

Multimedia Applications for Supportive Language Learning for Students with Dyslexia in Secondary Schools in Port Harcourt Metropolis, Nigeria

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Abstract—The study investigated dyslexia styles in Public Secondary Schools in Port Harcourt Metropolis, Nigeria using a battery of tests and observation on writing, reading, memory, speed of processing information built on self-structured instrument Dyslexia Achievement Test (DAT). The dyslexics were treated with multimedia applications videos – audio in order to support their language learning. Learning outcomes was measured using the Managing Dyslexia through multimedia modes (MDMM). These instruments validated by experts in language instruction had reliability coefficients of 0.87 and 0.74, determined using Kuder Richardson KR-20 reliability formula. Thirty dyslexic students were used for the study from two schools selected using a purposive sampling technique. The main problems of dyslexia were phonological processing and visual perception, writing difficulty and comprehension difficulty (19.67% of sample. Findings of the study are that dyslexia remediation can be conducted using multimedia resources with improved achievement of 42.5%, 54.62% and 56.4%, 61.57% in oral and written comprehension. There was a significant difference between student's pre-test scores and post-test scores after treatment. It is recommended that dyslexic students be treated with multimedia language instruction modes in order to improve on their language requisition and achievement. Teachers should investigate at the entry behaviour stage of English learners in secondary schools, to identify and classify incidences of dyslexia for remediation.

Keywords—Multimedia resources, Dyslexia, Remediation, Visual perception, Phonological processing, Impairment.

I. INTRODUCTION

The development of students' language acquisition through an educational process have been impaired by a lot of factors. Most often instructors depend on learner's performance outcomes as to evaluate the levels of acquisition or knowledge reposed on them within a specific period. Presumably, those with resounding academic performance are exonerated from salient impairment or clinical problems associated with underachievement in the process of

their language development. Second language teachers' knowledge and belief about dyslexia as an impairment to language development disagree with causal effects on students' achievement traceable to other means. Diagnosis based on the Knowledge and relieve Developmental Dyslexia Scale (KBDDS), emphasized that dyslexia is linked with low intelligence and laziness; notably emphasizing that the dyslexic students have strength in understanding being desirous for the need for individualized instruction (Ozcan & Yoksel, 2025). However, dyslexic students have difficulty with words specifically on reading, spelling, expressing words and expressing thoughts on paper, they read inaccurately, lack fluency and have need for a structured, sequential direct instruction in basic skills and learning strategies (Sidhu & Manzura, 2025; Greene, 2006; Francis et al; 2019). The British Dyslexia Association (2020) defined Dyslexia as a specific learning difficulty that mainly affects the development of literacy and language related skills, it is characterized with difficulties of phonological processing, rapid naming, working memory and processing speed.

Dyslexia styles, according to the American Psychiatric Association (2023) should be used only if there is an overt restricted progress in learning, to read or spell and inability to catch up with peers despite the extra help at home and school in literacy and numeracy skills.

Language experts detect incidences of dyslexia amongst students through self-structured assessment modes on speech, writing and talks involve their responses hence case of inability of learners to make word pronunciation precisely due to phonological interferences with mother tongue, environment and proximal deficit, exposes dyslexia.

Dyslexia is the outcome of multiple risks which accumulate towards a threshold for what is usually

termed diagnosis. Saksida et al., (2016) and Perry et al., (2019) diagnosed developmental dyslexia as incidences of phonological impairment making problems with word precision (e.g Pirates, Parties, Smite Slime), expressive and receptive language inability considered as Communication Disorder (CD), separate from learning disorder, a characterized by heterogeneity and individual differences (Bishop et al., 2017).

