The Effect of Digital Media on Improving Reading Skills amongst Lower Primary School Pupils of Dodoma City in Tanzania

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Abstract
The study explored the effect of digital media (videos and digital games) in improving reading skills (basic sounds, word pronunciation) amongst the lower primary school pupils of Dodoma City in Tanzania. The hypothesis assumed a significant relationship between the use of digital media and the improvement of reading skills amongst lower primary school pupils. The study included 160 pupils (80 in the control and 80 in the experimental groups) from two public schools in Dodoma City. A stratified sampling technique was used to obtain a sample for the study by selecting pupils with F-grade scores from the continuous assessment. The study was guided by the cognitive theory of multimedia learning, which emphasises the importance of videos, digital games, and digital pictures in learning. The study also used a standardised test to collect data and the Multivariate General linear model for data analysis. The analysis indicated a statistically significant linear relationship between the use of digital media (videos, digital games) and reading skills (basic sounds, word pronunciation) amongst the lower primary school pupils of Dodoma City in Tanzania. Findings also showed a significant mean difference between the control and experimental groups, indicating higher test scores in the experimental group than in the control group. The study recommends that policymakers, curriculum developers, curriculum implementers such as teachers, and other education stakeholders consider videos and digital games when designing instructional tools to facilitate reading skills (basic sounds, word pronunciation) amongst lower primary school pupils.

Keywords: *Digital media, reading skills, lower primary school pupils.*

Introduction

Reading is a key to learning in school and throughout life as it allows everyone to connect prior knowledge with learning, thus ensuring various important ideas and practices are passed on to the next generation (Torres, 2019). According to Bana (2020), reading affords experience and enlarges horizons of knowledge, identifies, spreads, and increases awareness to a deeper understanding of oneself, other people, and the world. Sari (2017) also suggested that reading among pupils in the 21st century cannot be

underestimated because as pupils climb the educational ladder, reading becomes denser and more challenging. Despite the significance, there has been a reading difficulty in decoding basic sounds, word pronunciation, and comprehension among pupils worldwide (Oyshajo et al., 2020).

Various world reports indicate that reading problems, specifically in basic sounds, word pronunciation, and comprehension among lower primary school pupils, still exist (UNESCO, 2017). The World Literacy Foundation (2015) conveyed that more than 796 million pupils face this difficulty. UNESCO (2017) reported that more than 617 million pupils in lower primary schools around the world are not achieving minimum proficiency levels (MPLs) in reading skills (basic sounds, word pronunciation, and comprehension). In Sub-Saharan countries, (89%) of the pupils from Central Asia, (80%) from Southern Asia, and (64%) from Western Asia and Northern Africa lack proficiency in reading (basic sounds, word pronunciation, comprehension) (UNESCO,2017). The urgency of this problem cannot be overstated. Although Tanzania has made progress in access and equity in education, reading skills (basic sounds and word pronunciation) remain a challenge amongst Tanzanian pupils, where only 54% of pupils in the early grades can read with comprehension (USAID,2021). In Tanzania, reading competence among pupils enrolled in primary education in 2017 was reported to be three out of 10 (Uwezo, 2017; USAID, 2018).

The report (Uwezo, 2017) indicated that only 50 per cent of standard three pupils could read a standard two-story book in Kiswahili, and only 20 per cent could read a standard two-story book in English. This reading problem seemed to increase in central regions of Tanzania, where three out of ten of every pupil who completed standard seven in 2017 needed more basic skills in reading (basic sounds, word pronunciation, and comprehension) (Uwezo, 2019). The Tanzanian Government has undertaken various initiatives to elucidate this problem among them was the introduction of the Primary Education Reform Project (PERP) (2014), which aimed at improving teachers' competence in reading skills among the lower primary school pupils by training teachers on the proper reading techniques. Education Quality Improvement Program (EQIP) (2015) was introduced to increase learning outcomes in Primary schools by reforming an old curriculum for grades one and two through in-service training (Equip-t, 2015 and URT, 2014). USAID (2018) initiated a project to improve the quality of lower primary school pupils' reading skills by developing new teaching and learning materials like textbooks for grades one and two.

