

<https://doi.org/10.48047/AFJBS.6.14.2024.5689-5719>**African Journal of Biological Sciences**Journal homepage: <http://www.afjbs.com>

Research Paper

Open Access

QUASI-EXPERIMENTAL STUDY OF THE EFFECT OF A WEB-BASED APPLICATION ON GRADE 4 PUPILS' ACHIEVEMENT IN ARABIC READING SKILLS IN JORDAN**Siti Mastura Baharudin¹, Najla Abdel Majid Ababneh²**

1Dr. in School of Education Studies, Universiti Sains Malaysia, Malaysia

2Master Student, School of Education Studies, Universiti Sains Malaysia, Malaysia

Volume 6, Issue 14, Aug 2024

Received: 15 June 2024

Accepted: 25 July 2024

Published: 15 Aug 2024

*doi: 10.48047/AFJBS.6.14.2024.5689-5719***ABSTRACT**

Reading is still difficult for primary school pupils. These pupils are mostly non-native Arabic speakers with poor Arabic command in Jordan. A web-based app can significantly improve pupils' reading skills. This study investigates the effect of a web-based app on pupils' Arabic reading skills and achievement, focusing on information transfer, reading steps, guided reading, and creative reading. The study employs a mixed-methods approach, including a quasi-experimental design and interviews, to evaluate the effect of a six-week intervention on Arabic reading skills. The findings showed that a web-based app, LUMIO, significantly improved the reading skills of Grade 4 Jordanian pupils. The experimental group outperformed the control group in post-tests for achievements in information transfer, guided reading, and creative reading compared to the pre-test. The app had no significant difference in reading steps between the pre-test and post-test. Five out of ten pupils interviewed found the app enjoyable, while two had learning difficulties. The intervention significantly improved Arabic reading skills, indicating its effect of implementing Arabic reading through web-based app intervention in Arabic classes. The findings support the usefulness of the app in improving Arabic language literacy. Web-based app intervention is effective for Jordanian Grade 4 Arabic reading classes. Instructors should be prepared to engage pupils, and future studies should include web-based labs, cooperative teaching strategies, and standardized questionnaires.

Keywords: LUMIO, Arabic Reading Skills, Arabic Speaking Skills, Quasi-Experimental, Web-Based Application.

1. INTRODUCTION

The current spike in interest in Web-based apps for basic education indicates their perceived effectiveness and promise in language teaching and learning, both in the present and the future (Bashori et al., 2022; Biresaw & Bogale, 2024). Given the potential of Web-based apps to efficiently fulfill the demands of today's learners, many primary schools have been looking forward to incorporating their traditional language approach into an integrated Web-

based app (Nasri et al., 2021). Recently, researchers have developed web-based apps that incorporate reading technologies to help Arabic language learners become more proficient readers (Ritong et al., 2022).

According to Roy (2024), reading skills are the most important abilities in both school and society, and they involve a complex cognitive process that contributes to learning outcomes and achievement. Pupils, especially non-native Arabic speakers, can use new technology to enhance their reading skills and achieve better in classrooms (Thomas et al., 2024). This is because reading is an unavoidable aspect of being a pupil. It is important to be proficient in this area. In particular, pupils using eLearning are expected to read extensively (Eren-Zaffar, 2020). Pupils who learn to read well can digest new knowledge faster and improve their achievement in other areas, such as classroom grades. Reading a parallel reading passage gives pupils the opportunity to read, review, and get familiar with the text's vocabulary, grammatical structures, and content (Damaianti et al., 2020). Pupils may experience reduced stress and anxiety when reading through web-based apps (Al-Obaydi et al., 2024). The influence of web-based apps on pupils' reading abilities is critical to their success in Arabic classes.

Web-based apps are widely used in Jordanian education. Alzubi (2023) shows that pupils in Jordan have the prospect of learning more about digital literacy and how to enhance their abilities through the efficient use of web apps. Any learner in Jordan can access their school's curriculum and instructional materials from anywhere in the country by using web learning tools (Al-Bordeini, 2020). This suggests that pupils can still get a top-notch education even if they reside in remote Jordanian areas or are unable to attend regular class sessions. A web app allows pupils to use their free time to increase their knowledge (Makhlouf & Alani, 2022). A web-based app can be used to provide pupils in Jordan with an incredible online learning experience (Alkhwaldi and Abdulmuhsin, 2022). Alawawdeh et al. (2020) assert that end-user data in Jordan is secure and adaptable to meet demand spikes.

Web-based apps that are incredibly entertaining and active, such as LUMIO, etc., can help pupils become more proficient readers (Tatli et al., 2022). Pupils at the beginner or intermediate level who want to get better at reading can benefit from these web-based resources. Learners can improve their oral communication skills by decreasing their reading difficulties and anxiety via LUMIO, which encourages fun reading activities (Al-Khalifa et al., 2016; AlOkaily, 2021). Instructors can design engaging and collaborative classes for their pupils' reading skills with the help of LUMIO (Lee, 2020; Osipova & Bagrova, 2022). LUMIO

provides pre-made materials for many subject areas and academic levels. Pupils can view pre-recorded clips or visit LUMIO's website to learn more about the subjects (Romero Calvo et al., 2019). LUMIO has materials designed to maintain pupils' interest at home as well as in the classroom (Raghunath et al., 2018). It includes interactive lessons, game-based activities, collaboration tools, and formative assessments. LUMIO provides synchronous instruction to pupils through live sessions (Chang et al., 2019). Asynchronous learning can allow Jordanian pupils to learn independently and take responsibility for their education on their own schedule (Osipova & Bagrova, 2022). Teachers can monitor pupils' progress in learning, provide immediate feedback, and examine pupils' comprehension for formative tests, individual worksheets, and group workspaces (Mangione & Calzone, 2019). The advantages of LUMIO for Arabic learning are that it can ease the pupils' difficulties in reading.

Conversely, web-based apps can influence pupils' achievement (Shi, Wang, & Ding, 2022). According to studies, employing web-based apps in the classroom can help pupils learn more and enhance their reading skills (Al-Khalifa et al., 2016; Dissanayake & Dias, 2017; Bashori et al., 2022; Derya et al., 2022). Interactive web-based apps have an impact on pupils' learning achievements. However, there is a lack of information on LUMIO and its impact on pupils' reading achievements, such as information transfer, reading steps, guided reading, and creative reading. Despite LUMIO's demonstrated effectiveness in improving pupils' learning in other contexts, Jordan lacks information on Arabic reading skills (Mangione & Calzone, 2019). In addition, many non-native Arabic speakers in Jordan are indicated to have commonly faced problems with Arabic reading, including information transfer, reading steps, guided reading, and creative reading (Al-Bordeini, 2020; Yunis & Dajani, 2022). On the other hand, studies have demonstrated that web-based apps enhance focus, language skills, creativity, memory, and collaboration (Kim et al., 2020; Achkan et al., 2022). Learning how to read Arabic texts and develop language skills may be made easier using a web-based app. Thus, this study is aimed at investigating the effect of a web-based app on reading skills and pupils' Arabic learning achievement among pre-test and post-test with regard to (i) information transfer, (ii) reading steps, (iii) guided reading, and creative reading.

The study is significant for reading instruction in schools, which is necessary for efficient communication and learning in a variety of settings. Pupils' reading skills can be enhanced through information transfer, reading steps, guided reading, and creative reading-based school curriculum redesign. Pupils who read also learn to comprehend a variety of texts, including tales, arguments, and explanations. Reading in the classroom gives pupils the opportunity to

collaborate, converse, and receive feedback, all of which can help them become more proficient in language and reading comprehension. This could have positive benefits for pupils, teachers, and society at large.

2. LITERATURE REVIEW

2.1. Jordan and Web-based applications

The Jordanian Ministry of Education (MoE) has instituted several programs to improve pupils' Arabic literacy, including non-native speakers (Sakarneh, 2014; Nusair & Palmer, 2023). The Jordan National Arabic Reading Strategy (2023–2028) offers a comprehensive road map for enhancing literacy outcomes for pupils through sixth grade, and Early Grade Reading is one of these projects (Gove et al., 2017; Nusair & Palmer, 2023). Ensuring that all Jordanian children and youth, regardless of background, have access to high-quality education is the aim of the UNESCO and MoE collaboration program Inclusion and Diversity in Education (Yahya et al., 2023). Public school teachers and staff will receive training on inclusive practices and methods, and more non-native pupils with impairments, learning disorders, and refugees will be enrolled as part of this program (Almeqdadi & Al Zoubi, 2022). Non-native Arabic speakers can enrol in the Divan International program (Albadri, 2023). Divan International provides a standards-based curriculum to enhance pupils' proficiency in Modern Standard Arabic communication. Recently, Khasawneh et al. (2024) have indicated that language learning can be improved via Arabic content delivery in Jordanian e-learning environments, including web-based apps.

