement ensures a well-rounded and effective learning experience.

ACKNOWLEDGEMENTS

This work was supported by Suranaree University of Technology (IRD2-203-66-12-34).

REFERENCES

[1] Amoah, S., & Yeboah, J. (2021). The speaking difficulties of Chinese EFL learners and their motivation towards speaking the English language. *Journal of Language and Linguistic Studies*, *17*, 56-69.
[2] Arnsten, A. F. T. (1998). The biology of being frazzled. *Science*, *280*(5370), 1711-1712.
[3] Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Freeman.
[4] Başar-Eroğlu, C., Strüber, D., Schürmann, M., Stadler, M., & Başar, E. (1996). Gamma-band responses in the brain: A short review of psychophysiological correlates and functional significance. *International Journal of Psychophysiology*, *24*(1-2), 101-112.
[5] Chi, M. T. H., & Wylie, R. (2014). The ICAP Framework: Linking Cognitive Engagement to Active Learning Outcomes. *Educational Psychologist*, *49*(4), 219-243.
[6] Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*. Harper & Row.
[7] Daskalovska, N., Hadzi-Nikolova, A., & Alogjozovska, N. J. (2023). The use of metacognitive listening strategies by English language learners. *European Journal of English Language Teaching*, *8*(1), 19-33.
[8] Daubney, M., Dewaele, J.-M., & Gkonou, C. (2017). Preliminary thoughts on language anxiety and the focus of this anthology. *New insights into language anxiety: Theory, research and educational implications*, 1-7.
[9] Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227-268.
[10] Dewaele, J.-M., & MacIntyre, P. D. (2014). The two faces of Janus? Anxiety and enjoyment in the foreign language classroom. *Studies in Second Language Learning and Teaching*, *4*(2), 237-274.
[11] Donato, R. (2000). Sociocultural contributions to understanding the foreign and second language classroom. In J. P. Lantolf (Ed.), *Sociocultural Theory and Second Language Learning* (pp. 27-50). Oxford University Press.
[12] Dörnyei, Z. (2001). *Motivational Strategies in the Language Classroom.* Cambridge University Press.
[13] Dweck, C. S. (2017). *Mindset: The New Psychology of Success*. Ballantine Books.
[14] Ellis, R. (2018). *Reflections on Task-Based Language Teaching*. Multilingual Matters.
[15] Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, *56*(3), 218-226.
[16] Guk, I., & Kellogg, D. (2007). The ZPD and whole class teaching: Teacher-led and student-led interactional mediation of tasks. *Language Teaching Research*, *11*(3), 281-299.
[17] Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, *77*(1), 81-112.
[18] Helme, S., & Clarke, D. (2001). Identifying Cognitive Engagement in the Mathematics Classroom. *Mathematics Education Research Journal*, *13*(2), 133-153.
[19] Hinton, C., & Fischer, K. W. (2010). Learning from the developmental and biological perspective. *The nature of learning: Using research to inspire practice*, 113-134.
[20] Howard, M. W., Rizzuto, D. S., Caplan, J. B., Madsen, J. R., Lisman, J., Aschenbrenner-Scheibe, R., Schulze-Bonhage, A., & Kahana, M. J. (2003). Gamma oscillations correlate with working memory load in humans. *Cerebral Cortex*, *13*(12), 1369-1374.
[21] Jensen, O., Kaiser, J., & Lachaux, J.-P. (2007). Human gamma-frequency oscillations associated with attention and memory. *Trends in Neurosciences*, *30*(7), 317-324
[22] Krippendorff, K. (2018). *Content Analysis: An Introduction to Its Methodology (4th ed.)*. Thousand Oaks, CA: SAGE Publications.
[23] Lambert, C., & Zhang, G. (2019). Engagement in the use of English and Chinese as foreign languages: The role of learner-generated content in instructional task design. *The Modern Language Journal*, *103*(2), 391-411.
[24] Liu, M., & Jackson, J. (2008). An exploration of Chinese EFL learners' unwillingness to communicate and foreign language anxiety. *The Modern Language Journal*, *92*(1), 71-86.
[25] MacIntyre, P. D., & Gregersen, T. (2012). *Emotions that facilitate language learning: The positive-broadening power of the imagination. Studies in Second Language Learning and Teaching*, *2*(2), 193-213.
[26] Pekrun, R., & Linnenbrink-Garcia, L. (2012). Academic emotions and student engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 259-282). New York, NY: Springer.
[27] Pekrun, R., Lichtenfeld, S., Marsh, H., Murayama, K., & Goetz, T. (2017). Achievement Emotions and Academic Performance: Longitudinal Models of Reciprocal Effects. *Child Development*, 88.
[28] Ray, W. J., & Cole, H. W. (1985). EEG alpha activity reflects attentional demands, and beta activity reflects emotional and cognitive processes. *Science*, *228*(4700), 750-752.
[29] Reeve, J., & Tseng, C. M. (2011). Agency as a fourth aspect of students' engagement during learning activities. *Contemporary Educational Psychology*, *36*(4), 257-267.
[30] Schmidt, L. A., & Trainor, L. J. (2001). Frontal brain electrical activity (EEG) distinguishes valence and intensity of musical emotions. *Cognition and Emotion*, *15*(4), 487-500.
[31] Skinner, E. A., & Pitzer, J. R. (2012). Developmental dynamics of student engagement, coping, and everyday resilience. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 21-44). New York, NY: Springer.

[32] Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.
[33] Wang, X., Liu, Y.-l., Ying, B., & Lin, J. (2023). The effect of learning adaptability on Chinese middle school students' English academic engagement: The chain mediating roles of foreign language anxiety and English learning self-efficacy. *Current Psychology*, *42*(8), 6682-6692.
[34] Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem-solving. *Journal of Child Psychology and Psychiatry*, *17*(2), 89-100.

Jeffrey Dawala is an assistant professor at the Graduate School of Foreign Languages, Institute of Social Technology, Suranaree University of Technology, Nakhon Ratchasima, Thailand. His research interests are emotions in language teaching and learning, English medium instruction, and English as a lingua franca. He can be contacted at email: wilang@g.sut.ac.th

Ittipon Fongkaew is a faculty member at the School of Physics, Suranaree University of Technology. He obtained his Ph.D. in Physics from Suranaree University of Technology in 2016 and his B.Sc. in Physics (First-Class Honors) from Khon Kaen University in 2010. His research focuses on theoretical condensed matter physics, computational materials science, and data-driven materials informatics. Dr. Fongkaew specializes in first-principles calculations, density functional theory, and x-ray absorption spectroscopy analysis. He has received prestigious awards, including the Thailand Research Fund (TRF) Award for Excellent Doctoral Dissertation (2018) and the National Research Council of Thailand (NRCT) Award for Invention (2023) for his work on wild animal detection systems. He has published extensively in high-impact journals on energy storage materials, electronic properties of nanomaterials, and computational materials discovery. Beyond physics, his interests include artificial intelligence, blockchain, and machine learning applications in scientific research.