Exploring the Long-Term Effect of the Flipped Learning Model in Primary English Classrooms

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Abstract

The flipped learning model has proven more effective in enhancing each aspect of language learning. However, a study is necessary to examine the long-term effects of the flipped learning model within primary educational contexts. To address this research gap, the present study examines the effectiveness of the flipped learning model in terms of long-term learning outcomes in English language teaching within primary education. In the study, 56 students participated. The participants were divided into two groups: flipped and non-flipped classrooms. The flipped classroom received treatment through the flipped learning model, and the non-flipped classroom received treatment through the conventional learning model. The data were collected four times using pre-test, post-test, mid-test, and delayed post-test. The study demonstrated that the flipped learning model was more effective than the conventional learning model in enhancing the retention of subject-specific knowledge over an extended period. Specifically, the findings showed that students improved their performance from the pre-assessment through the following assessments, including mid-tests and post-tests. The study highlights the effectiveness of the flipped learning model relative to conventional practices in fostering long-term knowledge retention, suggesting that its implementation could improve educational outcomes within primary programs.

Keywords: English diphthongs, ESL classrooms, flipped learning model (FLM), long-term retention, Primary English classroom

1. Introduction

The study aims to examine the impact of the flipped learning model (FLM) on long-term learning outcomes, specifically focusing on English as a Second Language (ESL) classrooms at the primary education level. It specifically compares these outcomes with those produced through the conventional learning model (CLM), focusing on differences in long-term retention and phonological mastery. This research focuses on the effectiveness of these instructional models in teaching English diphthongs to first-grade primary students, with an emphasis on understanding how these differing instructional models affect students' learning and retention over time. In recent years, learner-centered and technology-integrated approaches such as the Flipped Learning Model (FLM) have gained traction as alternatives to conventional teaching strategies, particularly in ESL education. The study is rooted in the broader shift in educational paradigms towards learner-centered instructional approaches, particularly with the integration of technology to enhance active learning (Bishop & Verleger, 2013; Lo & Hew, 2022; Alam et al., 2023). Flipped learning, as a transformative pedagogical model, redefines the traditional instructional framework by transferring direct instruction outside the classroom and fostering interactive, application-based learning within the classroom environment. However, while numerous studies have investigated the flipped classroom's effectiveness at higher education levels and in general English learning contexts, research on its application to early phonological instruction—such as teaching English diphthongs to young ESL learners—remains scarce.

Recent studies (e.g., Xue & Dunham, 2021; Khasanah & Anggoro, 2021; Dehghanpour et al., 2023; Zhang et al., 2016; Yang & Chen, 2019) highlighted the promise of flipped learning for enhancing English pronunciation. Xue and Dunham (2021) executed a pedagogical strategy known as the flipped classroom method for university-level students. This study resulted in significant enhancements in knowledge and pronunciation accuracy, as demonstrated by comparing pretest and posttest scores, with the former exhibiting a more pronounced improvement in knowledge mastery than pronunciation. In contrast, Khasanah & Anggoro's (2021) study documented marked improvement in students' pronunciation accuracy as evidenced by their higher scores on the post-test. Similarly, Dehghanpour et al. (2023) revealed that the flipped classroom approach produced superior efficiency in improving pronunciation in pre-intermediate EFL learners compared to the blended-learning approach and conventional learning environments. Furthermore, Zhang et al. (2016) found that first-year learners taking part in English pronunciation exercises through flipped classroom techniques experienced marked advancements in their pronunciation, as reflected in their post-test scores, when compared to peers who received standard instruction. Zhang (2018) implemented multiple flipped strategies and found substantial progress in pronunciation across groups, although teacher-specific factors

influenced effectiveness. The findings revealed substantial progress across all models, although the effectiveness varied. This variability emphasized the critical role of the educator's teaching strategies within the flipped classroom framework. Yang and Chen (2019) pointed out that in the flipped classroom setting, a substantial improvement was observed in the learning of English vowel sounds ('a', 'e', 'i', 'o', 'u') among primary English students. This improvement was effectively demonstrated through significant increases in average scores from the pretest to the post-test in the classes that adopted the flipped learning method. Specifically, in one class, the average pretest score was recorded at 8.77, which subsequently rose significantly to 13.98 in the post-test. Similarly, in another flipped classroom instance, the mean score increased from 11.02 to 17.26, thus indicating a considerable improvement in students' understanding of the lesson content.

More recent studies further highlight the growing interest in evaluating the long-term efficacy of flipped learning. For instance, Kanwal (2024) underscored the positive correlation between flipped learning and student autonomy in language learning, while Usama et al. (2024[1]) demonstrated that early exposure to flipped learning methods enhances students' metacognitive skills, critical for retention. Similarly, Alam et al. (2024) observed significant improvements in pronunciation accuracy and speaking fluency among young ESL learners utilizing mobile-assisted flipped learning techniques. However, most of these contributions focus on short-term effects and older learners, leaving a gap in early phonological instruction using FLM. A critical gap, therefore, remains: there is insufficient empirical evidence comparing the long-term effectiveness of FLM and CLM for teaching complex phonological structures, such as English diphthongs, to young ESL learners. Addressing this gap is critical for informing pedagogical practices tailored to young learners' phonological development. To the best of our knowledge, no study has systematically analysed the comparative long-term outcomes of these models for this specific context (Jiang et al., 2020; Vitta & Al-Hoorie, 2020; Turan & Akdag-Cimen, 2019).

Theoretically, this study extends the application of Cognitive Load Theory (Sweller, 2011) and Vygotsky's Interactive-Constructivist Theory (1978) to primary ESL phonological instruction. It explores how these instructional models affect cognitive processing, retention, and socially scaffolded learning of complex sounds, thereby offering implications for designing developmentally appropriate instruction. This contribution responds directly to the gap identified above and aligns with calls for research that connects theory with practice in early phonological learning contexts. Consequently, the study hypothesises that differences will exist between groups over time, providing robust empirical evidence for instructional designers and teachers working in primary ESL settings.

