Exploring the Social and Cognitive Factors Shaping the Acquisition of Science Concepts among Primary School Students in first and second languages

O. F. Adebusuyi[1*], A. Adeleye[2], D. Jimoh [3], Ayinde [4], A. Adedoyin[5]

[1,4, 5]*Department of Art and Social Science Education, Olabisi Onabanjo University, Nigeria*

[2,] *Department of Human Kinetics and Health Education, Olabisi Onabanjo University, Nigeria*

[3]*Department of Early Childhood and Educational Foundations, Olabisi Onabanjo University, Nigeria*

Corresponding Author. Email: adebusuyibusayoade@gmail.com

Abstract

This study investigates the intricate interplay of social and cognitive factors influencing the acquisition of science concepts among primary school pupils, with a focus on their first and second language. A survey research design was carried out across different primary schools in Ijebu Ode Government Area of Ogun State, during the third term of the 2022/2023 academic year. A sample size of 268 primary four pupils, 196 from eight private and seventy-two (72) from three public primary schools, were randomly selected through simple random sampling technique. A pilot survey was conducted by administering the research instruments to 46 male and 72 female randomly selected primary 4 pupils after which the instruments were subjected to analysis. The data collected were analyzed using a t-test and hierarchical regression analysis. Regression analysis showed that pupil motivation, teacher support, parent support, and school environment have a significant contribution to pupils' science performance test (SPT). The results revealed a significant correlation between pupil motivation, teacher support, parental involvement, and the school environment, collectively influencing pupils' science performance. The study emphasizes addressing language disparities, enhancing student motivation, fostering collaborative support from parents and teachers, and creating a conducive learning environment in primary schools to improve overall science education performance.

INTRODUCTION

In the era of a dynamic globalized society, the rapid advancements in science and technology underscore the growing importance of cultivating artificial intelligence skills. As a requisite for the future, both developed and developing nations are recognizing the significance of imparting scientific knowledge to empower individuals (Thibaut, et. al. 2018). This imperative is especially pertinent in the educational domain, where fostering a solid foundation in scientific understanding and reasoning from an early age becomes instrumental. (Adebusuyi et al 2022; Akaygun, & Aslan-Tutak, 2016). Given these breakthroughs in science and technology, children must have a solid foundation in scientific understanding and reasoning from a young age (Benson, 2014). The Nigerian educational curriculum, extending from elementary to secondary to university levels, underscores the critical role of science education. At the primary school level, the emphasis on scientific instruction is not merely an academic achievement; it catalyzes for cultivating curiosity and nurturing an inquiry-based approach to learning. This approach equips young learners with essential tools for comprehending complex life situations, making informed decisions, and actively participating in civic discourse (Adebusuyi et. al 2022). It equips them with the tools to evaluate scientific claims, differentiate between reliable and unreliable sources of information, and make informed decisions related to their health, environment, and everyday life.

Furthermore, a robust foundation in science education at the primary school level is pivotal for

steering students toward future pursuits in Science, Technology, Engineering, and Mathematics (STEM) fields (Adebusuyi et al 2022; Millen & Supahar, 2023). However, the language employed in science instruction at the primary school stage is a pivotal factor influencing the learning process. While recognizing the debate between the utilization of native languages and official languages like English, the current study navigates through the complex terrain of language in the Nigerian educational sector, distinguishing between first and second languages (Huerta, et al 2016; Ipek, 2009). This dichotomy raises questions about its impact on the academic performance of pupils, especially in the context of disparities between public and private schools (Agbofa 2023; Kunwar 2021).

However, as young pupils, the language used in science instruction and learning at this stage (primary school level) plays an important role in the learning process. The use of suitable language while educating students has a significant impact on their academic performance and achievement in science (Prinsloo, 2018). Nevertheless, while Benson (2005) argued that teachers must ensure that the native language is employed for instruction in various fields of study. Prinsloo (2018) posited that the new culture of African parents frequently speaking the official language (English language) to their children at home had a significant connection with the Science achievement results of Grade Nine learners in South Africa. Similarly, language in Nigeria's educational sector is divided into first and second language. The first language is the indigenous language (mother language), while the second language is the foreign language, which is English language and had been reported to have greater impact on learning science than L2 (Baker, 2008; Ipek, 2009). Yet, it is now possible in Nigeria for students' first language to be the official language of instruction. Typically, schools are divided into groups based on ownership (private vs. public) or geography (rural vs. urban) (Abamba, 2021; Agbofa 2023; Akinloye et al 2015; Kunwa, 2021).

