Asia Pacific Journal of Developmental Differences
Vol. 13, No. 2, July 2026, pp. 337—364
DOI: 10.3850/S2345734126000151

Investigating the effects of inductive approach in teaching and learning of grammar for children with dyslexia: An Action Research

Tan Yee Ping Mariel[1*]

1. *Dyslexia Association of Singapore*

Abstract

Grammar is essential in language, but effective teaching methods remain debated, and students with dyslexia often struggle with grammar concepts. This study examined the effectiveness of the inductive approach in teaching grammar to three students with dyslexia. An action research design was used, with the first cycle focusing on the past tense suffix '-ed' and the second on irregular past tense verbs to address overgeneralisation. Data were collected through a pre-test, post-test and delayed post-test design and classroom observations. Findings showed improvement in grammar performance across both cycles. Four factors contributed to these gains: student engagement, collaborative learning, teacher scaffolding, and students as constructors of knowledge. These results suggest that the inductive approach is an effective learner-centered method for teaching grammar to students with dyslexia, and that teachers should integrate such strategies in professional practice and classroom instruction.

Keywords: dyslexia, grammar instruction, inductive learning, learner-centered teaching, action research

* *Correspondence to:*

Tan Yee Ping Mariel, Senior Educational Therapist, Dyslexia Association of Singapore. Email: mariel.tan@das.org.sg

INTRODUCTION

Dyslexia is a learning disability that affects reading and spelling despite normal intelligence and educational opportunity (Roitsch & Watson, 2019). While phonological awareness and rapid naming are commonly recognised as the primary challenge, growing evidence suggests that grammatical difficulties are also a significant component of the language struggles faced by individuals with dyslexia.

Xiao and Ho (2013) found that Chinese children with dyslexia performed significantly poorer on syntactic tasks than reading-level matched controls, suggesting that weakness in grammar may contribute to reading difficulties. Similarly, Rispens et al. (2004) demonstrated that children with dyslexia struggle to discern and identify the inflectional grammatical errors. (Caglar-Ryeng et al., 2019) also found that children with familial risk of dyslexia performed poorer in both grammar and vocabulary compared to the control group. These findings indicate that grammar poses distinct challenges for dyslexic learners, yet little research has examined how best to teach grammar to this population.

The question of how to teach grammar remains debated with little consensus regarding the most effective approach and two dominant methods emerging: deductive and inductive (Sik, 2015; Vogel et al., 2011; Mahjoob, 2015). The deductive approach is a teacher-centred approach where it involves the educator presenting the grammar rule first, followed by exercises or activities to practise applying the rule (Benitez-Correa et al., 2019). While time-efficient, it limits students' involvement and interaction with the material and may be unappealing to younger learners as they may not be able to understand certain grammar terminology and may struggle to grasp the concept. Conversely, the inductive approach is student-centred, requiring learners to discover rules through examples (Male, 2016). This approach promotes engagement, autonomy, and meaningful learning, though it carries risks such as students deriving incorrect rules and reduced practice time due to the time spent discovering those rules.

As an Educational Therapist at the Dyslexia Association of Singapore (DAS), I observed that students receiving explicit Orton-Gillingham instruction made strong gains in reading and spelling, yet continued to struggle with grammatical accuracy in speaking and writing. This disconnect between progress in decoding and persistent grammar difficulties prompted the present study. The selected class for this study is a group of three students ages nine to ten years old. They are inquisitive and often enjoy finding patterns, rules and position of the phonograms taught in class. They also enjoy interacting with each other and working collaboratively on certain tasks such as planning a narrative story and crossword puzzles. These are characteristics that align well with inductive learning. Therefore, this raises the question: Can grammar be taught inductively to learners with dyslexia?

This action research examines the effectiveness of an inductive approach in teaching grammar to children with dyslexia. The research questions are:

- Does the inductive approach improve students with dyslexia's ability to apply grammar rules?
- How does inductive grammar instruction influence students' learning of grammar?

For question one, it is hypothesised that post-test scores will exceed pre-test scores (H_1), and that delayed post-test scores will also exceed pre-test scores, indicating retention (H_1). The null hypotheses predict no significant differences.

2. LITERATURE REVIEW

2.1 Dyslexia Learning Theories

Based on the phonological deficit theory, one challenge children with dyslexia face is the storage and retrieval of speech sounds (Caylak, 2010). This impacts their ability to read and spell. Consequently, children with dyslexia are typically taught with a structured literacy approach, such as the Orton-Gillingham (OG) approach, which teaches phonics explicitly and systematically (Sayeski et. al, 2018).

Its key characteristics are:

(1) systematic, sequential and cumulative instruction;
(2) explicit and direct instruction;
(3) multi-sensory engagement;
(4) a cognitive approach; and
(5) being emotionally sound (Purkayastha et al., 2012).

Hwee and Houghton (2011) found that a one-year OG intervention improved word recognition and decoding in Singaporean children with dyslexia, though not sentence reading. However, lack of a control group limits the study's internal validity (Sullivan, 2011). Subsequent studies by Tilanus et. al. (2016) and Rijthoven et. al. (2020) addressed this limitation. Both included control groups and found that Dutch students with dyslexia who received systematic, explicit OG-based instruction made more progress in word and pseudoword reading than controls, with Rijthoven et. al. (2020) also finding improved spelling. This highlights the positive effects of explicit instruction for phonics.

While explicit instruction has been proven effective for phonics instructions for children with dyslexia, some researchers argue that a more discovery-based, interactive approach may offer additional benefits in higher-order language learning, such as

grammar acquisition. This leads to the discussion of constructivism as an alternative perspective. Is explicit teaching the only way to teach a student with dyslexia? Does it work the same in grammar teaching as well?

2.2 Theoretical Framework: Constructivism

Constructivism is a teaching and learning approach based on the premise that individuals construct knowledge by putting new information together with their prior knowledge and experiences (Sharma, 2014). Piaget's theory of cognitive constructivism proposed that individuals construct knowledge based on their experiences and interaction with the environment around them (Devi, 2019). Vygotsky extended the constructivist view by proposing social constructivism where individuals construct knowledge through interactions with one another (Devi, 2019). Vygotsky argues that children learn through their social environment. When they are exposed in their social environment, they internalise and construct new information through self-regulation. The Zone of Proximal Development (ZPD) as coined by Vygotsky describes what a learner can accomplish independently and what they can achieve with the support of a more knowledgeable individual (Khadidja, 2020). This highlights that guidance and interaction guides children to acquire new knowledge, a concept called scaffolding, where a more skilled individual provides guidance to help students master a new skill, offering more support at the beginning and gradually reducing it as they gain independence (Khadidja, 2020).

There are several benefits of constructivism. When students are actively involved in the learning process, it motivates them and they find learning more enjoyable (Bada, 2015; Sarita, 2017). Lee et al. (2022) found that students receiving constructivist instruction reported consistently higher engagement than those receiving direct instruction. Furthermore, constructivism focuses on developing critical thinking skills and understanding instead of relying on rote learning (Bada, 2015). Le and Nguyen (2024) found that undergraduates in a constructivist setting achieved significantly higher scores on critical thinking tasks than a control group. These critical thinking skills can be translated to academic achievement. can translate to academic achievement. A meta-study by Semerci and Batdi (2015) highlighted that constructivist approaches yielded significant academic gains compared to traditional methods. Therefore, this highlights the benefits of constructivist approaches in promoting student engagement and developing critical thinking skills, both of which contribute to improved academic achievement.