The views of psychologists agree on the facts that dyslexia is a difficulty in learning to decode, read aloud and spell, apply print and sound and acquire detailed orthographic knowledge about written knowledge, a deficit located in the cognitive reading system and thus specific to reading, showing poor knowledge of grapheme – phoneme correspondences. It is often indicated in poor speech sounds at the temporal frequency of syllables hence students exhibit difficulties in perceiving the phonemic categories (Schmalz, Trescani & Mulatti, 2021; Nation, 2020)

Resolving Dyslexia Styles among Students

Dyslexia incidences have deepened psychological issues relating to wellbeing of individuals apart from the challenges in reading, writing and spoken languages, it's increase complicates anxiety and depression as comorbidities. Depression in an academic world is tantamount to extreme poor academic achievement which is linked to criminality, low self-esteem and suicide. Perry, Zorzi and Ziegler (2019) stated that understanding dyslexia through a personalized large scale computational modes, phonological skills, visual attention span, visual stress, students with awful spelling deficiency and its possible interference with other neuropsychological cases have made resolving dyslexia important Al-Dockhling, Bukhamsean & Driwish (2022) adopted an assistive technological application on dyslexia students during the Covid-19 Pandemic. The Visual Perception (VP) and Phonological Processing (PhP) using a quasi-experimental design which resolved students visual and phonological impairment.

Smirni et al., (2020), Zhao et al., (2018) and Chang et al., (2021) in different research locations and study identified students poor pseudo-word reading, non-word repetition, name of object, short term memory, poor phonemic awareness and poor knowledge of compression (can't link words and count syllables) identifying their sounds. An application of

multigenity, multimedia model was used to support children with dyslexia (Sidhu & Mamzura, 2025).

Although digital media can show hazardous demonstration in core subjects (Olele & Nwabueze, 2015), a combination of media formats (multimedia) are not only interactive in their various design and application but adequate in resolving students learning deficiency and internalizing of teacher education. The audio, visual, audio-visual educational resources are adopted for one-way and two-way interactive learning, mobile devices of different sizes make for browsing, presentation and mediation of programme which can reduce dyslexic styles if programmed intently.

The use of multimedia in foreign language instruction cannot be over-emphasized. The advantages of motivation, improved learning engagement, individualized programme, facilitation of teaching at cultural perspectives, enhancement of communication skills and language competency.

Zhou (2020) utilized multimedia combination in English language teaching based on a computer platform to improve students difficulty in reading and writing skills. The model was characterized with the teaching goal, involved rational selection, graphics, images, sound, and a number of ways of machine – construction. It provided video collection and mediation of texts.

The essential features of a multimedia platform can be used to resolve dyslexia. Sihdu & Manzura (2025) stated that multimedia promotes drill and practice methods of language instruction. The use of multiple senses text-to speech, interactive elements, audio-support, visual customization, use of colours, interactive learning and use of games and quizzes multimedia resources can reduce cognitive overload and improve the dyslexic achievement.

Alobaid (2020) designed a smart multimedia learning of ICT that improved language learners writing fluency. The design involved a YouTube online English learning program. In Japan, the national institute of Multimedia Education achieved better knowledge, presence of skills, innovative capabilities and readiness to learn among students. Guan et al., (2018) emphasized that ICT use of hardware and software which serve the purpose of collecting, processing, storing, presenting and sharing of

information, mostly in digital forms using text, audio, video and several allowable contributions is to improve students with learning deficiencies.

Multimedia technology is aimed at accommodating quality education and opens access to large majority of learners, a veritable strategy to provide solution to the gap in the provision of equality in education and

resolving of crowdedness in classroom learning. (Abdulrahman et al., 2013) multimedia resources provided an appropriate application to help students language learning in a sense of sociocultural context as well as raising language awareness, it improves learners' listening ability, sharing of information and enable active participation of students (Pun, 2013; Yang, 2008).