Accordingly, the study is guided by the following revised research objectives, refined for clarity and measurability: (1) Examine the impact of the flipped learning model (FLM) on the long-term learning and retention of English diphthongs among primary ESL students; (2) Compare the long-term phonological outcomes of FLM and CLM and provide empirical insights into how these models shape ESL learners' diphthong acquisition; (3) To measure learners' post-test performance across multiple time intervals to determine the sustainability of diphthong retention under FLM versus CLM conditions.The study accordingly addressed the significant question: Is there any evidence of a statistical variation in learning outcomes between students in FLM and CLM classrooms? How do FCM and CLM affect long-term learning outcomes in primary English classrooms?

2. Literature Review

2.1 Flipped Learning Model

The theoretical underpinning for this model can be linked to Vygotsky's (1978) Sociocultural Theory, emphasizing the importance of social interaction and scaffolding in cognitive development. In a flipped classroom, peer collaboration and teacher facilitation align with Vygotsky's notion of the "Zone of Proximal Development," where learners achieve higher cognitive functions through interactive guidance. Moreover, the Cognitive Load Theory (Sweller, 2011) supports FLM, suggesting that segmenting complex learning into manageable parts, such as through video lectures and in-class active learning, can reduce extraneous cognitive load and enhance knowledge retention.

FLM, recognized as an innovative teaching approach, has garnered significant attention from both researchers and educators, particularly within the context of teaching English as a second or foreign language, often abbreviated as L2 (see, for instance, Al-Shahri & Mudhsh, 2025; Mehring, 2016; Mohammed et al., 2025; Wang et al., 2018; Wanner & Palmer, 2015; Zou & Xie, 2019). In 2014, the Flipped Learning Network outlined that this approach contrasts with traditional classroom methods where lectures precede students' homework. FLM engages students in pre-class activities, such as watching instructional videos, before participating in classroom sessions (Keengwe et al., 2014; Reidsema et al., 2017; Rahman et al., 2025). The preparatory activities conducted prior to class enable learners to progress at a pace conducive to their individual learning styles, thereby alleviating anxiety and augmenting their preparedness for following in-class endeavours (Scheg, 2015; Mok, 2014). Consequently, instructional time is optimized for participation in activities that center around the students, fostering an environment where they can internalize and connect the knowledge acquired independently, delve into comprehensive investigations, and collaborate on a range of educational tasks (Chen et al., 2017; Gannod et al., 2008). This pedagogical transition significantly enriches the educational experience and promotes a more interactive and collaborative classroom atmosphere. In contrast, the traditional non-flipped classroom model primarily consists of educator-led presentations, which often restrict student involvement and proactive learning (Andrews et al., 2011). Such a framework tends to be predominantly passive, particularly within the context of Asian educational settings (Lee & Wallace, 2018). In contrast, FLM promotes active student participation by assigning pre-class activities and focusing on in-class problem-solving (Chuang et al., 2016; Milman, 2012), shifting the onus of learning to the students (Hao, 2016).

2.2 Advantages of Implementing The Flipped Learning Model

The FLM has garnered attention for its ability to enhance students' learning (Bond, 2020; Meyliana et al., 2021; Fisher et al., 2018; Yılmaz & Yılmaz, 2022; Huang et al., 2023; Deng & Gao, 2023; Gustian et al., 2023), perception and attitude (Ye, 2022). In comparison to traditional teaching methods (Vitta & Al-Hoorie, 2020; Turan, 2021), the FLM offers a more captivating learning experience (Scagnoli et al., 2017; Musib, 2014; De Grazia et al., 2012; Jensen, 2011), mainly when students are provided with video lectures instead of relying solely on textbook readings. Several studies have demonstrated that FLM students dedicate more time to class preparation (Zheng et al., 2019; Ölmefors & Scheffel, 2021; Larson & Linnell, 2023). However, it is necessary to confirm the quality (in the context of high resolutions) of the videos as they play a critical role in sustaining student interest (Mayer, 2009). Ultimately, the integration of enhanced engagement and extended study periods in a flipped classroom paradigm results in superior learning outcomes compared to conventional methodologies (Ng, 2023). Furthermore, Kong's (2014) examination within Integrated Humanities revealed significant progressive advancements in knowledge acquisition, especially concerning information literacy and cognitive abilities. This highlights the beneficial influence of this pedagogical strategy in enhancing students' understanding within their academic disciplines. Moreover, one significant benefit of the Flipped Learning Model (FLM) is that it empowers students, which greatly helps those who might find learning challenging or have lower grades, as they get the chance to manage their own learning pace by using pre-recorded teaching videos (Rajaram, 2021; Mok, 2014; Musib, 2014). The students' learning can be enhanced through flipped classrooms with the involvement of parents (Tambunan et al., 2022). This enhanced autonomy cultivates a more profound comprehension and achievement in the learning process (Yılmaz & Yılmaz, 2022; Huang et al., 2023; Deng & Gao, 2023). FLM, in addition to fostering reflective learning, encourages students to link pre-lesson resources to in-class engagements, thereby augmenting their capacity for reflection (Chien et al., 2021). Furthermore, this pedagogical approach assists in cultivating transferable skills such as effective communication and cooperative teamwork, which are learned through interactions with instructors and peers as well as group endeavors (Rajaram, 2021). Moreover, within the context of English language instruction, these interactive and collaborative components also promote language learning (Mehring, 2016). However, recent critiques (Aldhafeeri & Alotaibi, 2023) argued that without careful instructional design, FLM risks burdening students with extraneous cognitive load and causing disparities among learners with limited access to digital resources. Thus, while the advantages of FLM are well documented, its successful implementation requires attention to equitable access and learner support strategies.