The government also introduced the use of ICT in Teachers' Training colleges to improve the teaching and learning process in pre-primary,

primary, and secondary schools (URT, 2005). However, there has been little effort in exploring the usefulness of ICT in improving learning outcomes among primary pupils (Oreku, 2022). Presently, reading can no longer be confined to print reading (Umeh, 2016). The scope of reading sources has changed drastically in the Internet revolution, including websites, web pages, e-mail, discussion boards, chatrooms, instant messaging, blogs, wikis, and other multimedia documents (Umeh, 2016). Studies show that electronic media, particularly television, mobile phones, computers and even the radio, are gradually taking over the relevance of books in society (Silva, 2015).

Higgins et al. (2012), Beschorner and Hutchison (2013), and Archer and Savage (2014) have highlighted the importance of digital media (videos, digital games) in enhancing learning outcomes for primary pupils. Their research confirmed that pupils improved performance when utilising digital media such as videos and digital games. Amosa and Ogunlade (2015), as well as Chinooneka and Mupa (2015), conducted a study comparing students using traditional lecture-based learning with those utilising digital media (video, digital games). They concluded that the digital media approach, incorporating songs, pictures, and games, resulted in significantly better performance than the lecture-based method, motivating pupils to learn. It is argued here that the growth of technology has automatically shifted most of the information to the digital world; thus, integrating digital media in the classroom context would help pupils grasp reading skills very quickly and in a broader way.

In Tanzania, the use of digital media for learning, including online textbooks, academic videos through television, literature books, and digital reference materials, increased its momentum during the COVID-19 pandemic because pupils were not allowed to attend physical classes. However, at the end of the lockdown, the digital media programmes lacked consistency (Oreku, 2022). The lack of consistence might be influenced by limited awareness to educational stakeholder on the significance of using digital media like videos and digital games in improving reading skills (basic sounds, word pronunciation) among pupils. This study explored the effect of digital media (videos and digital games) on improving reading skills (basic sounds, word pronunciation) among lower primary school pupils.

Effect of Digital Media: Theoretical framework

In trying to explore the effect of Digital Media on reading skills (basic sounds, word pronunciation) among lower primary school pupils, we employed the cognitive theory of multimedia learning (CTML) by Mayer and Moreno (2003). The theory asserts that people learn more deeply from words and pictures than words alone. This is referred to as the multimedia principle.

Multimedia researchers generally define multimedia as the combination of text and pictures. The words can be spoken or written, and the pictures can be any form of graphical imagery, including illustrations, photos, animation, or video. Multimedia instructional design attempts to use cognitive research to combine words and pictures in ways that maximise learning effectiveness (Sorden, 2013). The cognitive theory of multimedia learning provides a guideline to describe how the mind can make meaningful connections between words, sounds, and pictures. The theory has three basic principles: dual channels, limited capacity, and active processing (Mayer & Moreno, 2003). Dual channels assume that learners have different channels in their brains for processing visual and verbal material separately (Austin, 2009; Mayer & Moreno, 2003). Limited capacity means a limit to the amount of information each channel can process (Mayer & Moreno, 2003). Active processing is the learner's cognitive processing ability to select, organise, and integrate the information (verbal and visual) being presented (Mayer, 2008). Since pupils possess different channels of receiving information while learning, the dual channel would provide a guideline on how the brain processes visual and verbal information, thus being able to connect quickly the words and the sounds when reading. Active processes, however, could help pupils in selecting, organising, and integrating information that comes into the brain and is in a position to give a correct interpretation. Therefore, to improve reading skills (basic sounds and word pronunciation), pupils need digital media (videos, digital games) since it allows them to integrate written text and visualizations (Schmidt-Weigand et al., 2010).