In Jordan, there are many Web-based apps available that can be accessible to schools and pupils across Hashemites; among these is the LUMIO app (Osman et al., 2022). LUMIO (previously known as SMART Learning Suite Online) is a digital learning platform that turns classes into active, collaborative learning experiences that pupils may access on their own devices (Ghonaim et al., 2018). SMART refers to a self-monitoring approach to reading and thinking. It is a Web-based app that makes it simple to convert lessons into interactive, collaborative learning experiences to engage pupils on their devices (Kwet & Prinsloo, 2020). LUMIO provides teachers with constant feedback on their pupils' achievements. Through its dashboard, teachers may view each pupil's work in real time and provide feedback as they advance (Agustiani et al., 2021). Teachers can always monitor their pupils' learning progress with the inclusion of numerous polling and brainstorming tools (Meng et al., 2020). LUMIO

aims to sustain pupils' engagement with the content, whether in the classroom, at home, or both. It encourages pupils to have access to knowledge and education while also giving them the skills and mindset they need to flourish in the modern world (Huh & Lee, 2020). According to Fangesti (2022), SMART is an excellent tool for changing classrooms and creating supplemental materials to help students get better at reading, particularly in Jordan.

Ardiansyah and Jaya (2020) carried out research on students' narrative text comprehension via reading SMART (LUMIO). The experimental group studied using SMART, while the control group received instruction in the traditional manner. The outcomes demonstrated that using SMART produced statistically significant differences between the experimental and control groups. In comparison to the traditional method of teaching, the students at each of the levels improved along with their academic achievement. Kim et al. (2020) investigated technology-supported reading comprehension using SMART (LUMIO). Data revealed that SMART improved classroom dynamics and increased pupil engagement and learning achievement. It also exposed issues with timing and the user interface. Agustiani (2021) investigated the effect of SMART and self-efficacy on the reading skills of first grade students' narrative texts. The findings showed that pupils who received instruction using SMART had superior reading comprehension of narrative texts than pupils who received instruction using small group discussion. Pupils with high reading self-efficacy had better reading comprehension than those in small group discussions.

2.2. Arabic Learning Achievement

There are no barriers to Arabic language use in the classroom in Jordan (Al-Bordeini, 2020). Arabic seems more comprehensible because certain of its concepts are unlike those of English (Ritonga et al., 2022). Effective material design significantly influences both the language of instruction and the content of learning materials (Ilmiani & Miolo, 2021). Teaching foreign languages in the twenty-first century often makes use of a second language (L2; Hilmi, 2021). The benefits of Arabic in Jordan include easy communication and the ability to learn a new language. According to Moh'd Al-Assaf (2021), the key objective of language acquisition is communication, which highlights the need for using Arabic to enhance language proficiency, especially in reading. Mastering the Arabic language requires effective communication. Furthermore, communication is a prerequisite for interaction, language learning, and language acquisition (Arafa & Badr, 2020). Hussein (2021) asserts that exposure to Arabic reading might

impact language acquisition and enhance students' ability to communicate in everyday situations. To study Arabic, one must have a supportive linguistic environment. It will be easy to put language learning into practice if pupils can pick up a language effortlessly and without the burden of learning. The presence of a non-stressful linguistic environment (computer-based learning, games, etc.) is essential for speech acquisition.

The success or failure of an educational process is evaluated by learning achievement, which is the learning exercises that pupils have completed (Roy, 2024). The outcomes of evaluations can be used to quantify the internal and external influences on pupil achievement (Thomas et al., 2024). In the language and digital learning environment, evaluating pupil achievement is crucial. Studies have indicated that pupil achievement is contingent upon a pupil's ability not only for acquiring Arabic literacy but also for comprehending spoken and written language, communicating their knowledge orally and in writing, and mastering literacy skills like spelling, reading, and writing (Al-Bordeini, 2020; Nusair & Palmer, 2023). According to Alim et al. (2024), there is a significant correlation between pupils' ability to communicate effectively and achievement in the Arabic language, where reading ability is positively related to pupil achievement and their ability to effectively express themselves in the classroom. According to van de Ven (2019), there is a direct correlation between pupils' motivation and their achievement in learning Arabic; the more motivated they are, the more progress they have achieved. These researchers indicated that motivations include appropriate technology (i.e., Web-based app) with creative reading, reading steps, and guided reading.

2.3. Reading Skills in Arabic

The Arabic alphabet must be mastered in order to read, speak, and understand the language. Information transfer, reading steps, guided reading, and creative reading are all crucial aspects of the challenging process of reading (Ocak & Karşlı, 2022). Find out how readers use these components in combination to understand print (Bakı, 2020). Reading is the process of making sense of written words (Palupi & Hermaniar, 2020). Effective reading is defined as reading that helps students understand written texts and reflect on them. The reading skill is essential for students in elementary or basic education (Eser & Ayaz, 2021). One can increase their proficiency in the Arabic language by improving their reading skills in addition to their reading comprehension (Yunis & Dajani, 2022).

The practice of adapting knowledge or abilities acquired in one context to another is information transfer among the pupils (Malaia & Wilbur, 2020). A pupil reading a new word in Arabic might interpret it in their home tongue (English), or a pupil learning a grammar rule in one language might interpret it in another (Leider et al., 2013). Depending on whether information is transferred correctly or incorrectly, it can have a positive or negative impact on reading skills.

Reading steps are exercises or strategies that pupils use to improve their reading comprehension skills (Kasem et al., 2022). While attentively reading the material, apply a few comprehension strategies (Palupi & Hermaniar, 2020). These reading strategies can help pupils become more fluent and confident readers (Dobson & Ziemann, 2020). More resources and knowledge about reading comprehension strategies are available.

A guided reading exercise aims to enhance students' reading comprehension skills (Khaliq et al., 2022). Pupils typically read aloud from a text in small groups during a guided reading exercise while being monitored by a teacher or a classmate (Tiarazani, 2020). Before, during, or after a pupil reads an Arabic text, a peer or teacher may provide guidance, critique, or ask probing questions. (Weinstein, 2019).

Creative reading refers to engaging with a text in novel and creative ways, going beyond its literal interpretation (Nazarenko, 2019). Pupils who read creatively can improve their empathy, creativity, and critical thinking abilities in addition to enjoying reading more in Arabic (Machynska & Zadunayska, 2019).

Pupils who read Arabic independently have higher levels of reading comprehension, verbal fluency, and general knowledge than those who do not (Eren-Zaffar, 2020). They become better readers, perform better in achievement, and have more in-depth subject knowledge than their non-reading counterparts (Al-Obaydi et al., 2024). Independent readers have better reading comprehension, verbal fluency, and general knowledge than non-readers (Damaianti et al., 2020). In comparison to their non-reading peers, they improve as readers, perform better on achievement in exams across the board, and possess more in-depth subject knowledge. Reading fosters critical thinking in pupils and enhances reading comprehension, which is advantageous in all subject areas (Chen et al., 2020). Pupils carry their reading-based talents into adulthood, the workforce, and society as a whole. Al Saud (2021) concurred that reading for enjoyment is crucial for academic achievement and the future.

2.4. Theoretical Framework

The constructivism theory serves as the theoretical cornerstone of this study. This study uses a distinct theoretical framework to evaluate the pupils' reading skills in order to promote meta-level learning in Arabic. This theoretical framework informs the instructional strategies used in the classroom to analyse the reading skills on LUMIO.

According to the philosophy of constructivism, pupils actively create knowledge rather than merely passively absorbing it (Koptseva, 2020). Individuals develop their own representations and assimilate new information into their previous knowledge as they see the world and think back on those experiences (Clark, 2018). Constructivist reading theory goes one step further by putting the reader at the heart of the science of reading, building on the idea of active participation (Ichsan et al., 2020). Social constructivism and the Zone of Proximal Development serve as the foundation for the constructivist theory, which holds that pupils learn about the world by doing and experiencing things and then thinking back on those experiences (Payong, 2020). It implies that the process of reading is about creating knowledge rather than merely obtaining or receiving information. The reader understands, interprets, and makes meaning of the text by drawing on prior knowledge and cognitive development. This approach highlights the reader's active participation in deriving meaning from texts in the context of reading.