Fig 1 defines the integration model of multimedia in resolving dyslexia styles among L2 learners

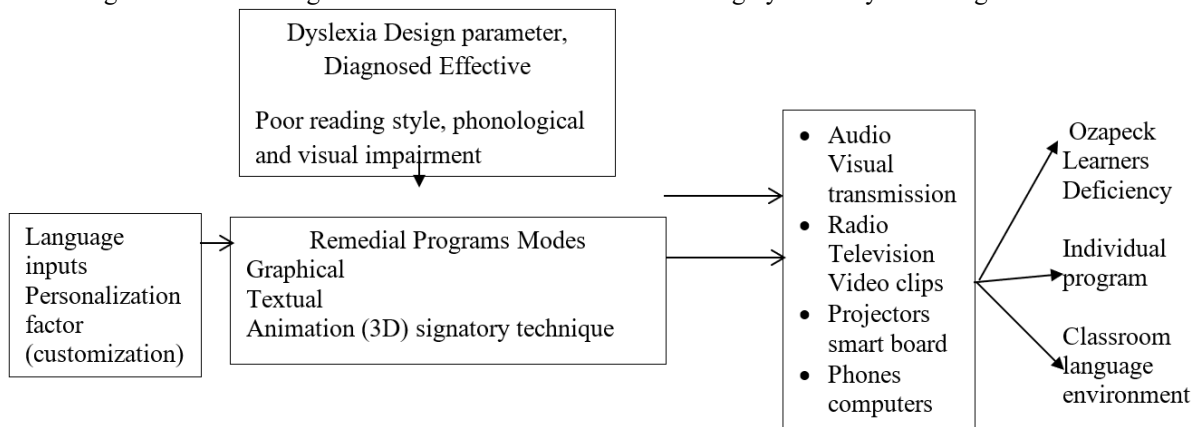


Fig1: Integral Mode for Multimedia dyslexia learners (Researchgate)

The model explains that the dyslexic characterized with impaired gramophones and phonemes, poor visual placement, requiring language customization – individual design of materials for individual need presented through different modes of graphical textual and emanation in built signals are transmitted in the form of audio, visual and audio-visual modes to teach dyslexia through phones, computer, projectors and video clips. It is advantaged in large classroom environment, individualized program attentive on learners deficiency. Multimedia contamination resolves students dyslexia (Lebenicnik, Pitt and Stareic, 2020). Such optimal cases involves audio-visual using scroll down website with on screen text and static pictures while one can modify using animation as shown in fig 1 with three dimensional views. Adding audio support on multimedia is highly resourceful and beneficial for dyslexia students. Carolien et al., (2020) stated that it improves on understanding and retention of resources with decreasing effect for dyslexia.

Problem of the Study

Students Oral English proficiency is a requisite to effective spelling and writing in L2 instruction. There has been poor performance in English language as stated (WAEC 2022, 2023) examiners report, that candidates had grammatical, punctuation and

spelling errors, illegible hand writing and poor knowledge of oral and written literature and poor phonological aspect in Languages (P.xvi). native language interference in communication, deep lack of reading and inability to amend readability difficulties in soft and print documents, have grossly contributed to students lack of interest in their language development.

Incidences of dyslexia attributed to environmental influences, emotional factors, impairments of phonological and visual perception have manifested in language instruction classrooms have affected students' achievement in languages of instruction. The persistence of this problem is maybe due to teachers lack of application of technology in teaching, improper statistic entry behaviour assessment and ignorance of psychoanalytic methods of detecting learning deficiency of students. The problem of the study is how to identify cases of dyslexia styles among students in public secondary schools and the use of multimedia applications to support their language learning for remediation and improvement of their language achievement.

II. AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to determine the effects of multimedia (audio-visual) applications for supportive

language learning dyslexic students in secondary schools in Port Harcourt metropolis, Nigeria.

III. METHODS

Specific objectives of the study are to:

- i. Identify dyslexic styles among students in public secondary schools in Port Harcourt metropolis using recognition, decoding, spelling, reading and syllabic count drill.
- ii. Determine the effect of multimedia on comprehensibility of students.
- iii. Determine the effects of multimedia (audio-visual) on visual perception and phonological processing of students with dyslexia

Research Questions

Three research questions were formulated to guide the process of research.

1. What dyslexic styles are identified among students in the public secondary schools in Port Harcourt metropolis?
2. How has dyslexia affected comprehensibility of students in public secondary schools in Port Harcourt metropolis?
3. What are the effects of multimedia on visual perception and phonological impairment among dyslexic students in public secondary schools in Port Harcourt metropolis?

