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Flipped learning in Spanish as a foreign language: effects of instructional design on speaking interaction skills

Sofía Sooyeon Choi^{1*}, Cristina Herrero-Fernández² and Ocarina Masid Blanco²

*Correspondence: choi_sooyeon@moe.edu.sq

MOE Language Centre, Singapore, Singapore Departamento de Lenguas Aplicadas, Universidad Antonio de Nebrija, Madrid, Spain

Abstract

This study explores the potential of a pedagogical model based on Flipped Learning (FL) to support the development of speaking interaction skills in Spanish as a foreign language (SFL). A preliminary instructional framework grounded in FL principles was designed specifically for A2-level SFL learners, and its implementation was examined through a pre-experimental quantitative research approach. The study involved 20 Singaporean students enrolled in an A2-level SFL course who participated in an 11-week intervention using FL methodologies. Data collection included pre- and posttests focused on the speaking interaction component of the DELE (Diploma de Español como Lengua Extranjera) A2 exam. To address the research question—whether students' speaking interaction skills showed measurable changes after applying the FL model—the Wilcoxon signed-rank test was employed. Results indicated improved speaking interaction skills, with mean scores increasing from 2.400 (SD = 1.536) in the pretest to 3.600 (SD = 1.465) in the posttest. Improvements were also observed in linguistic skills and task completion. While these findings are preliminary, they suggest that the FL model shows promise as a structured and interactive approach to enhancing speaking interaction skills in non-immersive SFL learning contexts. This study offers insights that may inform future pedagogical approaches for foreign language teachers aiming to foster speaking interaction skills in similar settings.

Keywords: Flipped learning, SFL, Speaking interaction, Instructional design, Spanish

Introduction

Foreign language education in non-immersive contexts presents unique challenges, particularly in fostering speaking skills, which are widely recognized as one of the most complex and demanding aspects of language acquisition (Aburezeq, 2020; Al-Grani & Almuhammadi, 2019; Almanza et al., 2019; Andini et al., 2020; Choi, 2018; Falero, 2016; Hachimi, 2023; Lara-Velarde et al., 2022; Oviedo-Guado & Mena-Mayorga, 2021; Santhanasamy & Yunus, 2022a, 2022b; Vélez Yanza & Paredes Rodríguez, 2021). Despite its importance, foreign language classrooms in non-immersive settings often prioritize test preparation over tasks designed to engage students in meaningful, real-world communication (Lee & Liu, 2021). Moreover, many of these classrooms



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lack activities emphasizing genuine communicative value, restricting opportunities for students to develop practical speaking skills (Ironsi, 2023). This gap highlights the critical need for innovative teaching strategies that support the active development of speaking skills through systematic, communicative, and learner-centered approaches (Doughty, 2000; García-García, 2007; Lara-Velarde et al., 2022).

In non-immersive learning environments, where real-time opportunities for language practice are limited, classroom activities that foster speaking interaction skills become essential for language proficiency (Bachelor, 2017; Chantaraphat & Jaturapitakkul, 2023; García-García, 2007; Manogaran & Sulaiman, 2022; Zhang, 2009). Addressing the challenges of these settings has been a central focus in foreign language education (Hein et al., 2021), with particular emphasis on improving students' speaking skills. Research underscores the need for instructional tools and strategies tailored to this goal (Choi, 2018; Falero, 2016; Santhanasamy & Yunus, 2022a, 2022b). Among various pedagogical approaches, Flipped Learning (FL) has emerged as a promising approach to meet these challenges by leveraging technology and fostering active learner engagement. By reversing traditional classroom dynamics, FL enables students to actively participate in their learning, facilitating deeper comprehension and effective peer collaboration (Abdullah et al., 2019; Santhanasamy & Yunus, 2022b).

While English as a Foreign Language (EFL) has been the most extensively studied domain in foreign language (L2) education concerning FL (Heredia-Ponce et al., 2022), research on its application to other languages, such as Spanish as a Foreign Language (SFL), is notably scarce. Moreover, although there is a tendency to develop communicative skills, research is limited to the teaching and learning of grammar, and lack of other linguistic skills, particularly concerning speaking skills (Sönmez, 2020). Existing studies on FL's impact in SFL, particularly concerning speaking skills offer fragmented insights and fail to provide a complete understanding of its impact (Choi, 2018; Cintas, 2024). Moreover, implementing FL in K-12 education, even in the relatively well-researched context of EFL classrooms, has received minimal attention, underscoring the need for further investigation in this area (Linling & Abdullah, 2023). These research gaps highlight the necessity of exploring FL model that can effectively enhance speaking skills among secondary-level students in SFL, particularly within non-immersive educational contexts.