Moon et al. (2021) found that pupils who received instruction utilizing constructivist learning techniques had improvements in reading comprehension by 31%. This research implies that learning to read by pupils using a constructivist approach can improve their literacy and cognitive development. The constructivist reading theory emphasizes the importance of viewing reading as an active, constructive process (Leng, 2020). It guided the pupils to learn in classrooms that facilitate pupils' active interaction with texts, giving them the tools they need to become independent learners capable of creating their own knowledge and understanding (Zajda & Zajda, 2021).

2.5. Study Rationale and Research Questions

Many pupils in Jordan can read a basic statement in their daily lives (Hawatmeh et al., 2023). However, studies have shown that various factors, such as information transfer, reading steps, guided reading, and creative reading, may influence achievement levels (Abu-Hamour

& Al-Hmouz, 2018; Alawawdeh et al., 2020; Fraihat, 2023; Masri et al., 2023). Some studies suggest that learning Arabic in primary schools in Jordan could enhance pupils' literacy and enthusiasm for the language because they would be more accustomed to reading in Arabic (Alsoud et al., 2021). The Ministry of Education found that non-native pupils struggle to achieve good reading skills due to their poor command of the Arabic language (Al-Adwan, 2019). According to research, reading comprehension in Arabic is a problem for non-native pupils in Jordan (Fraihat, 2023; Masri et al., 2023). They have trouble comprehending texts and applying Arabic reading skills correctly.

Conversely, web-based apps can influence pupils' achievement (Shi et al., 2022). According to studies, employing web-based apps in the classroom can help pupils learn more and enhance their reading skills (Bashori et al., 2022; Derya et al., 2022). There are many web-based apps designed for basic education, including LUMIO, Quizalize, videogames, Pictionary, Hangman, etc. LUMIO is one of the latest classroom applications that is considered effective in delivering language instruction in primary schools. However, information on LUMIO and its effect on pupils' achievements in reading skills, including information transfer, reading steps, guided reading, and creative reading, is lacking. Even though LUMIO has been shown in other contexts to increase pupils' attitudes toward learning and language skills (Mangione & Calzone, 2019), it has not been tested for pupils' Arabic reading skills. This study seeks to address the following research questions:

- i. What is the effect of web-based app on reading skills and pupils' Arabic learning achievements with regards to information transfer among pre-test and post-test? (RQ1)
- ii. What is the effect of web-based app on reading skills and pupils' Arabic learning achievements with regards to reading steps among pre-test and post-test? (RQ2)
- iii. What is the effect of web-based app on reading skills and pupils' Arabic learning achievements with regards to guided reading among pre-test and post-test? (RQ3)
- iv. What is the effect of web-based app on reading skills and pupils' Arabic learning achievements with regards to creative reading among pre-test and post-test? (RQ4)

Based on these research questions, the following hypotheses are statistically explored as support for this study: The significance level of $p < .005$ determines whether the hypothesis is accepted or rejected.

H₁: There is no significant difference among pupils' reading skills with regards to information transfer and Arabic achievements between pre-test and post-test using web-based app.

H₂: There is no significant difference among pupils' reading skills with regards to reading steps and Arabic achievements between pre-test and post-test using a web-based app.

H₃: There is no significant difference among pupils' reading skills with regards to guided reading and Arabic achievements between pre-test and post-test using a web-based app.

H₄: There is no significant difference among pupils' reading skills with regards to creative and Arabic achievements between pre-test and post-test using a web-based app.

3. METARIALS AND METHODS

3.1. Research design, participants, and sampling

This study used a mixed-methods approach that included a quasi-experimental design and an interview. Table 1 displays this study's quasi-research design. The pre-test and post-test models are used for two-group evaluation, and the quasi-experimental design was chosen for this purpose. School J1 is the same for both the experimental and control groups, though the classes are different. In both groups, pre-test and post-test (PR and PO) are carried out. The experimental group receives an intervention (T) for six weeks, and the data are gathered to draw conclusions. The control group was excluded from the intervention sessions but used the conventional reading teaching model.

Table 1: Design of quasi experiment.

Group type	School	Pre-test	Treatment	Post-test
Experiment	J1	PR	T	PO
Control	J1	PR	T	PO

Note: PR: pre-testing, PO: post-testing, T: intervention, J1: experimental group,

According to Al-Hassan et al. (2022), there were 1493 private schools and 2787 government schools in Jordan. From this, Amman has 316 schools in total, of which 235 are primary schools. There were overall 650,615 students enrolled in Amman schools (Shattnawi

et al., 2022). Jordan's development goals prioritize access to basic education. Every town and hamlet has a school with ten hundred pupils registered in classes, according to government policy (Shattnawi et al., 2022).

This study was conducted in the K–6 international school in Amman, Jordan, meeting the requirements of a broad population of foreign and local pupils. Grade 4 pupils (9–10 years old) who speak Arabic as a second language make up the target population for this study. Out of the 600 pupils enrolled in this targeted school, the majority are non-native Arabic speakers, or foreign pupils, which constitutes the population of this study. We selected the pupils based on the difficulties they face when reading Arabic texts or scripts in the classroom. The presence of an adequate number of foreign pupils, the school's support system (facilities), and the communication medium formed the key decision for selecting the target school.

The pupils in Grade 4 of the target school are chosen using simple random sampling (Augusto Taconeli & Rodrigues de Lara, 2022) for the reading tests. The simple random sampling equation $N-n/N-(n-1)$ was used to calculate the required sample. P is a probability, n is the sample size, and N represents the population. 10% of the population was used, resulting in a sample size of 60 pupils in this study.

We selected two different classrooms (Class A and Class D) with 30 pupils each in the same school. These classes were several meters away from each other to avoid contact between the two groups. We chose the same lesson period before break time to prevent communication between the selected groups. According to the school timetable, we sampled class A during the first lesson period, and immediately selected class D before break time, while the class was still in progress. Moreover, we used a pre-test to determine whether the pupils' reading skills were equivalent in the post-test.

3.2. Research Instruments

3.2.1. Pre-Test and Post-Test

A week before treatment began, a pre-test was administered to determine the pupils' past reading skills. The reading skills were evaluated using the IBT-test-Arabic-A-Grade-4 paper for the primary school achievement test (Jordan). Table 2 shows the mark allocation for pre-test reading. For Section A, information, from infographics to texts, had to be read by the pupils. The pupils directly read through word order, grammatically and creatively. A total of 20 points were awarded for this section (Table 2).

Section B contained two different types of questions in the form of guided reading. The pupils answered both questions. Section B(i) required the pupils to provide a list of three distinct justifications, thoughts, suggestions, or remarks based on the specified stimuli. Section B(ii) gave the pupils a case and required them to read a brief essay of 50 to 80 words. It was necessary for the pupils to respond to the question with original thought and imagination. The two sections received a total of 40 points (Table 2).

Section C was the creative reading section. There were three possible question options in this section. Question 1 was a composite image encouraging pupils to read words or a question to encourage them to answer a query. Question number two presented a sequence of images containing word hints. Pupils were required to read an essay in a paragraph between 80 and 100 words. This section received a total of 40 points (Table 2). The ministry of education in Jordan and the new technical and vocational skills development commission (TVSDC) marking scheme were used to provide marks for the questions in Sections B(ii) and C. Following the pre-test, the intervention process via a web-based app (LUMIO) was implemented (details in the 3.3 section).

A post-test was administered at seven weeks after six- weeks of intervention. Post-test questions are the same as in the pre-test. The same scoring allocation used in the pre-test was also used in the post-test (Table 2). The question paper and its structure were the same as in the pre-test.

Table 2: Marks allocation for pre-test reading.

Section	Question	Score
A	Information Transfer	20
B(i)	Reading steps	20
B(ii)	Guided reading	20
C	Creative reading	40
TOTAL		100

Table 3 displays the scoring scale for the grades received by the pupils in the pre-test and post-test in the quasi-experiment. 100 is the highest score, while any score below 49 is considered very poor. The scoring scale is obtained from the selected school, which is based on the Ministry of Education Jordan and the new Technical and Vocational Skills Development Commission (TVSDC) marking scheme.

Table 3: Scoring scale used in this study.