Research Hypothesis

One alternate hypothesis is stated and tested at 0.05 significance level.

Ho₁: The mean post-test performance scores of dyslexic students exposed to multimedia interactive modes differ significantly with mean pre-test scores on cases of visual perception and phonological processing impairment.

The study adopted an quasi experimental study of the pretest – posttest type. A purposeful sampling technique was used to select two schools in Port Harcourt metropolis for the rigorous battery of tests and observation by the researcher, an expert in language instruction, on writing, reading, memory, speed of processing information. Students were specifically given to complete the questionnaire DAT, reading and writing abilities, phonological awareness, working memory and listening comprehension. On the topic “Train a woman and create a nation”. Thirty (30) students were identified diagnostically as dyslexic out of a population of 126 students randomly selected from SSSII in the two schools. The dyslexics (30) were randomly selected into two unequal groups based on gender (18 boys and 12 girls). Experimentation involved written comprehension, spelling drills, word pronunciation, spelling, word composition, reading aloud mediated in an instrument. Managing Dyslexia through Multimedia Mode (MDMM). At the pretest level thirty (30) identified dyslexia were tested using a diagnostic instrument DAT (Dyslexic Achievement Test). Treatment procedure lasted for 2 weeks. Two language experts used self-structured lesson plans involving reading, writing, spelling, comprehension, painting visibility and pronunciation exercises, mediated in a video with audio outlet, use of microphones, white board and different colours as instructional materials.

The students were administered a post-test to measure the effect of treatment using MDMM. The scores pretest and posttest of experimental group were used for analysis.

Fig II: Indicates instrumentation, spelling drill, pronunciation, counting of syllables, word formation and data collection instrument

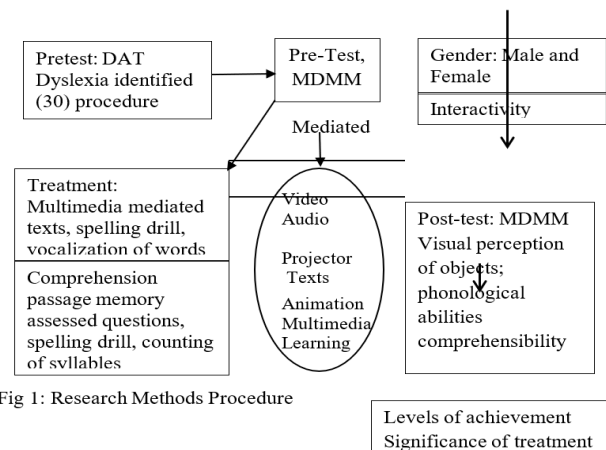


Fig 1: Research Methods Procedure

By the end of two weeks, the students were administered the restricted reverse of MDMM post-test to assess students' outcome in visual perception, phonological abilities and comprehension. Their responses were retrieved and evaluated as post test scores. The scores were used to answer the research questions and test of the hypothesis, in comparison with the pretest MDMM scores.

IV. RESULTS

Research question 1

What dyslexic styles are identified among students in public secondary schools in Port Harcourt metropolis?

Table 1: Identified dyslexic students in the research area

S/N	Dyslexia Style	No. of Students	% of Respondents
1.	Phonological impairment • Spelling • Fluency of speech	12	19.67
2.	• Comprehension	16	26.22
3	• Visual perception • Identification	21	34.42
	Total visual/oral comprehension lack of writing	18	28.5
	Total	61	109.81

The table 1 shows that 19.67% of the students had phonological impairment observed in their difficulty of spelling, speech fluency 26.2% had poor performance in the 3-paragraphs comprehension passages.34.42% had visual perception difficulties and 27.5% had writing problems and poor oral comprehension.

Research Question II

How has dyslexia affected comprehensibility (oral and written) in public secondary schools in Port Harcourt metropolis?