This study, therefore, aims to validate a didactic proposal based on the FL model to develop speaking interaction skills among secondary school students learning SFL in non-immersive contexts. To achieve this objective, a systematic, FL-based instructional approach was specifically designed to address the challenges of fostering speaking interaction skills in SFL classrooms. The research outlines the proposed FL model, its theoretical foundation, and its practical application, providing a comprehensive framework for implementing the model in real-world educational settings.

The findings offer valuable insights into how the FL model can be adapted for non-immersive language learning environments, presenting a structured and replicable teaching strategy for educators seeking to enhance students' oral interaction skills. Additionally, this study contributes to filling the existing research gap by providing empirical evidence of the potential benefits of FL in the context of SFL education.

While the focus of this study is on SFL, the proposed FL model offers a replicable framework adaptable to other languages and educational settings, particularly those with similar constraints.

Literature review

Speaking interaction skills

Speaking interaction skills is the communicative process through which individuals share information across various settings (Meiranti et al., 2022). Throughout this process, students actively participate in discussions and share their views and insights on topics discussed in class, thereby naturally refining and adjusting their expressive abilities. Moreover, student interactions can foster autonomy in their learning processes (Torky, 2016). Through these interactions, students independently manage their participation, choose the appropriate tools, and construct meaning within the conversation collaboratively. These interactions provide opportunities to demonstrate their interactional skills, such as initiating a turn or introducing a topic (Acosta-Ortega & López, 2022).

The place in which interactions occur is critical, as John and Yunus (2021) emphasize that fostering a supportive environment is fundamental to encouraging active student engagement. This environment, identified as the Zone of Proximal Development (ZPD) (Vygotsky, 1978), is instrumental in facilitating cognitive development by enabling students to reconstruct their knowledge through peer interactions. This collaborative learning approach where the students' speaking interactions take place effectively, narrows the knowledge gaps among students (Herazo Rivera, 2010). The ZPDs are created by fostering an environment that encourages peer interactions. In this study, small group discussions and collaborative group mini activities help establish ZPDs, enabling students to develop their speaking interaction skills by working within their abilities while receiving support from peers and teachers.

Despite the recognized benefits of speaking skills in foreign language learning, numerous studies have highlighted that students often find these skills more challenging than other linguistic abilities such as reading, writing, or listening (AlKhoudary & AlKhoudary, 2019; Dasa et al., 2021; Davila-Romero & Kirchhoff, 2021; Santhanasamy & Yunus, 2022a, 2022b; Sarasyifa, 2018; Timpe-Laughlin et al., 2020). This difficulty is attributed primarily to insufficient opportunities for comprehensible input and output production. Owing to time constraints and the absence of an immersive context, foreign language lessons frequently prioritize comprehension skills over production abilities (García, 2010, as cited in Brazales, 2021; Guado & Mayorga, 2021). Historically, the teaching of speaking skills has not been a focal point within our foreign language learning systems, which may contribute to the observed deficiencies in learning practices (García-Sampedro et al., 2018). Furthermore, the critical role of speaking skills in enabling effective conversation and addressing the demands of the twenty-first century necessitates a reassessment of whether our foreign language classes are sufficiently developing students' communicative competence and integrating all linguistic skills effectively.

It has become clear that there is a need to revise and reevaluate the structure of foreign language lessons and teaching methods, particularly in enhancing the didactic elements associated with speaking interaction skills. Such revisions are essential for facilitating a more balanced development of all linguistic skills. Numerous studies have introduced various models for speaking interaction activities. Barroso-García(2000) suggested 9 types of activities to develop speaking interaction skills. Pinilla (2010) demonstrated 7 types of speaking interaction activities, mentioning the importance of the learning context. Herazo Rivera (2010) analyzed learning activities to examine which activities can be called authentic oral communication in English as a foreign language classroom. Sufficient and comprehensible input and output are needed to complete activities such as debates, negotiations, and conversations.

Davila-Romero and Kirchhoff (2021) stated three steps to create a learning environment to develop speaking interaction skills: previous input where a topic and linguistic concept is introduced, teacher intervention and introduction through the materials, and students' interactions in groups or pairs where students can obtain chances to practice their knowledge with peers. Based on this teaching approach, a lesson that provides students with sufficient and comprehensible input and output opportunities can be designed to create communicative-oriented environments where speaking interaction skills can be developed.

