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ARTICLE

A Study on the Impact of Flipped Classroom Strategy on Improving Reading Comprehension among Primary School Pupils

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ABSTRACT

This research focused on comparing the effectiveness of the flipped classroom method with traditional methods as a learning approach to improve reading comprehension across four areas: literal, inferential, critical, and creative comprehension. The research sample consisted of 186 pupils from Syrian refugee students within Syrian refugee schools, as there are schools specifically for Syrian pupils in northern Jordan supported by the United Nations. This study used a quasi-experimental design, where the research sample was divided into two groups: the experimental group, which was taught using the flipped classroom approach, and the control group, which used traditional methods. Data were gathered through a specially designed reading comprehension skills test, which was adapted for this study. The results revealed that the flipped classroom strategy significantly improved pupils' reading comprehension levels across all dimensions at a significance level of ($p \leq 0.05$). The experimental group confirmed notable progress in their capability to comprehend clear textual information, analyse and understand content collaboratively, assess texts critically, and express creative explanations. Furthermore, the results indicated that pupils maintained their reading comprehension skills over time, showcasing the flipped classroom's effectiveness in promoting sustainable learning outcomes. The results encourage broader adoption

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of flipped class strategy in reading instruction, urging teachers to create dynamic, pupil-centered learning experiences. Furthermore, the study highlights the importance of continuously assessing learning curricula to meet pupils' evolving needs and emphasizes the potential for further research on the long-term effects of the flipped classroom concept across various academic disciplines.

Keywords: Flipped Classroom; Learning Strategy; Reading Comprehension Skills; Primary Schools

1. Introduction

Reading plays a dynamic role in shaping cultural identity, allowing individuals to grasp the values and principles represented by different communities[1–4]. Through literature and cultural heritage, readers become familiar with narratives and experiences that reflect the lives of others, fostering empathy and understanding across cultures. Reading provides an opportunity to discover the traditions, myths, and values that shape societies, thus enhancing both individual and collective cultural identities[5–7]. Additionally, it promotes a spirit of dialogue and intellectual exchange; engaging with ideas presented in various texts enables individuals to form new opinions and broaden their perspectives[5, 6].

Recognizing reading as a multifaceted linguistic, social, and cognitive process necessitates that pupils engage actively with the text, context, and intent[8, 9]. For reading to be effective, pupils must cultivate a comprehensive set of sub-skills, including vocabulary development, visualization, activation of previous knowledge, identification of key concepts and details, questioning, inferring meanings, and oral communication. Mastering these reading skills is not merely important; it is crucial, as the ability to comprehend written texts serves as the cornerstone for interpreting information and understanding intended meanings[3, 5]. Comprehension goes beyond simple word recognition; it requires the ability to grasp abstract concepts and nuanced details across diverse contexts[10, 11] .

Nevertheless, the journey toward comprehensive understanding of texts remains fraught with challenges for learners. Active comprehension necessitates the development of a range of essential skills. Good readers must analyze texts and infer meanings, which calls for a certain level of linguistic and cultural understanding. To facilitate accurate comprehension, texts should present sufficient complexity for readers[5, 11]. Therefore, instructing pupils in reading and nurturing associated skills is essential for enhancing their ability to involve in self-directed learning and acquire knowledge effectively[5].

To effectively address the reading challenges faced by pupils, innovative teaching strategies such as the flipped classroom are essential. Traditional teaching methods often struggle to engage students, leading to gaps in reading comprehension and skills development[9, 12, 13]. The flipped classroom strategy counters this by reversing the conventional learning sequence, where students first engage with instructional content at home - through videos or reading materials - before class. This preparatory work enables pupils to familiarize themselves with reading concepts, making them better equipped for in-depth discussions and collaborative activities during class time[10, 11].

By allowing students to tackle reading materials at their own pace, the flipped classroom approach addresses individual learning needs and fosters a more personalized educational experience. This strategy not only improves students' understanding of reading text but also encourages active involvement in discussions, thereby reinforcing their learning[8, 9]. As a result, the flipped classroom emerges as an effective solution for overcoming reading challenges, ultimately aiming for significant improvements in students' reading skills[10, 11].

The flipped learning strategy represents an integrated learning strategy that reconfigures the traditional elements of the teaching process. In this strategy, pupils engage with course materials through online videos or audio recordings prior to class attendance, thus freeing up class time for discussion and practical application[12–14]. This strategy embodies a modern solution to traditional education by emphasizing the development of pupils' critical thinking skills and leveraging modern technology, particularly learning videos. Such a framework enables teachers to devote more time to interaction and discussion with pupils during class. Rather than presenting theoretical information during class time, pupils watch instructional videos at home, allowing them to focus

on discussions and practical applications under the teacher's supervision [5, 7].

The flipped class strategy is primarily associated with the utilization of videos as interactive learning tools. These videos afford pupils the opportunity to deeply understand the content through accessible technological means. Research indicates that teachers employing this strategy consider videos an effective learning resource for motivating pupils to prepare for classroom discussions, thereby enhancing their active participation in lessons [12–16]. Studies conducted by educationists [10, 13, 16–18] have confirmed that flipped class strategy is more effective when teachers create their own videos, as this allows for comprehensive coverage of lesson elements.

Ultimately, this strategy transforms the roles of both teachers and pupils; pupils transition from being passive recipients of information to active participants in the learning process, taking control of their classroom experiences [17, 18]. Numerous studies in the field of language education demonstrated the effectiveness of classroom-based learning strategies in developing language skills [1, 8, 9].