Table 2: Oral and written comprehension performance of dyslexia students

S/N	Dyslexia Style	Oral	Mean (\bar{x}) Oral Comprehension Scores	Mean (\bar{x}) Written comprehension Scores
1.	• Phonological impairment	23	29.5	42.8
2.	• Visual perception	39	50.62	61.4
3.	• Comprehension difficulty	61	37.29	28.14
		Average	39.13	44.11

Students who had phonological impairment scored 29.5 in oral comprehension but mean score of 42.8 in written comprehension. Those with visual perception had 50.62 in oral against 61.2 in written comprehension. The mean comprehension score of dyslexic students was 37.29 in oral and 28.14 in written comprehension.

Research Question III

What are the effects of multimedia (visual-audio) on visual perception (VP) and phonological impairment among dyslexic students in public secondary schools in Port Harcourt metropolis?

Table 3: Post Treatment Scores of Dyslexic Students

S/N	Simple	Pretest Scores (oral)	Written	Post-test scores oral	Written	Mean difference
1.	VP	29.5	42.3	42,5	56.4	13.9

22.	PhP	50.62	51.60	54.62	60.57	5.89
Total		80.12	904	97.12	116.91	19.79

The table indicates mean performance difference of 13.9 and 5.89 for those with visual perception and those students with phonological impairment who

were taught using multimedia modes. This means that there is a remediation effect on dyslexics exposed to use of multimedia modes.

Test of Hypothesis

Univariate Analysis of Variance

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	Value Label	N
Response	1.00 VP	30
	2.00 PHP	30

Response	Mean	Std. Deviation	N
VP	52.7333	3.06182	30
PHP	57.2333	7.96407	30
Total	54.9833	6.39781	60

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	423.069 ^a	2	211.534	6.053	.004	.175
Intercept	1192.593	1	1192.593	34.127	.000	.374
PreTest	119.319	1	119.319	3.414	.070	.057
Response	31.410	1	31.410	.899	.347	.016
Error	1991.915	57	34.946			
Total	183805.000	60			z	
Corrected Total	2414.983	59				

a. R Squared = .175 (Adjusted R Squared = .146)

At 0.05 significance, the f ratio calculated was 3.414 while the f critical value was 3.12 the vales shows that there is a significant effect of multimedia applications for supportive language learning for students with Dyslexia in secondary schools in Port Harcourt metropolis. The edta value indicates high level of significance.

V. SUMMARY OF FINDINGS

1. Dyslexia style were identified amongst students in Public Secondary Schools in Port Harcourt Metropolis Rivers State, Nigeria (phonological impairment detected on spelling and fluency of speech) writing 19.67% of the sample size (30).

- The average achievement of dyslexia students due to phonological impairment, visual perception and difficulty in comprehension 29.13% in oral comprehension and 44.11 on written comprehension.
- Multimedia resources in video and audio modes facilitated dyslexic students achievement in oral and written comprehension of 42.5% and 54.62% and 56.4% and 60.57% who had difficulties in visual perception and phonological processing.
- There is a significant differences in mean performance of students pretest scores and post-test scores who had visual perception and phonological processing impairment treatment

using multimedia resources (video-audio) modes in spelling, syllables count, oral and written comprehension.