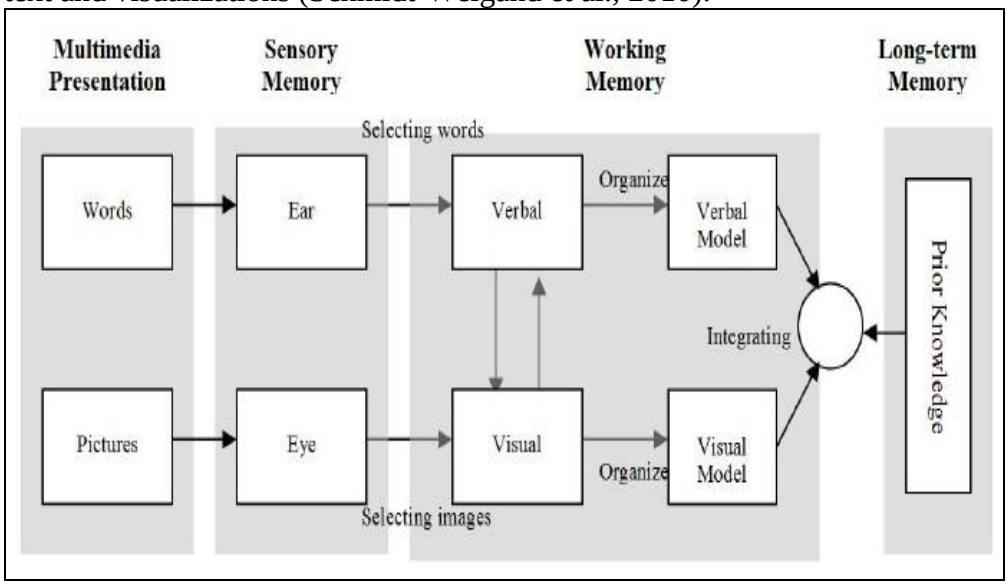

Figure 1: A framework for the cognitive theory of multimedia learning drawn from Mayer (2001)

Note: *Active processes of selecting, organising, and integrating information that comes from words and pictures into the brain and is in a position to give a correct interpretation*

The present study

The study investigated the effect of digital media (videos and digital games) in improving reading skills (basic sounds, word pronunciation) to lower primary school pupils in Dodoma City, Tanzania. Past research indicated that videos and digital games could significantly develop the skills mentioned above by providing multiple information presentation approaches and facilitating deeper understanding (Mayer, 2009). For example, the cognitive theory of multimedia learning suggests that presenting information through verbal and visual channels improve a pupil's retention and comprehension ability (Mayer & Moreno, 2003).

In addition to that, studies have shown that educational games and videos motivate students and make learning more engaging (Gee, 2003; Prensky, 2001). The use of visual aids like videos, pictures, and digital games has also been found to help pupils better understand basic sound concepts through concrete visual representations (Arcavi, 2003). Furthermore, audio-visual materials can enhance learning by providing a richer sensory experience that helps in better encoding of information in memory (Fletcher & Tobias, 2005).

The current research was designed to explore how videos and digital games improve basic sounds and word pronunciation. To address this, the study was guided by an assumption that there is a significant relationship between the use of digital media (video and games) and the improvement in reading skills (basic sounds and word pronunciation) amongst Lower Primary School Pupils. The aim was to provide empirical evidence on the effectiveness of digital media (video and games) in improving reading skills (basic sounds and word pronunciation) among lower primary school pupils, thus contributing to the broader discourse on integrating technology in education.

Methodology

Participants

The study involved 160 respondents (80 in the control group and another 80 in the experimental group) from two public schools in Dodoma City. A convenient sampling technique was used to select the schools by considering the availability of digital devices like projectors and laptops. A stratified sampling technique was used to select a stratum of pupils with F-grade scores in continuous assessment, specifically in basic sounds and word pronunciation. These students were then divided into two groups, with 50% in the control group and the other 50% in the experimental group. The experimental group participated in an intervention using video and digital games in reading class, while the control group maintained a traditional chalk-and-talk method. In addition, out of 160 pupils who participated in the study, 80 were females, and 80 were males. Among the females, 40 were in

the control group, and another 40 were in the experimental group. Similarly, the males were divided into two groups, with 40 in the control group and 40 in the experimental group. Moreover, 36.25% (n=58) in the experimental group and 13.75% (n=22) in the control group were between 6-7 years old. 13.75% (n=22) in the experimental group and 36.25% (n=58) in the control group were 8-9 years old, making a total of 100% (n=160) of all pupil respondents. In terms of class level, 30% (n=48) in the experimental group and 20% (n=32) in the control group were in standard one, while 20% (n=32) in the experimental group and 30% (n=48) in the control group were in standard two. 50% (n=80) of the participants in the experimental group were selected from school A, and 50% (n=80) were from school B (see Table 1).