Recent studies, such as Yulian [6], highlight the importance of integrating the flipped class strategy into blended and online learning environments, considering this methodology an effective tool for utilizing information and communication technologies in learning settings. By implementing flipped class, an environment is created that stimulates critical thinking and innovation, enhancing the effectiveness of classroom discussions and allowing pupils to exchange ideas in a more dynamic manner [4, 6, 9, 15].

The benefits associated with the flipped class strategy are numerous, as it allows pupils to learn at their own pace [12, 19–21]. With this strategy, pupils can watch lectures and lessons anytime and anywhere, reducing the time constraints that may hinder their understanding of new concepts [19, 22, 23]. Unlike traditional classrooms, where time may be limited, the flipped strategy provides pupils with the opportunity to immerse themselves in activities that enhance higher-order thinking skills during class time. Through self-study of materials at home, pupils can better apply what they have learned in interactive activities within the classroom.

The study by Fahmi et al. [24] investigated the effectiveness of flipped class strategy in enhancing reading comprehension among pupils with varying levels of reading proficiency. The findings revealed that using video-based activities in pre-reading stages within the flipped class strategy framework contributes to improved understanding and schema acquisition. The study also indicates that flipped class strategy provides personalized learning experiences; however, their effectiveness varies depending on the strategies and delivery methods employed. While most pupils benefit from this learning approach, those who struggle with self-discipline and time management may face challenges in adapting to the online components, potentially leading to a decline in their academic performance.

The quasi-experimental study conducted by Labordo [25] investigated the effect of differentiated instruction (DI) on the reading comprehension skills of 30 Grade Eleven learners in the Philippines. Using a pre-test-post-test design, the study involved an experimental group that received DI, while the control group was taught by traditional method. The results shown that learners in the experimental group achieved comprehension levels aligned with the middle high school stage, whereas those in the traditional instruction group only attained a sixth-grade comprehension level. The research highlighted the positive impact of DI on enhancing reading comprehension skills, fostering learners' interests and enthusiasm, and demonstrated the effectiveness of integrating their preferences to improve motivation and performance.

Another relevant study by Kasmaini & Riswanto [26] analyzed the quantitative effects of implementing the flipped class strategy on reading comprehension levels among high school pupils in Indonesia. The study included 56 pupils, and the results indicated a significant improvement in reading comprehension scores after using this learning strategy. This demonstrates that the flipped class strategy enhances pupil performance in Islamic secondary schools. The research results suggest that using the flipped classroom approach, in language classes is advisable as it enhances learning outcomes and offers advantages.

Flipped classrooms offer an edge compared to teaching methods by incentivizing and boosting pupil participation effectively. Both traditional and flipped methods use materials; however, flipped classrooms differentiate themselves by incorporating digital tools, like online games and simulations that make learning more engaging and impactful for pupils [23, 26]. An important advantage of flipped class-

rooms is the feedback they provide to pupils, on their reading progress. This feedback helps pupils pinpoint areas needing improvement and growth. It aids them in assessing their progress and development throughout their learning journey [12, 15].

Additionally, a study conducted by Samarakou et al. [27] indicates that mobile application-based language learning (MALL), considered a component of the flipped class strategy, and outperforms traditional methods in enhancing reading comprehension in English, whether as a foreign language or a second language (EFL/ESL). This suggests that the innovative use of technology within flipped class strategy offers pupils a distinctive learning experience that surpasses traditional methods. Furthermore, the potential of flipped class strategy as an innovative approach to improving English language teaching and learning has been acknowledged. Researchers [15, 18, 27–29] have emphasized the importance of flipped class strategy in developing language skills among pupils. Compared to conventional methods that utilize similar learning materials, flipped class strategy demonstrate their effectiveness in leveraging interactive, technology-driven resources, providing pupils with a rich learning experience filled with engagement and immediate feedback.

In conclusion, flipped class strategy represents a dynamic alternative that meets the needs of pupils in the digital age, making them a preferred choice in modern learning contexts. However, despite the numerous benefits, some studies indicate that flipped class strategy may fail if not designed and implemented properly. In this regard, the study by Al-Barakat et al. [30] revealed that teachers may encounter challenges in integrating technology and online education into their curricula if they do not receive adequate training and support. The success of flipped class strategy heavily relies on teachers' readiness and ability to effectively utilize modern tools and techniques. When teachers do not have the expertise and tools required for incorporating technology and educational approaches efficiently into their teaching practices; it poses a significant challenge that hampers the effectiveness of teaching methods and limits the advantages derived from online learning opportunities. Furthermore, inadequately crafted online learning programs might pose navigation challenges due, to directions or a scarcity of features; thus adversely affecting the learning process and amplifying pupils' sense of annoyance and disinterest, which in turn leads to subpar academic achievements [31–34].

Although previous studies over the past five years have demonstrated the effectiveness of the flipped classroom strategy in various fields of learning, a significant gap remains in its application to reading comprehension lessons, particularly in primary schools serving Syrian refugee students in northern Jordan. Most of these refugees have settled in this region, and the students face unique reading challenges that differ from those encountered by Jordanian students in other regions [12, 22, 35, 36], such as the central and southern areas. Due to the specific difficulties these students experience as a result of displacement, language barriers, and differing educational backgrounds, their reading proficiency often lags behind that of their Jordanian counterparts.