No.	Grade	Scores	Qualification
1	A	100 – 85	Excellent
2	B	84 – 70	Good
3	C	69 – 55	Average
4	D	54 – 50	Poor
5	E	49 – 0	Very poor

3.2.2. Intervention Activity on LUMIO Web-based App

This study used a series of reading exercises as an intervention activity for the pupils during the six-week quasi-experiment. Prior to this study, all necessary permission and approval were obtained from the selected school and the Ministry of Education (Jordan). LUMIO was utilized to implement the reading activities based on the research question of this study. We used this Web-based app to introduce the intervention plan (Figure 1), utilizing the available school facilities, particularly the computers with LUMIO software installed. The researcher provided the instructional materials to the pupils via LUMIO.

We created the online activities on LUMIO to align with the MOE Jordan Curriculum and Assessment Standard and Yearly Scheme for primary school Arabic subjects. The activities covered the themes: interpret direct information, understand “literary art in reading text,” analyse “elements in a story,” apply linguistic style in reading text,” compare different tales, etc.

The pupils were introduced to the LUMIO interface and features before the implementation of interventions in preparation for the lessons. Pupils were allowed to read and present a short essay or story within the allotted time frame. The reading tests (pre-test and post-test) on the web-based app were divided into weekly planned activities. Week 1 consists of preparatory work and lunching for the test experiment, while weeks 2–6 consist of reading skill activities. The activity periods were based on the school schedule.

We used a fun approach to create an engaging and successful reading experience through LUMIO, enabling the pupils to practice their Arabic reading skills. Therefore, we designed the lesson plan for the Arabic reading activities to ensure that learning was enjoyable. The design of the lesson activities and assessments was aligned with LUMIO and reading theory. The theory of this study was used to explain how the pupils will achieve an excellent

level of Arabic reading skills based on the curriculum and Arabic learning textbooks for Grade 4.

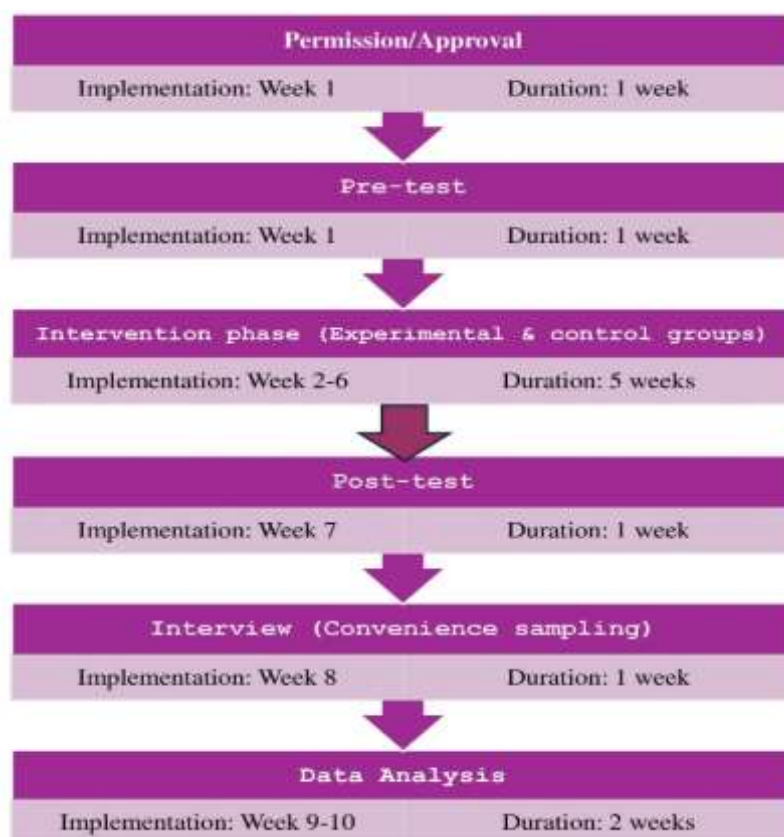


Figure 1: Flow Chart of the steps involve in the implementation process.

3.2.3. Interview and coding

A semi-structured interview was the second instrument of this study to support the results of the quasi-experiment. Convenience sampling was used for the data collection for the interview. According to research, 10 to 12 pupils are sufficient for interviews in qualitative research (Cobern & Adams, 2020; Tavory, 2020). Based on this, this study selected 10 pupils for interviews eight weeks after the intervention. We selected the pupils based on their post-test results. We used convenience sampling to select the pupils for the interview (Figure 1).

Each pupil underwent a 10- to 15-minute semi-structured interview. The interview questions were formulated to be appropriate for pupils in Grade 4 (9-10 years). Adeoye-Olatunde & Olenik (2021) showed that the interview tools are set up based on the questions and the way they are asked. The ability of the pupils to comprehend the questions in terms of Arabic was also considered. Even though the interview questions were in Arabic, Overall, there are 23 interview questions set for the pupils. The interview aimed to assess the pupils'

experience with LUMIO's reading activities. According to Bowles & Sharman (2014), the interview is valid if the questions relate to specific skills listed on the Skill Assessment book. For maximum validity, there must be a direct relationship between the interviewer's questions and the candidate's underlying skills. As a result, this study uses the pupil's Arabic language book (Jordan textbook for grade 4) to prepare the questions according to their capabilities and skills. The pupils were given labels: pupil 1, pupil 2, and soon. Even though a few of the pupils' responses lacked complete phrases, they were quite insightful as they comprehended the interviewer's questions.

Following the interview, the data was transcribed, followed by the coding and thematic process. According to Williams & Moser (2019), coding is the method of labeling and classifying qualitative data to distinguish different themes and the associations between them. During the coding process, we apply labels to words or phrases that indicate significant (and recurrent) themes in every pupil's feedback from the interview. Homberg et al. (2023) assert that we can code experience-based learning to align with the key variables. We used NVivo software to inductively code the interview transcripts based on the frequently used phrases or words by the participants. NVivo is one of the popular computer-assisted qualitative data analysis software (CAQDAS) used for qualitative research (Adu, 2019). The researcher entered the completed transcripts into NVivo, utilizing open coding to identify frequently occurring terms and phrases. We used the software to code these keywords, grouping them into a few important themes. We use the thematic analytical technique to develop themes from interview transcripts during open coding.

3.3. Data analysis

IBM SPSS Statistics version 27.0 was used to analyse the data collected in this study. We used the independent sample t-test to examine any significant differences between the achievement of the control and experimental groups in the Arabic reading activities. The significance level for the analysis was set at $p < .05$. The null hypothesis was rejected if the p value was less than .05.

4. RESULTS

4.1. Overall pupil achievement

Table 3 displays the summary of scores the group received in pre-test and post-test weeks 1–7 for the pupils' reading sessions on LUMIO using the IBT-test-Arabic-A-Grade-4 paper. In week 1, all pupils in classes A and D participated in the pre-test. The pre-test determined each pupil's reference point score. Following the administration of the intervention, which was reading Arabic skills sessions via the LUMIO platform (web-based app), Class A (the experimental group) outperformed Class D (the control group) in the post-test. The results showed that the intervention had a significant effect on pupils' reading skills, with those in Class A having a higher mean score than those in Class D.

Table 3: Summary of scores received by group in pre-test and post-test.

Group	N	Pre-test		Post-test	
		M	SD	M	SD
Class A	30	58.82	8.09	89.56	1.59
Class D	30	58.90	7.66	57.97	1.08

Table 4 presents the results of the effect of a web-based app on pupils' Arabic reading activities between the pre-test and post-test. The results showed that the pupils had significantly ($p < 0.05$) higher scores in their post-test for information transfer, guided reading, and creative reading compared to the pre-test. The results of the reading steps showed no significant difference between the pre-test and the post-test. This showed that web-based apps have a greater effect on pupils' Arabic reading skills in the post-test compared to the pre-test. Therefore, the null hypothesis is rejected, while the alternative hypothesis is accepted.

Table 4: Effect of LUMIO on pupils' Arabic reading activities among pre-test and post-test.

VARIABLE	GROUP	GROUP STATISTICS			
		N	Mean	Std deviation	Std. Error Mean
POSTINFOTRANSFER	Pre-test	30	58.75	6.38	4.43
	Post-test	30	80.87	7.53	5.45
POSTREADINGSTEPS	Pre-test	30	57.89	6.38	5.43
	Post-test	30	59.93	6.53	4.45

POSTGUIDEDREADING	Pre-test	30	57.53	8.24	5.22
	Post-test	30	90.09	7.31	6.23
POSTCREATIVEREADING	Pre-test	30	50.68	5.42	5.61
	Post-test	30	82.67	5.29	4.40

4.2. Demographic Characteristics of Participants

This segment explains the characteristics of participants in the current study, a quasi-experiment. The target sample was Grade 4 pupils who were non-native Arabic speakers in the selected school in Jordan. Figure 2 displays the characteristics of the pupils who participated in the intervention. The demography of the pupils showed the representativeness of the sample. Each class (Class A and Class D) included a different category of pupils. Both classes had comparable characteristics, including gender (male and female), race or ethnicity (black and white), gifted and non-gifted pupils (based on their performance and interactive sessions on a web-based app), and pupils with disabilities. The proportion of gifted and disabled pupils in each group was representative of the sample, which accounts for inconsistencies when assessing the study's assumptions.

