

An Instructional Exploration of Integrating Analogical Reasoning and the Feynman Technique in English as Second Language (ESL) at the Primary Level

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Abstract

The proposed research will examine the integration strategy between analogical reasoning and the Feynman Technique in primary school English as Second Language learning. The proposed research will be developed according to a qualitative approach, as the classroom implementation will be targeted. Analogical reasoning will allow young learners to create a conceptual link between old and new information, while the Feynman Technique will enable better comprehension and recall information by explaining things in a simple manner. An approach involving five levels: warm-up, input, processing, reflection, and transfer, including activities like analogy creation, peer explanation, and retelling, etc. It was identified that by blending the two approaches, better understanding, accuracy, and critical thinking are developed among young learners. The proposed research will present a cognitively grounded approach to teaching primary school students English as a Second Language, as well as offer implications for future longitudinal quantitative studies around the world.

Keywords: Analogical Reasoning, English as a Second Language (ESL), Feynman Technique, Instructional Design, Primary Education

Introduction

The English as a second language (ESL) programs in contemporary China focus on teaching students' pragmatic competence. According to Wei and Su (2012), English operates as a mandatory foreign language starting at third grade in primary school where about 300 to 400 million people in China study or use it. The

new curriculum standards for English proficiency have exposed the shortcomings of traditional teaching methods which depend on memorization and mechanical drills. These methods fail to develop higher order thinking skills in primary students. Paradis (2005) observed that primary school children who first encounter complex ESL grammar structures in their learning experience confusion, develop fear and anxiety, and show withdrawal behaviors. Teachers need to adopt effective instructional strategies, providing appropriate linguistic support and emotional guidance to help students gradually overcome the challenges of ESL learning and enhance their confidence and motivation.

Based on extensive feedback from teaching practice, current primary ESL education faces multiple challenges. Young students in primary grades face difficulties with language comprehension which stops them from building useful linguistic frameworks. Students develop wrong interpretations of reading materials, spoken content, and task instructions because of this problem (Gilakjani & Ahmadi, 2011). Students encounter challenges with ESL learning because they do not understand the connections between sentence elements which include causal, sequential, and conditional relationships. The restriction prevents them from using sentence structures in new situations and effectively summarizing written materials (Tedjo & Hartani, 2022). Students in China focus on memorizing facts because their exam-based education system forces them to use short-term memory for test success instead of developing real comprehension and knowledge integration skills (Zhao, 2023). The growing interest in ESL education contradicts with the shortage of non-classroom ESL environments which limits students' practice time which in turns damages their speaking and listening abilities and their overall language proficiency (Ismail, 2025).

The teaching methods require new approaches to become more innovative. According to Richland and McDonough (2010) analogical reasoning functions as a learning technique which helps people understand and remember new information by linking it to their existing knowledge base. The main concept of analogical reasoning requires people to find common characteristics between different ideas. This method helps students grasp difficult concepts as it shows them how their existing knowledge applies to new situations. According to Bullock and Lord (2011) analogy functions as an effective learning tool which enables second language students to understand new grammatical rules more efficiently. This pattern of

thinking moving from the known to the unknown and the concrete to the abstract, aligns with primary students' developmental traits and can effectively minimize learning hurdles.

On the other hand, the effectiveness of the Feynman technique tackles the Feynman cognitive enhancement challenges. Feynman, a physicist, developed a learning technique called the Feynman technique which involves simplifying and expounding on a concept. Feynman Techniques focuses on the “teaching the knowledge to others” which is a well-known instructions method of fostering cognitive enhancement. Adeoye (2023) explains that Feynman Techniques offers better comprehension and memory recalling among the slow learners. This method involves a role-playing session where the elementary learners act as “teachers” and “teach” the content learnt to “pupils” without any prompts. This is a game and active experience that makes learners more refreshed to learn while helping them to be better in expressing themselves, perform critical analysis, and talk with confidence.

The potential, both in terms of theoretical complementarity and practical implementation of analogical reasoning along with Feynman technique in primary ESL education is substantial. Analogical reasoning facilitates students establishing cognitive connections that boost learning retention and development by stimulating structural similarities between new and existing knowledge, which aids in the conceptual scaffold needed to concretize abstract ideas related to language (Wu & Weng, 2013). The Feynman technique helps to reinforce students' levels of output and reasoning ability regarding language learning, while supporting deeper processing and making meaning through retelling and explaining (Bsharat et al., 2024). Consequently, when analogical reasoning and Feynman processes are both incorporated into primary-level ESL applications, such as grammar, reading, and writing, they have the potential to enhance students' levels of attainment as they concurrently advance their language development skills.