In the classroom, the constructivist approach encourages students to build on their prior knowledge while engaging in meaningful interactions with peers and teachers (Bishaw & Egiziabher, 2019). This aligns with the inductive approach, where students construct knowledge by discovering rules or patterns through exploration, rather than receiving direct instruction (Sik, 2015). In the case of grammar learning, instead of being told

grammatical rules explicitly, students in an inductive learning environment are exposed to examples and guided to draw conclusions, reinforcing both cognitive and social constructivist principles (Mallia, 2014). The following sections will examine the evidence for inductive teaching.

2.3 Inductive vs Deductive Approach in Teaching Grammar

Several studies have examined the effectiveness of inductive and deductive methods for teaching grammar to typically developing English as a Foreign Language (EFL) and English as a Second Language (ESL) learners, specifically those without dyslexia or other learning difficulties, yielding contrasting results.

Alzu'bi (2015) compared the two approaches in teaching grammar across university and elementary students. Findings showed that both elementary and university groups receiving inductive instruction performed significantly better on a post-test than their deductive counterparts. Anani (2017) found similar results in Ghana, with students in the inductive group outperforming those in the deductive group. Anani (2017) attributed this success to students' opportunity to seek out the grammar structures and learn to apply it on their own with the guidance of their teachers. reducing the need for rote memorisation. This reduces the need to have to memorise the grammar rules and thus result in lesser instances where they forget the rule.

However, other studies have indicated that the deductive approach can be more effective. Mallia (2014) examined inductive and deductive learning with 50 adults. On an immediate post-test, the deductive group performed significantly better. However, a delayed post-test showed no significant differences between groups, suggesting similar long-term retention. Notably, through questionnaires on their perception of the approaches, most learners favoured the deductive approach, indicating a preference for structured, explicit instruction. Nesic & Hamidovic (2015) similarly found that while the majority of adult EFL learners preferred the deductive approach as they believed that clear explanation of rules helps with the mastery of grammar, they also valued the active participation associated with the inductive approach, suggesting a combined approach may be most effective.

These studies highlight the contrasting results regarding the effectiveness of inductive and deductive grammar teaching. However, these findings are based on typically developing learners, raising the question of whether such results apply to dyslexic learners.

2.4 Inductive Approach in Teaching Grammar to Students with Dyslexia

Research exploring grammar learning in dyslexia has often used Artificial Grammar Learning (AGL) to gain insight into how students with dyslexia learn and process patterns

or rules in language-like structures. Specifically, these studies examine whether students with dyslexia can implicitly learn and apply grammatical rules through exposure rather than through explicit instructions. This process parallels the principles of inductive learning. Insights on how students with dyslexia engage with implicit rule-learning in AGL studies can offer important implications for the effectiveness of inductive grammar instruction in real classroom settings (Vender et al., 2019).

Pavlidou et al. (2009) used AGL to compare nine to ten year-old children with and without dyslexia. Children with dyslexia performed significantly worse on implicit grammar tasks, suggesting they may have deficits in picking up rules implicitly. Similarly, Vender et al. (2019) found that while both monolingual and bilingual children with dyslexia demonstrated some implicit learning, they were less accurate than peers without dyslexia.

However, Katan et al. (2017) suggest that task complexity affects performance. They found that when the artificial grammar system was less complex, children with dyslexia showed improved implicit learning, although they still lagged behind peers. This suggests that reducing the complexity of grammar rules can support implicit learning in this population.

While AGL studies provide insight, they have limitations. Unlike real-world language learning, AGL removes contextual familiarity and the influence of a meaningful linguistic environment. Additionally, AGL excludes the role of the teacher, who provides essential scaffolding to help students implicitly derive grammatical rules. This differs significantly from a classroom setting, where teacher guidance plays a crucial role in facilitating inductive learning. To date, no research has specifically examined grammar teaching grounded in constructivist principles for children with dyslexia within a classroom context.

3. METHODOLOGY

3.1 Research Design

This study employed an action research design integrating mixed methods with a quasi-experimental approach to evaluate the effectiveness of an inductive approach to grammar instruction for students with dyslexia.

3.1.1 Action Research

Action research in education is a reflective process in which educators evaluate and improve their practice while simultaneously contributing to theoretical understanding (James & Augustin, 2017). The model typically involves four stages: planning, acting, observing, and reflecting (Mertler, 2020).

- **Planning:** The researcher identifies a problem, reviews relevant literature, and develops a research plan.
- **Acting:** The intervention is implemented, and data are collected on student outcomes.
- **Observing:** The researcher monitors student performance and engagement to assess progress.
- **Reflecting:** Results are analyzed, and instructional strategies are adjusted as necessary.

This approach is relevant to this research as this method will be employed to investigate if an inductive approach to grammar would benefit students with dyslexia. Therefore, the researcher will take on an active role in identifying an area of grammar in which the students have difficulties in, before collecting data before implementing the action plan.

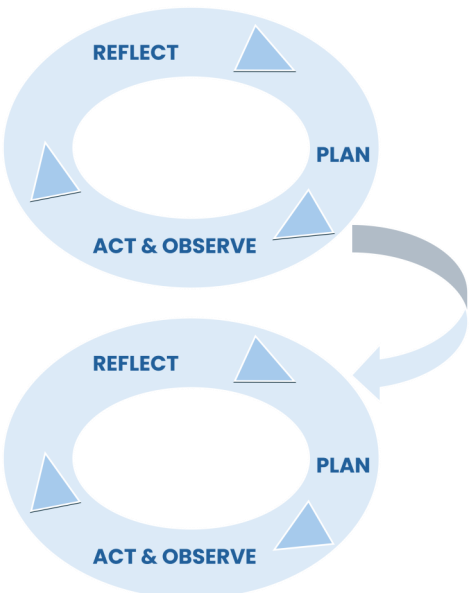

Figure 1. The Action Research Spiral (Kemmis & McTaggart, 1999)

In this study, the researcher acted as both educator and researcher, which could introduce confirmation bias (Roulston & Shelton, 2015). To mitigate this, the study employed mixed methods, combining quantitative assessments and qualitative observations.

3.1.2 Mixed Methods

An embedded mixed methods design was adopted, integrating quantitative and qualitative data to provide a comprehensive understanding of student learning (Creswell & Clark, 2010). Quantitative data gives breadth to the research by providing quantifiable data about the phenomenon in an objective and structured approach, which allows the researcher to generalise the findings for a population. Qualitative data provides depth to the research by collecting data through rich description of words or pictures, gaining deeper insights into the narratives of the participants (Queirós et al., 2017). Triangulation of these datasets enhances the validity and credibility of findings (Hafsa, 2019).

In this study, quantitative data included pre-tests, post-tests, and delayed post-tests, while qualitative data were derived from unstructured teacher observations during lessons.

3.1.3 Quasi-Experimental Design

A one group pre-test-post-test design with a delayed post-test was employed. This design involves measuring participants' initial understanding before instruction and then reassessing their knowledge afterward. By analysing the difference between pre-test and post-test results, educators can evaluate the instructional effectiveness, as well as assess retention over time (Augustine et al., 2015; Ramraje, 2011).

3.2 Participants

Convenience sampling was used to select three nine-year-old students formally diagnosed with dyslexia from the Dyslexia Association of Singapore (DAS) Learning Centre. Participants were in Primary Three and regularly attended the Main Literacy Programme (MLP) for weekly two-hour sessions.

3.3 Intervention and Instructional Procedures

The intervention was initially planned for three weeks, with each 45-60 minute session embedded within regular MLP lessons. Due to the action research nature, an additional two weeks were added to address difficulties with the grammar concept, resulting in a five-week study, excluding pre-test, post-test and delayed post-test weeks. The researcher served as both teacher and observer, allowing close monitoring and immediate instructional adjustments. The timeline is illustrated in Table 1.

This study follows the action research framework, which consists of four main stages: planning, acting, observation, and reflecting (Mertler, 2020). Figure 1 illustrates an overview of the action research process, showing how each stage contributes to the implementation and evaluation of the inductive approach in teaching grammar. Although there were two action research cycles, both cycles followed the same sequence of stages.