Recent research indicates that while rural and urban pupils may not significantly differ in physics performance tests, a persistent gap in academic performance exists between public and private school pupils (Agbofa, 2023; Duncan & Sandy 2007; Akinloye et al 2015; Kunwa 2021), with private school pupils outperforming public school pupils. This gap, wherein private school pupils consistently outperform their public-school counterparts, poses a concern, particularly given the financial constraints that limit access to private education. Addressing this disparity demands an exploration of factors in African primary schools

beyond mere ownership or geographical categorization, delving into the intricate interplay of language, socioeconomic status, and other cognitive and social determinants.

Duncan and Sandy (2007) reported that 45% of private school pupils' exam results school were attributed to family characteristics, which include parent status and support, 26% were attributed to the school environment, while only 26% were traced to pupils' personal characteristics. Relatively, providing instruction that suits the pupil's situation at home may improve the pupils' performance in learning science concepts because parent socioeconomic status was reported to influence pupils' performance in science (Safwat, 2014). Therefore, more studies are needed to address this situation by examining if the language parent speaks at home, which forms pupils' first language will influence pupils' performance on a science performance test (SPT).

Studies have proposed that aside from the language used, the learning process can be significantly influenced by other various factors which are social, cognitive, psychological, economic, environmental, and personal factors, particularly for primary school pupils who are in the formative stages of their educational journey (Kristi et al 2022; Kirui & Kaluyu 2018; Li et al 2022; Daher et. al 2017; Al-Daihani et al 2016). All of these variables have been reported to have a dependent impact on pupils' academic performance, either favorably or adversely (Rollnick, 1998). However, the interaction of these variables with each other and their relationship with language development in learning science concepts at an early age is not clear. Hence, the present study proposes that the extent of influence of these variables may depend on the school type and language used at home and in school. It also investigated the interaction of cognitive and socio factors pupils need to perform well in science (Rollnick, 1998; Sari, 2019).

Cognitive factors refer to the mental processes and abilities that play a role in learning and understanding information (Benson, 2005). When it comes to science education in primary schools, pupils' cognitive development, language proficiency, and prior knowledge all play crucial roles in shaping their understanding of science concepts. The cognitive factors that influence the learning of science concepts in primary school pupils, particularly in their first and second language, are essential to understand how to effectively teach and support these young learners. One of this is Language proficiency used in teaching the subject.

Proficiency in the language of instruction can significantly influence pupils' comprehension and

acquisition of science concepts (Al-Tameemi et al. 2023; Fakeye & Ogunsiji, 2009; Jha, et al 2019; Martirosyan et al 2015). In the case of second language learners, limited proficiency in the second language can create barriers to understanding scientific terms, explanations, and complex concepts. Pupils may struggle to comprehend scientific texts, engage in classroom discussions, and express their ideas effectively (Al-Tameemi et al. 2023). Language proficiency, in both first and second languages, is crucial for meaningful science learning (Ipek, 2009). However, due to the disparity between the language used to teach science concepts and that of the pupils' first language at home, especially in a heterogeneous classroom, pupils often do not master any of it. This disparity in bilingual context presents a unique set of challenges and opportunities that may influence pupils' engagement, comprehension, and overall achievement in science. Poor performance in Multilingual classrooms, where pupils come from diverse linguistic backgrounds, has been reported in recent literature (Al-Tameemi et al 2023). In real sense, these classrooms are supposed to offer rich opportunities for cultural exchange and diversity thereby improving pupils' performance. Especially in Nigeria, which is a country that has a lot of tribes with each tribe having various specific languages. Therefore, proficiency in the language utilized in primary school science instruction is an important cognitive factor as these classrooms present challenges for science concept learning due to language barriers and varying language proficiency levels. Studies (Al-Tameemi et al 2023; Rollnick 1998; Rinseveld et al 2016; Safwat et al 2014) have addressed these challenges from different angles; however, no study has considered the social and cognitive factors interaction with the L1 to ensure equitable science education for all pupils.