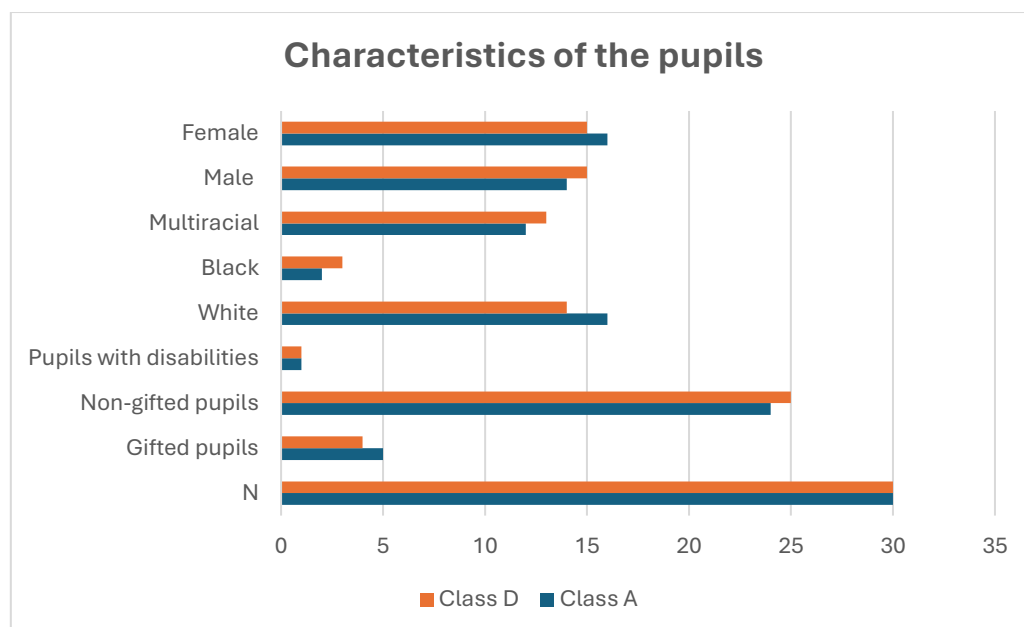


Figure 2: Characteristics of the pupils participated in the intervention.

4.3. Answering Research Question 1: Effect of Web-based App on Information Transfer among Pre-Test and Post-Test

This section provides the answer to the first research question of this study. To do this, we tested the first hypothesis (H1). The hypothesis testing was performed using an independent sample t-test, and the results are displayed in Table 5. The results showed that pupils in the post-test had higher ($M = 72.698 > 48.756$) achievement in terms of information transfer compared to the pre-test. The result of the pre-test group was comparable to that of the control group. This showed that web-based apps have a significant effect on pupils' information transfer and achievements in pre- and post-test Arabic classes. Therefore, the null hypothesis is rejected, while the alternative hypothesis is accepted.

Table 5: Effect of web-based app on pupils' information transfer and achievements among pre-test and post-test in Arabic class.

		Group Statistics				
Class	Test	N	Mean	Std. Deviation	Std. Error Mean	Sig.
Control group		30	47.037	4.165	0.921	0.04
Experimental group	Pre-test	30	48.756	4.165	0.903	
	Post-test	30	72.698	5.736	1.084	

4.4. Answering Research Question 2: Effect of Web-based App on Reading Steps among Pre-Test and Post-Test

This section provides the answer to the second research question of this study. To do this, we tested the second hypothesis (H2). The hypothesis testing was performed using an independent sample t-test, and the results are displayed in Table 6. The results indicated that there was no significant ($0.083 > 0.05$) difference between pupils in the pre-test, post-test, and control in terms of achievement in reading steps. This demonstrated that a web-based app has no significant effect on pupils' reading skills and achievements in pre- and post-test Arabic classes. Thus, the null hypothesis is accepted, while the alternative hypothesis is rejected.

Table 6: Effect of a web-based app on pupils' reading steps and achievements among pre-test and post-test in Arabic class.

		Group Statistics				
Class	Test	N	Mean	Std. Deviation	Std. Error Mean	Sig.
Control group		30	46.032	3.361	0.511	0.083
Experimental group	Pre-test	30	49.521	4.228	0.634	
	Post-test	30	50.171	3.012	0.697	

4.5. Answering Research Question 3: Effect of Web-based App on Guided Reading among Pre-Test and Post-Test

This section provides the answer to the third research question of this study. To do this, we tested the third hypothesis (H3). The hypothesis testing was performed using an independent sample t-test, and the results are displayed in Table 7. The results showed that pupils in the post-test had higher ($M = 86.171 > 50.521$) achievement in guided reading compared to the pre-test. The result of the pre-test group was comparable to that of the control group. This demonstrated that a web-based app has a significant effect on pupils' guided reading and achievements in pre- and post-test Arabic classes. Hence, the null hypothesis is rejected, while the alternative hypothesis is accepted.

Table 7: Effect of a web-based app on pupils' guided reading and achievements among pre-test and post-test in Arabic class.

		Group Statistics				
Class	Test	N	Mean	Std. Deviation	Std. Error Mean	Sig.
Control group		30	49.874	5.006	0.953	0.001
Experimental group	Pre-test	30	50.521	6.178	1.012	
	Post-test	30	86.171	4.991	1.275	

4.6. Answering Research Question 4: Effect of Web-based App on Creative Reading among Pre-Test and Post-Test

This section provides the answer to the fourth research question of this study. To do this, we tested the fourth hypothesis (H4). The hypothesis testing was performed using an independent sample t-test, and the results are displayed in Table 8. The results indicated that pupils in the

post-test had higher ($M = 93.342 > 51.775$) achievement in creative reading compared to the pre-test. The result of the pre-test group was comparable to that of the control group. Despite one of the pupils scoring averagely in this group, the achievement of the pupils was highly impressive, which showed that web-based apps have a significant effect on pupils' creative reading and achievements in pre- and post-test Arabic classes. Thus, the null hypothesis is rejected, while the alternative hypothesis is accepted.

Table 8: Effect of a web-based app on pupils' creative reading and achievements among pre-test and post-test in Arabic class.

		Group Statistics				
Class	Test	N	Mean	Std. Deviation	Std. Error Mean	Sig.
Control group		30	50.529	5.25	0.854	0.001
Experimental group	Pre-test	30	51.775	5.621	1.186	
	Post-test	30	93.342	7.991	1.413	

4.7. Qualitative Data Analysis

4.7.1. Web-based Experience

Out of the total of ten pupils who participated in the interview, five indicated that they had no knowledge of the web-based app and had never used it. These pupils were from class D, which was the control group for this study. However, five students who happened to be part of the experiment shared their experiences with the web-based app. The three pupils of the experimental groups agreed that they had never used LUMIO prior to this intervention, and they all agreed that they can now read Arabic texts and have fun using the web-based app for their reading activities in class. Overall, this indicates that the intervention had a significant effect on the students' Arabic reading skills. Examples of the transcripts for these pupils are given below:

“No, I have no...used this Lumio before, but now I like it...want it for my learning in school” (Pupil_1)

“mmhm, I am not using web-based learning for Arabic before...nhm.. this. Doing this, in this class, it is fun and interesting to me” (Pupil_5)

“...Not really. My first time to use Lumio. It is very good for my learning in this class. It is fun...I think I like it... for now” (Pupil_6)

The last two pupils out of the five from the experimental group indicated that they have previous experience using the web-based app but not for learning reading skills. Both pupils showed that they were happy with the web-based app for their activities in the classroom. An example of the pupil's transcript is given below:

“Yea, I want to learn reading and speaking on the web-based... Lumio. Yea...it is very fun reading on it. I am happy...teacher” (Pupil_1)

“nnn..Yes. I have used this application at home...but long time ago. It is over a year. But, this is the first time, I used it for learning about speaking and...reading. I am happy that I learn much with it.” (Pupil_2)

4.7.2. Reading Experience

The pupils in the experimental group appeared to have diverse experiences using the web-based app for reading activities. After the intervention, five of the students agreed that they could read stories and words on the LUMIO. These pupils also stated that they were able to identify and read groups of words on the cards and pictures displayed on the LUMIO interface. We present examples of these pupils' transcripts below. This showed that the intervention through the web-based app had a significant effect on the pupils' Arabic reading abilities or skills.