Table 1. Timeline of the Research Across Two Action Research Cycles

Action Research Cycle	Week(s)	Activity	Action Research Stage
Cycle 1	1	Pre-Test (suffix –ed)	Planning Stage
	2-4	Intervention * Observation of students' responses and engagement (qualitative)	Acting Stage
	5	Post-Test (suffix –ed)	Observation and Reflecting Stage
	13	Delayed post-test—2 months later (suffix –ed)	Observation and Reflecting Stage
Cycle 2	6	Pre-test (irregular past tense)	Planning Stage
	7-8	Intervention * Observation of students' responses and engagement (qualitative	Acting Stage
	9	Post-Test (irregular past tense)	Observation and Reflecting Stage
	17	Delayed post-test—2 months later (irregular past tense)	Observation and Reflecting Stage

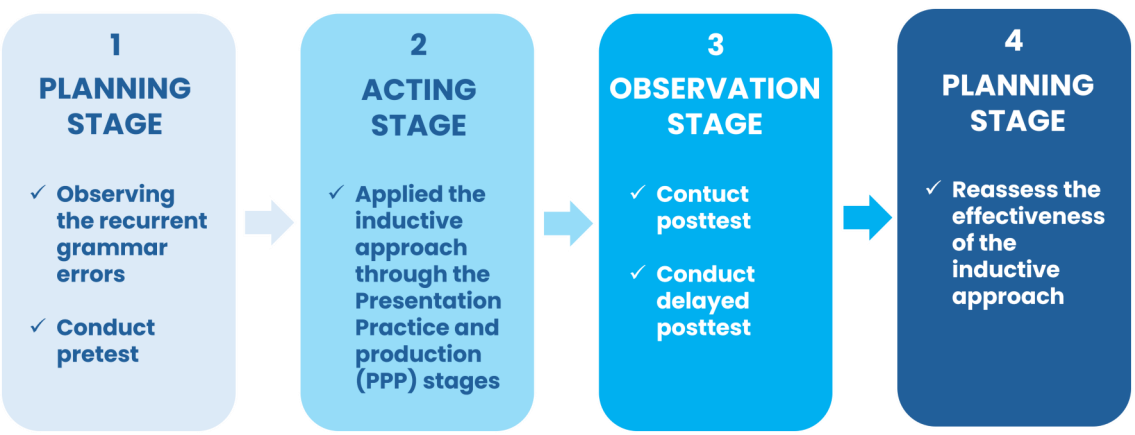

Figure 2. Action Research Cycle for Teaching Grammar Using the Inductive Approach

Cycle 1: Regular Past Tense ('-ed')

1. **Planning:** Observation of student writing revealed recurring errors in past tense usage. A 15-item multiple-choice pre-test assessed understanding of present and past tense.

2. **Acting: Lessons proceeded in three stages:**

   - **Presentation:** The use of the past tense suffix '-ed' was introduced inductively. The educator posed the question, "What did you do yesterday before going to bed?" Student responses (e.g., "I brushed my teeth") were written on the board alongside present tense sentences (e.g., "I brush my teeth every day"). Students observed differences, guided by questions such as "Why does this word have '-ed' here and not there?" and "Is '-ed' only used for yesterday?" Students deduced that '-ed' indicates past actions. Once they verbalised this rule, the lesson moved to the practice stage.

   - **Practice:** Students engaged in scaffolded tasks, sorting present and past tense verbs (e.g., "walk" vs "walked") and completing sentences using time expressions to identify tense.

   - **Production:** Students wrote sentences based on pictures and time expressions, and finally wrote three sentences about the previous week using past tense correctly.

3. **Observation:** The 15-item multiple-choice post-test was administered to compare results. A delayed post-test was scheduled two months later. Educator observations were consolidated to assess peer and material interaction.

4. **Reflection:** Quantitative data were analysed. As students showed improvement, no teaching adjustments were necessary. However, observations revealed overgeneralisation of '-ed' to irregular verbs, prompting Cycle 2.

Cycle 2: Irregular Past Tense Verbs

1. **Planning:** Observation indicated overgeneralization of -ed to irregular verbs (e.g., buyed, breaked). A 6-item MCQ and 6 open-ended test assessed recognition and application.

2. **Acting: Three-stage lesson sequence:**

   - Presentation: The educator asked questions requiring irregular past tense

responses (e.g., "What did you eat for dinner?"), recording answers and circling the irregular verbs. Students were prompted to reflect on why they did not add '-ed' to these verbs, leading them to articulate that some verbs change form entirely.

- **Practice:** Students completed verb tables, read passages with target verbs, and played memory matching games with regular and irregular verbs.

- **Production:** Students wrote sentences using pictures and time markers to reinforce correct irregular past tense forms.

3. **Observation:** The same 6 multiple-choice and 6 fill-in-the-blank questions were administered as post-test. A delayed post-test was scheduled two months later. Educator observations were consolidated.

4. **Reflection:** Quantitative data were analysed. As students showed improvement, no further adjustments were necessary.

3.4 Methods of Data Collection

3.4.1 Quantitative Data

Cycle 1:

15 MCQs assessing present, past, and present continuous tense. Questions were created with reference to grade 3 assessment materials to ensure age-appropriateness.

Example (Cycle 1 MCQ):

Instruction:

Read the sentence. Use the clues in the sentence to help you choose the correct answer. Choose the best answer that fits what the sentence says. Write the number (1, 2, or 3) in the bracket.

Both Susan and her brother _____ playing badminton every Saturday morning.

(1) enjoy (2) enjoyed (3) are enjoying

Cycle 2:

6 MCQs and 6 open-ended questions assessing irregular past tense recognition and application.

Example (Cycle 2 MCQ):

Instruction:

Read each question carefully. Then choose the correct answer and write the number (1, 2, 3, or 4) in the bracket.

Question: Which sentence is correct?

1. *She wore a beautiful dress to the party yesterday.*
2. *She wored a beautiful dress to the party yesterday.*
3. *She wears a beautiful dress to the party yesterday.*
4. *She wearing a beautiful dress to the party yesterday.*

Example (Cycle 2 Open-Ended):

Instruction:

Complete each sentence using the correct past tense form of the verb in brackets. Only use the word in the brackets and change it to past tense.

He _____ (put) his phone on the table before leaving the room.

3.4.2 Qualitative Data

Teacher observation provided rich descriptions of the learning process, focusing on how students interacted with materials and each other. Observations followed an unstructured format, allowing capture of contextual nuances without a predetermined checklist (McKechnie and Mulhall, 2008). This was appropriate as the inductive approach emphasises the context of knowledge construction.

Observations were recorded directly on lesson plans, including reflective notes on engagement, responses to inductive activities, and instructional adjustments. These annotations served as qualitative data for analysing how understanding developed over time.

3.5 Data Analysis Procedures

3.5.1 Quantitative Data

Descriptive analysis examined intervention effects in both cycles. Pre-test, post-test and delayed post-test scores were compared descriptively to track individual performance over time. Raw scores were analysed, and bar graphs illustrated changes following

intervention. Paired-samples t-tests were conducted to determine statistical significance of changes across time points.

3.5.2 Qualitative Data

Thematic analysis was adopted based on Braun and Clarke's (2012) six phases:

1. familiarisation with data (lesson plan notes organised chronologically);
2. generating initial codes (short descriptions labelled on data);
3. generating themes (coded data grouped into broader themes);
4. reviewing themes (checking fit as meaningful interpretations);
5. defining themes (explaining how each relates to research questions); and
6. producing the report (developing coherent understanding).

