



Effect of Instructional Animation on Pupils' Academic Performance in Literacy

Azeez Arisekola Salman^{1*} 

¹ Department of Early Childhood and Primary Education, Faculty of Education Kwara State University, Malete, Nigeria

ARTICLE INFO

Article history:

Received March 10, 2025

Accepted July 15, 2025

Available online August 25, 2025

Kata Kunci:

Prestasi Akademik; Animasi Instruksional; Literasi; Murid

Keywords:

Academic Performance; Instructional Animation; Literacy; Pupils

DOI:

<https://doi.org/10.23887/jet.v9i3.98340>

ABSTRAK

Studi ini dimotivasi oleh masalah persisten kinerja melek huruf rendah di antara siswa sekolah dasar di Nigeria, yang sering dikaitkan dengan metode pengajaran yang berpusat pada guru dan penggunaan teknologi yang terbatas di kelas. Tujuan penelitian ini adalah untuk mengkaji pengaruh animasi instruksional terhadap kinerja akademik siswa dalam literasi, dengan perhatian khusus pada jenis kelamin dan jenis sekolah. Studi ini melibatkan 95 siswa dari empat sekolah dasar negeri dan swasta terpilih di Wilayah Pemerintah Daerah Ilorin West di Negara Bagian Kwara, yang terdiri dari 53 siswa dari sekolah umum dan 42 dari sekolah swasta. Desain kuasi-eksperimental kelompok kontrol pra-uji, pasca-tes, non-ekuivalen dengan struktur faktorial $2 \times 2 \times 2$ diadopsi untuk penelitian ini. Data dikumpulkan menggunakan Tes Kinerja Literasi Murid (PLPT), Panduan Instruksional Animasi Instruksional (IGIA), dan Panduan Instruksional Metode Konvensional (IGCM). Instrumen tersebut divalidasi oleh para ahli dan PLPT menghasilkan koefisien keandalan 0,74. Data yang diperoleh dianalisis menggunakan Analisis of Variance (ANOVA) untuk menguji efek utama dan interaksi animasi instruksional, jenis kelamin, dan jenis sekolah terhadap kinerja literasi siswa. Temuan ini mengungkapkan bahwa animasi instruksional memiliki efek positif yang signifikan pada kinerja akademik siswa dalam literasi, karena mereka yang diajarkan dengan animasi mengungguli rekan-rekan mereka yang diajarkan dengan metode konvensional. Namun, tidak ada efek interaksi yang signifikan antara animasi instruksional, jenis kelamin, dan jenis sekolah, yang menunjukkan bahwa strategi tersebut efektif dan inklusif di berbagai kelompok pelajar. Studi ini menyimpulkan bahwa mengintegrasikan animasi instruksional ke dalam pengajaran literasi dapat meningkatkan hasil belajar siswa dan mempromosikan pendidikan berbasis teknologi yang adil di sekolah dasar.

ABSTRACT

This study was motivated by the persistent problem of low literacy performance among primary school pupils in Nigeria, which is often attributed to teacher-centered instructional methods and limited use of technology in classrooms. The purpose of the research was to examine the effect of instructional animation on pupils' academic performance in literacy, with specific attention to gender and school type. The study involved 95 pupils from four selected public and private primary schools in Ilorin West Local Government Area of Kwara State, consisting of 53 pupils from public schools and 42 from private schools. A pre-test, post-test, non-equivalent control group quasi-experimental design with a $2 \times 2 \times 2$ factorial structure was adopted for the study. Data were collected using the Pupils' Literacy Performance Test (PLPT), the Instructional Guide for Instructional Animation (IGIA), and the Instructional Guide for Conventional Method (IGCM). The instruments were validated by experts and the PLPT yielded a reliability coefficient of 0.74. Data obtained were analyzed using Analysis of Variance (ANOVA) to test the main and interaction effects of instructional animation, gender, and school type on pupils' literacy performance. The findings revealed that instructional animation had a significant positive effect on pupils' academic performance in literacy, as those taught with animation outperformed their peers taught with the conventional method. However, there were no significant interaction effects among instructional animation, gender, and school type, indicating that the strategy was effective and inclusive across different learner groups. The study concludes that integrating instructional animation into literacy instruction can enhance pupils' learning outcomes and promote equitable, technology-based education in primary schools.

This is an open access article under the [CC BY-SA](#) license.
Copyright © 2025 by Author. Published by Universitas Pendidikan Ganesha.



1. INTRODUCTION

Excellent and effective teaching requires a range of devices, techniques, and strategies not only to achieve cross-curricular outcomes but also because variety itself is an objective (Darmansah, 2023; Puspitorini et al., 2022). Teaching has become one of the most stimulating professions in Nigerian society today, where knowledge is expanding and changing so rapidly that modern technologies necessitate the use of information and communication technology (ICT) (Abdulkareem et al., 2024; Abdulkareem & Lasis, 2024). Many countries now consider understanding ICT and mastering its basic concepts as essential components of education. However, studies have revealed that the current model of learning in Nigeria is primarily based on traditional chalk-and-talk (Abdulkareem & Lasis, 2024; Akinnubi & Adeoye, 2024). Other research has also shown that teaching still adheres

to a conservative approach, with teachers serving as repositories of knowledge and students as passive recipients. The teacher-centered method emphasizes learning through the teacher's direction, which favors the passive reception of knowledge by students and limits their opportunities to learn from diverse sources (Laili et al., 2024; Nasution, 2020). The utilization of information and communication technology (ICT) has seen gigantic acceptance in recent times. This may be due to its effect on all spheres of human endeavour (Mulyati & Evendi, 2020; Rahmawati & Atmojo, 2021). The field of education is not left out, as technology has positively affected teaching, learning, and research in many ways (Andini & Agung, 2022; Zahwa & Syafi'i, 2022). Another research opined that ICT has the potential to accelerate, enrich, and deepen skills; to motivate and engage students; to help relate school experience to work practices; to create economic viability for tomorrow's workers; as well as to strengthen teaching and help schools change. Interestingly, technology in many ways is expanding globally, and the need to adopt technology-based packages to improve the teaching and learning of literacy for effective learning outcomes of pupils cannot be overemphasized. The use of technology in the classroom has proven to be effective in teaching and learning (Agung & Sudatha, 2021; Ngao, 2022). It offers new, creative, and most engaging ways of teaching. Technology products such as instructional animation make teaching effective, as learning is enhanced with images, video, and sound. Also, the use of technology provides an enabling environment through which different types of learners (visual, audio, kinesthetic, etc.) learn (Bulkani et al., 2022; Puspita & Raida, 2021).