Accordingly, this research will aim to incorporate analogical reasoning and the Feynman approach into primary-level ESL teaching to boost cognitive engagement and linguistic skills among the students.

Research Objectives

The objectives are as follows:

1. To explore how analogical reasoning facilitates the formation of conceptual associations between former and novel language knowledge.
2. Examining the Feynman method as a facilitator in understanding, retaining, and reproducing information by simple explanation and interactions among peers.
3. To develop and propose an instructional framework that combines both strategies to improve grammar learning, reflective thinking, and communicative competence among young ESL learners.

Literature Review

Fundamental Theories of Analogical Reasoning

Analogy is a cognitive process where individuals use previous experiences to solve new problems. Gentner (1983) defined epistemic analogical reasoning as a process of understanding and reasoning which locates and identifies structural similarities between two domains. Richland and McDonough (2010) offered a more straightforward definition, describing it as a cognitive process that connects new information to existing knowledge. According to Holyoak (2012), analogical reasoning is a cognitive mechanism involving the mapping of relationships between a source domain and a target domain for the purpose of reasoning and learning. It has been seen that analogical reasoning involves comparing two objects or situations to identify their similarities at an abstract level, and then using these similarities to reorganize or transform knowledge from one context to apply it to another, thus enabling the solution of a new problem.

The basic principle of analogical reasoning is to infer that two objects (such as A and B), which share common attributes, may also be similar in other respects. However, such conclusions are probabilistic in nature (Kapon & diSessa, 2012), since A and B, despite certain similarities, may differ in significant ways. The characteristics which are shared between A and B need to be examined to establish whether any further similarities exist between the two objects. The basic idea of analogical reasoning depends on using shared features between two things to predict additional similarities between them. The basic framework of analogical

reasoning operates by using existing relationships between two things to predict which additional similarities will exist between them. The process of learning through analogies enables people to identify new concepts by recognizing their similarity to things they already understand. The basic framework of analogical reasoning operates by using existing relationships between two things to predict which additional similarities will exist between them. The process of learning through analogies enables people to identify new concepts by recognizing their similarity to things they already understand.

Research shows analogical reasoning operates as an educational tool which contains multiple dimensions. Studies by Chen and She (2020) indicate that analogical reasoning functions as an educational tool which helps students achieve better understanding and shows greater learning engagement. Studies from different cultural backgrounds show that analogical reasoning operates through various methods across cultural groups which suggest educational tasks need to consider cultural elements when they use analogical reasoning (Christie et al., 2020). The incorrect application of analogical reasoning in education leads to student confusion according to Saure et al. (2021), who recommend proper implementation of this method in teaching environments.

Application of Analogical Reasoning in Language Learning

The impact of analogical reasoning on language learning has received considerable attention in cognitive and educational research. As early as the Twentieth century, Vosniadou (1995) suggested that analogous reasoning as a basic mechanism for fostering understanding and learning, contributes to language learning by recognizing relational similarities and helping learners access their prior knowledge. For instance, Chinese learners may recognize the English word “bicycle” based on analogies in their native language. In separating the word “bi” (meaning two) and “cycle” (meaning rotation), the learner now has a way to understand that the term means two wheels that rotate. This analogy helps learners connect or relate vocabulary to what they already think, feel, or know.

Empirical investigations further established its pragmatism for language growth. Kamhi et al. (1990) reported that analogical reasoning was highly valuable in developing language skills and may considerably improve child language learning when students use appropriate learning strategies, particularly for children with

language impairments. Additionally, Burns (1996) proposes that there is a meta-analogical transfer construct, which accounts for the transferability of analogical reasoning among varying learning situations and more particularly indicated that developing strong analogical reasoning skills helps students generalize language rules and patterns in different contexts and improves language use.

Cognitive factors greatly shape the potential power of analogical reasoning. Stevenson et al. (2013) found working memory to be critical in training analogical reasoning and transfer. These authors suggest that when considering an intervention in language learning, one should consider individual differences in cognitive ability as well. A cross-cultural perspective provides additional possibilities to explore the influence of analogical reasoning in learning a language. Christie et al. (2020) found that relationships amongst East Asian children's reasoning, and their preference for similarity of objects, differed from that of Western children.