Flipped learning

Flipped Leaning (FL) is an innovative pedagogical approach that allows students to acquire knowledge through teacher-provided materials delivered via information and communication technology (ICT) tools before attending class. This individualized preclass phase enables learners to engage with content at their own pace, preparing them for active, student-centered activities in the physical classroom. These in-class activities prioritize communicative dynamics, collaborative learning, and active engagement, aligning with constructivist learning principles (Calvillo-Castro, 2014; Lundin et al., 2020). FL fosters an interactive and meaningful learning environment that supports cognitive development by integrating pre-class preparation with in-class collaboration.

The theoretical foundations of FL highlight its ability to reduce cognitive load and facilitate higher-order cognitive skills (HOTS). Pre-class preparation, guided by Bloom's Taxonomy (1956) and its revisions by Anderson and Krathwohl (2001), enables students to focus on foundational cognitive tasks such as remembering and understanding before class, while reserving classroom time for advanced cognitive processes, such as applying, analyzing, evaluating, and creating (Abeyesekera & Dawson, 2015; Brewer & Movahedazarhouligh, 2018). Furthermore, Carroll's Model of School Learning (1963) highlights the importance of aligning instructional strategies with individual learning paces, while Bloom's Mastery Learning Theory underscores the need for frameworks that ensure all students achieve mastery before progressing to complex tasks.

This dual focus on individualized pre-class learning and collaborative in-class activities aligns with constructivist principles, promoting meaningful engagement and facilitating the development of HOTS (Brewer & Movahedazarhouligh, 2018; Abeyesekera & Dawson, 2015; Mendaña-Cuervo & López-González, 2021; Riza & Setyarini, 2020). However, traditional foreign language instruction often prioritizes lower-order cognitive tasks, such as remembering and understanding, during class time, limiting students'

opportunities to engage in complex and communicative tasks. This limitation is particularly evident in oral communication, which is one of the most challenging skills to develop in foreign language acquisition.

Empirical research shows FL improves learning outcomes across disciplines (Brown et al., 2022; Campillo-Ferrer & Miralles-Martínez, 2021; Lee & Choi, 2019; Lee et al., 2018; Shih & Tsai, 2020), including speaking skills in foreign language education (Aburezeq, 2020; Sönmez, 2020). For instance, AlKhoudary and AlKhoudary (2019) found that FL significantly improved speaking skills in EFL, based on pre- and posttests and questionnaires. Recorded materials, a core component of FL, were found to play a key role in improving students' fluency and confidence in oral communication. Similarly, Fischer and Yang (2022) and Lin and Hwang (2018) reported that FL promotes active engagement and facilitates the development of communicative competence in EFL learners.

Despite the wealth of research in EFL, studies focusing on its application in other languages remain limited (Heredia-Ponce et al., 2022), particularly regarding its impact on developing speaking skills in non-immersive contexts and for secondary school learners (Linling & Abdullah, 2023; Sönmez, 2020). This gap in the literature underscores the need for further exploration of FL's potential to address the unique challenges of teaching speaking interaction in such foreign language learning environments. Moreover, current studies on FL's impact in SFL, particularly concerning speaking skills, provide only partial insights and lack a comprehensive understanding (Choi, 2018; Cintas, 2024). Addressing this gap, research on FL within the context of SFL can offer valuable perspectives on adapting FL to accommodate linguistic, cultural, and pedagogical differences, thereby enriching its applicability across diverse settings.

Given these insights, this study evaluates the effectiveness of a proposed instructional model grounded in FL principles to enhance speaking interaction skills among secondary school students learning SFL in non-immersive context. By addressing both cognitive and pedagogical challenges, the proposed model aims to create a more personalized, interactive, and effective learning environment, enabling students to progress toward mastering HOTS in foreign language education.

Methodology

The study employed a pre-experimental design with a pretest/posttest design with a single experimental group to assess the impact of an experimental didactic treatment (Doquin de Saint Preux, 2024), based on the FL model, on improving speaking interaction skills among secondary school SFL students.