Data collection Procedures

Since the study was interventional, it was designed to explore the use of digital media (video and digital games) in improving basic sounds and word pronunciation amongst lower primary school pupils of Tanzania. The intervention was conducted for 10 weeks in different phases. In the first phase, by the first week of February 2023, a pre-test was administered to all pupils. The purpose of the pre-test was to evaluate pupils' previous knowledge of basic sounds and word pronunciation before using digital media (video and games). The pre-test encompassed ten questions; the first three tested basic sound skills, and the following seven tested word pronunciation. In the second phase, the researcher conducted a one-week training for ten standard one and standard two teachers to equip them with digital media (video and games) skills to facilitate basic sounds and word pronunciation skills. During the training, teachers were taught to download various video and digital games containing basic sounds and word pronunciation modules. Teachers were also taught various techniques on how to integrate videos and games into reading activities. The main digital devices that were available at school for the intervention included projectors and laptops, which were connected to the internet to display the video and games with basic sounds and word pronunciation. The third phase involved eight weeks of experimentation, during which teachers started using videos and games to teach pupils basic sounds and word pronunciation. The lessons were conducted in the classroom context for 40 minutes in one session every day, whereby teachers integrated the reading contents with video and games to comprehend basic sounds and word pronunciation. After the eight weeks of the experiment, the post-test was conducted on the last week of April 2023 to measure the effect of video and digital games on the improvement of basic sounds and word pronunciation amongst the lower primary school pupils in Tanzania.

Table 1: Demographic Characteristics by Condition

Characteristics	Category	Intervention		Control	
		n	%	n	%
Gender	Male	40	25%	40	25%
	Female	40	25%	40	25%
Age	6-7 years	58	36.25%	22	13.75%
	8-9 years	22	13.75%	58	36.25%
Class Level	Standard one	48	30%	32	20%
	Standard two	32	20%	48	30%
Schools	School A			80	50%
	School B	80	50%		

Measures

Basic sounds and word identification skills in Pupils

To evaluate pupils' basic sound skills and word pronunciation, we designed a standardised test based on the format of the review questions from the 2018 Standard One Pupil textbook published by the Tanzania Institute of Education (TIE). TIE, a Parastatal Organization under the Ministry of Education and Vocational Training (MoEVT), is responsible for ensuring education quality in Tanzania at the preschool, primary, secondary, and teacher training levels. Before the test was given to pupils, the researcher assessed its reliability to ensure its consistency.

Reliability Statistic

The alpha coefficient for the ten items was .953, suggesting that the items have relatively excellent consistency. Note that a reliability coefficient of .70 or higher is considered "acceptable" in most social science research situations.

Table 2: Cronbach's Alpha of the items

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Basic sounds	21.73	173.834	.571	.958
Basic sounds	21.98	165.652	.755	.950
Basic sounds	22.13	164.246	.790	.948
Word pronunciation	22.39	160.089	.883	.944
Word pronunciation	22.54	160.011	.896	.943
Word pronunciation	22.71	161.130	.895	.943
Word pronunciation	22.79	161.817	.894	.943
Word Pronunciation	23.03	171.291	.822	.947
Word Pronunciation	22.92	175.031	.676	.952
Word pronunciation	23.03	171.062	.830	.947

Note: The items have relatively excellent reliability with Cronbach's alpha $\alpha = .953$

Statistical analysis

We used SPSS Statistics software version 26.0 to merge two data sets with the same variables into one file. A Multivariate General Linear Model was used to determine whether there was a statistically significant linear relationship between the use of digital media (video, digital games) and the improvement of basic sounds and word pronunciation skills amongst the lower primary school pupils. We chose this statistical test because our sample sizes were equal, ensuring a homogeneous population. After all, it is not recommended if the sample sizes for each group are unequal, as the p-value would not be reliable. Before conducting a Multivariate General Linear Model, we assessed whether the data met various requirements, such as the data's homogeneity assumption and the variables' linearity. To attain this, we tested the null hypothesis of Levene's test to prove the homogeneity assumption of the variance between the variables (see Table 4). Lastly, we used the multivariate test to assess the linearity of the variables (i.e., if the independent variable has a linear relationship with the dependent variable) (See Table 6).