Theoretical Foundation of the Feynman Technique

Knowledge exists in two distinct forms which include knowing the name of something and understanding its true essence. Most people tend to remain in the first category, while Nobel Prize-winning physicist Richard Feynman deeply recognized the distinction between the two and developed "Feynman Technique" as a key method for mastering knowledge. The method of "learning through teaching" stands as the core principle of this approach which requires students to teach their subject in basic terms to another learner. Students can find their knowledge gaps through this method by working to improve their explanations until they create accurate and understandable concept summaries. The method which demands learners to perform mental operations leads to better comprehension and long-term retention of information. The Feynman Technique proves more effective than repetitive reading because it helps students learn deeply and apply knowledge which modern learning sciences recognize as an essential deep learning strategy.

The Feynman Technique requires people to break down complex ideas into basic terms which children or untrained people can easily understand. The method focuses on memory reinforcement and understanding by making people repeat what they have learned. The method requires four steps which start with writing down the learning topic, then explaining it to an 8-year-old using basic language, next identifying unclear sections to review the materials, and finally simplifying

the explanation through continuous refinement. The process needs students to grasp the fundamental concept because children lack the ability to understand complex language. The method provides multiple chances to evaluate comprehension while showing learners how abstract ideas connect to their own experiences which helps them remember better.

Application of the Feynman Technique in Language Learning

The Feynman Technique serves as a widely used method for teaching science, but researchers have yet to explore its potential benefits for language learning. The technique operates according to the principles of constructivist learning theory (Bruner, 1974) and cognitive load theory (Sweller, 1988) as well as Vygotsky's Zone of Proximal Development (ZPD) theory. When students attempt to explain language rules, vocabulary use, or grammatical structures to others through a simplified explanation, they stay within their optimal development zone. During this interaction, students continuously modify and reinforce their cognitive structures which effectively facilitate the construction/improvement of language competence. The Feynman Technique also encourages learning via active recall, metacognitive reflection, and conceptual simplification, getting learners to explain complex ideas in simple language (Bsharat et al., 2024). As a result, the learners will engage in deep processing and transfer of language knowledge. In a 12-week ESL study, the experimental group using the Feynman Technique had language proficiency improvement scores, from an average of 65% to 82% on a pre-test which is significantly higher improvement than the control group. Additionally, most students in the experimental group reported improvement of language expression, confidence, and engagement in the classroom.

The effectiveness of the Feynman Technique has also been demonstrated in other language skills. For example, Alfareza (2022), in a study conducted at a vocational high school in Indonesia, found that students in the experimental class who used the Feynman Technique to guide reading comprehension scored an average of 76.53 on the post-test, significantly higher than the control group's 61.25. The findings reveal that students who explain content through their own words achieve better understanding of both main ideas and detailed information. It is important to note that some learners, especially those with weaker language foundations, may initially struggle to transform language knowledge into teachable content. Teachers should therefore provide appropriate scaffolding, such as guided

examples, peer discussions, and feedback mechanisms to reduce cognitive barriers and support the internalization of knowledge (Ellis, 2023; Johnson & Christensen, 2024).