The theoretical underpinnings of this study are grounded in Constructivist Learning Theory and Social Learning Theory, which emphasize active, student-centered learning and peer collaboration, both central to the flipped classroom strategy [37, 38]. Cognitive Load Theory supports the idea that shifting content delivery outside of class allows students to process information at their own pace, a crucial consideration for refugee students facing unique challenges. Additionally, Dual Coding Theory highlights the benefits of using multimedia tools to reinforce reading comprehension, especially for students with limited educational backgrounds. These theories, combined with Critical Pedagogy and reading comprehension frameworks, provide a robust foundation for understanding how the flipped classroom can specifically address the needs of Syrian refugee students and improve their reading skills [23, 24, 39, 40].

While the importance of reading proficiency for academic success and long-term opportunities is well recognized, there is a noticeable lack of research focused on using the flipped classroom strategy to address these challenges in reading comprehension. Although many studies have confirmed the positive effects of the flipped classroom in enhancing learning outcomes, the absence of research applying this method to reading instruction for refugee students highlights a critical gap. Therefore, this study is urgently needed to provide empirical evidence on the effectiveness of the flipped classroom strategy in improving the reading skills of Syrian refugee students [16, 21, 23, 41, 42]

Moreover, PISA assessments have shown that both Jordanian students and Syrian refugees in Jordan face significant

difficulties in reading comprehension. This reinforces the necessity of addressing this issue through innovative teaching approaches like the flipped classroom. By investigating the impact of this strategy on a vulnerable population, this study aims to contribute valuable insights that can inform educational strategies and interventions. The findings are expected to not only benefit Syrian refugee students but also provide a framework for improving reading instruction in similar contexts, ultimately helping to reduce the achievement gap and promote educational equity.

In light of these considerations, this study raises the following research questions:

1. What is the impact of employing the flipped classroom strategy on improving pupils' performance in reading comprehension skills among the experimental group compared to the control group that learned through traditional methods?
2. Are there statistically significant differences at the significance level ($p \leq 0.05$) in the mean scores of the experimental group pupils between the delayed achievement test and the immediate achievement test?

The significance of this study stems from the urgent need to address the reading challenges faced by Syrian refugee students in northern Jordan, particularly within the context of primary education. The results are anticipated to inform future educational practices not only for Syrian refugees but also for other refugee populations, offering solutions that enhance reading comprehension and promote equity in education.

2. Materials and Methods

2.1. Study Design

The current study employed a quasi-experimental design, which is characterized by the lack of random assignment to treatment and control groups. This design allows researchers to assess the effects of an intervention when randomization is not feasible [40]. In this study, a pretest-posttest approach was utilized, involving two groups: an experimental group and a control group, as follows:

- O1 X O1 = EG
- O1 - O1 = CG

The symbols represent the following:

- **EG (Experimental Group):** The experimental group was taught using the flipped classroom strategy.
- **CG (Control Group):** The control group was taught using traditional methods.
- **O1 (Pretest and Posttest):** Refers to the administration of a reading comprehension test before and after the intervention for both groups.
- **X (Experimental Treatment):** Represents the flipped classroom intervention applied to the experimental group.
- **(-):** Indicates the use of traditional teaching methods for the control group.

This quasi-experimental design enables the comparison of outcomes between the two groups while accounting for pre-existing differences, providing valuable insights into the effectiveness of the flipped classroom strategy in enhancing reading comprehension.

2.2. Participants

The primary schools were purposefully selected from those that teach Syrian refugee pupils in northern Jordan. The selection process was based on the consent of school principals and their willingness to cooperate with the researchers, as well as the availability of necessary technical resources. Ninth-grade pupils from three schools in the region were randomly selected to participate in the study. The random sampling method ensured that the participants were drawn from a diverse pool, contributing to the creation of two groups: an experimental group and a control group, each consisting of 93 pupils distributed across three classes.

In forming the groups, a heterogeneous grouping approach was adopted, allowing for a mix of abilities and backgrounds among the pupils. This method was chosen to enhance the external validity of the findings, as it reflects the diverse learning environments present in the schools. All pupils came from similar backgrounds concerning their status and learning environment, which provided a balanced comparison between the experimental and control groups.

2.3. Study Instrument (Reading Comprehension Skills Test)

This aim is to measure the level of ninth-grade pupils' acquisition of reading comprehension skills. The test creators collaborated with experts, in language assessment and teach-

ing methods as consulted with language educators to develop the test questions. They also reviewed existing research and literature, on the subject. The reading comprehension skills test encompassed 30 questions covering aspects of reading comprehension skills. The Reading Comprehension Skills Test evaluates a range of kills related to reading and understanding written material, which are described as:

- **Literal comprehension** is, about how well pupils can grasp and remember information that is directly stated in the text by answering questions related to the idea and key details provided clearly. In the test, this skill was measured through 8 questions that required pupils to retrieve concrete information from the passage.
- **Inferential comprehension** is, about delving into the texts meaning beyond what's explicitly stated; it requires pupils to analyze and deduce implications that are not overtly expressed in order to draw conclusions and predict outcomes based contextually. The evaluation of this skill was conducted using eight questions designed to prompt pupils to critical thinking and establish connections.
- **Critical comprehension** is crucial as it involves analyzing and assessing the content of the text with an eye. A reader must evaluate the strength of arguments presented in the text by recognizing any bias and assessing the reliability of its sources. The test included 8 questions that challenged pupils to think critically about the reasoning presented in the text.
- **Creative comprehension**: This skill encourages pupils to use their imagination and extend ideas beyond the text. It involves generating new interpretations, suggesting alternative endings, or applying themes from the reading to different contexts. The test measured this skill through 6 questions that concentrated on pupils' ability to think creatively and examine opportunities derived from the text.