Findings

Mean and Standard Deviation of Pupils' Arithmetic Score over time

The mean of the basic sounds in T1 was (*M*=7.3, *SD*=3.7) for the control group and (*M*=6.9, *SD*=4.1) for the experimental group. T2 (*M*=7.9, *SD*=3.9) in the control group and (*M*=8.1, *SD*=3.9) in the experimental group. For word pronunciation, the mean of T1 was (*10.5*, *SD*=7.4) in the control group and (*M*=17.2, *SD*=9.3) in the experimental group. For T2, the mean was (*M*=12.5.*SD*= 8.7) in the control group and (*M*=21, *SD*=9.1) in the experimental group (see Table 3, Figure 2 and Figure3).

Table 3: Mean and Standard Deviation of Pupils' Arithmetic Scores over time

Skills	Time	Condition	M	SD
Basic Sounds	Time 1	Control	7.2727	3.69849
		Experimental	6.9136	4.06632
	Time 2	Control	7.8845	3.85115
		Experimental	8.1194	3.90144
Word Pronunciation	Time 1	Control	10.5224	7.36763
		Experimental	17.2434	9.32694
	Time 2	Control	12.5073	8.74549
		Experimental	21.0256	9.05135

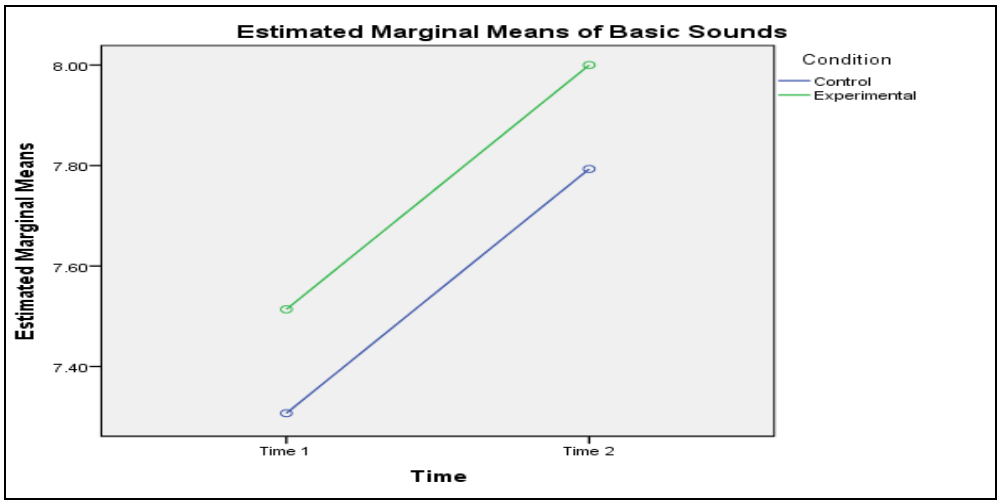

Figure 2: Means of Basic Sounds

Note: Pupil basic sound improvement for the experimental group and control group between T1 and T2