Methodology

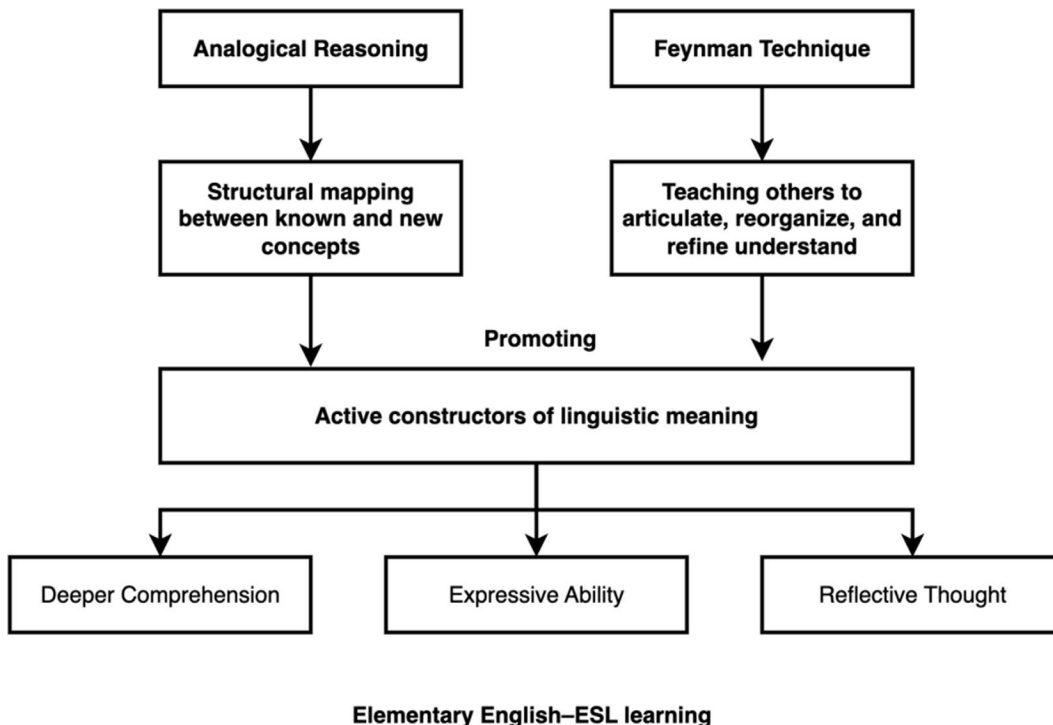
Instructional Design

Teaching Philosophy and Design Principles

The educational approach of this instructional design integrates constructivism with sociocultural learning theory to create a unified learning system. Language acquisition emerges as a process through which learners build meaning while transferring cognitive elements instead of merely collecting linguistic structures. The rationale for the design includes two complementary cognitive processes: analogical reasoning and the Feynman technique. Analogical reasoning supports the development of abstract ideas and structures schema of meaning through structural mapping between new and prior concepts. The Feynman process involves students using language to explain content to others, which engages them in articulate experience, re-organizing and reformulating their understanding, exposing cognitive gaps, and deepening the internalizing process overall. Together used, these two processes shift students from passive information consumers to active meaning constructors. The result is a deeper understanding, improved abilities in language expression as well as reflective thinking, in primary level ESL learning.

Figure 1

Design Principles



Formulation of Instructional Objectives

The design of objectives in this pedagogy follows the principle of all-round development. The objectives refer to four dimensions: knowledge, skills, thinking, and emotion. For the knowledge dimension, the goals describe how to help students secure the basic English grammatical structures used regularly for language production. These aim for students to have secure structures that are labelled as simple present tense, basic (simple) connectives, etc. The skills dimension describes how the students are meant to use language flexibly in specific context as well as experience observing how comparing/analogizing is used to understand and express language phenomena, all served with opportunities for performing succinct oral retelling and grammatical explanation, and a shift of moving from the action of ‘to understand’ to ‘to express’. The thinking dimension introduces the students to grounded, analogizing and Feynman technique, in the hope of students’ improvement in terms of existing cognitive linguistic abilities

of structural mapping and logical language organization as well as foster students' metacognitive awareness and actively builds their knowledge of language. For the emotion dimension, the instruction's goals are to emphasize on the learning pertained to motivational learning and emotional regulation. Using tasks such as role-played explanations and providing learners with self-explanations of their output aims to promote self-efficacy in participation within the classroom, which informs orientation, engagement, and positive attitude towards general learning and language learning in their cluster pathway.

Integration of Instructional Content and Task Design

The study has been designed to be very much based on the content and task design of the key topics in the primary English school textbooks around introducing one's self, daily routines, and the weather, and identifies analogy-based tasks that are cognitively demanding and engaging approaches to learning English. In choosing text materials, priority has been given to those which have clear language structures and typical grammatical patterns, which help students, deconstruct the language and will help them notice rules. The unit involves a three-part approach of 'Analogy generation – structural analysis – retell with some refinement'. This approach helps students to notice structural features from a familiar context and to map these onto a new context to engage in analogy. By using oral explanation and repeated retelling, internalizing knowledge about the language. The instructional tasks tend to be set up like games. Examples of the similarities may include, "I Am a Little Teacher," where students are explainers and try to teach others; "Vocabulary Matching," which enable students to classes words meanings by analogy; and "Grammar Detective," which allows students to look for hidden structure and logical rules in the language. These tasks are important in helping motivate and engage the student with language while also creating the cognitive processing of the language.