3.6 Ethical Considerations

Permission was obtained from the DAS research committee, USW ethics committee, and the centre manager. Parental consent and student assent were obtained. Participants' identities are protected through pseudonyms, and data are securely stored to ensure confidentiality.

To avoid disrupting regular lessons, the intervention occupied only 45-60 minutes of each two-hour session, ensuring other components were completed. Writing activities were incorporated into lesson materials to cover the writing component.

3.7 Limitations

The small sample size of three students limits generalisability (Tipton et al., 2016). However, the mixed-methods approach enhances the credibility and validity of findings by offering a well-rounded understanding of the issue through multiple forms of evidence and viewpoints (Ivankova and Wingo, 2018).

The one group pre-test-post-test design lacks a control group, preventing clear attribution of changes to the intervention alone (Capili and Anastasi, 2024). Without comparison between inductive and deductive approaches, or a no-treatment control group, causality cannot be conclusively determined. To mitigate this, qualitative data offer insights into how and why the intervention may have influenced learning (Loeb et al., 2017).

Another limitation is participant reactivity. Participant reactivity refers to changes in the subject's attitude or behaviour that are altered when they are aware that they are being observed, potentially affecting the validity of the measured results (Runhardt, 2025). To minimise this, the intervention was embedded within regular lessons, maintaining a familiar environment.

Testing effects may occur when pre-tests enhance attention and retention during intervention. To reduce this, the pre-test was administered one week prior (Hulstijn, 2003), and answers were not disclosed, ensuring post-test improvements reflected learning rather than feedback.

Maturation and history threaten internal validity. Maturation refers to the fact that participants have grown older which may account for the change in results, while history refers to being exposed to other external factors that could cause the change in results (Rogers and Révész, 2020). These are unlikely to have affected immediate post-test results due to the short intervention duration (three weeks in Cycle 1, two weeks in Cycle 2). However, for the delayed post-test two months later, maturation and history effects (e.g., exposure to grammar content in school) are acknowledged as potential influences.

4. RESULTS

4.1 Quantitative Data

The study tested two hypotheses:

Students with dyslexia will score higher on grammar tests immediately after learning through the inductive approach compared to pre-test scores.

Students will retain grammar knowledge, reflected by higher scores on the delayed post-test compared to the pre-test.

Results for each cycle are presented separately, including descriptive statistics and paired-samples t-test analyses.

4.1.1 Cycle 1 – Regular Past Tense ('-ed')

Figure 3 presents descriptive statistics for the pre-test (PR), post-test (PT) and delayed post-test (DPT) on 15 multiple-choice questions testing the suffix '-ed'. The pre-test was administered in Week 1, post-test in Week 5, and delayed post-test in Week 13.

All students showed improvement from PR to PT and DPT. Student C improved from 8/15 (PR) to 14/15 (PT) and 13/15 (DPT). Student A scored 6, 13 and 12 respectively. Student T scored 5, 14 and 13 respectively. These findings suggest that the inductive method positively impacted results.

A paired-samples t-test confirmed that post-test scores ($M = 13.67$, $SD = 0.58$) were significantly higher than pre-test scores ($M = 6.33$, $SD = 1.53$), $t(2) = -8.315$, $p = .014$. Similarly, delayed post-test scores ($M = 12.67$, $SD = 0.58$) remained significantly higher than pre-test scores, $t(2) = -7.181$, $p = .019$, indicating retention of learning. No significant

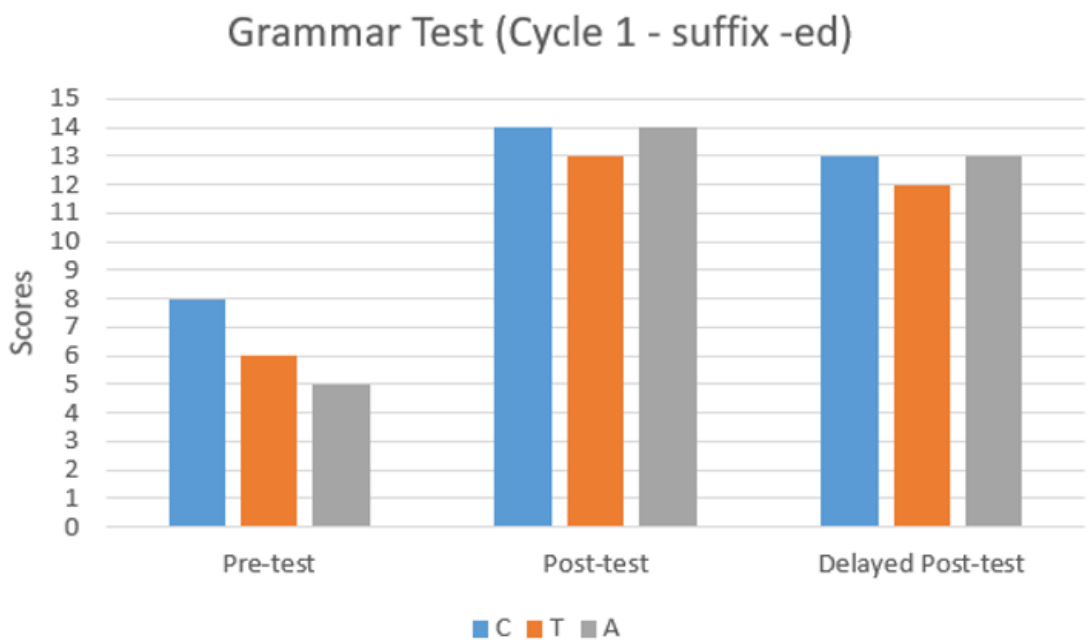

Figure 3. Scores during pre-test, post-test and delayed post-test in Cycle 1

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Pretest - Posttest	-7.33333	1.52753	.88192	-11.12792	-3.53875	-8.315	2	.007	.014
Pair 2	Pretest - Delayedposttest	-6.33333	1.52753	.88192	-10.12792	-2.53875	-7.181	2	.009	.019

Figure 4. Paired sample t-test results in Cycle 1

difference was observed between post-test and delayed post-test scores, consistent with descriptive trends. These results support Hypotheses 1 and 2.

4.1.2 Cycle 2 – Irregular Past Tense Verbs

In Cycle 2, PR, PT and DPT were conducted using 6 multiple-choice and 6 open-ended questions testing irregular past tense verbs. The pre-test was administered in Week 6, post-test in Week 9, and delayed post-test in Week 17.

All students improved from PR to PT. Student C improved from 7/12 (PR) to 11/12 (PT); Student T from 6 to 11; Student A from 5 to 12. All three students' scores decreased slightly on the DPT, with Student C, T and A scoring 10, 8 and 8 respectively.