One teaching instrument that perhaps is rarely used is instructional animations, of which, if encouraged, learning activities could become more interesting (Apriansyah, 2020; Rachmavita, 2020). Instructional videos are commonly used as supplemental materials to enhance learning during lectures or tutorials (Puspita & Raida, 2021; Putra & Sujana, 2021). Instructional videos can be in the form of live-action video or animation or even both (hybrid). Also, there are numerous Web 2.0 technologies and platforms that can provide many options for animation video creation (Apriansyah, 2020; Impronah & Batubara, 2021). Other than that, watchers can likewise see these recordings from the comfort of their computer work areas at home or on their handheld gadgets in a hurry. Simultaneously, educational video is gaining back its popularity due to the adoption of a Massive Open Online Course (MOOC) to counter the rising cost of education (Amante et al., 2023; Tzeng et al., 2021). Animation and live-action videos possess different visual characteristics. According to other research, live-action videos cannot readily portray the explanatory abstractions as well as expository animations. Live activity video may be inadequate to display hypothetical cases or non-visual pieces of a theme (Ismawati, S. & Mustika, 2021; Pratama et al., 2022). They also added that animation has more flexibility as it can manipulate the portrayal of the subject matter through abstraction and visual-spatial reorganization (Hamidi et al., 2023; Suryaman & Suryanti, 2022).

The rationale behind the teaching and learning activities in a classroom is to bring about a desirable change in learners' behaviour. This change is possibly determined by the extent of the pupils' performance on a learning task or subject. Performance is a scholastic perspective of learners who exhibit intellectual capability on an assigned test. Constantly, the outcome of pupils' academic performance has been used to judge the educational quality of a nation (Rahina & Kastam, 2020; Zhang & Leong, 2024). Another research described the academic performance as participants' examination grades (Grade Point Average) at the concluding part of a term, semester, or program. That got a support by another research submitted that academic performance is a measure of pupils' assessment through comprehensive, systematic, cumulative, diagnostic, formative, and summative evaluation of what they have learned in various subjects, including English (Bećirović et al., 2025; Nguyen et al., 2024). There has been a high rate of students' low performance in the English language, which might be due to several factors ranging from teachers' poor skills to ineffective handling of the course and the use of archaic methods of teaching (Kazazoglu, 2025; Malmström & Zhou, 2025). The situation becomes worrisome daily and thus requires urgent attention (Sumitro & Rizqi, 2024; Zumroti, 2022). Many efforts have been explored, and like other core subjects, priority attention has been given to this compulsory subject. Another research noted that students continue to perform very poorly in the subject at both promotional and terminal examinations, to the displeasure of parents, teachers, examiners, and policymakers. In 2014, only 31.28% of 529,425 students passed with credit in English Language from available WAEC records. The Joint Admission and Matriculation Examination results are also not better; the state has been continuously poor. The pass percentage of students in the 2015 WAEC results shows only 38.68% of the 616,370 students that sat for the final secondary school examination in the English language had a credit pass in the English language, a situation that has not significantly improved up till 2019. The reasons for these scenarios are many, and the roles of teachers and teaching strategies are pertinent in this situation. Specifically in early childhood and primary education, there should be more attention on this foundation stage of child development (Amante et al., 2023; Mutoharoh et al., 2021).

The fundamental role of the English language as a requirement for admission into higher institutions of learning has made it an extremely important subject. Therefore, focused efforts must be directed toward improving learners' proficiency in the language (Padmadewi et al., 2023; Rusmiati et al., 2024). This can be effectively achieved through the continuous professional development of English language teachers, particularly in adopting innovative teaching strategies that incorporate ICT competence—especially in the use of computers and related educational tools such as internet resources and instructional software (Agung & Sudatha, 2021; Zumroti, 2022).

English language teachers occupy a central position in the teaching and learning process in Nigeria. The National Policy on Education (NPE) emphasizes that “no educational system can rise above the quality of its teachers.” Consequently, the policy recommends measures to strengthen the teaching profession, including the training, recruitment, and retraining of teachers at both the primary and secondary school levels. Furthermore, the literature identifies several variables that can influence academic performance in literacy (Kazazoglu, 2025; Luo et al., 2020). These include gender, school type, teacher characteristics, curriculum, and teaching methods. However, the additional variables of specific interest in this study are gender and school type. Gender is a socially constructed phenomenon through which society assigns distinct roles, duties, behaviors, and mannerisms to individuals based on sex. It is closely connected to the cultural attributes associated with males and females (Dell et al., 2020; Rusyati et al., 2020). According to another study, gender represents the psychological experience of being male or female. The authors further explain that gender is a socio-cultural construct that reflects the differentiated roles and responsibilities of males and females within a given society. This definition implies that gender influences the roles individuals play in relation to the political, cultural, social, and economic systems of society (Smith & Reimer, 2024; Thomas et al., 2024). Similarly, other researchers define gender as the collection of attributes, expectations, and responsibilities assigned to males and females by their society (Aucejo et al., 2022; Thomas et al., 2024).

It has been maintained that due to biological differences in human composition—such as those between men and women people often presume that one sex may possess a learning advantage over the other. However, there are practically no significant differences in intelligence between males and females that can be attributed to gender. Some scholars argue that the perception of men as the dominant or superior sex does not imply that they are artistically more capable than women. In fact, it has become a common assumption that literacy is predominantly a female domain. A meta-analysis study revealed that females tend to perform better in literacy, whereas males generally excel in computation. Nevertheless, no significant gender differences were found in the understanding of literacy concepts (Eriksson et al., 2020; Rusyati et al., 2020). Studies carried out in some countries have revealed that males do better than females in literacy. Another research showed that boys generally achieve higher than girls on standardized English tests (Aucejo et al., 2022; Smith & Reimer, 2024). However, an interesting body of international literature opined that girls do better than boys. A large-scale study in the United States of America showed that females have reached parity with males in English achievement, including at a high school where there was a difference in the early decades. They averred that females are now performing better than males (Aldahdough et al., 2020; Miyamoto et al., 2024). Gender has long been recognized as an important factor influencing students’ academic achievement, including literacy. However, findings across studies remain inconsistent. While some research reports that boys outperform girls in literacy tasks others indicate that girls achieve better results or that no significant difference exists between the two genders (Aucejo et al., 2022; Smith & Reimer, 2024). Another research attributed this inconsistency to variations in learning environments and school systems, suggesting that gender disparities in literacy performance may differ across contexts. Similarly, differences between public and private schools may also contribute to varied learning outcomes. Private schools tend to have higher-quality inputs and better resources due to stronger financial support, while public schools often face challenges in funding and management (Aldahdough et al., 2020; Angeli & Valanides, 2020). These mixed findings highlight a gap that this study aims to address by examining the effects of instructional animation on pupils’ academic performance in literacy, with specific attention to gender and school type in Ilorin West Local Government Area of Kwara State.