Teaching Steps and Activity Arrangement

Step 1 Warm-up

During the warm-up stage, the instructional design focuses on activating the students' existing knowledge and cognitive connections through multimodal information, in order to create a reference point from which the students can use their analogical reasoning. The teacher can use a combination of images, videos, real objects, or role-play to create contextual scenarios that students can relate to in

their daily lives and connect to. For example, using a simple image of people doing family activities would help students jog their memories on ways to express daily routines which gives a reference point for the introduction of the simple present. From this the teacher can formulate analogy-oriented questions such as “Is your morning like this picture?” or “Can you talk about yourself using ‘always’ and ‘sometimes’?”. This will help students create connections to the target language from their familiar domain. Such introductory exercises, which utilize images alongside contextual cues, facilitate the bridging of transitional gaps, stimulate students’ prior knowledge, and establish perceptual as well as cognitive foundations that support subsequent analogical transfer together with Feynman-style explanations of language structures.

Step 2 Input

During the input phase, the teacher is both a coach and a model, helping students notice language forms embedded in real language contexts (known as authentic contexts) and create schematic representations of grammar and vocabulary. The input phase helps students to draw patterns from language source texts and internalize them through comparison, classification, and analogy. In an example of a distinction between the simple present tense and the present continuous tense, the teacher points out two contextualized sentences: “She eats breakfast at 7:00 a.m.” and “She is eating breakfast now.” The students are able to notice features such as verb change, time adverbs and states of action, and map the forms and meaning used in the two tenses through use of diagram structures. The teacher could also help students to use color highlighting, arrows and word walls to shift from abstract grammar rules into visual cognitive structures by showcasing visual representation and mapping sequences congruent to learning new language and building stable language schemata.

Step 3 Processing

The processing phase of the instructional design guides the students through group work and using the Feynman technique to explain and reconstruct some of the language points they have learned. In doing so, they extend their understanding and develop their capacity to express their understanding. Each group focused on a particular grammatical structure, or vocabulary topic (such as the conjunction “because”, or the simple present tense, 3rd person singular). The exercise encourages

students to attempt to explain the meaning and usage of the target item to their group members- all using the simplest language. As they are explaining to their peers, the students are encouraged to recognize gaps in their knowing and utilize the group to revise and supplement their explanation through group discussion, peers' questions and teacher prompts. This represents a potential reorganization and refinement of knowledge. The activity also supports the students in strengthening their generation and use of grammar structures during actual communicatively; while developing fluency in logical language expression and confidence - it helps with metacognitive regulation. The collaborative nature of the Feynman explanations also builds a positive learning community where students are developing a deeper knowledge of language knowledge through listening and providing feedback to each other.

Step 4 Reflection

In the reflection stage, the emphasis is on examining and developing students' first output with respect to explanations. Classmates' evaluations, as well as teacher evaluations, will help students reflect on and refine planning language production at a metacognitive level. Evaluation instruments can be as simple as a rubric or oral feedback, e.g., "Was the explanation clear?" or "Did they use an appropriate example", supporting students to look at logic, accuracy, and delivery areas. The teacher will follow questions, re-statements, or additional examples to help students adjust or identify the gap between understanding and language coherence. Students will have to reorganize into a "re-presentation" sequence to re-present their explanation with further consideration, which constitutes a second length of output that will deepen their processing and strengthen knowledge construction. With the repetitive occurrences of output and revision, students will be solidifying their language knowledge and will experience "adjustment from the ability to use" to "explain", which represents improvement in understanding and performative ability.

Step 5 Transfer

The instructional aim in the transfer stage has to do with leading students to apply the learned language structures fluently in authentic contexts and demonstrate integrated tasks with a communicative purpose. In this stage of learning, the emphasis is on activating and transferring knowledge to students, which is accomplished through the processes of changing grammatical structures as well

as vocabulary or any other linguistic resources learned through use of analogical reasoning and explaining like Feynman, etc. Turning the language into output that has a clear communicative purpose. These can involve more rigorous, topic-based short writing tasks like describing a daily routine or writing a script for a weather forecast or even delivering role-played oral dialogues such as conversations in a supermarket or making a phone call to invite a friend, where students can use target sentence patterns in context. These transfer tasks also reinforce social/scenario awareness and the use of communication strategies to help learners move from closed knowledge into open expression. Transfer tasks also allow students the real and specific context to observe students' overall language performance and also facilitates an effective transition from classroom practice to practical real-world use.