2.3 Flipped Learning Model in ESL Learning Environments

Previous studies in the domain of English language teaching reveal that FLM has been employed in the teaching of speaking (Abdullah et al., 2020; Abdullah et al., 2021), writing (Al-Raimi et al., 2024; Fathi & Rahimi, 2020; Challob, 2021; Su Ping et al., 2019), reading (Huang and Hong, 2016), grammar (Mudhsh et al., 2025; Chang, 2023; Afzali & Izadpanah, 2021), or pronunciation (Xue & Dunham, 2021; Khasanah & Anggoro, 2021; Zhang et al., 2016; Dehghanpour et al., 2023; Zhang, 2018; Yang & Chen, 2019), at primary or secondary or senior secondary schools (Huang & Hong, 2016; Afzali & Izadpanah, 2021; Yang & Chen, 2019), or colleges or universities (Abdullah et al., 2020; Abdullah et al., 2021; Fathi & Jalil, 2020; Challob, 2021; Khasanah & Anggoro, 2021). The findings of these research studies are articulated as follows:

Abdullah et al. (2021) have explored how the flipped classroom develops the confidence of students in the context of English-speaking skills. The results based on the questionnaires and interviews demonstrated that the flipped classroom model positively affects enhancing English-speaking confidence. In a similar vein, Abdullah et al. (2020) articulated in their research that students engaged in flipped classrooms exhibited a considerable reduction in anxiety levels alongside an enhancement in their English-speaking capabilities. Furthermore, prior investigations within the realm of writing competencies, Sharom and Na (2022) evaluated the effectiveness of the flipped classroom model utilizing an experimental approach to bolster English writing proficiency among primary school students. The results of this study revealed that the experimental cohort, which participated in the flipped classroom methodology, outperformed the control cohort in writing improvement. In addition, Challob (2021) conducted a study aimed at investigating the impact of the flipped classroom model on the development of writing proficiency among EFL students at the University of Anbar-Iraq. The findings indicated significant progress in the students' writing skills, which were largely ascribed to an interactive learning atmosphere, adaptable scheduling, and varied feedback mechanisms. As a result, the flipped classroom model played a pivotal role in fostering a more engaging and collaborative educational experience. Moreover, Su Ping et al. (2019) explored the influence of flipped writing classrooms on the writing enhancement of low-proficiency EFL learners, emphasizing advancement following instruction at a foreign university in Malaysia. The outcomes of this research underscored five key aspects: extended preparation time, increased student engagement and interaction, an amplified focus on practical exercises and motivation, immediate feedback provision, and an elevation in students' self-efficacy beliefs. The study concluded that the flipped classroom model substantially improved learners' writing capabilities and enriched their overall educational experience.

In the context of enhancing reading competencies, Huang and Hong (2016) ascertained that the implementation of the flipped classroom pedagogical approach resulted in significant advancements in the English reading comprehension abilities of tenth-grade learners. This observation suggests a direct correlation between the flipped classroom model and the augmentation of reading skills.

Chang's (2023) research primarily concentrated on individuals characterized by restricted proficiency, with the findings indicating that the flipped learning methodology demonstrated a significantly positive impact on both grammatical performance and learner attitudes. It was substantiated by enhanced performance levels and readily observable alterations in behavior. Afzali and Izadpanah (2021) carried out an investigation involving a cohort of 360 students, wherein they observed that the implementation of flipped classrooms yielded noteworthy improvements in motivation and engagement levels in the context of English as a Foreign Language (EFL) grammar learning when

compared to conventional instructional environments. It thereby functions as an exemplar of the effectiveness of this educational methodology in enhancing the caliber of grammar acquisition.

The efficacy of the flipped classroom pedagogical model in enhancing English pronunciation has been consistently evidenced across diverse educational settings. Xue and Dunham (2021) undertook an empirical investigation to assess the implementation of a flipped classroom methodology aimed at instructing university students in English pronunciation within the context of an English Education program. The results indicated that the experimental cohorts exhibited significantly superior performance regarding both the comprehension and precision of pronunciation, in contrast to the control group. Nonetheless, it is important to acknowledge that the advancements in pronunciation were not as pronounced as those observed in the domain of knowledge comprehension. Ultimately, these outcomes signify high student contentment, efficacy, and acceptance of the instructional model. Likewise, a study was carried out by Khasanah and Anggoro (2022) at Walailak University, which involved second-year students. The analysis utilized pretest and post-test evaluations as well as a survey questionnaire. The findings indicated significant improvements in the pronunciation capabilities of the students, as evidenced by elevated scores in the post-assessment evaluations. However, a notable absence of a substantial correlation was detected between the students' perceptions regarding the flipped classroom model and the actual advancements in their pronunciation proficiency. Furthermore, Dehghanpour et al. (2023) executed a study wherein they assessed the effectiveness of three distinct educational environments - flipped, blended, and traditional - in relation to 120 pre-intermediate EFL learners. Their outcomes revealed that the flipped classroom model demonstrated the highest degree of effectiveness, with the blended learning method ranking closely behind, particularly concerning the enhancement of pronunciation skills. These findings accentuate the prospective benefits of integrating flipped and blended pedagogical approaches within the realm of language learning. Additionally, Zhang et al. (2016) undertook a study to investigate the effectiveness of a flipped learning paradigm in an English pronunciation curriculum. By comparing two cohorts of first-year university students in northern China, the research disclosed that the group utilizing the flipped classroom approach attained significantly superior scores relative to the cohort receiving instruction through conventional methods. This underscores the merit of individualized support embedded within the flipped classroom model, a feature frequently absent in traditional pedagogical strategies. Moreover, the implementation of a flipped classroom model aimed at enhancing English pronunciation for first-year English majors was scrutinized (Zhang, 2018). The investigation encompassed the application of three distinct flipped classroom frameworks, each tailored to align with the instructors' preferences and experiences. A remarkable improvement in the pronunciation skills of the students was observed across all frameworks, thereby underscoring the advantageous effects of the flipped classroom methodology. Nevertheless, the study also revealed the differing levels of efficacy manifested by the various models, thereby highlighting the pivotal role of the instructor within such educational settings. Furthermore, a quasi-experimental investigation was conducted by Yang and Chen (2019) to evaluate the effectiveness of employing a flipped classroom for teaching English vowel letters in primary EFL classrooms in China. This research compared the results of flipped and traditional instructional environments, emphasizing the perceptions and engagement of both students and educators, as well as their comprehension through lesson videos. The results indicated a generally positive response to the flipped classroom approach, with students demonstrating significant improvements in their comprehension of the lesson content. This exploration highlighted the possibility of the flipped classroom model in improving students' learning outcomes in primary EFL/ESL settings. Nevertheless, critical perspectives (Kanwal, 2024) pointed out that gains in pronunciation are sometimes less substantial than gains in general linguistic knowledge, suggesting that flipped learning might require supplementary interventions for complex phonetic elements like diphthongs.