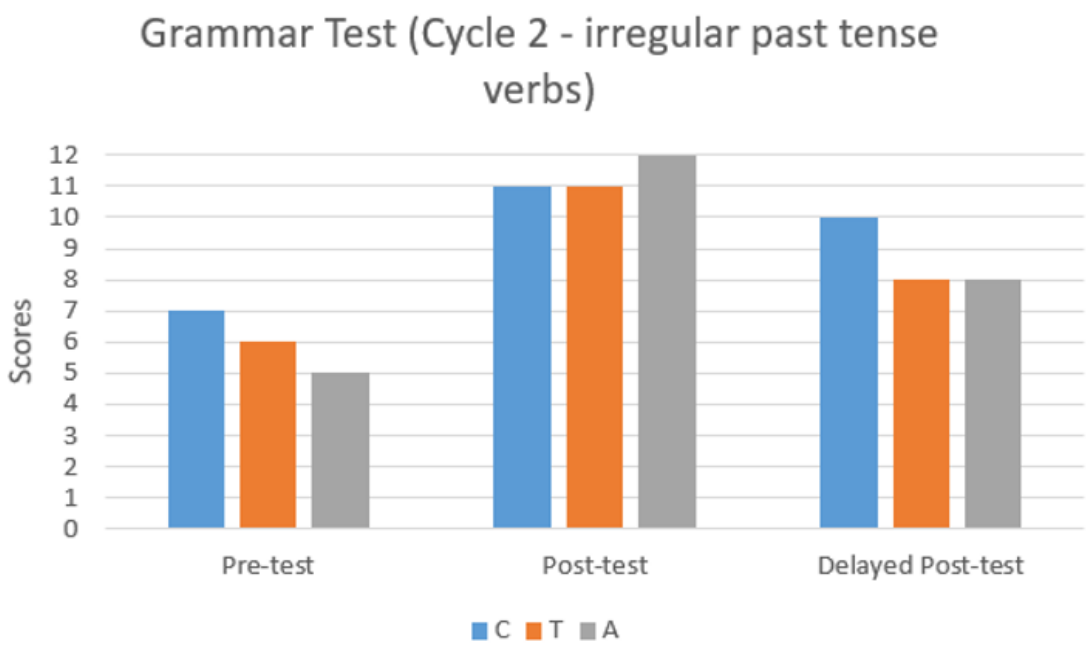

Figure 5. Scores during pre-test, post-test and delayed post-test in Cycle 2

Paired Samples Test

		Paired Differences					t	df	Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Pretest - Posttest	-5.33333	1.52753	.88192	-9.12792	-1.53875	-6.047	2	.013	.026
Pair 2	Pretest - Delayedposttest	-2.66667	.57735	.33333	-4.10088	-1.23245	-8.000	2	.008	.015
Pair 3	Posttest - Delayedposttest	2.66667	1.52753	.88192	-1.12792	6.46125	3.024	2	.047	.094

Figure 6. Paired sample t-test results in Cycle 2

Paired-samples t-tests confirmed that PT scores (M = 11.33, SD = 0.58) were significantly higher than PR scores (M = 6, SD = 1), t(2) = -6.047, p = .026. DPT scores (M = 8.67, SD = 1.15) were also significantly higher than PR scores, t(2) = -8.0, p = .015, suggesting retention of knowledge. Comparison between PT and DPT showed no significant difference, t(2) = 3.02, p = .94, indicating stable performance over time despite a slight decrease in scores. These findings support both hypotheses.

4.2 Qualitative Data

The themes in Table 2 were derived from unstructured teacher observations recorded on lesson plans throughout the intervention. Using thematic analysis (Braun & Clarke, 2012), four themes emerged:

1. Student engagement,
2. Collaborative learning,
3. Students as constructors of knowledge, and
4. Teacher as facilitator.

Theme 1: Student engagement

This theme captures students' active participation in learning the concept rather than passively receiving information. The following conversation occurred while students learned when to apply the suffix '-ed':

Example:

(Context: Teacher gave examples of two sentences. *"I brushed my teeth yesterday."* vs *"I brush my teeth every day"* and asked students when should the suffix *'*-ed*'* be applied.)

Student T: *"When there is the word 'yesterday'. Then if there is no 'yesterday' we cannot use '-ed'."*

(Context: Teacher gave two more examples of sentences. *"They kicked the ball really hard last week."* and *"They pushed the trolleys an hour ago."* The teacher asked the students when should the suffix *'*-ed*'* be applied.)

Student T: *"You add '-ed' when it is 'yesterday', 'last week' and 'an hour ago'."* (A14)

These exchanges highlight students' curiosity and active pattern-seeking. Student T observed time markers to derive the rule. Student C extended this by testing her own hypothesis with *"one minute ago,"* while Student A further questioned whether the length of time affects '-ed' usage.

Theme 2: Collaborative learning

This theme focuses on how students worked together to support each other's understanding. When Student A posed a question about '-ed', peers helped resolve his misconception:

Example:

Student A: *"What happens if -ed is in front of the word. Does it mean you don't have to add -ed behind the word to make it past tense?"*

Teacher: *"Let's try with the word 'edit'. The 'ed' is in front, so does it mean if it happened in the past, I would not need to add '-ed'?"*

Student A: *"So does this mean I don't have to add -ed behind? Is 'edit' in the past tense?"*

Student T: *"I think -ed can only be added behind a word. So it means it becomes edited."*

Student C: *"I think '-ed' is a suffix"* (points to visual cue on suffix)

Student A: *"Oh like 'walked', 'brushed', 'played'. it's all behind. So what does the ed in front of edit do?"*

Student T provided the answer, while Student C used prior knowledge of suffixes to help Student A understand '-ed's role, demonstrating peer-supported learning through the inductive approach.

Theme 3: Students as constructors of knowledge

This theme examines how students recognised patterns, articulated rules, and applied them.

Example (Continuing from the previous conversation):

Teacher: *"Cover the 'ed' in front of edit, what will you get?"*

Students: *"it"*

Teacher: *"Is it a different word? Does it have a different meaning if I remove the 'ed'?"*

Students: *"Yes."*

Student A: *"Oh so '-ed' in 'edit' is part of the word."*

Teacher: (Gave example of 'played') *"If I remove the '-ed' in played, does the meaning change?"*

Students: *"No"*

Student T: *"So if it does not change the word meaning it is a suffix for past tense?"*

Teacher: *"What about bed?"*

Student A: *"No, because if you cover ed it is just 'b'"*

Student C: *"'b' is not a word"*

Teacher: *"So when do you know if '-ed' is used as a past tense suffix?"*

Student A: *"When you cover the '-ed' it must still be the same word."*

Students constructed knowledge by recognising that '-ed' at the front of a word is not a suffix, and that not every word ending in 'ed' uses it as a past tense marker. They articulated the rule and applied it to new contexts.

Theme 4: Teacher as facilitator

This theme highlights the teacher's role in guiding students to derive rules through questioning and examples, rather than delivering explicit instruction.

Example 1

Student A: *"What happens if -ed is in front of the word. Does it mean you don't have to add -ed behind the word to make it past tense?"*

Teacher: *"Let's try with the word 'edit'. The 'ed' is in front, so does it mean if it happened in the past, I would not need to add '-ed'?"*

Example 2

Teacher: *"Just because the 'ed' is at the end of a word, does it mean it is a past tense verb?"*

Students: *"No"*

Teacher: *"Let's try 'jumped' and 'sled'. Are both '-ed' here a past tense suffix?"*

These excerpts illustrate the teacher's use of probing questions and examples to guide discovery and resolve misconceptions, encouraging students to test their hypotheses about grammar concepts.

5. DISCUSSION

RQ1: Does the inductive approach improve students with dyslexia's ability to apply grammar rules?

Quantitative results from both cycles indicate that the inductive approach effectively improved students' ability to apply grammar rules. In Cycle 1, all students demonstrated significant improvement from pre-test to post-test, with delayed post-test scores showing

minimal decrease while remaining substantially above pre-test levels, indicating retention. In Cycle 2, post-test scores also increased significantly; however, the delayed post-test showed a larger decrease, suggesting that retention of irregular past tense verbs was less stable.

This difference may be attributed to the nature of the concepts taught. Cycle 1 involved regular past tense verbs, which follow generalizable rules, enabling consistent application. This aligns with Berger and Batterink (2024), who note that children are more capable than adults in picking up implicit rules of a language, generalising the rules and retaining them over a period of time. In contrast, Cycle 2 focused on irregular past tense verbs, which require memorisation, recognition, and contextual application (Monica, 2023). However, it should be noted that Cycle 1 and Cycle 2 used different test formats. Cycle 1 employed only multiple-choice questions, while Cycle 2 included both multiple-choice and open-ended items. The open-ended format requires productive recall rather than recognition, which may be more demanding for students with dyslexia and could partially explain the lower delayed post-test scores observed in Cycle 2. Future research should use consistent test formats across cycles to allow for direct comparison. This suggests that students are required to memorise them which then is more challenging to internalise if students do not apply it regularly in their daily lives (Germain et al., 2025).