“I can read any story.... I.. can also read many information on the Lumio..... example I can tell about thatmmmhnn...second picture..where cat sat on the desk and under it, there is a hat..” (Pupil_1)

“Yess, I can read stories...I can read story of cat.... story of teacher and the student....story of lion king. I can read words on the picture, even faster.... I can read the words on... in the.. box, square, also cards.” (Pupil_2)

“mmhn...yes teacher.. I can read well now in Arabic. I can read the stories on the Lumio. The stories are very good and interesting. I like to read these

stories always.” “The words... the words on the cards are simple for me to read, because teacher... I have also memorized many words....I am happy that I can now read Arabic on my own.” (Pupil_5)

Two pupils out of the five in the experimental group stated that they have some learning difficulties. These pupils stated that they still have challenges with the reading of the provided Arabic stories and word arts. However, the pupils stated that they enjoyed the sessions during the intervention, and they are still willing to do so. The statements of the two pupils are displayed below:

“.....Yes. I cannot read some story...humnn...the writing...very hard... humnn to read” “...but I can identify the words....and me can try to read...the story that are short...but not difficult....me like words on the pictures....the cat on the table.. and under it....hmmnn...yes..good for me” (Pupil_6)

“I can read slow slow. I try my best to read....part... some texts you show on the web app...I am still try to leansome wordsss....on..nhm...on image, cardsss...I want this app,..Lumio is good for my reading in Arabic....I still want to learn using this app.” (Pupil_8)

5. DISCUSSION

This study aimed to investigate the effect of a web-based app on students' reading skills and Arabic learning achievement in both the pre-test and post-test phases, specifically in the areas of information transfer, reading steps, guided reading, and creative reading. The findings indicate that after six weeks of Web-based app intervention, quasi-experimented pupils outperformed control pupils, with overall achievement in post-test (score = 89.56) surpassing pre-test (score = 57.97). The findings showed that the invention had a significant effect on the pupils' reading skills. This may be because the Web-based app intervention made the Arabic reading activities easily accessible and understandable through the intervention sessions. Our results seem to support our assumption that pupils' reading skills might improve significantly because of participating in the web-based app intervention. The experimental group showed significantly higher achievements in information transfer, guided reading, and creative reading compared to the control group. Based on these results, it can be said that reading activities via web-based apps encourage the growth of reading proficiency in these three domains. Biresaw

& Bogale (2024) reported that pupils who got web-based training as opposed to traditional instruction showed much stronger improvement in their basic reading skills. Since not every pupil can read at the same level, strategic reading interventions are required in this case to improve their reading skills. According to Striftou et al. (2024), for struggling readers, reading intervention offers extra skills and exercises to improve reading proficiency in the areas of decoding in a creative manner, comprehension, and fluency. Thus, the curriculum of conventional reading can be supplemented by reading intervention activities in school for Grade 4 pupils.

These findings can be explained in the context of constructivist theory, which holds that pupils learn about the world by doing and experiencing things and then thinking back on those experiences (Payong, 2020; Maisa, 2022). The constructivist theory, or constructivism, showed that reading is not just about acquiring or receiving instruction in knowledge; it is about constructing knowledge (e.g., creative reading, information transfer, etc.). The pupils use their background knowledge (e.g., information transfer) and cognitive development to comprehend, interpret, and make sense of the texts. It implies that the process of reading is about creating knowledge rather than merely obtaining or receiving information. The pupils understand, interpret, and make meaning of the text by drawing on prior knowledge such as information transfer, as exhibited by the pupils in post-test. This constructivism approach emphasizes the reader's active participation in deriving meaning from texts within the context of reading (Wyatt, 2012; Zajda & Zajda, 2021). Damayanti & Hamidah (2023) found that pupils taught with constructivist approaches had a 31% increase in their reading comprehension skills. The post-test pupils' achievement is about 63% higher than the pre-test pupils. This showed that constructivism can help Grade 4 pupils become more proficient readers by encouraging their active interaction with the text and strengthening their comprehension of the subject matter through Web-based app. The findings of this study motivate schools and teachers in Jordan to design classrooms that facilitate pupils' active interaction with texts, giving them the tools (i.e., a web-based app or LUMIO) they need to become independent learners capable of creating their own knowledge and comprehension.

We found that web-based app has no significant effect on pupils' achievements in reading steps among pre-test and post-test Arabic classes. This may be because the reading steps are not directly impact the Arabic reading skills in Grade 4. The insignificant result may also be attributed to the constructivism effect on information transfer and experiences rather than reading steps in interpreting Arabic text. According to Heidari et al. (2024), pupils are

more likely to succeed when provided with a systematic approach to reading instead of steps. A creative reading offers them more experience in a place to start and a path to take in case they run into difficulties, which might be the reason for the outperformance noted in post-test pupils than pre-test pupils in skimming the instructional material on the Web-based app.

Creatively reading a text allows the pupils to get the most out of the reading experience by allowing their minds to be warmed up to notice subtle details, draw connections, and so on. Most pupils can succeed at this stage, and the teacher may want them to feel comfortable reading through a web-based app. The information transfer can help set the stage for this reading journey. Pupils are far more likely to comprehend and like what they are reading if they have some prior knowledge that they can draw from, which is the constructivism approach. This suggests that lower-performing pupils were more likely to fall in this creative reading than high-performing pupils via the intervention. Moreover, the guided reading has helped the pupils who are struggling with Arabic and are interested in reading text via the Web-based app. Through this, pupils are motivated to read for a multitude of reasons, both internal and external, that go beyond only reading the instructional materials to be taught in primary school. One way that encourages possibilities for the creation of self-experiencing learning is guided reading. Shattnawi et al. (2022) assert that readers who receive assistance in reading a text develop a self-extending system that enhances their comprehension of reading with each reading experience.

6. CONCLUSION

The findings of this study showed that the intervention had a significant effect on the pupils' reading skills, with the experimental group outperforming the control group in the post-test. The findings also showed that the pupils had significantly higher scores in the post-test for information transfer, reading steps, guided reading, and creative reading compared to the pre-test. The results of the reading steps showed no significant difference between the pre-test and the post-test. The results showed that the web-based app had a significant effect on these reading skills. The findings of the qualitative analysis revealed that out of ten pupils interviewed, five showed that they had never used the LUMIO web-based app before, while five had used it for reading Arabic texts and found it enjoyable. Five of the pupils were able to read stories and words on the app, as well as identify and read groups of words. Two pupils still had learning difficulties with the provided Arabic stories and word arts, but enjoyed the

sessions during the intervention and expressed a desire to continue using the app. The study concluded that the intervention significantly improved the pupils' Arabic reading skills and achievements in Arabic classes. This study indicated that the Web-based app improved the Arabic language literacy of Grade 4 Jordanian pupils. These findings support the usefulness of the curriculum's broad implementation of Arabic reading through Web-based app intervention, regardless of its use in an Arabic class setting.

Therefore, it is recommended that Web-based app intervention be effective. Schools, particularly in Jordan, must provide Grade 4 pupils with enough Web-based support, and the instructors themselves must be prepared to commit the necessary effort in the Arabic reading class. In the future study, researchers might set up a Web-based lab where pupils might play reading games activities akin to the variables of this study. Also, the instructors could employ more cooperative teaching strategies with small groups of pupils to foster greater reading activities and communication. Creating a standardized questionnaire for Jordanian primary school Arabic learning classes for beginners is also a good idea. Lastly, there are some limitations to this study. Firstly, the lack of sufficient funding for the researchers resulted in limited communication with the teachers. Most of the communication was done with the school administration and management, despite being physically present during all intervention sessions and school visits. Second, because some classrooms had more than thirty pupils, the researcher had to select classes that adequately represented the current study sample size to be able to give each pupil the same attention. Third, learners of the native Arabic speakers were not the target of this study; thus, a few classes with some native speakers were excluded during selection.