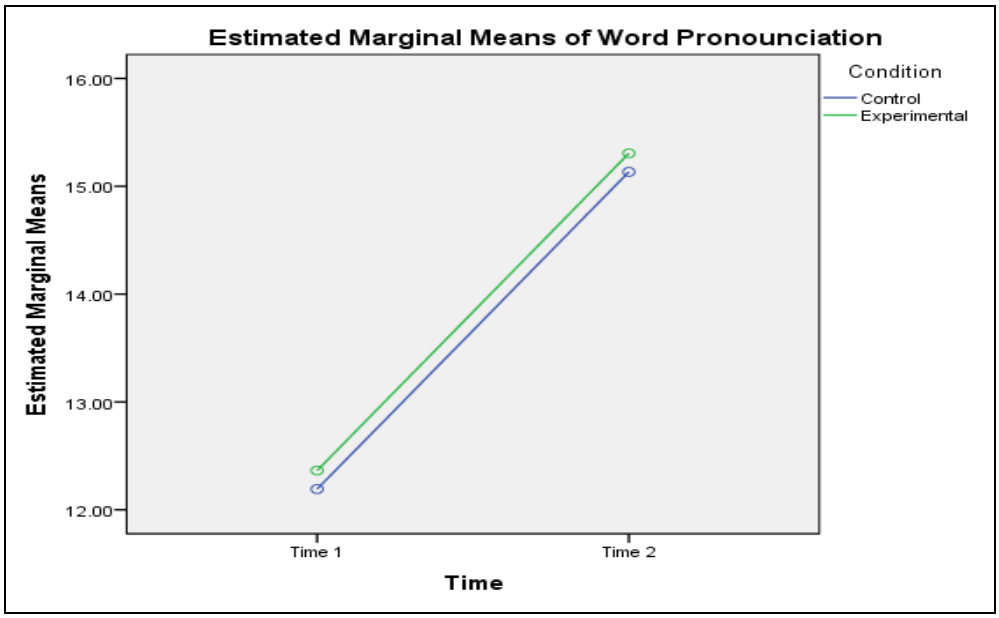

Figure 3: Means of Word Pronunciation

Note: Pupil word pronunciation improvement for the experimental group and control group between T1 and T2

Levene's Test of Equality of Error Variances

Levine's Test indicates that the null hypothesis was maintained, showing equal error variance between T1 and T2 for basic sounds F (3,316) = .565, p = .639 and word pronunciation F (3,316) = .776, p = .508. The p-values being

greater than, $p>.05$ means that the homogeneity assumption of the variance was met. (See Table 4).

Table 4: Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Basic Sounds	.565	3	316	.639
Word Pronunciation	.776	3	316	.508

Note: Levine's Tests suggested the null hypothesis that the error variance of the dependent variable is equal across groups was not statistically significant at $p>.05$; thus, the homogeneity assumption of the variance was met**.**

Correlations among Study Variables

Table 5 shows statistically significant correlations between pupils' age and the improvement of basic sounds r (160) =. -117, p=.037, and word pronunciation r (160) =.221, p=.0001. It was found that age has relationship with the use of digital media (videos and digital games) because most pupils at the specified age are motivated by the use of videos and digital games to learn basic sounds and word pronunciation (see Table 5). This study is consistent with Higgins et al. (2012), Beschorner and Hutchison (2013), and Archer and Savage (2014), who support that the use of digital media in learning among primary pupils helps them perform better due to stimulus found from the sounds, video and digital pictures.

Table 5: Correlations among Study Variables

	1	2	3
1. Gender			
2. Age	-.007 .899		
3. Class level	-.039 .483	.075 .178	
4. Basic Sounds	-.051 .366	-.117* .037	.067 .231
5. Word Pronunciation	-.081 .147	.221** .000	.054 .333

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Multivariate General Linear Model

The Multivariate General Linear Model output displayed a statistically significant linear relationship between the use of digital media (videos and digital media) and pupils' (Participants) improvement of basic sounds [F (1,314) =86.4. p=.0001, partial η^2 =.216] and [F (1,314) =88.1, p=0001, partial η^2 =.219] for word pronunciation skills. The class level and school type showed non-statistical significance (see Table 6).

Table 6: Tests of Between-Subjects Effects

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
School Type	Basic Sounds	.558	1	.558	.048	.826	.000
	Word Pronunciation	25.928	1	25.928	.462	.497	.001
Class level	Basic Sounds	12.080	1	12.080	1.045	.307	.003
	Word Pronunciation	46.864	1	46.864	.835	.362	.003
Participants	Basic Sounds	998.501	1	998.501	86.380	.000	.216
	Word Pronunciation	4943.778	1	4943.778	88.068	.000	.219
Error	Basic Sounds	3629.658	314	11.559			
	Word Pronunciation	17626.604	314	56.136			

a. R Squared = .227 (Adjusted R Squared = .214)
b. R Squared = .364 (Adjusted R Squared = .353)