Another cognitive factor worthy of investigation is pupils' motivation towards the learning of science concepts. Motivation plays a crucial role in influencing pupils' learning of science concepts in both their first and second languages. It influences their interest, effort, and perseverance in the learning process as a cognitive component. Motivation in the field of learning science may be divided into extrinsic and intrinsic motivation. Intrinsic motivation is the intrinsic drive and interest to do something for its reason, uninfluenced by rewards or pressure from others (Kirui & Kaluyu 2018). When pupils are intrinsically motivated to learn science, they exhibit a genuine interest in understanding scientific concepts and phenomena. This internal motivation drives them to explore, ask questions, and seek knowledge independently. In the case of learning science in a first language, intrinsic motivation can be fueled by factors, such as personal curiosity, the desire to understand the natural world, and the joy of discovery. In this scenario, pupils are more likely to be self-driven and actively engage with science materials and activities.

Extrinsic motivation refers to engaging in an activity to attain external rewards or avoid punishment. In the context of learning science, extrinsic motivation can be driven by factors such as grades, competition, recognition, or praise from teachers or parents. Motivation, both intrinsic and extrinsic, plays a significant role in influencing pupils' learning of science concepts in their first and second languages (Daher et. al 2017). Intrinsic motivation drives students to explore and understand scientific phenomena out of personal interest and curiosity, while extrinsic motivation can reinforce their efforts and provide additional support, especially when learning in a second language. Educators should create a positive and supportive learning environment that nurtures pupils' intrinsic motivation while effectively leveraging appropriate extrinsic motivators to enhance their learning experience.

Apart from cognitive factors, social factors that could significantly affect the performance of pupils in SPT are Parental factors, gender, ethnicity, school environment, and teacher support, which have been regarded to shape pupils' experiences and interactions with science (Baker 2008). For example, pupils without effective parent-child interaction may face additional challenges in language development and have limited access to educational resources, discrimination, or stereotypes. These factors can impact motivation, self-efficacy, and engagement in science learning. In this study, parental, teacher support, and school environment will be considered as they have shown to contribute immensely towards pupils' performance (Kontagora et. al 2018; Safwat et al 2014).

The school environment and teaching practices also play a crucial role in pupils' science learning experiences. Inclusive and culturally responsive classrooms that value pupils' linguistic and cultural diversity can foster positive attitudes toward science. Teachers should promote collaborative learning, encourage active participation, and provide opportunities for pupils to use both their first and second languages to construct and communicate scientific knowledge. Moreover, elementary school pupils are at a stage of development where their attitudes, beliefs, and motivations toward science are being built. Their perceptions of science, self-perceived competence, and interest in the subject are influenced by a range of social and cognitive factors. Exploring these determinants can provide valuable insights into how

to foster positive attitudes and motivations toward science, leading to enhanced learning experiences and improved academic performance.

This study endeavors to unravel the intricate connections between language, cognitive factors such as motivation and linguistic proficiency, and social factors like parental and teacher support, school environment, and socioeconomic status. Drawing on the socio-cognitive theory of Albert Bandura, the research seeks to understand how primary school pupils navigate the realms of science education in both their first and second languages. Therefore, the study aims to contribute valuable insights to the existing literature on science education and offer practical implications for educators, policymakers, and curriculum developers. Ultimately, this research aspires to shed light on the nuanced dynamics influencing science education, providing a foundation for the design of inclusive and effective instructional strategies.

Hence, this study explores the social and cognitive determinants that impact science learning among primary school pupils, focusing specifically on their first and second languages. Understanding the role of social (parental support, teacher support, and school environment) and cognitive factors, such as motivation and linguistic proficiency, can provide valuable insights into the complexities of science education and contribute to the development of effective instructional strategies.

RESEARCH METHOD

The study employed a survey research design (Bhattacherjee, 2012; Creswell, 2017; Fraenkel et al., 2023). The study was conducted during the third term of the academic year 2022–2023 across many primary schools in the Ijebu Ode Government Area of Ogun State, Nigeria. The population for comprised of all primary four pupils in public and private elementary schools in the study area. A sample size of 268 primary four pupils, 196 from eight private and seventy-two (72) three public primary schools were selected through simple random sampling technique from the total eleven (11) Primary schools in Ijebu-ode local government area of Ogun state, Nigeria. The participants were selected using a simple random sampling technique. The researcher considered a simple random sampling technique to be appropriate to give each member of the population an equal chance of being selected.