Results

Instructional Assessment and Feedback

Formative Assessment

The stage of formative assessment involves ongoing documentation and observation to assess each student's performance through the processes of analogy generation and explanation. In assessing performance in analogy generation and explanation, the emphasis is placed not just on whether students can accurately identify analogical relationships or articulate certain language structures or constructs clearly, but it also relies on assessing their logical organization, clarity of explanation, and engagement and collaboration with other peers. A structured observation form needs indicators to assess abilities such as making effective analogies and using clear language and responding to peer questions. The records deliver instant classroom feedback which allows teachers to create personalized learning strategies for their students.

Self-Assessment and Peer Assessment

The learning process includes self-assessment and peer assessment to help students develop their ability to understand their thinking and their ability to reflect on their learning. Students need to check their work by using the teacher's evaluation checklist. This list of self-assessment items contains questions about the clarity of grammar explanations and the effectiveness of examples, personal explanations, and answers to peer questions. The assessment needs to check if the explanation is

easy to understand, if it includes helpful examples, and if it improves the student's understanding of the subject. Students need to give each other meaningful feedback through these activities.

Task-Based Assessment

In task-based assessment, the main goal is to evaluate students by having them perform real-world language tasks which assess their integrated abilities. The teacher may create a “language structure explanation task” that asks students to pick a grammar point from their learning (like simple present tense or connectives) and explain it orally as a “little teacher” while maintaining accuracy and logical clarity and using proper examples. Students need to retell Little Red Riding Hood through the “metaphor-based story retelling task” by using fresh language while they create analogies which link story elements to real-world people and situations to prove their understanding of grammar and meaning connections.

Periodic Assessment

The teacher keeps track of student development through regular assessments which focus on language transfer and retelling abilities and grammatical knowledge. The assessments happen after students finish their unit work or learning activities. They include different exercises like structure transformation (such as changing simple present sentences into present continuous forms), grammar gap-filling, sentence reorganization, short oral retelling, and written expression based on learned language points. Students must demonstrate their ability to apply learned structures in new situations by showing their understanding of language rules and their ability to restate essential concepts in their own words. The teacher analyzes assessment results to discover student cognitive and language production weaknesses which leads to adapting teaching methods and creating customized support plans. The assessment methods focus on both teaching and learning processes which help students develop their language knowledge step by step from understanding to application and transfer skills.

Challenges and Practical Limitations

Despite the encouraging results, a number of inherent limitations need to be taken into account. The implementation process of the proposed model may be affected by a number of contextual issues, including the class size, the teachers'

readiness to embrace innovative teaching approaches, and the number of lessons embedded in the primary curriculum of the respective ESL schools. Such matters may have an impact on how deeply and how well the analogical reasoning approach, as well as the Feynman approach, will be applied in the classroom scenario. Additionally, given that this study marks the commencement of the exploration, future studies will require validating the proposed model by exploring a broader population.

Conclusion

This research examines the combined use of analogical reasoning and the Feynman technique in English instruction in primary education and gives a summary of the main findings that resulted from the study. The findings indicate that the pairing of the two approaches supports students in achieving sophisticated understanding of concepts, enhances their ability to map structures, and allows them to use language output to engage in active explanation and reflection. This work makes an important contribution to the theorizing and research on cognitively driven language instruction by offering a systematic instructional model which is driven by the shared reasoning and explaining mechanisms in both approaches. The theoretical model we offered is evidence-based that justifies the complementary, yet distinct roles analogical reasoning and the Feynman technique played in student learning. Where the analogical reasoning and reasoning acts to allow students to develop conceptual links between something they already know and something new, the Feynman technique acts to strengthen students understanding by reasoning about the new learning through a simplified and peer-regulated process of explaining. Together they form a dynamic cycle of acts that support student development of understanding, expression and reflective action in their learning. Future research may want to conduct longitudinal studies to help examine the lingering effects of the integrated model, examine the application of the model in other cultural contexts, and refine the scaffolding support for low proficiency students.

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