Discussion

Our research intervention found a statistically significant linear relationship between the use of digital media (videos, digital games) and improved reading skills (basic sounds, word pronunciation) amongst lower primary school pupils. The results proved that videos and digital games positively affect basic sounds and word pronunciation. Compared to existing literature, this study also revealed positive aspects of using videos and digital games in and outside the classroom to develop basic sounds and word pronunciation. Also, our research findings confirm a significant difference between the experimental group and the control group because the average performance of the experimental group demonstrated the greater effectiveness of videos and digital games compared to the control group. The results also align with the Cognitive Theory of Multimedia learning, as it describes how learners develop cognitive processing by selecting, organising, and integrating the information (verbal and visual) presented through videos and digital games (Mayer, 2008). This confirms the link between the use of digital media and the improvement of reading skills among the lower primary pupils. Today, pupils are more attracted to digital media such as audio, images, and video, which make reading more engaging than traditional printed books. Videos and digital games are especially beneficial in helping pupils learn new sounds and word pronunciation, as they offer additional features such as vocabulary and language elements. The findings correlate with studies by Amosa and Ogunlade (2015) and Chinooneka and Mupa (2015) who compared pupils using traditional learning methods with those using digital media (videos, digital games, pictures). Results showed significant relationship between videos, digital games, and reading skills (basic sounds and word pronunciation). The study is also in connection with Archer and Savage

(2014) who highlighted the importance of digital media such as audio, videos, pictures and digital games in enhancing learning outcomes for primary school pupils. It is suggested here that incorporating digital media in teaching, particularly through videos and digital games, can benefit lower primary school pupils by improving basic sound and word pronunciation development. Therefore, it is argued here that the Tanzanian government should take immediate and deliberate steps to support primary teachers with digital facilities and internet access to facilitate. This will ensure the use of videos and digital games in teaching reading skills and to show a solid commitment to the future of Tanzanian education.

Strength, Limitation, and Future Direction

This study differs from other studies conducted in Tanzania to address the effect of digital media (video and digital games), specifically in improving basic sounds and word pronunciation amongst Tanzanian lower primary school pupils in Dodoma City. These findings make the study distinctive from other literature regarding the effect of video and digital games in improving basic sounds and word pronunciation amongst Tanzanian lower primary school pupils. Therefore, the findings encourage education stakeholders to consider using digital media among Tanzania's lower primary school pupils. The study also opens the room for curriculum reformation in lower primary schools, which would allow the effective use of videos and digital games to facilitate basic sounds and word pronunciation. It may also attract donors to support digital facilities like computers, projectors, televisions, and tablets for running educational programmes. Since the study was experimental, more time was needed for intervention to implement digital media use effectively. Lack of competence and confidence in using digital media among primary school teachers was another challenge for the effective intervention process. A generalisation of the study could also be concrete if it involved a large sample, but generalisation was limited since it used a small sample.

As we consider the role of science and technology in primary education, it becomes clear that using videos and digital games to teach basic sounds and word pronunciation is not just beneficial but essential. Therefore, the Tanzanian government must immediately and deliberately support primary teachers with digital facilities and internet access. This will simplify the use of videos and digital games in teaching reading skills and demonstrate a solid commitment to the future of Tanzanian education.

Conclusion and Recommendations

This study highlights the general picture of the effect of digital media in improving reading skills amongst lower primary school pupils. It is

concluded here that videos and digital games improve reading skills (basic sounds and word pronunciation) amongst lower primary school pupils in Tanzania. It is therefore recommended that the policymakers, curriculum developers, curriculum implementers, teachers, and other education stakeholders consider using videos and digital games in instruction to improve basic sounds and word pronunciation amongst lower primary school pupils. Digital facilities should be considered as the compulsory teaching materials to be used in primary schools. The government budget should consider the presence of digital facilities like projectors, televisions, computers, and tablets in schools to enhance reading skills. The government should organise more capacity-building training for the in-serve and pre-service primary school teachers on using digital media to facilitate reading skills. The government should also encourage teachers to use it when facilitating classroom reading activities

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