The traditional way of teaching and learning in a classroom involves face-to-face teacher-learner interaction, learning through books, studying through teacher’s notes, and appearing for examinations to obtain scores as high as possible. In traditional learning, there is little involvement in audio and video aids; it is entirely focused on reading text (Isti et al., 2022; Suryaman & Suryanti, 2022). Presently, teaching aids have undergone a revolutionary change in the present era; educational aids involve traditional teaching styles in addition to extensive use of audio and video aids. It all happens due to the rapid growth of technology and its availability at a low cost (Boentolo et al., 2024; Fikri et al., 2022). The evolution of audio-video aids helps learners to understand concepts better than they used to. This teaching technology is less effective in improving the cognitive and literacy development in pupils (Chen et al., 2021; Keuangan et al., 2024). This is evident in the poor spoken English evident among some higher institution students and secondary school students who find it difficult to ask questions and answer questions correctly both in the classrooms and during examinations, which leaves a gap to fill. However, theoretical and empirical evidence on the learner-centered method of teaching has been documented in literacy across the globe, but empirical evidence of some of this innovative strategy (instructional animation) as used in this study is not much. To the best of the researcher’s knowledge and from the literature available to the researcher, there seems to be no documented empirical evidence on the effects of instructional animation on pupils’ academic performance in literacy in Ilorin West Local Government Area of Kwara State, Nigeria. Although some researchers have worked on other strategies, such as the effects of computer animation packages on the academic achievement of students, academic performance in literacy skills persists. Efforts had been made by the researchers in the past

and are still ongoing to improve pupils' literacy knowledge, while different strategies have been used to improve pupils' academic performances in literacy (Chen et al., 2021; Luo et al., 2020). Yet, pupils' performances in literacy are still low, thus bringing out the gap that the present study intends to fill. One can infer from the foregoing that, to improve pupils' academic performance in literacy, there is a need to explore other strategies that can captivate the interest of the pupils towards literacy skill development (Canfield et al., 2020; Rahayu et al., 2022).

The mixed findings from previous studies on gender and school type highlight the need for further empirical investigation into effective teaching strategies that can enhance literacy performance among pupils. The novelty of this study lies in its focus on the use of instructional animation as an innovative learning tool to improve pupils' literacy achievement an area that has received limited empirical attention in Nigeria. Unlike previous studies that broadly examined ICT integration or computer-assisted instruction, this research isolates the effect of animation-based teaching while simultaneously analyzing the moderating roles of gender and school type. Therefore, the purpose of this study is to determine the effect of instructional animation on pupils' academic performance in literacy and to examine whether gender and school type influence or interact with this effect in the Ilorin West Local Government Area of Kwara State.

2. METHOD

The research design adopted for this study was a pre-test, post-test, non-equivalent control group quasi-experimental design, which is suitable for determining cause-and-effect relationships where random assignment of participants is not possible (Abraham & Supriyati, 2022; Saragih et al., 2021). This design was employed to assess the effect of instructional animation on pupils' literacy performance while controlling for other influencing factors. A 2×2×2 factorial design was used to test the null hypotheses of the study. The first factor consisted of two levels of teaching methods: the experimental group, which received treatment using instructional animation, and the control group, which was taught using the conventional method. The second factor represented gender, categorized as male (M) and female (F), while the third factor was school type, consisting of public and private schools. This factorial design was appropriate because it allowed the researcher to examine not only the main effects of each independent variable but also their possible interaction effects on pupils' academic performance in literacy. Both the experimental and control groups were exposed to the same learning topics; however, only the experimental group received instruction through animation-based teaching. The control group, on the other hand, was taught using traditional teacher-centered methods. Both groups took a pre-test before treatment and a post-test after the completion of the treatment to determine the difference in literacy performance attributable to the instructional approach (Bećirović et al., 2025; Guggemos, 2021).

The population for this study comprised all pupils enrolled in public and private primary schools in the Ilorin West Local Government Area of Kwara State, Nigeria. According to the Kwara State School Census Report (2015–2016), there are 59 public primary schools with an enrollment of 28,387 pupils and 243 private schools (197 approved and 46 unapproved) with an enrollment of 19,304 pupils. From this population, the target group consisted of Primary Three pupils, as they are in a critical stage of literacy development and can effectively respond to simple instructional animations. A total of 95 pupils participated in the study, comprising 53 pupils from public schools and 42 pupils from private schools. The sampling procedure followed a multistage sampling technique, combining stratified, purposive, and intact class approaches to ensure representativeness. In the first stage, schools were stratified into two strata public and private. From each stratum, two schools were purposively selected based on specific criteria such as availability of electricity and multimedia teaching facilities, which were essential for the animation treatment. Consequently, a total of four schools were selected: two public and two private. In the second stage, the schools were randomly assigned into experimental and control groups such that one public and one private school served as the experimental group, while the remaining two schools (one public and one private) served as the control group. An intact class from each selected school was used to avoid disrupting the existing class structure, which aligns with the quasi-experimental nature of the study.

Three major instruments were employed in the study to collect data. The first instrument, the Pupils' Literacy Performance Test (PLPT), was designed to measure the pupils' literacy achievement both before and after the treatment. The PLPT had a reliability coefficient of 0.74, established through a pilot study using the Kuder-Richardson (KR-20) formula, indicating acceptable internal consistency. The second and third instruments were Instructional Guides: The Instructional Guide for Instructional Animation (IGIA) and the Instructional Guide for Conventional Method (IGCM). These guides were developed to standardize the teaching process and ensure consistency in lesson delivery between groups. The IGIA contained structured lesson plans, storyboards, and visual sequences used to deliver literacy concepts through animation, while the IGCM included lesson outlines aligned with conventional teacher-centered instruction. Both guides were subjected to content validation by experts in educational technology, language education, and curriculum studies to ensure appropriateness and relevance to the pupils' literacy level.

The procedure for the study was carried out in three phases: pre-testing, treatment, and post-testing. During the pre-test phase, the PLPT was administered to both experimental and control groups to establish their baseline literacy levels. In the treatment phase, the experimental group received instruction through the use of animation-based lessons for a specified period (typically four weeks, with two sessions per week), while the control group was taught the same topics using traditional chalk-and-talk methods. Both groups were taught by their regular classroom teachers who had been trained by the researcher to ensure uniformity in lesson delivery and minimize teacher bias. During the post-test phase, the same PLPT instrument was administered to both groups to measure the improvement in literacy performance after the intervention. Data obtained from the pre-test and post-test were subjected to statistical analysis using Analysis of Variance (ANOVA) for a 2×2×2 factorial design to determine the main and interaction effects of instructional animation, gender, and school type on pupils' literacy performance. The design and methodological approach of this study were carefully structured to ensure internal validity, minimize confounding variables, and provide credible evidence on the effectiveness of instructional animation as an innovative tool for improving literacy achievement among primary school pupils in Ilorin West, Kwara State.