The test consisted of multiple choice questions requiring pupils to choose the answer, from four options (labeled A through D). The questions were designed to be clear and suitable for graders while evenly spreading difficulty across skills without giving away any hints, to the correct responses. The distribution of test items in the instrument is not equal due to the varying emphasis placed on each dimension of reading comprehension skills. A different number of items was allocated to each dimension - literal comprehension, inferential comprehension, critical comprehension, and creative comprehension - based on their importance in the curriculum and specific learning objectives. This unequal distribution allows for a more accurate assessment of students' strengths and weaknesses across different aspects of reading comprehension, providing a clearer picture of their overall performance.

To ensure the test was effective in assessing pupils' abilities across different levels of reading comprehension, varying levels of difficulty and discrimination indices (ranging between 0.42 and 0.57, and 0.28 to 0.54) were applied for each evaluated item.

2.4. Validity and Reliability

2.4.1. Validity of the Test

The validity of a test plays a role, in evaluating how well an assessment works by showing how precisely and fairly it can gauge what it's supposed to measure and without bias. There are ways to determine test validity which fall under categories one being external validity that gauges the test results against outside benchmarks like standardized tests or real world performance, in the relevant area. Results must demonstrate a strong correlation with these criteria. The other type is internal validity which looks at how well the test content aligns with the intended goals. The evaluation relies on the nature of the items used and their formulation clarity, along with the precision of instructions provided to participants involved in the process. For this research projects assessment phase, the test was administered to a panel of nine experts specializing in measurement and assessment fields. All judges unanimously concurred that each item, within the test effectively gauges its intended measurement objective, thus showcasing the validity of the test.

2.4.2. Reliability of the Test

The reliability of the test is determined by its ability to produce consistent results over time and across different measurement methods. In this research study, the correlation coefficient was calculated to assess the relationship between test scores and the post-test results of the pupils' performance. A significant correlation between the scores from both tests indicates a level of consistency in the evaluation processes.

To provide a clearer understanding of how the test

scores were obtained the researchers conducted a comparative analysis of the initial test scores against the results from a follow-up assessment administered one week later to the same group of students. The instrument was pilot tested with a sample of 25 students who were outside the main study sample. The researchers employed various techniques to determine the reliability score of the test. The split-half method yielded a reliability score of 0.91, and an overall reliability score of 0.92 was achieved. These results demonstrate that the test outcomes are highly dependable.

To ensure the validity of the reading comprehension skills test, it was constructed with four dimensions in mind: literal comprehension skills, inferential comprehension skills, critical comprehension skills, and creative comprehension skills. The test consists of thirty multiple-choice questions, with one point awarded for each correct answer, resulting in a maximum score of thirty points. Each question was scored by assigning one point for the correct answer and zero points for an incorrect response. The total score for the pupils' responses is calculated by summing the points awarded, which can range from 0 to 30.

Furthermore, the correlation coefficients of each item with the total test and each item with its specific dimension were calculated to ensure result accuracy. The results showed that the correlation values, for the test questions regarding literal comprehension varied from 0.55 to 0.77 for inferential comprehension from 0.48 to 0.85 for critical comprehension from 0.39 to 0.87, for creative comprehension from 0.34 to 0.86 and, for questions related to reading comprehension skills across all test questions from 0.39 to 0.87. All correlation values were found to be statistically significant ($p \leq 0.05$) which adds credibility to the validity of the test.

Based on this evaluation we can see that the test created is reliable and valid which makes it a useful method to evaluate pupils reading abilities accurately and consistently. It was carefully designed with input, from experts to ensure results that align with the goals, in place.

2.5. Flipped Class Instructional Material

To achieve the objectives of the study, the requirements for implementing a flipped class strategy were established for instruction a series of reading texts. Several video clips were produced, each lasting between 7 to 12 minutes, following these steps:

(1) **Identifying target reading comprehension skills**: This step involves determining the essential skills that pupils are expected to develop from the selected reading texts, such as understanding implicit meanings, analyzing textual content, interpreting information, and engaging in critical thinking regarding the material.

(2) **Defining learning outcomes for each reading Text**: Clear, specific, and measurable learning outcomes were established for each reading text, enabling the instructor to assess the extent to which the objectives are met while ensuring alignment with the targeted skills.

(3) **Providing flipped class requirements**: The implementation of the flipped class strategy necessitates a range of tools and resources, including computers for video production, internet access for research purposes, video production applications such as Camtasia or Adobe Premiere, and a medium for disseminating the produced learning videos to pupils.

(4) **Preparing video clips**: In this phase, collaboration with experienced teachers was conducted to ensure the creation of effective instructional content, with an emphasis on high production quality concerning lighting, sound, and visual effects. This ensures that the videos are appropriately aligned with the designated texts and learning objectives.

(5) **Producing videos for each reading text**: This process entails editing the videos by incorporating voiceovers, background music, and necessary visual effects, as well as offering diverse content such as animations and illustrative materials to simplify complex concepts.

(6) **Integrating learning activities**: Interactive activities and questions were embedded within the videos to foster pupil engagement, encouraging critical thinking. These activities include multiple-choice questions, open-ended inquiries, and small projects.

(7) **Sharing learning content**: The texts and videos were uploaded to accessible links on learning platforms, and engagement was encouraged through social media channels to facilitate knowledge sharing and discussion of the content.

(8) **Reviewing content at home**: Pupils received clear

guidelines on how to access and engage with the learning content at home. Accompanying the videos, a notes sheet was provided containing key questions designed to assist pupils in focusing on significant aspects of the material.