A synthesis of these studies suggests that, while the flipped learning model has demonstrated effectiveness in enhancing various English language skills across diverse contexts, the majority of existing research has predominantly focused on short-term outcomes and general language proficiency. Few studies have specifically examined the sustained effects of FLM on phonetic aspects such as diphthongs in young ESL learners, especially within primary school contexts. This indicates a clear need for further research that integrates theoretical perspectives such as Sociocultural Theory and Cognitive Load Theory to understand the long-term phonological benefits of flipped learning approaches.

2.4 Research Gap

The existing studies above examined the role of the flipped learning model in ESL/EFL contexts and have primarily centered on examining the immediate impacts on various language skills and educational levels. These scholarly investigations encompassed an extensive array of competencies, which include speaking, reading, writing, grammar, and pronunciation, and they traverse various educational strata from primary institutions to tertiary education establishments. Despite the heterogeneity in skills and educational contexts, a recurring theme evident in these studies is their focus on immediate outcomes. The predominant concern is evaluating short-term enhancements and modifications after implementing the flipped classroom pedagogical approach. A synthesis of these past reviews indicates that although multiple studies confirm short-term gains in language performance, they also consistently highlight that improvements in nuanced areas of phonological competence, such as segmental and suprasegmental features, remain less substantial and underexplored. However, this focus engenders a considerable gap in academic exploration regarding the sustained effects of the flipped learning model, particularly within the domain of primary education and its long-term implications on linguistic competencies, such as phonetic accuracy (Jiang et al., 2020; Vitta & Al-Hoorie, 2020; Turan & Akdag-Cimen, 2019). Furthermore, previous systematic reviews suggest that integrating theoretical perspectives like Cognitive Load Theory and Sociocultural Theory is rarely done in depth, which limits the understanding of how flipped learning supports phonological development among young ESL learners. Moreover, the

integration of theories such as Cognitive Load Theory and Sociocultural Theory into flipped learning research remains largely underexplored, especially in the context of young ESL learners' phonological development. Recent studies (Nguyen et al., 2022; Kanwal, 2024) have called for longitudinal research approaches to assess the lasting learning impacts. Consequently, the present study addresses a critical gap by investigating how FLM and CLM influence the long-term retention of English diphthongs among primary ESL students, thereby contributing new theoretical and empirical insights to the field.

2.5 Aims of the Study

The present study examined the influence of the Flipped Learning Model (FLM) on the enduring learning outcomes associated with English diphthongs in English as a Second Language (ESL) classrooms situated in India. The study specifically focused on the pedagogical approaches for imparting these English diphthongs, which are frequently overlooked within English language instructional contexts. The selection of diphthongs as a focal parameter was predicated on their critical importance within the lexicon of the English language. The primary objective was to expose the ways in which the FLM can augment the long-term learning achievements and retention of these diphthongs among young ESL students. The study endeavoured to conduct a thorough evaluation of the continued efficacy of the flipped learning model within primary ESL learning environments. The research questions were developed in association with the purpose of the study:

1. Is there any evidence of a statistical variation in learning outcomes between students in FLM and CLM classrooms?

2. How do FCM and CLM affect long-term learning outcomes in primary English classrooms?

3. Method

3.1 Research Design

This study adopted a quasi-experimental research design with a pre-test, mid-test, post-test, and delayed post-test control group format. The quasi-experimental design was selected because it allows for examining the causal relationship between instructional models (FLM and CLM) and students' learning outcomes while accommodating the practical constraints of educational settings (Creswell, 2012). Two intact classrooms were assigned to the experimental (flipped) and control (non-flipped) conditions, respectively. The study also incorporated clear operationalization of treatment conditions, with explicit descriptions of pre-class and in-class activities to ensure replicability.

3.2 Participants

In the present study, using random sampling (Dornyei, 2007), a total of 56 ESL students were selected as participants from a primary school in India. The sample size was determined based on the guidelines for small experimental educational research (Fraenkel & Wallen, 2009), considering statistical power and effect size detection. A priori power analysis was conducted using G*Power software (Faul et al., 2009), indicating that a minimum of 52 participants would be required to detect a medium effect size (f = 0.25) with 80% power at α = 0.05. The participants were native Hindi language speakers. Additionally, convenience sampling was used to ensure accessibility, participant availability during the study timeline, and willingness to participate, thereby complementing the random classroom assignment. The study engaged a complete cohort of 56 first-grade primary students, comprising 34 males and 22 females, whose ages spanned from 6 to 7 years. The selection of this age group was purposeful, as early childhood represents a critical period for phonological development (Goswami, 2011). The investigation entailed the application of the flipped classroom model within a multimedia language laboratory (N=28), whereas the alternative classroom functioned as a traditional non-flipped setting (N=28). Prior to the execution of the study, all participants and their parents were informed of the objectives of the study, and their involvement was entirely voluntary.   Both classes (flipped and non-flipped) were taught by two female teachers, each with three years of teaching experience, ensuring instructional consistency across the two groups.

3.3 Activities in a Flipped Classroom

FLM was implemented in a class, which is known as a flipped classroom in this study, where video materials sourced primarily from YouTube were utilized (Fathi & Rahimi, 2020). Videos were also supplemented with teacher-recorded clips to tailor pronunciation practice to the learners' L1 interference patterns (Gilakjani, 2012). The selection criteria for video materials were based on content relevance (targeting eight English diphthongs), video quality (high definition with clear audio-visual elements), and engagement potential (animated or interactive formats) to maintain learners' attention, aligned with Mayer's (2014) Multimedia Learning Theory. For example, the "Phonics Diphthong Song" (https://www.youtube.com/watch?v=3S7Z2b3sGsk) was selected for its clear articulation and visual cues. The selected videos centered around the learning of eight English diphthongs. Examples of targeted diphthongs included /aɪ/ as in "kite," /eɪ/ as in "day," and /oʊ/ as in "go." High-quality videos were selected to sustain student interest; low-quality videos can be distracting and hinder effective engagement and learning (Brame, 2016; Mayer, 2009). The videos chosen ranged from 1 to 4 minutes in duration (Guo et al., 2014; Mayer, 2014; Brame, 2016; Yu & Gao, 2022), given that engagement tends to decrease for videos longer than 6 minutes in the flipped classroom, students utilized laptops and headphones to watch instructional videos individually. Additionally, students were tasked with completing worksheets before participating in face-to-face classroom activities. An example worksheet included tasks such as matching diphthong symbols with word examples, underlining diphthongs in sentences, and short listening discrimination exercises (see Appendix A for a sample).   These worksheets served dual purposes: firstly, to ensure students had engaged with the videos, and secondly, to provide formative assessment opportunities for teachers. During the instructional periods, a custom-designed narrative was presented,