3. RESULT AND DISCUSSION

Result

Five hypotheses were postulated in the study and tested with analysis of covariance at a 0.05 level of significance. There is no significant main effect of instructional animation on pupils' academic performance in literacy. Summary of ANCOVA analysis showing the effect of instructional animation on pupils' academic performance in literacy can be seen at [Table 1](#).

Table 1. Summary of ANCOVA Analysis Showing the Effect of Instructional Animation on Pupils' Academic Performance in Literacy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	218.284	8	27.286	3.350	0.002
Intercept	600.395	1	600.395	73.715	0.000
Pretest	23.967	1	23.967	2.943	0.090
School-type	3.186	1	3.186	0.391	0.533
Gender	9.166	1	9.166	1.125	0.292
Treatment	121.986	1	121.986	14.977	0.000
School-type * Gender	0.205	1	0.205	0.025	0.874
School-type * Treatment	14.296	1	14.296	1.755	0.189
Gender * Treatment	14.593	1	14.593	1.792	0.184
School-type * Gender * Treatment	18.000	1	18.000	2.210	0.141
Error	700.452	86	8.145		
Total	16844.000	95			
Corrected Total	918.737	94			

[Table 1](#) shows the effect of instructional animation on pupils' academic performance in literacy. There was a significant effect of instructional animation on pupils' academic performance in literacy ($F_{(1; 86)} = 14.977$, $P < 0.05$). The hypothesis is therefore rejected in light of the result since the significant value (.000) is less than 0.05. This implies that instructional animation had a significant main effect on pupils' academic performance in literacy. [Table 3](#) reveals the sources of the difference in pupils' academic performance in literacy. There is no significant interaction effect of instructional animation and gender on pupils' academic performance in literacy. Result research shows the interaction effect of instructional animation and gender on pupils' academic performance in literacy. There was no significant interaction effect of instructional animation and gender on pupils' academic performance in literacy ($F_{(1; 86)} = 1.792$, $P > 0.05$). The hypothesis is therefore not rejected in light of the result since the significant value (0.184) is greater than 0.05. This implies that the interaction of instructional animation and gender has no significant effect on pupils' academic performance in literacy. There is no significant interaction effect of instructional animation and school type on pupils' academic performance in literacy. Result research shows the interaction effect of instructional animation and school type on pupils' academic performance in literacy. There was no significant interaction effect of instructional animation and school type on pupils' academic performance in literacy ($F_{(1; 86)} = 1.755$, $P > 0.05$). The hypothesis is therefore not rejected in light of the result since the significant value (.189) is greater than 0.05. This implies that the interaction of instructional animation and school type has no significant effect on pupils' academic performance in literacy.

There is no significant interaction effect of gender and school type on pupils' academic performance in literacy. Result research shows the interaction effect of gender and school type on pupils' academic performance in literacy. There was no significant interaction effect of gender and school type on pupils' academic performance in literacy ($F_{(1; 86)} = 0.025$, $P > 0.05$). The hypothesis is therefore not rejected in light of the result since the significant value (.874) is greater than 0.05. This implies that the interaction of gender and school type has no significant effect on pupils' academic performance in literacy. There is no significant interaction effect of instructional animation, gender, and school type on pupils' academic performance in literacy. Result research shows the interaction effect of instructional animation, gender, and school type on pupils' academic performance in literacy. There was no significant interaction effect of instructional animation, gender, and school type on pupils' academic performance in literacy. ($F_{(1; 86)} = 2.210$, $P > 0.05$). The hypothesis is therefore not rejected in light of the result since the significant value (.141) is greater than 0.05. This implies that the interaction of instructional animation, gender, and school type had no significant effect on pupils' academic performance in literacy.

Discussion

The finding that emanated from this study was that there was a significant effect of instructional animation on pupils' academic performance in literacy. This implies that the pupils taught using the instructional animation strategy outperformed their counterparts taught with the conventional method (Edo & Wahyudi, 2022; Ismawati, S. & Mustika, 2021). The findings also agree another research, who concluded that there are positive effects of animation in promoting learning (Khasanudin et al., 2020; Rachmavita, 2020). Hence, this strategy led to meaningful learning achievements. The findings also corroborate another research who stated that when the animation is highly realistic, for example, video-based, it appears to be better than its reputation (Andriyani & Suniasih, 2021b; Moate et al., 2021). The findings supported the submissions, who both revealed that computer animation was more effective in improving students' academic achievement than other lecturing methods (Ningsih et al., 2023; Permata & Hapsari, 2022). The findings also are in line with another research, who stated that students who received animation visual treatment scored significantly higher on all criteria post-test than those who received the static visual treatment consistently for both phases of analysis. Students' attitude towards agricultural science was enhanced with the use of the animated instructional package. Students exposed to the developed animated agricultural package performed significantly better than those exposed to the conventional method (Puspita & Raida, 2021; Putra & Sujana, 2021).

The finding that instructional animation significantly improved pupils' literacy performance can be theoretically explained through the Cognitive Theory of Multimedia Learning, which posits that meaningful learning occurs when learners actively integrate both verbal and visual information through dual channels auditory and visual (Edo & Wahyudi, 2022; Ismawati, S. & Mustika, 2021). Instructional animation takes advantage of this dual processing system by presenting literacy content in a form that is simultaneously visual and auditory, enabling pupils to develop more concrete mental representations of abstract ideas such as spelling, phonemic awareness, and sentence structure. This dual encoding not only enhances retention but also reduces cognitive overload, as learners are guided through dynamic visual cues that clarify complex or abstract literacy concepts. Similarly, this finding supports Paivio's Dual Coding Theory, which explains that information encoded through both imagery and verbal codes is more easily retrieved and comprehended. Pupils exposed to animated literacy instruction therefore benefited from multiple modes of input, allowing for richer cognitive processing and improved understanding compared to those taught with static, text-only methods (Edo & Wahyudi, 2022; Luo et al., 2020).

Furthermore, the divergence between this study and earlier work, who found that animation did not necessarily increase learning effectiveness can be attributed to the advancement of educational technology and the evolution of animation design (Khasanudin et al., 2020; Putra & Sujana, 2021). Modern instructional animations are no longer passive or decorative; they are pedagogically grounded, interactive, and contextually aligned with learning objectives. The animations used in this study were deliberately structured around the pupils' developmental stage and literacy curriculum, featuring synchronized narration, pacing, and visual scaffolds that guided attention and supported comprehension. These features distinguish contemporary instructional animation from earlier static or oversimplified designs, leading to greater cognitive engagement and deeper understanding. Animated visuals promote meaningful learning when integrated with narrative explanation. Thus, the superior performance of pupils in the animation group can be attributed to both the technological and pedagogical sophistication of the animated materials used (Khasanudin et al., 2020; Rachmavita, 2020).