(9) **Facilitating classroom discussions**: In the classroom setting, the teacher engaged pupils in discussions about the content of each video they reviewed at home. This engagement allowed for questions and clarifications, as well as the execution of pre-planned learning activities, fostering deeper understanding of the material and enabling assessment of pupil learning.

Based on the above, and to ensure accuracy and reliability in implementing the flipped class teaching approach, the following steps were taken:

(1) **Phase of judging the learning material based on the flipped classroom**: To determine the suitability of the learning material for teaching pupils the content of the cognitive topic and achieving the study objectives, it was presented to several judges from learning faculty members at Jordanian universities with expertise in language teaching and information technology. This evaluation aimed to assess the learning material, provide feedback, suggest appropriate modifications, and evaluate its alignment with the lesson objectives. In light of this, all observations were taken into account.

(2) **Phase of preparing lesson plans**: Lesson plans designed for implementation through the flipped class strategy were developed, utilizing the preparation strategy approved by the Ministry of Education to assist teachers in effectively managing and engaging with the material. These lesson plans emphasized the teachers importance, as guides and mentors in supporting pupils learning journeys. The focus was, on placing the pupil at the center of the experience.

(3) **Phase of judging the lesson plans**: The lesson plans prepared according to blended learning based on the flipped class were presented to several judges from learning faculty members specializing in language teaching and information technology. This was done to ensure the clarity and feasibility of the procedures and to provide feedback and suggest appropriate modifications. In light of this, all observations were taken into account, and the suitability of the learning unit was confirmed.

(4) **Phase of teacher training**: The principal researcher trained the teachers of the experimental group who implemented the study on how to teach using the flipped class strategy, relying on reading texts based on the flipped learning strategy, similar to the original reading texts applied in the study.

2.6. Data Collection and Analysis

Before initiating data collection, the teachers of the experimental group received training on the flipped classroom teaching strategy and how to implement the selected learning material from the ninth-grade language curriculum. The performances of pupils in both groups were assessed using the study tool. The data were then entered into a computer for analysis using the Statistical Package for the Social Sciences (SPSS). To address the research questions, the following statistical analyses were conducted:

(1) The means and standard deviations of the pupils' grades in the reading comprehension test were computed for both groups.

(2) A t-test was employed to determine whether there were statistically significant differences at the significance level ($p \leq 0.05$) between the performances of the experimental and control groups. A t-test was also used to assess the differences in the performance of individuals within the experimental group on their immediate and delayed reading comprehension skills tests.

3. Results

3.1. Results of the First Question

The primary objective of the first question was to assess the impact of the flipped class learning strategy on enhancing reading comprehension skills among first-grade pupils. Before proceeding with the study implementation, the researchers verified the equivalence of the two groups, which means that a pre-test was administered to participants in both the experimental and control groups to assess their equivalence. Subsequently, the means and standard deviations of the pupils' performance in both groups were calculated. A

t-test was then conducted to determine whether there were significant differences between the means of the pupils' performance, evaluated at a statistical significance level of ($p \leq 0.05$) at the outset of the practical application.

This analysis effectively reveals the extent to which the experimental and control groups are equivalent in their scores on the reading comprehension skills test. The results of the t-test, presented in **Table 1**.

The above table indicates that there are no statistically significant differences ($p \leq 0.05$) in the means of the performance of ninth-grade pupils on the reading comprehension skills test according to the group variable (experimental vs. control). This result suggests the equivalence of the two groups prior to the intervention.

According to the findings presented here and following the programs schedule outline, for four weeks with an average of four classroom sessions lasting 45 minutes each – totaling 32 sessions in all – the study employed the flipped classroom approach to instruction as planned. The post intervention assessment for reading comprehension was carried out on pupils, from both the experimental and control groups in a manner to the pretest scenario.

Based on the above, the first study question aimed to identify whether statistically significant differences existed at ($p \leq 0.05$) between the mean performance of the experimental group and that of the control group across various reading comprehension skills, as well as in the overall assessment. The comparison focused on the learning strategy incorporating the flipped class strategy versus the conventional teaching approach. A t-test was employed to analyze the post-test results and investigate these differences, as illustrated in **Table 2**.

Table 2 reveals a huge significant variance in the mean scores between the control and experimental groups. This shows significant differences in overall performance between the experimental group and the control group across all dimension s of reading comprehension skills, with a significance level of ($p \leq 0.05$). Below is a detailed presentation of the findings of the statistical analysis across various reading comprehension skill dimensions:

- **Literal reading comprehension skills**: The experimental group displayed a mean score of 18.89, in contrast to 13.77 for the control group. The t-value for this comparison was 7.048, with a significance level of 0.002. These results indicate that pupils who were taught using the flipped class strategy demonstrated a substantial enhancement in their literal comprehension skills.
- **Inferential reading comprehension skills**: The experimental group showed performance, in inferential skills meaning from texts compared to the control group as indicated by a score of 17.19 versus 12.27 for the control group The t value was 8.045 with a significance level of 0.004 This illustrates that pupils were more adept, at understanding implied meanings in texts when utilizing the flipped classroom strategy.
- **Critical reading comprehension skills**: Distinguished enhancements were observed in critical skills as well, where the experimental group achieved a mean score of 18.36, while the control group scored 8.87. The t-value for this comparison was 14.567, with a significance level of 0.002. This result indicates that pupils taught through the flipped class method developed higher critical analysis skills in assessing reading texts.
- **Creative reading comprehension Skills**: The experimental group also showcased a significant advantage in creative skills, scoring 16.27 compared to 7.87 for the control group. The t-value was 13.446, with a significance level of 0.000, demonstrating that this teaching strategy fosters enhanced creative thinking among pupils.
- **Overall reading comprehension skills**: The experimental group achieved a mean score of 17.25, whereas the control group got 11.81score, resulting in a t-value of 12.478 and a significance level of 0.004. This outcome reflects a comprehensive positive effect of the flipped class strategy on all dimensions of reading comprehension skills.