REFERENCES

- Adeoye-Olatunde, O. A., & Olenik, N. L. (2021). Research and scholarly methods: Semi-structured interviews. *Journal of the american college of clinical pharmacy*, 4(10), 1358-1367.
- Adu, P. (2019). *A step-by-step guide to qualitative data coding*. Routledge.
- Agustiani, A. (2021). The Effect Of SMART (Self Monitoring Approach To Reading And Thinking) And Self-Efficacy Toward The Reading Skill On Narrative Texts On First Grade Students Of SMAN 10 Pekanbaru. *Diklat Review: Jurnal manajemen pendidikan dan pelatihan*, 5(2), 185-195.
- Al Saud, A. F. (2021). The Effect of Blended Learning on Children's Arabic Reading during Covid-19 Quarantine. *International Journal of Innovation, Creativity and Change*, 14.

Alawawdeh, N., & Ma'moun, A. L. S. H. T. A. I. W. I. (2020). Foreign languages e-learning: challenges, obstacles and behaviours during COVID-19 pandemic in Jordan. *PalArch's Journal of Archaeology of Egypt/Egyptology*, 17(6), 11536-11554.

Albadri, H. A. (2023). An Analytical Review of the Societal Impacts of the Jordanian "Wast El Balad" Program According to the Value Determinization. *Teaching*, 11(5), 355-372.

Al-bordeini, M. H. K. (2020). The effectiveness of e-learning on achievement in the Arabic language course among seventh grade students in Aqaba Governorate, Jordan. *Journal of Educational and Psychological Sciences*, 4(28), 36-52

Al-Hassan, O. M., Al-Hassan, M. A. M., Almakani, H., Al-Rousan, A., & Al-Barakat, A. A. (2022). Inclusion of children with disabilities in primary schools and kindergartens in Jordan. *Education 3-13*, 1-14.

Alim, U. N., Mariah, E., & Rivai, M. (2024). The Relationship Between Learning Motivation and Arabic Language Learning Achievement of Junior High School Students in Makassar City. *Pinisi Journal of Art, Humanity, and Social Studies*, 4(3), 214-224.

Al-Khalifa, H. S., Alfaadhel, A., Albulikhi, D., Alrakhes, L., Almugren, N., Alqubaisi, S., & Muhaureq, M. A. (2016, November). A web-based system and web service for coloring and decoding Arabic text for Arabic learners. In *Proceedings of the 18th International Conference on Information Integration and Web-based Applications and Services* (pp. 468-471).

Alkhwaldi, A.F. and Abdulmuhsin, A.A., (2022). Crisis-centric distance learning model in Jordanian higher education sector: factors influencing the continuous use of distance learning platforms during COVID-19 pandemic. *Journal of International Education in Business*, 15(2), pp.250-272.

Almeqdadi, F., & Al Zoubi, A. (2022). Teacher Education in Jordan: Retrospect and Prospects. In *Handbook of Research on Teacher Education: Pedagogical Innovations and Practices in the Middle East* (pp. 59-70). Singapore: Springer Nature Singapore.

Al-Obaydi, L. H., Rahul, D. R., & Pikhart, M. (2024). The effect of online oral reading on reading comprehension, reading anxiety, and classroom anxiety among EFL learners. *Education and Information Technologies*, 29(3), 2841-2855.

AlOkaily, R. (2021). Benefits and barriers of online speaking practice: A case study in the United Arab Emirates. *Studies in Technology Enhanced Learning*, 1(2).

Alzubi, A. (2023). The role of multimedia tools in Hashemite Kingdom of Jordan education classroom teaching in the digital era. *European Journal of Interactive Multimedia and Education*, 4(2), e02303.

Ardiansyah, F., & Jaya, A. (2020). Extending the Students' Narrative Text Comprehension through Reading SMART Protocol. *Esteem Journal of English Education Study Programme*, 3(1), 42-55.

Bakı, Y. (2020). The effect of critical reading skills on the evaluation skills of the creative reading process. *Eurasian Journal of Educational Research*, 20(88), 199-224.

- Bashori, M., van Hout, R., Strik, H., & Cucchiarini, C. (2022). Web-based language learning and speaking anxiety. *Computer Assisted Language Learning*, 35(5-6), 1058-1089.
- Biresaw, A., & Bogale, B. (2024). Web-based feedback system and the development of reading skills. *Education and Information Technologies*, 29(4), 4745-4761.
- Biresaw, A., & Bogale, B. (2024). Web-based feedback system and the development of reading skills. *Education and Information Technologies*, 29(4), 4745-4761.
- Bowles, P. V., & Sharman, S. J. (2014). A review of the impact of different types of leading interview questions on child and adult witnesses with intellectual disabilities. *Psychiatry, Psychology and Law*, 21(2), 205-217.
- Chang, M., Popescu, E., Kinshuk, E., Chen, N. S., Jemni, M., Huang, R., ... & Sampson, D. G. (2019). Foundations and Trends in Smart Learning: Proceedings of 2019 International Conference on Smart Learning Environments. Lecture Notes in Educational Technology. *Lecture Notes in Educational Technology*.
- Chen, C. M., Li, M. C., & Chen, T. C. (2020). A web-based collaborative reading annotation system with gamification mechanisms to improve reading performance. *Computers & Education*, 144, 103697.
- Clark, K. R. (2018). Learning theories: constructivism. *Radiologic technology*, 90(2), 180-182.
- Cobern, W., & Adams, B. (2020). When interviewing: how many is enough?. *International Journal of Assessment Tools in Education*, 7(1), 73-79.
- Damaianti, V. S., Rahma, R., & Astini, M. P. (2020). Basic Dimensions of Early Reading Skills of Elementary School Students in Bandung. *Jurnal Ilmu Pendidikan*, 26(1), 39-46.
- Damayanti, W., & Hamidah, S. (2023). The Application of the Constructivism Approach in Learning the Skills of Reading Scientific Articles in Online Journals. *DISCUSSANT: Journal of Language and Literature Learning*, 1(2), 61-72.
- Dobson, M., & Ziemann, B. (Eds.). (2020). Reading primary sources: The interpretation of texts from nineteenth and twentieth century history. Routledge.
- Eren-Zaffar, N. (2020). The Impact of Pre-reading Strategies on Reading Performance: An Action Research. In *2020 Sixth International Conference on e-learning (econf)* (pp. 210-213). IEEE.
- Eser, R. S., & Ayaz, H. (2021). The effects of creative writing activities on narrative text writing skills and advanced reading awareness. *Istraživanja u pedagogiji*, 11(2), 639-660.
- Fangesti, C. (2022). The Effect of Smart (Self Monitoring Approach to Read And Think) Strategy In Students' Reading Comprehension at SMAN 4 Kota Bengkulu. *Teaching English and Language Learning English Journal*, 2(2), 107-117.
- Ghonaim, W., Ghamdi, A. A. G., & Al-Ghamdi, A. (2018). A Smart Class Hyperlearning and Management Suite. In *2018 International Conference on Computational Science and Computational Intelligence (CSCI)* (pp. 555-561). IEEE.

Gove, A., Brombacher, A., & Ward-Brent, M. (2017). Sparking a reading revolution: Results of early literacy interventions in Egypt and Jordan. *New directions for child and adolescent development*, 2017(155), 97-115.

Heidari, Z., Javdani, M., & Keyhanzadeh, P. (2024). Investigating the effect of reading bag method based on social constructivism approach on the skill and attitudinal dimensions of reading in fourth grade elementary students of Abadeh city. *The Journal of Theory and Practice in Teachers Education*, 10(17), 157-147.

Homberg, A., Narciß, E., Thiesbonenkamp-Maag, J., & Schüttpelz-Brauns, K. (2023). Experience-based learning during the final year—quantitative content analyses of students' self-reports. *Medical Teacher*, 45(5), 542-549.

Huh, K., & Lee, J. (2020). Fostering creativity and language skills of foreign language learners through SMART learning environments: Evidence from fifth-grade Korean EFL learners. *TESOL Journal*, 11(2), e489.

Ichsan, I., Saefudin, A., & Meisarah, F. (2023). Constructivism Philosophy in Developing Prospective Educators on the Implementation of Merdeka Belajar in Vocational Schools. *International Journal of Education, Vocational and Social Science*, 2(01), 306-319.

Kasem, L. A. A. E., Ismail, A. M., & Elsayed, R. A. (2022). An Investigation of the Creative Reading Skills of Preparatory School EFL Students. *Sohag University International Journal of Educational Research*, 6(6), 67-74.

Khaliq, S., Tabassum, R., & Shaheen, G. (2022). Effect of guided reading strategies on the motivation of the students to increase reading skill of elementary level students in the subjects of English. *International Research Journal of Management and Social Sciences*, 3(1), 160-168.