Beyond theoretical support, this result has broader pedagogical implications. The effectiveness of instructional animation in improving literacy outcomes suggests that digital learning tools can serve as inclusive and equitable teaching strategies (Ismawati, S. & Mustika, 2021; N. Sari et al., 2021). The non-significant differences across gender and school type, observed later in the study, further imply that instructional animation has the potential to bridge long-standing educational disparities by standardizing the quality of learning experiences. This aligns with global education goals advocating for equity and accessibility in instruction through the integration of ICT in classrooms (Agung & Sudatha, 2021; Ngao, 2022). Teachers, curriculum developers, and

polymakers should therefore consider adopting instructional animation as a complement to traditional teaching methods, especially in foundational literacy education where engagement and comprehension are crucial (Akinnubi & Adeoye, 2024; Bers et al., 2023). By making literacy lessons visually stimulating, emotionally engaging, and cognitively accessible to all learners, animation-based instruction not only enhances academic performance but also fosters motivation, curiosity, and sustained attention key factors for long-term literacy development. Consequently, future research could extend this study by exploring the retention effects of animation-based instruction over time, its influence on reading motivation, and its integration with other emerging technologies such as augmented reality or interactive storytelling.

The study also showed the interaction effect of instructional animation and gender on pupils' academic performance in literacy. There was no significant interaction effect of instructional animation and gender on pupils' academic performance in literacy. This implies that instructional animation and gender had no significant effect on pupils' academic performance in literacy (Miyamoto et al., 2024; Thomas et al., 2024). This aligns with current research indicating that well designed digital learning tools, including instructional animations, provide inclusive learning experiences that do not favor one gender over another. Instructional animation enhances cognitive engagement and supports visual learning processes, which are effective across diverse learner demographics, including gender. Studies have shown that when instructional content is visually rich, interactive, and contextually relevant, it tends to bridge learning gaps between male and female students (Miyamoto et al., 2024; Thomas et al., 2024).

The study revealed the interaction effect of instructional animation and school type on pupils' academic performance in literacy. There was no significant interaction effect of instructional animation and school type on pupils' academic performance in literacy. This implies that instructional animation and school type had no significant interaction effect on pupils' academic performance in literacy. Technology enhanced learning strategies such as animations promote equitable learning outcomes across diverse school environments by standardizing the quality of instructional delivery (Andriyani & Suniasih, 2021b, 2021a). Digital instructional tools, when integrated into classrooms regardless of school ownership, provide learners with similar cognitive benefits and engagement levels (Kyza et al., 2022; P. N. Sari et al., 2023). Instructional media reduce dependency on traditional teacher-centered approaches, which often vary in quality between public and private schools. By relying on structured visual representations and consistent pacing, instructional animation minimizes disparities in teaching effectiveness across school types.

The study disclosed the interaction effect of gender and school type on pupils' academic performance in literacy. There was no significant interaction effect of gender and school type on pupils' academic performance in literacy. This implies that gender and school type had no significant effect on pupils' academic performance in literacy. The study revealed the interaction effect of instructional animation, gender, and school type on pupils' academic performance in literacy (Miyamoto et al., 2024; Thomas et al., 2024). There was no significant interaction effect of instructional animation, gender, and school type on pupils' academic performance in literacy. This implies that instructional animation, gender, and school type had no significant effect on pupils' academic performance in literacy. This finding is consistent with recent research showing that educational outcomes are increasingly influenced by instructional quality and learner engagement rather than demographic factors such as gender or school type (Miyamoto et al., 2024; Thomas et al., 2024). Literacy performance in early childhood education was more strongly correlated with instructional strategy than with school context or learner gender. When innovative teaching methods are applied uniformly, traditional performance gaps between public and private schools and between genders are minimized. Gender-stereotyped expectations in learning outcomes are declining, especially when digital or inclusive teaching approaches are employed consistently across different school types. This reflects growing parity in educational access and quality (Guggemos, 2021; Miyamoto et al., 2024).

This study demonstrates clear strengths in its innovative integration of instructional animation into literacy instruction, combining visual and auditory elements to enhance pupils' comprehension and engagement. Its findings contribute to the growing body of evidence supporting technology-enhanced and inclusive learning strategies that improve literacy performance regardless of gender or school type. However, the study is limited by its relatively small sample size and focus on a single local government area, which may restrict the generalizability of its results. Despite these constraints, the research provides important implications for educators and policymakers by emphasizing the need to incorporate well-designed instructional animations into primary school curricula to promote equitable, engaging, and effective literacy learning experiences.

4. CONCLUSION

The study concluded that instructional animation significantly enhances pupils' academic performance in literacy compared to the conventional teaching method. Pupils taught using animation-based instruction showed higher levels of comprehension, engagement, and retention, confirming that the use of visual and auditory elements through multimedia facilitates more meaningful learning. This finding aligns with the Cognitive Theory of

Multimedia Learning and Dual Coding Theory, which emphasize that combining words and images supports deeper processing and understanding. The study further revealed no significant interaction effects among instructional animation, gender, and school type, suggesting that this innovative instructional approach benefits all learners equally, regardless of demographic or institutional background. This indicates that instructional animation serves not only as an effective teaching strategy but also as an inclusive and equitable learning tool that bridges performance gaps across different school types. Therefore, the integration of instructional animation into literacy teaching can be considered a vital step toward improving the quality of primary education. It enhances not only pupils' literacy outcomes but also their motivation, participation, and long-term interest in learning, contributing to the broader goal of achieving equitable and technology-driven education in Nigeria.