These results demonstrate that the inductive approach supports immediate learning and, for regular patterns, effective long-term retention. For more complex or irregular structures, reinforcement over time may be necessary to maintain mastery.

RQ2: How does inductive grammar instruction influence students' learning of grammar?

Four key themes emerged from qualitative observations, providing insight into the learning process facilitated by the inductive approach.

Student Engagement and Academic Achievement

Student engagement can be understood through affective, behavioral, cognitive, and agentic dimensions (Sinatra et al., 2015). Observations revealed that students were behaviorally and cognitively engaged, actively questioning and exploring grammar rules rather than passively receiving instruction.

For example, students posed questions about time markers and suffix usage, testing and refining their understanding. Research indicates that engagement positively correlates with academic achievement (Lei, Cui & Zhou, 2018; Northey et al., 2017). This explains the improvements observed in post-test and delayed post-test scores, suggesting that engagement during inductive instruction supports both immediate learning and retention.

The Role of Collaborative Learning

Collaborative learning involves individuals with varying abilities coming together to contribute to accomplish shared learning goals (Laal & Ghodsi, 2012). Prior studies have demonstrated that collaborative learning can increase student motivation and improve academic outcomes (Anggeraini & Nilawijaya, 2021; Shahamat & Mede, 2015).

In this study, when Student A questioned the placement of -ed, Students C and T contributed their reasoning and prior knowledge to resolve the misconception. This aligns with Vygotsky's social constructivist theory, emphasising knowledge construction through social interactions (Topçiu & Myftiu, 2015).

However, peer collaboration alone is not always sufficient (Tudge, 1992). Less competent students may not benefit without guidance from more capable peers or teacher support. This suggests that peer collaboration alone, without feedback from teachers may not be beneficial for students in their learning. Therefore, the teacher's role in scaffolding becomes the next critical factor in supporting student learning.

Teacher as Scaffolder

In inductive teaching, the teacher's role is not passive. Instead, the teacher actively guides students' discovery, allowing students the space to construct their own knowledge and to step in and bring his or her expertise on the topic and when necessary, to clear any misconceptions and guide students to figure out the concept (Shah, 2019). Scaffolding involves providing support tailored to learners' abilities, maintaining engagement, and gradually reducing guidance as competence develops (Van de Pol et al., 2010).

In this study, scaffolding was evident when the teacher prompted students with guiding questions, modeled strategies (e.g., covering -ed to distinguish suffixes), and related grammar rules to students' personal experiences. Such support helped students navigate misconceptions and internalise grammar concepts effectively.

Students as Constructors of Knowledge

In traditional classrooms, there is great emphasis on rote memorisation. The teachers teach the concept and the students passively learn the concept being taught (Lunenburg, 2011). In contrast, the inductive approach encourages students to participate actively with the exploration and learning of a concept (Rahayu & Yuliana, 2025). Observations through this study revealed that students leveraged prior knowledge, such as understanding simple present tense or the concept of suffixes, to derive rules for past tense usage.

This aligns with Piaget's cognitive constructivism, which posits that children expand their knowledge through integrating new experiences and reframe their understanding to fit their existing cognitive structures (Bada, 2015). Therefore, the inductive approach not only reinforces prior knowledge but also fosters students' ability to actively construct and apply new knowledge, promoting deeper understanding and critical thinking.

Implications of the Findings

The study underscores the effectiveness of the inductive approach in teaching grammar, particularly for students with dyslexia.

For educators and schools, teacher training programs should provide practical experience in inductive teaching, as teacher self-efficacy influences adoption of this approach (Mambwe et al., 2019; Temiz & Topcu, 2013). Inductive instruction fosters learner-centered, engaging classrooms that promote higher-order thinking skills such as analysis and comparison (Ginaya et al., 2019). Teachers can enhance learning by designing lessons that integrate familiar experiences, guided exploration, scaffolding, and peer collaboration (Smart et al., 2012).

For students with dyslexia, inductive instruction supports both the discovery and retention of grammar rules, allowing learners to actively construct knowledge rather than relying on memorisation. Collaborative and scaffolded learning encourages participation, reinforces understanding, and resolves misconceptions effectively.

Overall, the findings suggest that the inductive approach can transform grammar instruction into an interactive, meaningful, and effective learning experience for students with dyslexia.

6. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The purpose of this research was to examine the effectiveness of the inductive approach in teaching and learning of grammar. The conclusions from this study would address the two research questions: (1) Does the inductive approach improve students with dyslexia's ability to apply grammar rules? and (2) How does inductive grammar instruction influence students' learning of grammar? This chapter presents the discussion of the main findings from this study and makes recommendations for future research.

The first finding of this research was that the inductive approach improved students with dyslexia's ability in learning and applying grammar concepts. The results from their pre-test, post-test, and delayed post-test have shown an improvement in scores, suggesting that students were able to grasp and apply the concepts effectively.

The second finding triangulated these results by identifying the elements that contributed to the effectiveness of the inductive approach. Four main factors emerged from lesson observations: student engagement, collaborative learning, teacher as scaffolder, and students as constructors of knowledge. Student engagement refers to participation through inquiry, testing of hypotheses, and observation of patterns. Collaborative learning refers to peer learning and support as students work together to solve difficulties. The teacher as scaffolder highlights how the teacher guided students' learning through questioning and other scaffolding techniques. Finally, students as constructors of knowledge shows how learners actively applied skills and knowledge to fuel their own understanding of the topic.

These findings highlight the effectiveness of using the inductive approach in teaching grammar to students with dyslexia. While existing research emphasises explicit instruction, particularly the Orton-Gillingham approach, and studies on Artificial Grammar Learning have shown limited implicit learning, these studies often omit the roles of teachers and peers in classroom contexts. This research fills that gap by demonstrating the effectiveness of the inductive approach and showing how it can actively engage students in grammar learning.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future research should address the limitation of small sample size. Generalising findings from three participants to the larger population is challenging (Tipton, 2013). Dyslexia encompasses a diverse range of difficulties and abilities (Snowling et al., 2020); therefore, a larger sample size would better represent this population and increase validity and reliability (Andrade, 2020).

Additionally, future research should explore the effectiveness of the inductive approach using a control group. While this study demonstrated improvement, it cannot conclude that the inductive approach is more effective than alternatives, as no comparison was made with a deductive approach or a no-treatment group. Control groups are necessary to compare intervention effects (Moser, 2019). Future studies could compare inductive and deductive approaches to determine which method best supports grammar learning for students with dyslexia.

REFERENCES

Alzu'bi, M. A. (2015). Effectiveness of Inductive and Deductive Methods in Teaching Grammar. *Advances in Language and Literary Studies, 6*(2). https://doi.org/10.7575/aiac.alls.v.6n.2p.187

Anani, E. G. (2017). Teaching and Learning of Grammar at the Basic Level of Education: Revisiting Inductive Teaching Approach. *Education Journal, 6*(1), 51. https://doi.org/10.11648/j.edu.20170601.17

Andrade, C. (2020). Sample Size and Its Importance in Research. *Indian Journal of Psychological Medicine, 42*(1), 102–103. https://doi.org/10.4103/IJPSYM.IJPSYM_504_19

Anggeraini, Y., & Nilawijaya, R. (2021). The Impact of Motivation and Collaborative Learning on Academic Achievement. *Jurnal Pendidikan Progresif, 11*(2), 235–245. https://doi.org/10.23960/jpp.v11.i2.202108

Augustine, J. M., Slack, M., & Warholak, T. L. (2015). A pre- and post-test assessment of concept learning in research design. *Currents in Pharmacy Teaching and Learning, 7*(6), 729–737. https://doi.org/10.1016/j.cptl.2015.08.006

Bada, S. O., & Olusegun, S. (2015). Constructivism learning theory: A paradigm for teaching and learning. *Journal of Research & Method in Education, 5*(6), 66-70.