According to Larsen-Freeman and Long (1991), a pre-experiment is suitable for testing the effectiveness of an experimental instructional treatment in the teaching of a foreign language due to its exploratory nature and flexibility in real educational contexts. This type of design allows for a preliminary evaluation of whether a teaching intervention has the potential to produce positive results, even when the necessary conditions for conducting a more rigorous controlled experiment, such as random participant assignment or the inclusion of a control group, are not present. Moreover, in language acquisition, pre-experiments provide an initial approach to identifying trends and refining future

studies. Their value lies in generating preliminary data that can guide the improvement of the treatment and support the development of more sophisticated experimental designs.

Setting and participants

The sample size was calculated using GPower for a Wilcoxon signed-rank test (paired samples). With a significance level of 0.05 and a statistical power of 0.80, it was determined that, to detect a medium effect size (r=0.3), a minimum of 20 participants is required. Thus, the study was conducted over one trimester (11 weeks) with 20 secondary 2 Singaporean students (n=20; girls=12; boys=8), each possessing an A1.1 level of Spanish according to the Common European Framework of Reference for Languages (CEFR). All participants had studied Spanish at the same Ministry of Education Language Centre for one year. These students were admitted to the Language Centre based on their academic results and were learning Spanish as their foreign language in addition to English and their mother tongue. Students were selected using non-probabilistic convenience sampling, allowing us to work with pre-formed, intact class groups (Doquin de Saint Preux, 2024). They were from the same class, which allowed researchers to manage the course curriculum flexibly and assign homework easily through a designated platform. All the participants had no previous experience with the FL model, and the foreign language class was conducted based on traditional teaching methods. The Human Research Ethics Committee at the Singaporean Ministry of Education approved the recruitment, consent, and study participation procedures. The parental and guardian consent forms were collected prior to the commencement of the study.

All the students were required to complete the online class component before attending school. They were provided access to the Student Learning System (SLS) platform, where they could watch instructional videos and complete relevant exercises. None of the participants had access problems, since all of them had the resources and material means to follow the class online.

Description of the didactic intervention

To ensure sufficient and comprehensible input and output for developing speaking interaction skills, adopting innovative teaching methods has become increasingly essential (AlKhoudary & AlKhoudary, 2019; Fiestas et al., 2022). Among these methods, FL has been widely explored in numerous studies. However, as Jiang et al. (2020) highlight, while FL's effectiveness in language classrooms is well-documented, the specific implementation techniques remain underexplored. Key challenges include determining content division between online and offline sessions and effectively integrating language teaching theories and strategies within the FL framework.

This study aimed to design a FL model employing the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) framework. This approach integrates relevant theoretical foundations from both ADDIE and FL strategies to facilitate teachers' understanding of the FL implementation process in their lessons. A panel of six experts, current SFL teachers in a non-immersive context, validated the didactic proposal. These experts, all familiar with FL and experienced in its application, ensured the model's

relevance. The validation followed the guidelines of Escobar-Pérez and Cuervo-Martínez (2008).

Each lesson was divided into two learning segments: online and offline sessions. At the beginning of the online session, the students engaged with authentic video or audio examples of the lesson content. Following this, they completed comprehensive questions on the topics, having already been introduced to new grammar or expressions implicitly. The students then accessed a separate video featuring a detailed explanation by the teacher. The learning objectives were clearly stated in an approximately 15-min instructional video designed via direct instructional methods. The students subsequently completed related exercises to assess their understanding of the new content. According to Hew and Lo (2018), verification quizzes testing learners' comprehension of pre-class content significantly enhances the efficacy of FL. These quizzes, followed by the instructional videos, serve to evaluate and reinforce students' understanding.

This online class effectively optimized learning time by systematically introducing new concepts and ensuring that the quality and depth of the teacher's initial explanations were strongly correlated with student learning outcomes (Joyce et al., 2015). Through an experiential learning approach, students interacted with authentic video and audio materials under teacher guidance, which further enhanced their comprehension and retention. Aligned with the three steps proposed by Davila-Romero and Kirchhoff (2021)—preparation, skill development, and collaboration—the online session successfully addressed the first two stages, preparing students to engage effectively in the final phase of collaborative group interactions. Unlike traditional classrooms that often focus on the lower levels of Bloom's Taxonomy during class time, the FL model allowed students to independently achieve foundational understanding online, thereby enabling deeper engagement in higher-order learning activities during in-person sessions.