5. REFERENCES

- Abdulkareem, H. B., & Lasis, K. A. (2024). Effects of Imago Relationship Therapy on Spousal's emotional instability married teachers in Kwara State, Nigeria. *Inovasi Kurikulum*, 21(2), 1069–1086. <https://doi.org/10.17509/jik.v21i2.69017>.
- Abdulkareem, H. B., Yusuf, J., & Lasisi, K. A. (2024). Self Esteem Influence on Emotional Instability Among Postgraduate Married Individual in Kwara State, Nigeria. *Journal of Multicultural Studies in Guidance and Counseling*, 8(2). <https://doi.org/10.17509/jomsign.v8i2.60934>.
- Abraham, I., & Supriyati, Y. (2022). Desain Kuasi Eksperimen Dalam Pendidikan: Literatur Review. *Jurnal Ilmiah Mandala Education*, 8(3). <https://doi.org/10.58258/jime.v8i3.3800>.
- Agung, A. A. G., & Sudatha, I. G. W. (2021). The Effect of E-Learning Based on Problem Based Learning (PBL) on Student Characters in Inferential Statistics Course. In *2nd International Conference on Technology and Educational Science (ICTES 2020)*, 108–110. <https://doi.org/10.2991/assehr.k.210407.222>.
- Akinnubi, O. P., & Adeoye, M. A. (2024). Principals' intellectual stimulation and teachers' job satisfaction in public secondary schools. *Curricula: Journal of Curriculum Development*, 3(2), 247–262. <https://doi.org/10.17509/curricula.v3i2.75053>.
- Aldahdouh, T. Z., Nokelainen, P., & Korhonen, V. (2020). Technology and Social Media Usage in Higher Education: The Influence of Individual Innovativeness. *SAGE Open*, 10(1). <https://doi.org/10.1177/2158244019899441>.
- Amante, L., Souza, E. B., Quintas-Mendes, A., & Miranda-Pinto, M. (2023). Designing a MOOC on Computational Thinking, Programming and Robotics For Early Childhood Educators and Primary School Teachers: a Pilot Test Evaluation. *Education Sciences*, 13(9). <https://doi.org/10.3390/educsci13090863>.
- Andini, N. P. M., & Agung, A. A. G. (2022). Multimedia Interaktif Berbasis Pendekatan Saintifik dalam Pembelajaran Sistem Pencernaan Manusia Kelas V SD. *Jurnal Media Dan Teknologi Pendidikan*, 2(1). <https://doi.org/10.23887/JMT.V2I1.44839>.
- Andriyani, N. L., & Suniasih, N. W. (2021a). Development of Learning Videos Based on Problem-Solving Characteristics of Animals and Their Habitats Contain in Ipa Subjects on 6th-Grade. *Journal of Education Technology*, 1(1), 37–47. <https://doi.org/10.23887/jet.v5i1.32314>.
- Angeli, C., & Valanides, N. (2020). Developing Young Children's Computational Thinking with Educational Robotics: an Interaction Effect Between Gender and Scaffolding Strategy. *Computers in Human Behavior*, 105. <https://doi.org/10.1016/j.chb.2019.03.018>.
- Apriansyah, M. R. (2020). Pengembangan Media Pembelajaran Video Berbasis Animasi Mata Kuliah Ilmu Bahan Bangunan Di Program Studi Pendidikan Teknik Bangunan Fakultas Teknik Universitas Negeri Jakarta. *Jurnal PenSil*, 9(1), 9–18. <https://doi.org/10.21009/jpensil.v9i1.12905>.
- Aucejo, E. M., Fruehwirth, J. C., Kelly, S., & Mozenter, Z. (2022). Teachers and the Gender Gap in Reading Achievement. *Journal of Human Capital*, 16(3), 372–403. <https://doi.org/10.1086/719731>.
- Bećirović, S., Polz, E., & Tinkel, I. (2025). Exploring students' AI literacy and its effects on their AI output quality, self-efficacy, and academic performance. *Smart Learning Environments*, 12(1). <https://doi.org/10.1186/s40561-025-00384-3>.
- Bers, M. U., Blake-West, J., Kapoor, M. G., Levinson, T., Relkin, E., Unahalekhaka, A., & Yang, Z. (2023). Coding as Another Language: Research-based Curriculum for Early Childhood Computer Science. *Early Childhood Research Quarterly*, 64(1), 394–404. <https://doi.org/10.1016/j.ecresq.2023.05.002>.
- Boentolo, F., Manu, C.-C. C. R., Saragih, O. G., & Zalukhu, S. (2024). Peran Guru Memanfaatkan AI dalam Membangun Generasi Unggul Menuju Indonesia Emas 2045. *Aletheia Christian Educators Journal*, 5(1), 42–48. <https://doi.org/10.9744/aletheia.5.1.42-48>.
- Bulkani, Fatchurahman, M., Adella, H., & Andi Setiawan, M. (2022). Development of animation learning media based on local wisdom to improve student learning outcomes in elementary schools. *International Journal of Instruction*, 15(1), 55–72. <https://doi.org/10.29333/iji.2022.1514a>.
- Canfield, C. F., Seery, A., Weisleder, A., Workman, C., Brockmeyer Cates, C., Roby, E., Payne, R., Levine, S.,