Benitez-Correa, C., Gonzalez-Torres, P., Ochoa-Cueva, C., & Vargas-Saritama, A. (2019). A Comparison between Deductive and Inductive Approaches for Teaching EFL Grammar to High School Students. *International Journal of Instruction, 12*(1), 225–236. https://doi.org/10.29333/iji.2019.12115a

Berger, S., & Batterink, L. J. (2024). Children extract a new linguistic rule more quickly than adults. *Developmental science, 27*(4). https://doi.org/10.1111/desc.13498.

Bishaw, A., & Egiziabher, Y. G. (2013). Comparison of traditional and constructivist teaching approaches in using English language learning strategies;(grade eleven students of Bahir Dar preparatory school). *Ethiopian Journal of Education and Sciences, 9*(1), 1-13.

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D., Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology*, Vol. 2: Research designs (pp. 57–71). American Psychological Association.

Caglar-Ryeng, Ø., Eklund, K., & Nergård-Nilssen, T. (2019). Lexical and grammatical development in children at family risk of dyslexia from early childhood to school entry: a cross-lagged analysis. *Journal of Child Language, 46*(6), 1102–1126. https://doi.org/10.1017/s0305000919000333

Capili, B., & Anastasi, J. K. (2024). An introduction to types of quasi-experimental designs. AJN, *American Journal of Nursing, 124*(11), 50–52. https://doi.org/10.1097/01.naj.0001081740.74815.20

Caylak, E. (2010). The Studies about Phonological Deficit Theory in Children with Developmental Dyslexia: Review. *American Journal of Neuroscience, 1*(1), 1–12. https://doi.org/10.3844/ajnsp.2010.1.12

Creswell, J. W., & Clark, V. L. P. (2010). *Designing and conducting mixed methods research* (2nd ed.). SAGE Publications.

Devi, K. S. (2019). Constructivist approach to learning based on the concepts of Jean Piaget and Lev Vygotsky An analytical Overview. *Journal of Indian Education, 44*(4), 5-19.

Germain, B. M., Augustin, M. S., & Katsiwa, C. T. K. (2025). From memorization to internalization of irregular verbs in the Beni EFL classroom. *IOSR Journal of Business and Management, 27*(5), 1–7.

Ginaya, G., Somawati, N. P., Aryana, I. N. R., & Putra, I. M. A. (2019). Improving Students' Communicative Competence through Inductive Method Using Authentic Materials. *Journal of Language Teaching and Research, 10*(5), 1080. https://doi.org/10.17507/jltr.1005.22

Hafsa, N.-E. (2019). Mixed Methods Research: an Overview for Beginner Researchers. *Journal of Literature, Languages and Linguistics, 58*(1), 45–49. https://doi.org/10.7176/jlll/58-05

Hulstijn, J. H. (2003). Incidental and intentional learning. *The handbook of second language acquisition*, 349-381.

Hwee, N. C. K., & Houghton, S. (2011). The effectiveness of Orton-Gillingham-based instruction with Singaporean children with specific reading disability (dyslexia). *British Journal of Special Education, 38*(3), 143–149. https://doi.org/10.1111/j.1467-8578.2011.00510.x

Ivankova, N., & Wingo, N. (2018). Applying Mixed Methods in Action Research: Methodological Potentials and Advantages. *American Behavioral Scientist, 62*(7), 978–997. https://doi.org/10.1177/0002764218772673

James, F., & Augustin, D. S. (2017). Improving teachers' pedagogical and instructional practice through action research: potential and problems. *Educational Action Research, 26*(2), 333–348. https://doi.org/10.1080/09650792.2017.1332655

Katan, P., Kahta, S., Sasson, A., & Schiff, R. (2016). Performance of children with developmental dyslexia on high and low topological entropy artificial grammar learning task. *Annals of Dyslexia, 67*(2), 163–179. https://doi.org/10.1007/s11881-016-0135-1

Kemmis, S., & McTaggart, R. (1999). The action research planner. Deakin University Press.

Khadidja, K. (2020). Constructivist theories of piaget and vygotsky: Implications for pedagogical practices. *Univ-ouargla.dz, [online]* 13(3). doi:https://doi.org/1112%20-%209263

Laal, M., & Ghodsi, S. M. (2012). Benefits of Collaborative Learning. *Procedia - Social and Behavioral Sciences, 31*(1), 486–490. https://doi.org/10.1016/j.sbspro.2011.12.091

Le, H. V., & Nguyen, L. Q. (2024). Promoting L2 learners' critical thinking skills: the role of social constructivism in reading class. *Frontiers in Education, 9*. https://doi.org/10.3389/feduc.2024.1241973

Lee, N. H., Wong, Z. Y., Lee, J., & Cheng, L. P. (2022). The effect of constructivist instruction on learning engagement in mathematics lessons: A flow theory perspective. *The Mathematician Educator, 3*(2), 133–153.

Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic achievement: A meta-analysis. Social Behavior and Personality: *An International Journal, 46* (3), 517–528. https://doi.org/10.2224/sbp.7054

Loeb, S., Dynarski, S., McFarland, D., Morris, P., Reardon, S., & Reber, S. (2017). Descriptive Analysis in Education: A Guide for Researchers. *NCEE* 4023. National Center for Education Evaluation and Regional Assistance.

Lunenburg, F. C. (2011). Critical thinking and constructivism techniques for improving student achievement. In *National Forum of Teacher Education Journal* 21(3). 1-9.

Mahjoob, E. (2015). A comparison of the effectiveness of inductive vs. deductive instruction of grammar to EFL students. *Journal of language, linguistics and literature, 1*(5), 164-169.

Male, H. (2016). Understanding Inductive and Deductive approaches in Teaching Grammar in EFL Context. *Jurnal Dinamika Pendidikan, 9*(1), 19. https://doi.org/10.33541/jdp.v9i1.135

Mallia, J. G. (2014). Inductive and Deductive Approaches to Teaching English Grammar. *Arab World English Journal, 5*(2).

Mambwe, R., Chishimba, P. C., & Manchishi, C. P. (2019). Student Teacher Preparation and Self-Efficacy Beliefs about Inductive Teaching Learning Methods in Primary Colleges of Education, Zambia. *International Journal of Education and Research, 7*(2), 179-196.

McKechnie, L., & Mulhall, A. (2008). Unstructured observation. In *The SAGE encyclopedia of qualitative research methods, Vol. 1*, pp. 573-575. SAGE Publications, Inc., https://doi.org/10.4135/9781412963909.n476

Mertler, C. A. (2020). *Action research: Improving schools and empowering educators* (6th ed.). Sage Publications, Inc.