After the online session, students participated in collaborative learning activities in the physical classroom, structured to complete speaking tasks. These activities were closely aligned with the online session, reflecting the findings of Lee and Choi (2019). Research by Santhanasamy and Yunus (2022b) highlighted students' positive responses to FL-based classroom activities, supporting this integration. This approach facilitated the development of HOTS through peer interaction, demonstrating the importance of the ZPD—where students construct knowledge and connect it to their prior learning—in FL. Through online knowledge construction, students are effectively prepared to work together and accomplish their speaking objectives during offline sessions.

As shown in Fig. 1, the offline class began with small group discussions where students shared their understanding in small groups and clarified any questions or doubts with the teacher and their peers, supporting the development of procedural fluency (Brewer & Movahedazarhouligh, 2018). This is the place where the ZPD occurs the most when students actively share their understanding and build together with teammates the common knowledge. The session proceeded to group mini activities that gradually expanded students' knowledge on the topic, incorporating comprehensive tasks and tasks focused on grammar or expression. During these activities, the students reflected on their learning, aligning with the "Applying and Analyzing" phases of Bloom's Taxonomy. The final part of the class involved a group speaking task, where students engaged in activities such as creating dialogues, debating, and expressing opinions on given topics (Aburezeq,

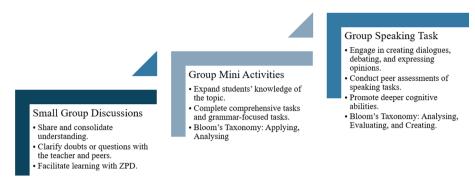


Fig. 1 HOTS steps for offline class activities

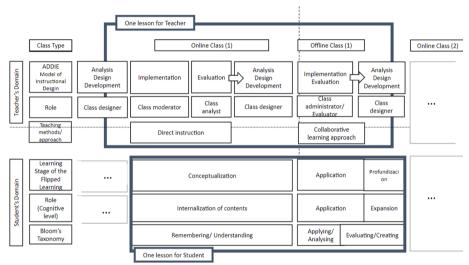


Fig. 2 Overview of the teacher and student's domains in the proposed flipped learning model

2020). This format not only allows students to assess each other's speaking tasks but also promotes deeper cognitive abilities.

Figure 2 provides a comprehensive depiction of the FL model implemented in this study, illustrating its operational principles as discussed earlier. This model, grounded in the ADDIE framework, systematically organizes the learning process to enhance speaking interaction skills and facilitate the development of HOTS in foreign language education. It elaborates the roles and expected activities of both teachers and students, offering a clear roadmap for effective implementation.

As shown in Fig. 2, students engage in a learning process through the FL model that allows sufficient time and opportunities for conceptualizing the content, applying their knowledge, and deepening their understanding through repeated practice. This approach ensures a balanced integration of the six levels of Bloom's Taxonomy, promoting comprehensive learning activities. Concurrently, teachers prepare, deliver, and evaluate the lessons following the ADDIE instructional framework. Each FL session involves the application of the ADDIE model twice, with the process centered on teacher-led activities. This iterative approach allows for interim assessments and

adjustments to teaching strategies based on students' comprehension and engagement during the online sessions.

In the online class, concise and efficient delivery of content is achieved through direct instruction, typically lasting about 15 min. This ensures clarity and maximizes learning outcomes. In contrast, the subsequent offline class adopts a collaborative learning approach, enabling students to actively engage with peers and apply the concepts learned during the online session. This dual-phase instructional strategy highlights the effectiveness of the FL model in fostering both individual understanding and collaborative skill development.

Data collection

Data were collected through pretest and posttest assessments via the DELE A2 Exam, speaking interaction exam part. The DELE (Diploma de Español como Lengua Extranjera) is an official examination by the Instituto Cervantes recognized globally for certifying Spanish proficiency. It offers six exams corresponding to each CEFR level (A1-C2) and assesses all four language skills. We selected these tests for their established validity and their annual administration to thousands of participants. For this study, we have chosen the A2 level speaking interaction test that requires students to engage in a dialogue within an imaginary situation, communicating with the examiner about a given scenario for 2-3 min. All the topics were derived from the Singaporean foreign language curriculum. In this study, "Shopping" and "Traveling" were selected as topics for the pre and posttest. To ensure a validated assessment of students' speaking abilities, the DELE A2 exam speaking rubric was employed. This rubric consists of two categories: linguistic skills, which focus on grammar control and expression abilities, and task completion, which focuses on communicative content skills. The total score is 6 points. All students participated in a one-on-one speaking test with the examiner in a separate classroom. Following the initial evaluation, the test results, accompanied by the recorded audio files, underwent a secondary assessment by additional evaluators to provide both holistic and analytical insights. The evaluators are currently working at the same language center but do not teach the participants of this research. They completed the DELE A1/A2 examiner accreditation course and had experience as a DELE A1/A2 level speaking test examiner. A pretest was administered at the beginning of the first trimester, followed by the posttest after 11 weeks.