intentionally embedding a high frequency of diphthong-containing words. Students collaboratively identified and analyzed diphthongs within the story, fostering cooperative learning, peer teaching, and deeper cognitive processing. All classroom activities were structured following Bloom's Taxonomy to scaffold students from lower-order recognition tasks to higher-order application and analysis. The flipped classroom activities spanned 18 sessions over 18 consecutive working days, with each session lasting approximately 50 minutes.

3.4 Activities in a Non-Flipped Classroom

The material and content employed in the non-flipped classroom were identical to those in the flipped classroom except for the mode of delivery. Instead of pre-watching video lectures, information was presented via PowerPoint presentations during in-person sessions. Each class lasted approximately 50 minutes, and like the flipped classroom, the entire instructional cycle was completed over 18 consecutive working days. Unlike the flipped classroom, no preliminary independent learning activities were assigned. Students prepared for assignments and completed exercises during class under the teacher's guidance.

3.5 Instruments

The primary instrument for data collection was a series of customized multiple-choice tests designed to assess students' identification and understanding of diphthongs across different word structures. The test items were validated by two subject-matter experts for content validity and piloted on a similar group of students to ensure clarity and reliability, achieving a Cronbach's alpha of 0.87. Worksheets were additionally used in the flipped classroom for formative evaluation purposes. All instruments were aligned with learning objectives derived from the curriculum and relevant phonological benchmarks (Celce-Murcia et al., 2010).

3.6 Data Collection and Analysis Procedures

3.6.1 Collection of Data

Data collection was systematically conducted at four distinct assessment stages: pre-test, mid-test, post-test, and delayed post-test, with each evaluation encompassing distinct tasks to assess the advancement of participants' learning (see Table 1 below). A pretest was administered, comprising 24 multiple-choice questions that targeted the eight diphthongal sounds in monosyllabic words, including diphthongs positioned at the initial, medial, and final. The purpose of this pretest was to gauge the students' fundamental knowledge of the sounds prior to instruction. Following the completion of the ninth session, a midtest assessment was executed, which again comprised 24 multiple-choice questions, yet this iteration specifically emphasized disyllabic lexicon. Following the intervention, a follow-up assessment was administered. This examination, likewise containing 24 multiple-choice questions, was centered on tri-syllabic lexicon to ascertain whether there was an improvement in student performance. Ultimately, a delayed assessment was conducted six weeks post-intervention, featuring 24 multiple-choice inquiries that encompassed a combination of mono-, di-, and tri-syllabic terminology. Each test was administered under standardized conditions, with an average completion time of 30 minutes per test to ensure consistency. This methodology is congruent with the objective of delayed assessment, which seeks to appraise the enduring retention of knowledge and the effectiveness of an intervention (Macalister, 2019; Harlen, 2005; Laufer, 2003; Black & Wiliam, 1998). The classification of these assessments was deliberately designed to thoroughly evaluate the pedagogical impact on students' comprehension and retention of diphthongal sounds across various levels of complexity.

Table 1. Timeline of data collection activities and assessments

Week	Activity	Details
Week 1	Pre-test Administration	24 MCQs on diphthongs in monosyllabic words (30 minutes duration)
Week 1–3	Intervention Sessions (Flipped & Non-Flipped Classrooms)	18 instructional sessions (one session per working day, 50 minutes each)
Week 2	Mid-test Administration	After the 9th session, 24 MCQs on diphthongs in disyllabic words (30 minutes)
Week 3	Post-test Administration	After the 18th session, 24 MCQs on diphthongs in tri-syllabic words (30 minutes)
Weeks 4–9	No instruction (Waiting Period)	No new instruction; retention period for delayed post-test
Week 10	Delayed Post-test Administration	24 MCQs mixing mono-, di-, and tri-syllabic words (30 minutes duration)

3.6.2 Variables

In the study, there were two variables: one was independent, and the other was dependent. Two independent variables were divided into two classrooms: a flipped classroom where students received the treatment through the flipped learning model and a non-flipped classroom where students received treatment through a conventional learning model. The four dependent variables were categorized as pretest, mid-test, post-test, and delayed post-test assessments to measure the effect of two independent variables on students' learning outcomes. The particular design facilitates a thorough assessment of the effect of the FLM, in relation to the CLM, on the students' learning outcomes over time, commencing from the initial phase of learning to the evaluation of long-term retention.

3.6.3 Analysis of Data

A spreadsheet was made in Excel to record the scores of students obtained from the pretest, mid-test, post-test, and delayed post-test in both

classrooms (flipped and non-flipped). After data entry, the scores were carefully checked for accuracy, and the dataset was subsequently imported into SPSS (version 22) for statistical analysis. Prior to conducting the mixed repeated measures ANOVA, the assumptions of normality and sphericity were evaluated. Shapiro-Wilk tests confirmed that the data were normally distributed across all time points (Pre-test: W = 0.96, p = .18; Mid-test: W = 0.97, p = .23; Post-test: W = 0.95, p = .12; Delayed post-test: W = 0.96, p = .15). Mauchly's Test of Sphericity indicated that the assumption of sphericity was met, χ^2 (5) = 4.32, p = .36. The Mixed Repeated Measures Analysis of Variance (Mixed RM-ANOVA) was performed to evaluate the collected scores, as this statistical approach is appropriate for studies involving one between-subjects factor (Group: Flipped Learning Model [FLM] versus Conventional Learning Model [CLM]) and one within-subjects factor (Time: Pre-test, Mid-test, Post-test, and Delayed Post-test). This analysis allowed for the examination of the main effects of Time and Group, as well as the Time × Group interaction effect, thus enabling a comprehensive understanding of both the short-term and long-term impacts of instructional models on students' learning outcomes. The use of mixed repeated measures ANOVA was particularly suitable for the current study, considering the recurrent observations at multiple stages, as it appropriately accounted for the correlations among repeated measures within subjects while allowing for comparisons across instructional groups (Field, 2013). Unlike independent measures ANOVA, which treats each measurement as an isolated observation, repeated measures ANOVA acknowledges that the same participants are assessed repeatedly, enhancing the statistical power to detect progressive changes over time (Maxwell et al., 2017). This methodology thereby strengthens the capacity to discern within-subject differences and between-group effects across multiple observations, making it highly effective for evaluating the enduring impacts of different instructional strategies in educational research (Gueorguieva and Krystal, 2004). Effect sizes (partial eta squared) were computed to interpret the magnitude of significant effects, and Bonferroni-adjusted post hoc comparisons were conducted where necessary to explore pairwise differences. Throughout all analyses, a significance threshold of p < .05 was maintained.