REFERENCES

- [1] Abdulrahman, M.D., Frank, N., Oloyede, A.A., Saradeen-Bakinde, N.T., Olawayin, L.A., Mejabi, O.V., Imam-Fulani, V.O., Falim, A.O., & Azeez, A.L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon* 6(11).
- [2] Al-Dokling, A.A., Bukham-Seen, W.A., Draish, A.M. (2022). Influence of assistive technology application on dyslexic students: The case of Saudi Arabia during Covid-19 Pandemic. *Education Information Technology Disorder* 27(9), 2213-2249.
- [3] Alonaid, A. (2020). Smart multimedia learning of ICT: Role and impact on language learners' writing fluency YouTube online English learning resources. Researchgate downloaded 20/09/25.
- [4] American psychiatric Association (2013). Diagnostic and statistical of mental disorders.
- [5] Bishop, D.V., Snowing, M.J., Thompson, P.A., & Green-Halgh, T. (2011). Phase 2 of catalyse: A multinational and multidisciplinary Delphic consensus study of problems with language development terminology. *Journal of Child Psychology and Psychiatry*, 58(10), 1068-1080.
- [6] Caroline, A.N., Knoop-van, C., & Verhoeven, S.L. (2020). Effect of audio support on multimedia outcomes on students with dyslexian. *Computer and Education*, 130:103858.
- [7] Chang, X.I., & Lou, K. (2021). 5 principles for using technology to teach foreign language. *Journal of Health and Community English*. 29(1), 5519472.
- [8] Cheng, C., Yao, Y., Wang, Z. & Zhao, J. (2023). Visual attention span and phonological skills in Chinese developmental dyslexia. *Research in Developmental Disabilities*. 116:104015.
- [9] Francis, D.A, caruana, N, Hudson, J.L. & Arthur G.M (2091) the association between pour reading and internalizing problems a systematic review and meta analysis. *clinical psychology review* 67,45- 60
- [10] Guan, N., Song, D.L. (2018). In the advantages of computer multimedia-aided English teaching. *Procedia Computer Science* 131(1), 727-732.
- [11] Lebenicnik ,M, pittly , I & starcic , A,I (2020) optional multimedia combination for student with dyslexia *METODOLOSKI ZVEVIK* , 17 (2) 30-48 .
- [12] Nation, K. (2020). The problem of dyslexia: Historical perspective. *Oxford Review of Education*, 46:501-513.
- [13] Ogah, M. (2020). Use of multimedia in English to young learners. *European Journal of Research and Reflection in Educational Sciences*, 8(4), 2056-5822.
- [14] Olele, C.N. & Nwabueze, A.I. (2015). *Audio and Visual Technologies in Digital Era: Implications for Teaching and Learning in Universities in Rivers State, Nigeria; In (eds) S.O. Oluwuo, N.J. Ekoli, S.D. Osaat and C.M. Uche. 100 years of Education in Nigeria: Science, ICT and Environmental Issues. Port Harcourt: University of Port Harcourt Press Ltd.*
- [15] Ozcan, E., & Yuskel, H.G. (2025). Second language teachers' knowledge and beliefs about dyslexia: Turkish context. *Wiley Open Access Collection*, 31(2).
- [16] Pelleriti, M. (2018). Dyslexic students from language learning to language testing. *International Conference in Higher Education Advances. (HEAD)* 18:8231.
- [17] Perry, C., Zorzi, M., & Ziegler, J.C. (2019). Understanding dyslexia through perspective large-scale computational modes. *Psychological Studies*, 30(3), 386-395.
- [18] Pun, M. (2013). The use of multimedia technology in English language teaching: A global perspective crossing the border: *International Journal of Interdisciplinary Studies*, 8752.
- [19] Roche, J. (2020). Multimedia in language instruction, IALLT. *Journal of Language Learning Technologies* 31(1-2), 45-52.
- [20] Saksida, etal (2016). Phonological skills in developmental dyslexia: Insight from a population of French children. *Developmental Psychology*, 52(10), 1503-1516.
- [21] Schmalz, X., Treccani, B., & Mulatti, C. (2021). Developmental dyslexia, reading acquisition and statistical learning: A sceptics guide, *Brain Science* 11(9), 1143
- [22] Sidhu, M.S., & Manzura, E. (2025). *A Multisensory Multimedia Model to Support Dyslexic Children in Learning.*
- [23] Smirni, P., Vetri, L., Misuraca, E., Cappadanna, M., Operto, E.E., Pastorino, G.M.G., Marotta, R.

- (2020). Misunderstandings about developmental dyslexia: A historical overview. *Pediatric Report* 12(2), 50-53.
- [24] Yang, W. (2008). Optimization of multimedia English teaching in context. *International Education Series*, 1(4).
- [25] Zhao, J., Lou, M., Lou, H., Huang, C. (2024). Increased deficit of visual attention span with development in Chinese children with developmental dyslexia. *Scientific Report*, 8(1) 1-13.