Data analysis

For data analysis, the results of the students' speaking interaction skills from the pretest and posttest were statistically examined via a paired sample t-test. As explained in the analysis of the results, the sample analyzed does not have a normal distribution. Therefore, nonparametric statistical tests, such as the Wilcoxon signed-rank test with JASP version 0.18.3, were performed. The selection of the Wilcoxon test for this analysis is based on its robustness to non-normal data and its ability to handle outliers, making it particularly suitable for evaluating pretests and posttests. Unlike data transformations, which can distort the nature of the data and complicate interpretation, the Wilcoxon test preserves the original structure by using ranks, ensuring clear and easily interpretable results. Transforming oral interaction scores can also skew relative differences between

students, especially when initial values vary widely. By relying on ranks rather than absolute values, the Wilcoxon test allows for the evaluation of changes without altering the original data or introducing potential biases from inappropriate transformations. Furthermore, this type of data often contains outliers due to individual variability or assessment errors. Parametric tests and transformation-based approaches are typically sensitive to such values, whereas the Wilcoxon test's rank-based method is more robust. In educational and linguistic research, this test is widely accepted in similar studies, supporting its methodological consistency, its suitability for this type of analysis, and its ability to communicate practical results clearly and effectively.

The analysis was initially conducted on the total score of the tests, followed by a focus on two sections: linguistic skills and task completion. This separation allowed for a detailed analysis of which aspect was more influenced by the FL model.

Results

Total marks from the pre- and posttests

The statistical analysis revealed a notable improvement in their posttest scores compared with their pretest scores. Specifically, as Table 1 illustrates, there was a significant increase in the mean scores from the pretest (M=2.400, SD=1.536) to the posttest (M=3.600, SD=1.465). This finding suggests that the students' speaking interaction skills improved following implementing the FL model in classes.

Since the Shapiro Wilk test results indicated non-normality for the pretest total scores (W = 0.900, p < 0.05) and normality for the posttest total scores (W = 0.921, p > 0.05), the Wilcoxon signed-rank test was conducted to address the following research question: Is there a statistically significant difference in the speaking interaction skills of secondary school students in the SFL before and after the application of the proposed FL model? In other words, does the proposed FL model influence the development of the speaking interaction skills of secondary school students in the SFL?

A comparison of the total scores from the pretest and posttest revealed a statistically significant improvement in the students' speaking interaction skills scores (W=12.000, z=-3.053, p<0.001). The effect size, calculated as r=0.683, indicates a large effect. Additionally, the strong inverse rank-biserial correlation (rrb=-0.843) further supports that higher posttest scores are associated with lower pretest scores. These findings provide evidence of the positive impact of the FL model on enhancing students' speaking skills.

Marks from the two sections of the pre- and posttests

To determine which aspect of speaking interaction skills was most influenced by the FL model, we conducted a separate analysis of two sections: linguistic skills and task

Table 1 Mean scores of total marks from the pre- and posttests

	Mean	SD	Shapiro-Wilk	<i>P</i> value of Shapiro– Wilk
PreTest: Total	2.400	1.536	0.900	0.041
PostTest: Total	3.600	1.465	0.921	0.104

Table 2	Moan scores	of linquistic d	kills and tack	completion t	from the pro-	and posttests
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	Mean	SD	Shapiro-Wilk	<i>P</i> value of Shapiro– Wilk
Descriptive statistics				
PreTest: Uso de la lengua	1.100	0.788	0.809	0.001
PostTest: Uso de la lengua	1.925	0.783	0.884	0.021
PreTest: Cumplimiento de la tarea	1.300	0.801	0.870	0.012
PostTest: Cumplimiento de la tarea	2.125	0.887	0.844	0.004

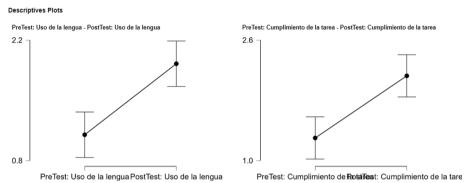


Fig. 3 Improvement in two sections of speaking interaction skills

completion. These sections were evaluated as "uso de la lengua" and "cumplimiento de la tarea", respectively.