4. Results

4.1 Effect of Instructional Models (FLM vs. CLM) on Learning Outcomes

Employing mixed repeated measure ANOVA test on the obtained scores in learning English diphthongs with 2 classrooms (i.e., flipped classroom, non-flipped classroom) × 4 tests (i.e., pretest, midtest, posttest, delayed posttest), our study offered a significant main effect on classrooms, $F_{(1, 27)}$ = 4.326, P=.047, η_p^2 = .138. The mean score of students was higher in the flipped classroom than in the non-flipped classroom. It was suggested that a flipped classroom through a flipped learning model positively enhances learning outcomes, which is entirely comparable to the conventional teaching approach in the non-flipped classroom (see Fig. 1 and Table 1 below).

Table 1. Comparison of Mean Scores between FLM and CLM Groups across All Tests

Method	Mean	Std. Error
Flipped Classroom	8.679	0.514
Non-Flipped Classroom	7.018	0.442

4.2 Progressive Improvement Across Assessments

Additionally, statistical analysis also revealed a significant main effect of 4 assessents (i.e., pre-test, mid-test, post-test, delayed post-test), $F_{(1, 27)}$ = 76.064, P=.001, η_p^2 = .901, showed progressive achievements from pretest, mid-test, posttest, and delayed post-test (see Fig. 2 and Table 2). Figure 2 exhibited a gradual escalation in average scores from the pretest assessment to the posttest assessment, implying an enhancement in student aptitude during the period of instructional intervention. The mid-test assessment demonstrated a marginal uptick from the pretest assessment, whereas the final assessment unveiled a more substantial elevation in the mean score, suggesting a greater comprehension as the instructional process unfolded. Interestingly, the delayed posttest assessment, which traditionally gauges long-term retention, exhibited a minor decline in the mean score compared to the post-test assessment, yet it remained higher than the pre-test and mid-test assessment scores. It suggests that even though some information may have been forgotten from memory, students retained a substantial amount of the acquired knowledge.

Table 2. Descriptive Statistics for Mean Scores at Each Assessment Stage

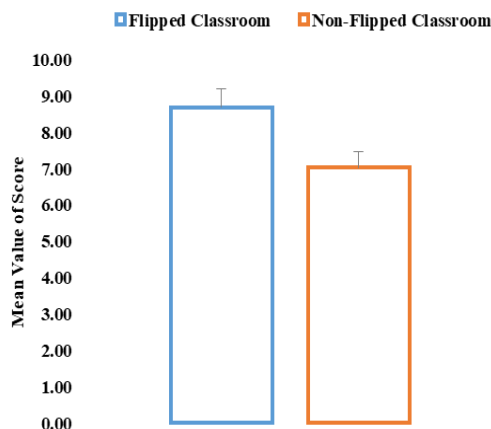| Assessment	Mean	Std. Error
Pre-Test	6.607	0.336
Mid-Test	7.571	0.257
Post-Test	9.179	0.291
Delayed Post-Test	8.036	0.329

Figure 1. Comparative analysis of assessment scores between flipped and non-flipped classrooms
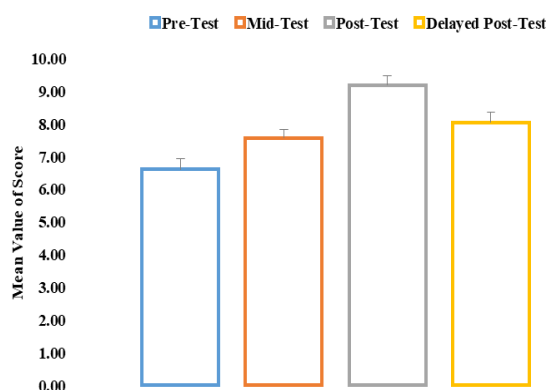

Figure 2. Progressive assessment of scores across four stages: pretest, midtest, posttest, and delayed posttest
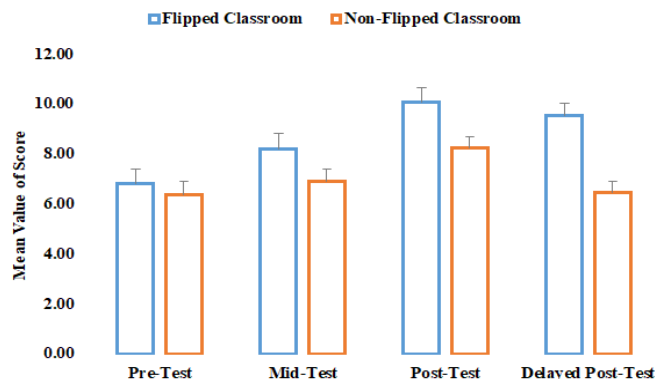

Figure 3. Performance comparison in flipped versus non-flipped classrooms across four testing intervals: pre-test, mid-test, post-test, and delayed post-test

4.3 Interaction Effect of Classroom Type and Time

There was also a two-way significant interaction between (flipped classroom, non-flipped classroom) × 4 assessments (pre-test, mid-test, post-test, delayed post-test), $F_{(1, 27)} = 8.597$, P=.001, η ₚ² = .508, indicating that the mean scores obtained by students in classrooms (i.e., flipped and non-flipped) varied significantly over time (see Fig. 3 and Table 3). In both classrooms, there is evidence of a rise in students' scores between the pretest and post-test assessments, which indicates that learning occurs in both environments (FLC and CTM) during the intervention period. It is worth mentioning that the flipped classroom consistently achieves a higher average score across all assessments than the non-flipped classroom, suggesting a potential advantage of the flipped classroom approach in improving students' learning outcomes. The outcomes of the mid-test appraisal indicate that the average score of the flipped classroom is marginally higher than that of the non-flipped classroom, and this tendency persists and becomes more noticeable in the ultimate appraisal. Interestingly, in the delayed post-test assessment, which assesses long-term retention, both classroom environments undergo a decline in mean scores

when compared to the post-test. Nonetheless, the flipped classroom maintains its higher level of performance. This observation implies that while a performance decrease is expected over time, the flipped classroom approach may still have a more enduring impact on learning retention than the non-flipped classroom.