Khasawneh, N. A. S., Khasawneh, A. J., Khasawneh, M. A. S., & jadallah abed Khasawneh, Y. (2024). Improving Arabic Content Delivery on Cloud Computing Platforms for Jordanian E-learning Environments. *Migration Letters*, 21(S1), 575-585.

Kim, M. K., Gaul, C. J., Bundrage, C. N., & Madathany, R. J. (2020). Technology supported reading comprehension: a design research of the student mental model analyzer for research and teaching (SMART) technology. *Interactive Learning Environments*, 1-25.

Koptseva, N. P. (2020). Constructivist pedagogy in context of modern philosophy of education. *Перспективы Науки и Образования Perspectives of Science and Education*, 41.

Kralj, K. (2019). *Integration in the Creative Approach to Required Reading* (Doctoral dissertation, University of Zagreb. Faculty of Teacher Education).

Kwet, M., & Prinsloo, P. (2020). The 'smart' classroom: a new frontier in the age of the smart university. *Teaching in Higher Education*, 25(4), 510-526.

Lee, J. (2020). Research on SMART Learning Model Based on 5 Steps Using Media-Based Teaching and Learning Method. *Public Value*, 5(2), 1-12.

- Leider, C. M., Proctor, C. P., Silverman, R. D., & Harring, J. R. (2013). Examining the role of vocabulary depth, cross-linguistic transfer, and types of reading measures on the reading comprehension of Latino bilinguals in elementary school. *Reading and Writing*, 26, 1459-1485.
- Leng, L. (2020). The role of philosophical inquiry in helping students engage in learning. *Frontiers in psychology*, 11, 519240.
- Machynska, N. I., & Zadunayska, Y. V. (2019). The development of primary school pupils' creative abilities by means of innovative technologies. *Sciences of Europe*, (35-4 (35)), 24-28.
- Maisa Seh, A. (2022). The Effectiveness of the Constructivist Learning Model in Enhancing the Motivation of Fourth Grade Students towards Reading among Arab Students in Israel. *Journal of Positive School Psychology*, 384-400.
- Makhlouf, M. H., & Alani, R. (2022). COVID-19 and education: insights into the impact of E-learning on accounting education: evidence from Jordan. *VINE Journal of Information and Knowledge Management Systems*, (ahead-of-print).
- Malaia, E. A., & Wilbur, R. B. (2020). Syllable as a unit of information transfer in linguistic communication: The entropy syllable parsing model. *Wiley Interdisciplinary Reviews: Cognitive Science*, 11(1), e1518.
- Mangione, G. R. J., & Calzone, S. (2019). The Italian Small School Toward Smart Pedagogy. A Cross-Reading of Opportunities Provided by the National Operational Program (PON) "For Schools 2014–2020–Skills and Learning Environments". In *Didactics of smart pedagogy* (pp. 233-252). Springer, Cham.
- Meng, Q., Jia, J., & Zhang, Z. (2020). A framework of SMART pedagogy based on the facilitating of high order thinking skills. *Interactive Technology and Smart Education*.
- Nasri, M., Shafiee, S., & Sepehri, M. (2021). An investigation of Iranian intermediate EFL learners' L2 motivation and attitude in a computer-assisted language learning environment. *Issues in Language Teaching*, 10(1), 355-389.
- Nazarenko, O. V. (2019). Extracurricular reading as a tool of development of pupils' creative abilities. *Creative Education*, 11(08), 28.
- Nusair, L., & Palmer, R. (2023). Weak foundations in Arabic literacy: Drivers of learning poverty in Jordan. *International Journal of Educational Development*, 99, 102774.
- Ocak, G., & Karşlı, E. (2022). Relationship between critical reading skills and creative reading perceptions of fifth grade students. *International Journal of Education and Literacy Studies*, 10(3), 91-100.
- Osipova, E., & Bagrova, Y. Y. (2022). Lumio by Smart in Distance Learning: a Case of EFL Vocabulary Learning. *Russian Linguistic Bulletin*, (5 (33)), 7.
- Osman, M. N., Maghribi, M., Puddin, N. S. S., Sedek, K. A., & Othman, N. A. (2022). The Design and Implementation of Web-Based Multimedia Learning Content Management System

for Arabic Vocabulary Pronunciation. *Journal of Computing Research and Innovation*, 7(1), 93-103.

Palupi, T. W., & Hermaniar, Y. (2020). The Implementation of Reading Indicators of Syllabus and Questions Reading in Smart Steps 2 Textbook. *Lentera: Jurnal Ilmiah Kependidikan*, 15(1), 68-77.

Payong, M. R. (2020). Zone Of Proximal Development and Social Constructivism Based Education According to Lev Semyonovich Vygotsky. *Jurnal Pendidikan dan Kebudayaan Missio*, 12(2), 164-178.

Raghunath, R., Anker, C., & Nortcliffe, A. (2018). Are academics ready for smart learning?. *British journal of educational technology*, 49(1), 182-197.

Ritonga, M., Febriani, S. R., Kustati, M., Khaef, E., Ritonga, A. W., & Yasmar, R. (2022). Duolingo: An Arabic speaking skills' learning platform for andragogy education. *Education Research International*, 2022.

Romero Calvo, A., Biggs, J., & Topputo, F. (2019). Attitude Control For the LUMIO CubeSat in Deep Space. In *International Astronautical Congress: IAC Proceedings* (pp. 1-13).

Roy, A. (2024). Analysis of the influence between study plan, locus of control learning achievement at BSM 1 High School in 2024. *ProBisnis: Jurnal Manajemen*, 15(1), 01-08.

Sakarneh, M. (2014). Quality teaching: The perspectives of the Jordanian inclusive primary school stakeholders and the Ministry of Education. *International Journal of Psychological Studies*, 6(4), 26.

Shattnawi, K. K., Al Ali, N., & Ma'abreh, Y. L. M. (2022). Prevalence of adverse childhood experiences and their relationship with self-esteem among school-age children in Jordan. *Child Psychiatry & Human Development*, 1-11.

Striftou, A., Zygouris, N. C., Vlachos, F., Patrikelis, P., & Messinis, L. (2024). The effectiveness of a reading and cognitive task-based Web delivered intervention program for children with reading difficulties. *Applied Neuropsychology: Child*, 1-12.

Tatli, Z., Turan, S., Yaman, H., & Er-Nas, S. (2022). Need Analysis of a Web 2.0 Tool to Be Developed for Measurement and Evaluation in Education. *Journal of Theoretical Educational Science*, 15(1), 104-125.

Tavory, I. (2020). Interviews and inference: Making sense of interview data in qualitative research. *Qualitative Sociology*, 43(4), 449-465.

Thomas, D. P., Hopwood, B., Hatisaru, V., & Hicks, D. (2024). Gender differences in reading and numeracy achievement across the school years. *The Australian Educational Researcher*, 51(1), 41-66.

Tiarazani, R. (2020, August). The Effect of Guided Reading Strategy and Reading Interest on Reading Comprehension of Grade VIII Students of SMPN 16 Pekanbaru. In *Eighth International Conference on Languages and Arts (ICLA-2019)* (pp. 179-182). Atlantis Press.

van de Ven, I. (2019). Creative reading in the information age: Paradoxes of close and distant reading. *The journal of creative behavior*, 53(2), 156-164.

Weinstein, B. (2019). The Impact of Guided Reading Instruction on Students' Reading Achievement in Third Grade. *Language Teaching*, 10(1), 355-389.

Williams, M., & Moser, T. (2019). The art of coding and thematic exploration in qualitative research. *International management review*, 15(1), 45-55.

Wyatt, M. (2012). Issues in supporting the teaching of reading in English as a second language to Arabic-speaking children. *Reading*, 12(2).

Yahya, S. M., El-Freihat, S. M., & Safa'A, A. M. S. (2023). Breaking down barriers to science education: Evaluating the readability of science textbooks for second-grade secondary students in Jordan. *International Journal of Instruction*, 16(4), 965-986.

Yunis, I., & Dajani, B. (2022). Acquiring Reading and Writing Skills among Beginner Learners of Arabic Language, An Applied Analytical Study of the First and Second Books of the University of Jordan's Arabic Curriculum for Non-native Speakers. *Dirasat: Human and Social Sciences*, 49(5), 275-286.

Zajda, J., & Zajda, J. (2021). Constructivist learning theory and creating effective learning environments. *Globalisation and education reforms: Creating effective learning environments*, 35-50.