Table 2 shows significant improvements in both linguistic skills and task completion following the implementation of the FL model. The mean scores for linguistic skills increased from 1.100 (SD=0.788) in the pretest to 1.925 (SD=0.783) in the posttest. Similarly, the mean scores for task completion increased from 1.300 (SD=0.801) in the pretest to 2.125 (SD=0.887) in the posttest. These findings highlight the positive impact of the FL model on students' linguistic skills and task completion abilities in speaking interaction skills.

The Shapiro–Wilk test results indicated significant deviations from normality for both the pre- and posttests scores in both categories (p < 0.05), and the Wilcoxon signed-rank test was conducted to analyze the differences. The results for linguistic skills indicate a significant improvement in students' scores following the implementation of the FL model (W = 6.000, z = -3.067, p < 0.001). The effect size, calculated as r = 0.686, indicates a large effect. Additionally, the rank-biserial correlation (rrb = -0.900) suggests a strong inverse relationship between the pretest and posttest scores. Similarly, the results for task completion also indicate a statistically significant difference (W = 5.000, z = -2.982, p = 0.001). The effect size (r = 0.667) represents a large effect, and the rank-biserial correlation (rrb = -0.905), highlights the substantial improvement in task completion skills. These findings confirm the positive impact of the FL model on enhancing students' linguistic skills and task completion abilities in speaking interaction skills.

As illustrated in Fig. 3, students' skills in both sections of the speaking exam improved significantly as a result of being taught via the FL model. Both sections experienced an

equal improvement of 0.825 in their mean scores. There were no significant differences in the degree of improvement between the two sections. These results imply the efficacy of the FL model in promoting significant enhancements in students' speaking interaction skills overall.

Discussion

The findings of this study underscore the potential of the proposed FL model to enhance speaking interaction skills, particularly in non-immersive foreign language learning environments. Improvements observed in linguistic proficiency and task performance suggest that FL can serve as an effective pedagogical approach to addressing challenges unique to these contexts.

The positive impact of FL on students' speaking skill development observed in this study aligns with prior research (Aburezeq, 2020; AlKhoudary & AlKhoudary, 2019; Fischer & Yang, 2022; Hsiao et al., 2021; Lee, 2023; Lin & Hwang, 2018). Key linguistic improvements, including vocabulary expansion, enhanced grammatical accuracy, and increased fluency, can be attributed to intensive online drills and the use of direct instructional methods during online sessions (Brown & Lee, 2015). Moreover, recorded resources, a fundamental component of the FL approach, offered opportunities for repetition and self-paced practice, which significantly contributed to students' proficiency gains (AlKhoudary & AlKhoudary, 2019; Lee, 2023). These findings are consistent with Carroll's Model of School Learning (1963), which underscores the importance of providing adequate time and resources for mastering new content.

Beyond linguistic achievements, the study also revealed positive effects on students' engagement in learning. The offline classes, which incorporated collaborative activities, fostered active participation and highlighted the FL approach's capacity to enhance the affective dimensions of learning, as supported by previous studies (Abeyesekera & Dawson, 2015; Campillo-Ferrer & Miralles-Martínez, 2021; Chen, 2021; Hsiao et al., 2021). The FL model served as a conducive environment for students to critically reflect on their ideas, reorganize their thoughts, and develop well-structured opinions, thereby promoting procedural fluency and sustained cognitive engagement.

A significant contribution of this research is its emphasis on the structural and methodological components of FL, using the ADDIE model as a guiding framework. Unlike prior studies, which often predominantly focused on the effectiveness of FL without delving into its structural components or instructional design strategies (Lee, 2023), this study presents a systematic FL model. This approach not only clarifies the roles of teachers and students but also provides practical insights into implementing FL in diverse classroom settings. By addressing instructional design, this study moves beyond simply assessing FL's effectiveness and offers a replicable framework for educators seeking to adopt innovative teaching practices.

The adaptability of the proposed FL model further enhances its practical implications. By tailoring the structure to learners' proficiency levels, the model can support a range of educational contexts. For example, scaffolded online activities can aid lower-proficiency students, while advanced learners may benefit from more autonomous and complex speaking tasks. However, challenges such as limited access to technology for students and insufficient teacher training present barriers to widespread implementation. These

issues highlight the need for professional development programs and low-tech adaptations to make FL more accessible across resource-constrained settings.