Monica, T. (2023). The Effect Of Using Memories Application To Improve Students' Memorization Of Irregular Verb. *Jolly Journal of English Education, 1*(2), 177–187. https://doi.org/10.63435/jjee.v1i2.62

Moser, P. (2019). Out of Control? Managing Baseline Variability in Experimental Studies with Control Groups. *Good Research Practice in Non-Clinical Pharmacology and Biomedicine, 257*(1), 101–117. https://doi.org/10.1007/164_2019_280

Nesic, I., & Hamidovic, K. (2015). Teaching English grammar: Efficiency of inductive and deductive approaches students' perceptions. *Zbornik Radova Filozofskog Fakulteta U Pristini, 45*(3), 189–205. https://doi.org/10.5937/zrffp45-9250

Northey, G., Govind, R., Bucic, T., Chylinski, M., Dolan, R., & van Esch, P. (2017). The effect of "here and now" learning on student engagement and academic achievement. *British Journal of Educational Technology, 49*(2), 321–333. https://doi.org/10.1111/bjet.12589

Pavlidou, E. V., Williams, J. M., & Kelly, L. M. (2009). Artificial grammar learning in primary school children with and without developmental dyslexia. *Annals of Dyslexia, 59*(1), 55–77. https://doi.org/10.1007/s11881-009-0023-z

Purkayastha, S., Nehete, N., & Purkayastha, J. (2012). Dyscover – An Orton-Gillingham approach inspired multi-sensory learning application for dyslexic children. *2012 World Congress on Information and Communication Technologies.* https://doi.org/10.1109/wict.2012.6409163

Queirós, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European Journal of Education Studies, 3*(9), 369–387. https://doi.org/10.5281/zenodo.887089

Rahayu, O., & Yuliana, S. (2025). The effectiveness of implementing the constructivist learning model in improving elementary school students' conceptual understanding. *Didaskalos Journal, 1*(1), 17-24.

Ramraje, S. (2011). Comparison of the effect of post-instruction multiple-choice and short-answer tests on delayed retention learning. *Australasian Medical Journal, 4*(6), 332–339. https://doi.org/10.4066/amj.2011.727

Rijthoven, V. R., Kleemans, T., Segers, E., & Verhoeven, L. (2020). Response to Phonics Through Spelling Intervention in Children With Dyslexia. *Reading & Writing Quarterly, 37*(1), 1–15. https://doi.org/10.1080/10573569.2019.1707732

Rispens, J., Roeleven, S., & Koster, C. (2004). Sensitivity to subject–verb agreement in spoken language in children with developmental dyslexia. *Journal of Neurolinguistics, 17*(5), 333–347. https://doi.org/10.1016/j.jneuroling.2003.09.001

Rogers, J., & Revesz, A. (2019). Experimental and quasi-experimental designs. In *The Routledge handbook of research methods in applied linguistics* (pp. 133-143). Routledge.

Roitsch, J., & Watson, S. (2019). An overview of dyslexia: Definition, characteristics, assessment, identification, and intervention. *Science Journal of Education, 7*(4), 81–86. https://doi.org/10.11648/j.sjedu.20190704.11

Roulston, K., & Shelton, S. A. (2015). Reconceptualizing Bias in Teaching Qualitative Research Methods. *Qualitative Inquiry, 21*(4), 332–342. https://doi.org/10.1177/1077800414563803

Runhardt, R. W. (2025). Reactivity, validity, and measurement in the social sciences. *Studies in History and Philosophy of Science, 112,* 1–9. https://doi.org/10.1016/j.shpsa.2025.05.006

Sarita, P. (2017). Constructivism: A new paradigm in teaching and learning. *International Journal of Academic Research and Development, 2*(4), 183-186.

Sayeski, K. L., Earle, G. A., Davis, R., & Calamari, J. (2018). Orton Gillingham: Who, What, and How. *TEACHING Exceptional Children, 51*(3), 240–249. https://doi.org/10.1177/0040059918816996

Semerci, Ç., & Batdi, V. (2015). A Meta-Analysis of Constructivist Learning Approach on Learners' Academic Achievements, Retention and Attitudes. Journal *of Education and Training Studies, 3*(2). https://doi.org/10.11114/jets.v3i2.644

Shah, R. K. (2019). Effective Constructivist Teaching Learning in the Classroom. *Shanlax International Journal of Education, 7*(4), 1–13. https://doi.org/10.34293/education.v7i4.600

Shahamat, A., & Mede, E. (2015). Integration of collaborative learning in Grade K-5 EFL classrooms. *Education 3-13, 44*(6), 682–697. https://doi.org/10.1080/03004279.2014.1002516

Sharma, R. K. (2014). Constructivism-an approach to enhance participatory teaching learning. *GYANODAYA - the Journal of Progressive Education, 7*(2), 13. https://doi.org/10.5958/2229-4422.2014.00003.6

Sik, K. (2015). Tradition or Modernism in Grammar Teaching: Deductive vs. Inductive Approaches. *Procedia - Social and Behavioral Sciences, 197*, 2141–2144. sciencedirect. https://doi.org/10.1016/j.sbspro.2015.07.340

Sinatra, G. M., Heddy, B. C., & Lombardi, D. (2015). The Challenges of Defining and Measuring Student Engagement in Science. *Educational Psychologist, 50*(1), 1–13. https://doi.org/10.1080/00461520.2014.1002924

Smart, K. L., Witt, C., & Scott, J. P. (2012). Toward Learner-Centered Teaching. *Business Communication Quarterly, 75*(4), 392–403. https://doi.org/10.1177/1080569912459752

Snowling, M. J., Hulme, C., & Nation, K. (2020). Defining and understanding dyslexia: Past, present and future. *Oxford Review of Education, 46*(4), 501–513. https://doi.org/10.1080/03054985.2020.1765756

Sullivan, G. M. (2011). Getting Off the "Gold Standard": Randomized Controlled Trials and Education Research. *Journal of Graduate Medical Education, 3*(3), 285–289. https://doi.org/10.4300/jgme-d-11-00147.1

Temiz, T., & Topcu, M. S. (2013). Preservice teachers' teacher efficacy beliefs and constructivist-based teaching practice. *European Journal of Psychology of Education, 28*(4), 1435–1452. https://doi.org/10.1007/s10212-013-0174-5

Tilanus, E. A. T., Segers, E., & Verhoeven, L. (2016). Responsiveness to Intervention in Children with Dyslexia. *Dyslexia, 22*(3), 214–232. https://doi.org/10.1002/dys.1533

Tipton, E. (2013). Improving generalizations from experiments using propensity score subclassification: Assumptions, properties, and contexts. *Journal of Educational and Behavioral Statistics, 38*(3), 239-266.

Tipton, E., Hallberg, K., Hedges, L. V., & Chan, W. (2016). Implications of Small Samples for Generalization: Adjustments and Rules of Thumb. *Evaluation Review, 41*(5), 472–505. https://doi.org/10.1177/0193841x16655665

Topçiu, M., & Myftiu, J. (2015). Vygotsky Theory on Social Interaction and its Influence on the Development of Pre-School Children. *European Journal of Social Sciences Education and Research, 4*(1), 172. https://doi.org/10.26417/ejser.v4i1.p172-179

Tudge, J. R. H. (1992). Processes and Consequences of Peer Collaboration: A Vygotskian Analysis. *Child Development, 63*(6), 1364–1379. https://doi.org/10.1111/j.1467-8624.1992.tb01701.x

Van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher–student interaction: A decade of research. *Educational Psychology Review, 22*(3). https://doi.org/10.1007/s10648-010-9127-6

Vender, M., Krivochen, D. G., Phillips, B., Saddy, D., & Delfitto, D. (2019). Implicit Learning, Bilingualism, and Dyslexia: Insights From a Study Assessing AGL With a Modified Simon Task. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.01647

Vogel, S., Herron, C., Cole, S. P., & York, H. (2011). Effectiveness of a Guided Inductive Versus a Deductive Approach on the Learning of Grammar in the Intermediate-Level College French Classroom. *Foreign Language Annals, 44*(2), 353–380. https://doi.org/10.1111/j.1944-9720.2011.01133.x

Xiao, X.-Y., & Ho, C. S.-H. (2013). Weaknesses in Semantic, Syntactic and Oral Language Expression Contribute to Reading Difficulties in Chinese Dyslexic Children. *Dyslexia, 20*(1), 74–98. https://doi.org/10.1002/dys.1460