- Mogilner, L., Dreyer, B., & Mendelsohn, A. (2020). Encouraging Parent–Child Book Sharing: Potential Additive Benefits of Literacy Promotion in Health Care and The Community. *Early Childhood Research Quarterly*, 50, 221–229. <https://doi.org/10.1016/j.ecresq.2018.11.002>.
- Chen, J., Zhang, Y., & Hu, J. (2021). Synergistic Effects of Instruction and Affect Factors on High- and Low-Ability Disparities in Elementary Students' Reading Literacy. *Reading and Writing*, 34(1), 199–230. <https://doi.org/10.1007/s11145-020-10070-0>.
- Darmansah, T. (2023). Peran Pengawas Pendidikan Dan Kepala Sekolah dalam Meningkatkan Profesionalisme Guru. *MUDABBIR Journal Reserch and Education Studies*, 2(1), 11–21. <https://doi.org/10.56832/mudabbir.v2i1.179>.
- Dell, N. A., Vidovic, K. R., Huang, J., & Pelham, M. (2020). Self-Reported Emotional Reactivity, Depression, and Anxiety: Gender Differences among a Psychiatric Outpatient Sample. *Social Work Research*, 44(3), 205–214. <https://doi.org/10.1093/swr/svaa007>.
- Edo, E., & Wahyudi. (2022). Pengembangan Media Video Animasi Kartun Dengan Power Point Untuk Meningkatkan Minat Belajar IPA Peserta Didik Kelas VI SD. *Jurnal Pendidikan Dan Konseling*, Vol.4, No.(2685-936X), 4967–4981. <https://doi.org/10.31004/jpdk.v4i5.7416>.
- Eriksson, K., Björnstjerna, M., & Vartanova, I. (2020). The Relation Between Gender Egalitarian Values and Gender Differences in Academic Achievement. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.00236>.
- Fikri, K., Rahma, Y. A., Rahfitra, A. A., & Rahayu, S. S. (2022). Meningkatkan Minat Baca Anak-Anak Melalui Gerakan Literasi Membaca di SDN 02 Desa Sri Gading. *Jurnal Pengabdian UntukMu NegeRI*, 6(2). <https://doi.org/10.37859/jpumri.v6i2.4153>.
- Guggemos, J. (2021). On the Predictors of Computational Thinking and its Growth at The High-School Level. *Computers and Education*, 161(March 2020), 104060.1-15. <https://doi.org/10.1016/j.compedu.2020.104060>.
- Hamidi, K., Jamaluddin, W., Koderi, K., & Erlina, E. (2023). Pengembangan Media Pembelajaran Bahasa Arab Berbasis Video Animasi Interaktif untuk Siswa Madrasah Aliyah. *Journal on Education*, 5(2), 5289–5296. <https://doi.org/10.31004/joe.v5i2.1098>.
- Impronah, I., & Batubara, H. H. (2021). Pengembangan Media Video Animasi Zepeto untuk Materi Metamorfosis Kupu-Kupu untuk SD/MI. *EduBase: Journal of Basic Education*, 2(2), 85. <https://doi.org/10.47453/edubase.v2i2.392>.
- Ismawati, S., & Mustika, D. (2021). Validitas Media Video Berbasis Animasi Dalam Pembelajaran Tematik. *Innovative: Journal Of Social Science Research*, 1(2), 291–297. <https://doi.org/10.31004/innovative.v1i2.52>.
- Isti, L. A., Agustiningsih, A., & Wardoyo, A. A. (2022). Pengembangan Media Video Animasi Materi Sifat-Sifat Cahaya Untuk Siswa Kelas IV Sekolah Dasar. *EduStream: Jurnal Pendidikan Dasar*, 4(1), 21–28. <https://doi.org/10.26740/eds.v4n1.p21-28>.
- Kazazoglu, S. (2025). Environmental Education Through Eco-Literacy: Integrating Sustainability into English Language Teaching. *Sustainability*, 17(5), 2156. <https://doi.org/10.3390/su17052156>.
- Keuangan, D. L., Keuangan, I., Digital, L., Usaha, K., Kecil, M., & Sumenep, K. (2024). Reslaj: Religion Education Social Laa Roiba Journal. *Reslaj: Religion Education Social Laa Roiba Jornal*, 6(1), 2266–2282. <https://doi.org/10.247476/reslaj.v4i1.458>.
- Khasanudin, M., Cholid, N., & Indiyarti Putri, L. (2020). Pengembangan Media Audio Visual Berbasis Animation Dalam Pembelajaran Matematika Materi Bangun Ruang Untuk Kelas V Sd/Mi. *Journal of Elementary Education*, 03(05), 259–267. <https://doi.org/10.22460/collase.v3i5.5888>.
- Kyza, E. A., Georgiou, Y., Agesilaou, A., & Souropetsis, M. (2022). A Cross-Sectional Study Investigating Primary School Children's Coding Practices and Computational Thinking Using ScratchJr. *Journal of Educational Computing Research*, 60(1), 220–257. <https://doi.org/10.1177/07356331211027387>.
- Laili, N., Darmawan, D., & El Yunusi, M. Y. M. (2024). Pengaruh Media Pembelajaran, Metode Pembelajaran, Dan Dukungan Orang Tua Terhadap Minat Belajar Siswa Smp Buana Waru Sidoarjo. *Khazanah Pendidikan*, 18(2), 260. <https://doi.org/10.30595/jkp.v18i2.21824>.
- Luo, R., Tamis-LeMonda, C. S., & Mendelsohn, A. L. (2020). Children's Literacy Experiences in Low-Income Families: The Content of Books Matters. *Reading Research Quarterly*, 55(2), 213–233. <https://doi.org/10.1002/rrq.263>.
- Malmström, H., & Zhou, S. (2025). Language–Subject Teacher Collaboration in English-Medium Higher Education: Current Practices and Future Possibilities. *RELC Journal*. <https://doi.org/10.1177/00336882241313234>.
- Miyamoto, A., Gauly, B., & Zabal, A. (2024). Gender Differences in Literacy in Piaac: Do Assessment Features Matter? *Large-Scale Assessments in Education*, 12(1), 21. <https://doi.org/10.1186/s40536-024-00208-9>.
- Moate, J., Kuntze, S., & Chan, M. C. E. (2021). Student Participation in Peer Interaction - Use of material