While these initial results are promising, it is important to acknowledge the limitations of this pilot study. The findings are based on a small-scale implementation, which may not fully capture the variability of student populations or learning contexts. Furthermore, the lack of a control group prevents direct comparisons with other teaching methods, which is necessary to determine the relative effectiveness of the FL model. Since a non-probabilistic sampling method and a pre-experimental design were used, the results should be interpreted as specific to the studied sample. While the sample size met the minimum required to detect medium effects, future studies could benefit from random sampling, controlled designs, and larger samples to detect smaller effects and enhance the generalizability of the findings. Additionally, future research should address these limitations by conducting larger-scale experimental studies with diverse student populations. Such studies should employ rigorous methodologies, including randomized controlled trials, to establish causal relationships and provide more conclusive evidence. Furthermore, longitudinal studies could explore the sustained impact of the FL model on speaking interaction skills over time.

Finally, this study opens pathways for future research. The FL model's application to other linguistic competencies, such as reading, listening, and writing, can offer opportunities for broader exploration. Moreover, it would be beneficial to investigate how specific elements of the FL model—such as the nature of pre-class materials and the design of in-class activities—contribute to the development of speaking interaction skills. Understanding these dynamics could help refine the model and maximize its potential benefits for students.

Conclusions

This study demonstrates the potential of the FL model as a valuable approach for developing students' speaking interaction skills, particularly in non-immersive education settings. By combining individualized pre-class preparation with collaborative in-class activities, the model appears to provide a supportive environment where students can actively practice and refine their speaking abilities. These findings validate FL's theoretical advantages, including learner autonomy, optimized classroom time, and personalized feedback opportunities.

Unlike prior studies that focus solely on FL's general effectiveness, this research offers a deeper examination of the structural and methodological components of the instructional framework, guided by the ADDIE model. This model provides a defined structure for planning, implementation, and evaluation, enhancing the study's replicability across various contexts. Furthermore, this study highlights speaking interaction skills, addressing one of the most underexplored areas in prior FL research. By incorporating targeted interaction activities rooted in collaborative learning principles and Vygotsky's ZPD, it offers a comprehensive framework that integrates both practical strategies and theoretical insights for improving oral communication instruction. Additionally, the study offers practical tools and strategies that can be adapted to various educational contexts, including the teaching of other languages. The validation of this instructional framework

within the context of SFL establishes a foundation for future research, paving the way for its application across different proficiency levels and educational settings.

Although the study employs a pre-experimental design without a control group, the inclusion of a pretest and posttest allows for the measurement of changes in participants' speaking interaction skills before and after the intervention, facilitating the evaluation of the direct impact of the FL model on students. The speaking interaction tests were based on the internationally recognized DELE A2 exam, validated by the Instituto Cervantes. This instrument provides a standardized evaluation rubric, ensuring consistent and objective criteria for assessing linguistic skills and task performance. To minimize potential biases in scoring, the oral tests were evaluated by two accredited examiners, independent of the research, who used the same rubrics. The test results were analyzed using the Wilcoxon test, a robust statistical method that does not assume normal data distribution, thereby enhancing reliability when working with small samples and potential outliers.

In conclusion, while the results of this pilot study suggest that the FL model has significant potential for fostering speaking interaction skills, further research is necessary to fully validate its effectiveness and adaptability in various educational contexts.

Abbreviations

ADDIE Analysis, design, development, implementation, and evaluation framework

CEFR Common European Framework of Reference for Languages

DELE Diploma de Español como Lengua Extranjera

FL Flipped learning

HOTS Higher-order cognitive skills

ICT Information and communication technology

L2 Second language

SFL Spanish as a foreign language SLS Student learning system platform ZPD Zone of proximal development

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Author contributions

SYC analyzed and interpreted the data and wrote the manuscript. CHF and OMB revised the manuscript and contributed methodological insights to the study design and materials. All authors read and approved the final manuscript.

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Availability of data and materials

There are the student's speaking pre- post test results and recording files. However, the datasets analysed during the current study are not publicly available due to the identity of the participants is to be never disclosed, but are available brief information from the corresponding author on reasonable request.

Declarations

Competing interests

The authors declare no competing interests.

Human ethics and consent to participate declarations

This study involving human participants was reviewed and approved by the Ethics Committee of Ministry of Education, Singapore (No. 63be41eff457810012724516). Written informed consent to participate in this study was provided by the participants and their legal guardian/parents.

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