Table 3. Two-Way Mixed ANOVA: Interaction of Group ×Assessment Time

Assessment	CLM Mean	FLM Mean	Gain (FLM–CLM)	SE of Gain
Pre-Test	6.393	6.821	0.428	$\sqrt{(0.530^2+0.604^2)}=0.80$
Mid-Test	6.929	8.214	1.285	$\sqrt{(0.498^2+0.620^2)}=0.79$
Post-Test	8.25	10.107	1.857	$\sqrt{(0.456^2+0.552^2)}=0.72$
Delayed Post-Test	6.5	9.571	3.071	$\sqrt{(0.435^2+0.481^2)}=0.65$

5. Discussion

The analysis in the current exploration revealed that the flipped classroom showed exceptional performance of students compared to the non-flipped classroom throughout all stages of assessments. This superiority was particularly evident in the delayed posttest, where students in the flipped classroom displayed remarkable retention. The observed increase in scores from the pretest to the posttest in the classroom confirms the efficacy of these models. However, the flipped approach exhibited a more distinct and sustained impact on learning English diphthongs, as demonstrated by both immediate and long-term assessments. The significant interaction effect between classroom type and assessment time further suggests that the benefits of the flipped classroom extend beyond short-term learning, offering advantages for long-term educational outcomes.

The findings of the current study revealed that students in the flipped classroom outperformed their counterparts in the non-flipped classroom across all assessment phases, with the superiority of the flipped learning model (FLM) being particularly pronounced in the delayed post-test, demonstrating remarkable long-term retention of English diphthongs. These outcomes are strongly aligned with the principles of Cognitive Load Theory (Sweller, 2011), which posits that instructional methods reducing extraneous cognitive load while promoting germane processing enhance learning efficiency and retention. In the flipped classroom, students were able to engage with instructional materials (videos) at their own pace prior to class, thereby allowing for more cognitive resources to be devoted to deeper processing during face-to-face interactions, rather than being overwhelmed by simultaneous content delivery and practice as often observed in conventional classrooms. This pre-class preparation likely minimized extraneous load and optimized the intrinsic cognitive processing necessary for mastering complex phonological structures like diphthongs. Furthermore, the findings resonate with Vygotsky's Sociocultural Theory (1978), which emphasizes the role of social interaction and scaffolding in cognitive development. Within the flipped classroom, collaborative in-class activities that involved identifying diphthongs in narratives facilitated active knowledge construction through peer interaction, aligning with the concept of the Zone of Proximal Development (ZPD). By providing opportunities for learners to collaboratively apply pre-learned concepts under the guidance ofteacher and peers, the flipped model fostered higher-order thinking and deeper linguistic competence. The significant interaction effect between classroom type and assessment time, demonstrating sustained advantages for the flipped classroom, further corroborates existing evidence suggesting that flipped instruction not only enhances immediate learning gains but also cultivates durable educational outcomes (Bishop & Verleger, 2013). These results mirror the observations of Nguyen et al. (2022), who reported that mobile-assisted flipped learning substantially improved the long-term language proficiency of ESL learners, and Kanwal (2023) who emphasized that early flipped learning experiences enhance learners' metacognitive awareness and autonomy, both critical factors for lasting academic achievement. Thus, the current study not only supports but also extends the theoretical understanding of flipped learning's effectiveness by demonstrating its potent role in fostering both immediate mastery and long-term retention in early phonological development within ESL primary education contexts.

Despite the demonstrated advantages of the flipped learning model in this study, it is important to acknowledge that the success of flipped classrooms is not universally guaranteed and may be contingent on several contextual factors. According to Alam et al., (2024), the effectiveness of flipped instruction can be compromised if students lack sufficient self-regulation skills or if access to high-quality technological resources is limited. In particular, for younger learners, such as primary school students, the requirement for independent pre-class learning assumes a certain level of self-discipline and parental support, which may not always be consistently available (Nguyen et al., 2022). Moreover, without careful instructional design, pre-class materials may inadvertently increase cognitive load rather than reduce it, particularly if video content is poorly structured or overly complex (Mayer, 2014). In line with Sociocultural Theory (Vygotsky, 1978), the role of teacher scaffolding remains crucial; without guided support during in-class activities, the benefits of prior independent learning may not fully materialize. Therefore, while the flipped learning model presents significant potential for enhancing both immediate and long-term learning outcomes, its implementation must be thoughtfully adapted to the developmental level of learners, the quality of instructional materials, and the learning environment to maximize its effectiveness across diverse educational settings.

5.1 Effect of the Flipped Learning Model and the Conventional Learning Model

In assessing learning outcomes between flipped and non-flipped classrooms, our study highlights the different impressions of the flipped and conventional learning models on student learning outcomes. In line with previous studies (Xue & Dunham, 2021; Khasanah & Anggoro, 2021; Zhang et al., 2016; Dehghanpour et al., 2023; Zhang, 2018; Yang & Chen, 2019), our results demonstrate that learners in flipped classrooms due to the intervention of the flipped learning model demonstrated superior learning outcomes compared to their counterparts in non-flipped classrooms. The findings are consistent with the FLM, which adheres to fundamental principles of teaching and learning by emphasizing active student engagement, collaboration, and analytical thinking in a classroom environment that caters to

learners' needs (Bishop & Verleger, 2013). In addition, the FLM involves students engaging with the material before class and then applying it in class, which is different from the CLM, where the teacher leads instruction. The constructivist approach also posits that active engagement enhances learning (Prince, 2004). Moreover, the findings of our study are consistent with Tucker (2012), who emphasizes that the success of FLM is primarily ascribed to their facilitation of various learning speeds and the facilitation of more profound cognitive involvement. The flipped learning model is in accordance with Vygotsky's social learning theory, which emphasizes the significance of social interaction and prompt feedback in learning (Vygotsky, 1978). Moreover, our findings reinforce the argument for incorporating additional flipped classroom methodologies in the primary classroom environment (Tucker, 2012). This integration caters to immediate academic achievement and ensures enduring educational advantages, as the flipped learning model promotes more substantial learning outcomes than CLM.