- Resources as a Key Consideration in an Open-Ended Problem-Solving Mathematics Task. *Lumat*, 9(1), 29–55. <https://doi.org/10.31129/LUMAT.9.1.1470>.
- Mulyati, S., & Evendi, H. (2020). Pembelajaran Matematika melalui Media Game Quizizz untuk Meningkatkan Hasil Belajar Matematika SMP. *GAUSS: Jurnal Pendidikan Matematika*, 3(1), 64–73. <https://doi.org/10.30656/gauss.v3i1.2127>.
- Mutoharoh, Hufad, A., Fathurrohman, M., & Rusdiyani, I. (2021). Unplugged coding activities for early childhood problem-solving skills. *Jurnal Pendidikan Usia Dini*, 15(1), 121–140. <https://doi.org/10.21009/JPUD.151.07>.
- Nasution, A. K. P. (2020). Integrasi Media Sosial Dalam Pembelajaran Generasi Z. *Jurnal Teknologi Informasi Dan Pendidikan*, 13(1), 80–86. <https://doi.org/10.24036/tip.v13i1.277>.
- Ngao, A. I. (2022). Understanding Teacher Educators' Perceptions and Practices about ICT Integration in Teacher Education Program. *Education Sciences*, 12(8). <https://doi.org/10.3390/educsci12080549>.
- Nguyen, A., Hong, Y., Dang, B., & Huang, X. (2024). Human-AI collaboration patterns in AI-assisted academic writing. *Studies in Higher Education*, 49(5), 847–864. <https://doi.org/10.1080/03075079.2024.2323593>.
- Ningsih, P. O., Alkhasanah, N., Isnaini, Y. F., Maulana, I., Hidayati, Y. M., & Desstya, A. (2023). Penerapan model project based learning dengan pendekatan tpack pada pembelajaran ipa. *Jurnal Ilmiah Pendidikan Citra Bakti*, 10(4), 707–721. <https://doi.org/10.38048/jipcb.v10i4.1904>.
- Padmadewi, N. N., Artini, L. P., Ratminingsih, N. M., Suhardiana, I. P. A., Zamzam, A., & Juniarta, P. A. K. (2023). Designing Project-Based Learning in Research Proposal Writing: Its Effect, Problems, and Scaffolding Utilized. *Studies in English Language and Education*, 10(2), 841–862. <https://doi.org/10.24815/siele.v10i2.27408>.
- Permata, G., & Hapsari, P. (2022). Pengembangan Media Video Animasi Berbasis Aplikasi Canva untuk Meningkatkan Motivasi dan Prestasi Belajar Siswa. *Jurnal Basicedu*, 5(4), 2384–2394. <https://doi.org/10.31004/basicedu.v5i4.1237>.
- Pratama, T. A., Alim, J. A., & Hermita, N. (2022). Pengembangan Video Animasi Geometri Kelas II. *Journal of Primary Education*, 5(2), 205–220. <https://doi.org/10.24014/ejpe.v5i2.18907>.
- Puspita, I., & Raida, S. A. (2021). Development of Video Stop Motion Graphic Animation Oriented STEAM (Science, Technology, Engineering, Arts, And Mathematics) on Global Warming Materials in Junior High School. *THABIEA: Journal of Natural Science Teaching*, 4(2), 198. <https://doi.org/10.21043/thabiea.v4i2.11895>.
- Puspitorini, F., Hamdani, H., Zulfadhli, M., Muhendra, R., & Kusuma, A. P. (2022). Optimalisasi Media Ajar dalam Pengajaran Berbasis Digital di SD Negeri Muktiwari 01. *Jurnal Komunitas : Jurnal Pengabdian Kepada Masyarakat*, 5(1), 67–73. <https://doi.org/10.31334/jks.v5i1.2364>.
- Putra, I. G. N. A. D., & Sujana, I. W. (2021). Animation Video Based on Tri Kaya Parisudha in the Topic of Cultural Diversity. *Jurnal Ilmiah Sekolah Dasar*, 5(1), 149–157. <https://doi.org/10.23887/jisd.v5i1.32226>.
- Rachmavita, F. P. (2020). Interactive media-based video animation and student learning motivation in mathematics. *Journal of Physics: Conference Series*, 1663(1). <https://doi.org/10.1088/1742-6596/1663/1/012040>.
- Rahayu, S., Isaeni, W., & Masturi, M. (2022). Critical Thinking Skills and Digital Literacy of High School Students in Science Learning Using E-Learning with STEM Vision. *Journal of Innovative Science Education*, 11(3), 347–361. <https://doi.org/10.15294/jise.v11i1.57281>.
- Rahina, A. C., & Kastam, S. (2020). Independent Curriculum in the Perception of Indonesian Language Teachers of Smp/Mts in Yogyakarta. *International Journal of Linguistics, Literature and Translation (IJLLT)*, 3(11), 55–67. <https://doi.org/10.32996/ijllt>.
- Rahmawati, F., & Atmojo, I. R. W. (2021). Analisis Media Digital Video Pembelajaran Abad 21 Menggunakan Aplikasi Canva Pada Pembelajaran IPA. *Jurnal Basicedu*, 5(6), 6271–6279. <https://doi.org/10.31004/basicedu.v5i6.1717>.
- Rusmiati, R., Rakhmyta, Y. A., Hanif, H., & Saputra, E. (2024). Extensive listening as a tool for language proficiency improvement: A qualitative analysis of student feedback. *Getsempena English Education Journal*, 11(1), 28–38. <https://doi.org/10.46244/geej.v11i1.2876>.
- Rusyati, L., Rochintaniawati, D., Agustin, R., Sanjaya, Y., & Deandra, I. (2020). Gender Differences in The Attribution of Creative Thinking: Experimental Evidence using STEM-based E-Module. *Proceedings of the Proceedings of the 7th Mathematics, Science, and Computer Science Education International Seminar, MSCEIS 2019*. <https://doi.org/10.4108/eai.12-10-2019.2296391>.
- Saragih, L. M., Tanjung, D. S., & Anzelina, D. (2021). Pengaruh Model Pembelajaran Open Ended terhadap Hasil Belajar Siswa pada Pembelajaran Tematik. *Jurnal Basicedu*, 5(4), 2644–2652. <https://doi.org/10.31004/basicedu.v5i4.1250>.
- Sari, N., Jarmita, N., & Hayati, Z. (2021). Pengembangan Media Pembelajaran Animasi Berbasis Macromedia

- Flash Pada Materi Operasi Hitung Bilangan Cacah Di Kelas Iii Min 11 Aceh Tengah. *Primary : Jurnal Keilmuan Dan Kependidikan Dasar*, 3(2). 10.32678/Primary.V13i2.4677. <https://doi.org/10.32678/primary.v13i2.4677>.
- Sari, P. N., Siswandari, & Sangka, K. B. (2023). Why Instrument Needs to be Revised? An Experience in Developing Digital Creativity Instrument with The Expert Judgement. *Dinamika Pendidikan*, 18(2), 140–159. <https://doi.org/10.15294/dp.v18i2.48024>.
- Smith, E., & Reimer, D. (2024). Understanding Gender Inequality In Children’s Reading Behavior: New Insights From Digital Behavioral Data. *Child Development*, 95(2), 625–635. <https://doi.org/10.1111/cdev.14001>.
- Sumitro, E. A., & Rizqi, H. (2024). Kemampuan Berbicara Bahasa Inggris Siswa Sekolah Menengah Atas: Studi Eksperimen Metode Pembelajaran Berbasis Proyek. *Jurnal Riset Dan Inovasi Pembelajaran*, 4(2), 768–776. <https://doi.org/10.51574/jrip.v4i2.1689>.
- Suryaman, S., & Suryanti, Y. (2022). Pengembangan Media Video Animasi Berbasis Plotagon Dan Capcut Untuk Meningkatkan Hasil Belajar Kognitif Siswa Kelas Ii Sekolah Dasar. *Jurnal Cakrawala Pendas*, 8(3), 841–850. <https://doi.org/10.31949/jcp.v8i3.2575>.
- 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. <https://doi.org/10.1007/s13384-022-00583-8>.
- Tzeng, S.-F., Li, M.-F., & Chang, C.-S. (2021). Applying Importance–Performance Analysis to Explore The Key Factors of Learners’ Satisfaction with MOOC platforms. *Jurnal Pedagogi Dan Pembelajaran*, 26(6), 6763–6784. <https://doi.org/10.1007/s10639-021-10589-8>.
- Zahwa, F. A., & Syafi’i, I. (2022). Pemilihan Pengembangan Media Pembelajaran Berbasis Teknologi Informasi. *Equilibrium: Jurnal Penelitian Pendidikan Dan Ekonomi*, 19(01), 61–78. <https://doi.org/10.25134/equi.v19i01.3963>.
- Zhang, H. L., & Leong, W. Y. (2024). Transforming Rural and Underserved Schools with AI-Powered Education Solutions. *ASM Science Journal*, 19, 1–12. <https://doi.org/10.32802/ASMSCJ.2023.1895>.
- Zumroti, N. (2022). Peningkatan Motivasi dan Hasil Belajar Bahasa Inggris tentang Pemahaman Isi Bacaan Teks Recount melalui Metode NHT Peserta Didik Kelas VIII B SMP Negeri 3 Adiwarna. *STRATEGY : Jurnal Inovasi Strategi Dan Model Pembelajaran*, 2(4), 406–414. <https://doi.org/10.51878/strategi.v2i4.1694>.