3.2. Results of the Second Research Question

This question intended to investigate the performance of the experimental group sample on the delayed reading comprehension skills test compared to the immediate post-test. To achieve this aim, the means and standard deviations of the experimental group's scores in both the immediate and delayed applications of the test were calculated. This was illustrated in **Table 3**.

Table 1. The results of the pre-test for equivalence between the experimental and control groups.

Reading Comprehension Skills	Group	No.	Mean	Standard Deviation	T Value	Degrees of Freedom	Significance Level
Literal Reading Comprehension Skills	Experimental	93	8.84	6.723	5.057	184	0.072
	Control	93	8.99	4.678			
Inferential Reading Comprehension Skills	Experimental	93	8.24	7.768	3.045	184	0.097
	Control	93	8.29	8.458			
Critical Reading Comprehension Skills	Experimental	93	7.89	9.127	4.563	184	0.067
	Control	93	7.36	7.487		184	
Creative Reading Comprehension Skills	Experimental	93	4.78	9.786	7.216	184	0.078
	Control	93	4.88	6.783		184	
Overall Levels	Experimental	93	8.31	8.612	9.479	184	0.087
	Control	93	8.81	7.873			

Table 2. T-test Results of the Reading Skills Post-Test.

Reading Comprehension Skills	Group	No.	Mean	Standard Deviation	T Value	Degrees of Freedom	Significance Level
Literal Reading Comprehension Skills	Experimental	93	18.89	1.767	7.048	184	0.002
	Control	93	13.77	1.946			
Inferential Reading Comprehension Skills	Experimental	93	17.19	1.246	8.045	184	0.004
	Control	93	12.27	1.967			
Critical Reading Comprehension Skills	Experimental	93	16.36	1.121	14.567	184	0.002
	Control	93	8.87	1.867		184	
Creative Reading Comprehension Skills	Experimental	93	16.27	1.236	13.446	184	0.000
	Control	93	7.87	2.893		184	
Overall Levels	Experimental	93	17.25	3.647	12.478	184	0.004
	Control	93	11.81	5.878			

Table 3 reveals no statistically significant differences at the significance level ($p \leq 0.05$) between the immediate and delayed applications of the achievement test across all levels of reading comprehension skills (literal, inferential, critical, and creative), as well as in the overall score for the experimental group.

For literal reading comprehension skills, the mean score in the immediate application was 18.85, while in the delayed application, it was 18.78. The T-value of (0.920) and significance level of (0.065) indicate no statistically significant differences, as the significance level exceeds (0.05). Similarly, in inferential reading comprehension skills, the mean score for the immediate application was 17.10, compared to 17.12 in the delayed application, with a T-value of (3.769) and a significance level of (0.074), confirming the absence of significant differences.

Regarding critical reading comprehension skills, the immediate application yielded a mean score of 15.99, and although the mean for the delayed application was not explicitly stated, the T-value of (3.451) and significance level of (0.090) indicate no statistically significant differences. In creative reading comprehension skills, the mean score in the immediate application was 16.38, compared to 16.33 in the delayed application, with a T-value of (3.364) and significance level of (0.062), again showing no significant differences.

For overall reading comprehension skills, the mean score in the immediate application was 17.10, while in the delayed application, it was 17.07. With a T-value of (3.769) and significance level of (0.080), this reinforces the conclusion that no statistically significant differences exist between the immediate and delayed tests. This finding indicates that the performance of the experimental group remained consistent across time, with no significant changes observed between the immediate and delayed testing phases.

4. Discussion

4.1. Discussion of the First Question

The results of the study revealed a substantial impact of the flipped class strategy on pupils' reading comprehension skills. The significant differences observed between the experimental and control groups indicate that this instructional approach fosters a more engaging and interactive learning environment, which is essential for developing various dimensions of reading comprehension. The significant progress observed in the reading comprehension skills of the group

Table 3. T-test results between the immediate and delayed applications among experimental group.

Reading Comprehension Skills	Application	No.	Mean	Sd.	T-Value	df	Sig.
Literal Reading Comprehension Skills	Immediate Delayed	93 93	18.85 18.78	1.74 1.77	0.920	92	0.065
Inferential Reading Comprehension Skills	Immediate Delayed	93 93	17.10 17.12	1.34 1.40	3.769	92	0.074
Critical Reading Comprehension Skills	Immediate Delayed	93 93	15.99	1.16	3.451	92	0.090
Creative Reading Comprehension Skills	Immediate Delayed	93 93	16.38 16.33	1.28 1.39	3.364	92	0.062
Overall Skills	Immediate Delayed	93 93	17.10 17.07	3.67 2.33	3.769	92	0.080

that underwent the experiment indicates that the flipped classroom approach is beneficial, in helping pupils understand information presented in texts more effectively. By encouraging pupils to review the study materials before class sessions begin enables them to actively participate in discussions and activities that reinforce their grasp of ideas. This prior familiarity, with the content improves their capacity to grasp aspects of the text and consequently results in performance in examinations assessing literal comprehension. These findings align with many researchers [13, 22, 23, 33, 36, 37, 43, 44], who found that pupils exposed to flipped class strategies showed improved comprehension and retention of course material due to their increased preparedness and engagement during class.