5.2 Long-term Learning Outcomes or Retention in Primary English Classrooms

Our study has revealed that the flipped learning model significantly amplifies the learning outcomes of students in primary classrooms, specifically in the learning and remembering of English diphthongs. Students who were exposed to the FLM consistently surpassed those in CLM, showcasing superior competence in long-term knowledge retention.

The FLM is characterized by involving students in learning materials prior to attending classroom activities, while utilizing the time spent in class for activities that encourage interaction to enhance long-term retention. The efficacy of FLM in facilitating the long-term learning of English diphthongs is consistent with Mayer's (2009) cognitive theory of multimedia learning, which underscores the advantages of integrating both auditory and visual learning resources. Bergmann and Sams (2012) have also emphasized how the FLM nurtures the development of self-directed learning, which is an essential element within the realm of learning. The FLM places great importance on engaging and cooperative classroom activities, which align with Vygotsky's (1978) social learning theory. Based on this proposition, social interaction is imperative for enhancing cognition and enabling long-term retention. The viewpoint is additionally encouraged by the research conducted by González-Lloret (2016), who revealed that incorporating interaction and practical implementation into the process of language learning dramatically improves the ability to retain knowledge in the long run. Furthermore, as elucidated by Knewton (2013), the influence of technology in the context of FLM facilitates the creation of a personalized and dynamic learning environment, thus augmenting the attainment of enduring learning outcomes. Moreover, the uniformity of elevated average scores in the flipped classroom throughout our exploration implies that the FLM's activities implemented in the in-classroom offer a more substantial basis for the long-term learning of English diphthongs. Shahnama et al.'s (2021) findings align with this observation, as they demonstrated that active learning practices commonly employed in flipped classrooms generally yield superior results to conventional lecture-based instruction.

The flipped learning model presents itself as a superior strategy for achieving successful outcomes in learning English diphthongs in primary classrooms. This approach effectively combines the advantages of technology-enhanced learning with interactive classroom dynamics, resulting in enhanced long-term retention.

6. Conclusion

The present study was designed to examine the effectiveness of the flipped learning model compared to the conventional learning model when it comes to enhancing learning outcomes for primary students, particularly in the domain of learning English diphthongs. This study addressed four refined research objectives: (1) to examine the impact of the flipped learning model (FLM) on the long-term learning and retention of English diphthongs among primary ESL students; (2) to compare the long-term learning outcomes of FLM with the conventional learning model (CLM) and determine whether statistically significant differences exist in students' mastery of English diphthongs; (3) to measure learners' post-test performance across multiple time intervals to determine the sustainability of diphthong retention under FLM versus CLM conditions; and (4) to refine instructional design strategies by providing empirical evidence on how FLM and CLM influence young learners' phonological development in ESL contexts, thereby contributing to theory and practice. The instructional model, acknowledged as the flipped learning model, consistently resulted in higher average scores across various assessments, including the pretest, mid-test, post-test, and delayed post-test, thus strengthening its effectiveness in facilitating long-term knowledge retention. A notable primary impact on instructional models statistically supported this trend. The findings revealed that students in the FLM condition demonstrated significantly better immediate learning outcomes and superior long-term retention compared to those in the CLM condition, confirming the effectiveness of active and technology-integrated pedagogical models. The findings of our study support the fundamental principles of active, student-centered learning, in line with the concepts of multimedia learning and social interaction in cognitive development. Specifically, the results align with Cognitive Load Theory (Sweller, 2011) by demonstrating that reducing extraneous cognitive load through pre-class video engagement enhances deeper classroom learning.Additionally they align with Sociocultural Theory (Vygotsky, 1978), highlighting the importance of social collaboration during in-class activities for knowledge construction. The flipped learning model's utilization of technology alongside interactive classroom engagements has demonstrated its effectiveness in addressing the long-term maintenance of English diphthongs. This phenomenon also indicated the progressive enhancement in student attainment from the pretest assessment to the posttest assessment, while the sustained, albeit slightly weakened, performance in the delayed posttest assessment signifies significant advantages in long-term learning. The significant correlation between the two classrooms and the various times of assessment administration further emphasizes the distinctive advantage of the FLM in promoting long-lasting learning benefits. Thus, this study makes a theoretical contribution by extending the application of Cognitive Load Theory and Sociocultural Theory to the specific domain of early phonological acquisition in ESL primary education, a relatively underexplored area. The statement above situates the FLM as a progressively pertinent and practical approach within the developing landscape of primary education.

While clarifying the benefits of utilizing the FLM within primary education for language learning, the study has a few limitations. The constrained size and particular demographic configuration of participants may impede the capacity to generalize the findings to a broader and more varied student populace, potentially constricting their overall relevance. Furthermore, the limited duration of the study necessitates additional analysis to gain a more extensive understanding of the enduring effects of FLM. The effort on English diphthongs also prompts questions regarding the relevance of these findings to alternative subjects or language aspects. Nonetheless, the study holds a noteworthy potential for applying FLM to enrich active learning and integrate technology into education. Accordingly, this calls for a strategic reorientation in educational policies, emphasizing enhanced teacher training in FLM methodologies and ensuring equitable access to technological resources among students. Future research should aim to validate these findings across more diverse educational settings, over extended periods, and within broader academic disciplines to fully establish the generalizability and long-term benefits of flipped learning in primary education. In particular, longitudinal studies, cross-disciplinary investigations, and comparative analyses with other technology-enhanced learning models would enrich the understanding of the flipped model's versatility and enduring educational value.

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