Moreover, the substantial gains in inferential reading comprehension skills among the experimental group point to the flipped classroom's effectiveness in promoting deeper engagement with texts. The collaborative nature of this instructional approach encourages pupils to analyze and interpret information collectively, which enhances their critical thinking and reasoning abilities. This environment of active dialogue likely empowers pupils to explore various perspectives, improving their capability to draw meaningful inferences from the material. This finding is consistent with numerus studies [21, 37–40], which highlighted that collaborative learning environments foster higher-order thinking skills and improve inferential comprehension among pupils.

Furthermore, the striking difference in critical reading comprehension skills underscores the potential of the flipped class to cultivate higher levels of analytical thinking. By fostering an interactive learning atmosphere, pupils are encouraged to critically evaluate and challenge the content they encounter. This shift from passive reception to active engagement allows pupils to not only understand the text but also assess its implications and underlying arguments, transforming them into more discerning readers. This result resonates with the study of Yang & Chen [7], who found that flipped class methods lead to increased critical thinking abilities as pupils engage more deeply with the material during class discussions.

In addition to these skills, the significant enhancement in creative reading comprehension skills among the experimental group highlights the importance of creativity in the learning process. The flipped class strategy provides opportunities for diverse instructional activities that encourage pupils to think innovatively. This creative engagement leads to a greater appreciation of literature and reading, as pupils learn to express their interpretations in unique ways. The focus on creativity supports the development of higher-order thinking skills, which are crucial for success in various academic and real-world contexts. This aligns with findings from previous studies [15, 25, 28, 35, 44, 45], which emphasized the positive impact of creative learning environments on pupils' engagement and comprehension in literacy.

In our view, we believe the success of the flipped classroom strategy can be linked to its harmony with beliefs underlying Piagets & Vygotskys work [28, 37, 39, 41, 42]. They highlight that learning takes place when pupils are actively involved in learning materials and work together with their peers. The flipped classroom approach naturally encourages these hands on learning experience by enabling pupils to be responsible, for their education, through class exploration

and engaging discussions during class hours. This method encourages a comprehension of the subject matter while also nurturing crucial abilities, like effective communication and teamwork as well, as analytical thinking.

In addition, to that the flipped classroom design recognizes the learning preferences of pupils by offering a range of resources and activities that cater to their learning styles. This customized method boosts motivation and fosters an understanding of the matter for pupils.

Finally, the comprehensive improvement in overall comprehension reflects the synergistic effects of these various skill enhancements. This suggests that the flipped class strategy not only enhances isolated reading skills but also contributes to a more holistic development of pupils' reading abilities. The active learning experience that the flipped class promotes prepares pupils for real-world reading tasks, equipping them with the tools necessary to navigate complex texts. These results align with the conclusions of Reflianto [3], who reported that pupils in flipped classroom environments confirmed greater overall comprehension and retention of content compared to those in traditional instructional settings.

Findings suggest that incorporating flipped classroom strategies, into literacy teaching is beneficial and underscores the importance of educators embracing engaging and pupil centered methods of instruction. To enhance pupils' reading comprehension and overall literacy skills significantly creating a supportive classroom atmosphere that promotes discussions collaboration and critical analysis of texts is essential. Further examination of this novel teaching approach in subjects and learning environments could offer evidence of its efficacy and shed light on its lasting advantages, for pupil learning. Situating these findings within the existing body of literature, it becomes evident that the flipped class not only aligns with previous research but also offers a promising avenue for future learning practices.

In light of the discussion of the results, future research should focus on exploring ways to optimize and expand the application of flipped class strategies across various subject areas. Investigating the integration of new learning technologies and innovative instructional strategies could further enhance the effectiveness of this teaching strategy. Additionally, research should examine how different learning contexts, such as varying age groups or diverse learner populations, respond to the flipped class strategy, providing insights that could refine its application.

4.2. Discussion of the Second Question

The results of the second question indicate that the performance of the experimental group on the delayed reading comprehension skills test, across all types (literal, inferential, critical, and creative), showed no negative impact when compared to their performance on the immediate post-test. These results affirm that the individuals' performance was not adversely affected between the immediate and delayed applications of the achievement test, which is an achievement worthy of commendation. These findings reflect the effectiveness of the flipped class strategy in enhancing learning, as pupils demonstrate an ability to retain acquired knowledge and skills over time. The absence of negative impact suggests that pupils were able to maintain the skills and knowledge acquired during a specific period, indicating that learning was not merely temporary.

These results underscore the importance of sustainability in the effectiveness of the learning methods used, as they show that pupils were able to consistently apply the skills they had acquired. Maintaining a high level of performance is an indicator that the flipped class strategy has succeeded in solidifying knowledge in pupils' minds. Therefore, the lack of negative impact can be considered evidence of the success of this strategy in promoting a deep comprehension of reading skills. The results reveal that pupils were capable of utilizing their skills in various situations, reflecting cognitive maturity and a greater readiness to comprehend and engage with texts.

These positive responses also indicate that pupils were prepared to face learning challenges, thanks to the dynamic learning environment provided by the flipped class strategy. Moreover, the absence of negative impact on performance suggests that pupils have developed a sense of confidence in their skills, which is a key factor in improving academic performance. When pupils feel capable of retaining what they have learned, it enhances their motivation to learn and participate more actively.

Furthermore, these results reflect the quality of the learning curricula used in the study, which were well-designed to meet pupils' needs. The ability to achieve positive outcomes shows that the flipped class strategy effectively

contributed to the development of reading skills, necessitating continuous assessment of learning curricula and their suitability for pupil needs. While these results reflect success, they also open the door for further development and improvement, as the absence of negative impact does not imply that performance has reached its peak.

This stability can be leveraged as a foundation for expanding the experiment, as the authors might consider how to incorporate new elements into the learning program to further enhance progress, such as using innovative teaching strategies or promoting continuous learning after the program's conclusion. In this context, these results can serve as a strategy for other learning experiments seeking to achieve sustainability in skill acquisition.

The findings of the study are in line with previous studies[1, 2, 4, 6, 8–13, 16, 21, 22], which supports the effectiveness of the flipped class strategy. For instance, a study by Fahmi et al.[24] demonstrated that using this strategy enhances deep understanding of academic subjects, leading to improved achievement levels. In Fischer's[1] study, it was found that the flipped class strategy promotes pupil engagement and strengthens their confidence in their skills, positively reflecting on academic performance.

Additionally, a study by Yulian[6] and Zhang[45] indicated that pupils who learn through the flipped class retain information better than those who learn through traditional methods. The findings showed that the experimental group that utilized the flipped class achieved higher scores in delayed tests, confirming the sustainability of learning.

Consequently, the evidence from the current study supports the importance of utilizing innovative learning strategies like the flipped class to achieve better learning outcomes and enhance learning effectiveness. Therefore, the absence of negative impact on performance is an achievement that positively reflects the influence of the flipped class strategy, ultimately leading to improved learning results for pupils.

Furthermore, studies should consider the long-term impact of the flipped class strategy on various academic disciplines, as well as its effects on different types of assessments, including formative and summative evaluations. This could provide a more comprehensive understanding of how the flipped class can contribute to sustained academic improvement and skill retention over time.

In summary, the evidence presented in this study strongly advocates for the adoption of flipped class strategies in literacy instruction and beyond. The results not validate that this teaching approach aligns, with learning methods but also indicate that it presents a hopeful avenue for future advancements in teaching techniques. By establishing an pupil focused learning atmosphere educators can notably boost pupils' ability to understand what they read and their overall literacy growth thereby equipping them for achievement, in an intricate and knowledge dense society.

5. Conclusions

The findings of this study obviously demonstrate that the flipped class strategy significantly enhances pupils' reading comprehension skills. By fostering an environment of active engagement and effective participation, this learning strategy allows pupils to delve deeper into the material. The notable enhancements observed across various dimensions of reading comprehension - including literal, inferential, critical, and creative skills indicate that pupils are better equipped to grasp textual information more profoundly. This enhanced capability is primarily attributed to the preparatory work that pupils engage in prior to class, which enables them to interact meaningfully with the content during instructional sessions. Consequently, they develop critical thinking skills and enhance their ability to evaluate the material critically.

Moreover, the data reveal that pupils' sustained performance on delayed assessments shows no adverse effects on the skills they acquired, suggesting that their knowledge retention extends well beyond the immediate learning experience. This result underscores the effectiveness of the flipped class strategy in cultivating a supportive learning environment that not only facilitates understanding but also builds pupils' confidence in their abilities. Increased confidence, in turn, correlates with heightened motivation to engage actively in the learning process, leading to further academic success.

However, it is important to recognize certain limitations within this study. The research was conducted on a specific sample of pupils from Northern Jordan, which may limit the generalizability of the findings to other regions or populations. Additionally, while assessments primarily measured reading comprehension skills, employing observational techniques could provide a richer understanding

of pupil engagement and participation within the flipped class strategy. Designing written tests that effectively assess reading comprehension skills could further enhance the evaluation of pupils' abilities.

Based on these findings and limitations, it is recommended that learning institutions in Northern Jordan take several proactive steps to enhance the effectiveness of the flipped class strategy. First, comprehensive training should be provided for teachers on the principles and practices of the flipped class strategy. This training should emphasize the design of preparatory materials that promote active engagement and critical thinking, enabling pupils to interact more deeply with the content before class sessions.

Furthermore, it is essential to develop diverse instructional resources and activities that cater to the varying needs and learning styles of students, effectively incorporating technology and multimedia resources. Establishing continuous assessment mechanisms to track student progress and provide immediate feedback is also crucial, as this will help identify areas where additional support is needed.

In addition to these foundational elements, it is recommended to adopt the flipped classroom model in the educational process. This model can enhance students' creative and critical thinking by encouraging self-directed learning through watching educational videos or reading preparatory materials. Moreover, organizing interactive activities such as group discussions and case study analyses will further develop their problem-solving skills.

Providing immediate feedback is essential to encourage innovative ideas and to pose open-ended questions that stimulate deeper thinking. Furthermore, promoting self-assessment through tools like learning portfolios to document student progress and the development of ideas is crucial.

Author Contributions

R.A., O.A.-H., A.A.-B. and B.A. conceptualized the manuscript's focus, proposed the aims, prepared the draft manuscript, and wrote all the sections. R.A., O.A.-H., A.A.-B., B.A., E.K., M.A., A.Z., and S.S. Also collected, analyzed, and interpreted the data. R.A. and A..A.-B. were major contributors to writing the manuscript. All authors read and approved the final version of the manuscript.

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Institutional Review Board Statement

The research involving human participants was reviewed and approved by the Deanship of Scientific Researchat King Faisal University. All participants provided their written informed consent prior to taking part in the study.

Informed Consent Statement

Informed consent was obtained from all individual participants included in the study.

Data Availability Statement

The authors will make the raw data supporting the conclusions of this article available upon request, without anyundue restrictions.

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Conflict of Interest

The authors declare no conflict of interest.

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