The instruments used for data collection are questionnaires and objective tests (Science Performance Test). The questionnaire used is subdivided into three sections (Section A, B, and C)

and two parts. Section A comprised the demographic data of pupils while section B titled the Psychosocial Factors Questionnaire (PFQ) consisted of 32 items of pupil motivation, (8 Items), teacher support, parent support, and school environment with 8 items each. Part C was the Use of Language Questionnaire (ULQ) developed by Salamonson et al (2021) which is an 11-item English language usage scale to judge nursing students' proficiency in the English language. The questionnaire was measured using a 4-point Likert-type scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The internal reliability coefficient reported for this scale was 0.96 but when applied to the Nigerian sample, Cronbach's alpha was used for testing the questionnaire, and it obtained a coefficient value of 0.82. The two parts of the questionnaire is the Science Performance Test (SPT) comprised of 15 multiple choice questions on the pupil's science knowledge. The SPT was subjected to face validity by the two professors of science education by assessing the items in the instrument. The corrections were affected, and a pilot survey was carried out by administering the research instruments to 10 males and 10 females randomly selected from different samples of primary four pupils who did not participate in the study. The initial data of SPT was subjected to Kuder Richardson formula 20 and was adjudged to be reliable.

The questionnaires alongside the SPT were distributed to all the selected participants and administered to them personally by the researchers. The correctly filled questionnaires and objective tests were sorted out and coded for analysis. Meanwhile, the incorrectly filled ones were discarded. The data from the completed research instruments were cleaned, decoded, and captured into the SPSS for analysis. The data collected were analyzed using a t-test and hierarchical regression statistics.

RESULTS AND DISCUSSION

The findings of the study are presented in the form of graphs, tables, or descriptions. Analysis and interpretations of these results are required before being discussed. The table is put in the middle or at the end of each description of research findings. If the table is not enough to be written in a half-page, it can be fully written in one page. The example is presented in Table 1.

Tabel 1. Difference between Public and Private school students on SLT

Schooltype		N	Mean	Std. D	Df	T	Sig
SLT	Public	72	9.50	2.17	266	8.47	0.000
	Private	196	12.36	2.54			

Table 1 shows that, there was a significant difference in the academic performance of public ($x^- = 9.50$, SD = 2.54) and private school pupils on the science performance test ($x^- = 12.36$, SD = 2.54); t (266) = 8.48, P < 0.05. Hence, 't' was significant at 0.05 level. The null hypothesis is hereby rejected. The result implied that pupils in private school performed better than public school on the science performance test.

The study initially scrutinized the performance of primary school pupils on a science performance test (SPT) in both private and public schools. A consistent finding across previous studies (Agbofa, 2023; Duncan & Sandy 2007; Akinloye et al., 2017; Kunwa, 2021) was reaffirmed, indicating superior performance by pupils in private schools. The disparities in science concept acquisition between these school types prompted an exploration of influencing factors, prominently featured in the existing literature. Of particular significance is the interplay between language acquisition—both first (L1) and second (L2)—and its impact on the learning process. The language incongruity between science instruction in schools and the pupils' home language necessitates attention.

Table 2. Regression Analysis showing the significant influence of first and second language on pupils' academic performance in SPT

Model	Unstandardized Coefficients	Standardized Coefficients	T	Sig
1 (Constant)	13.088	0.336		0.000
Secondlanguge	1.157	0.228	0.297	0.000
2 Constant)	15.887	1.027		0.000
Secondlanguge	1.797	0.316	0.461	0.000
Firstlanguage	0.765	0.265	0.234	0.004

Dependent Variable: SLT

Table 2 showed a significant influence of first and second language on pupils' academic performance in SPT. It implied that there was a significant influence of both the first and second language on the academic performance of the pupils on the SPT. However, the second language had more influence than the first language on the SPT. It found that there was a significant correlation between proficiency in the first language, and enhanced science comprehension. These findings echo established research emphasizing the pivotal role of language proficiency in science education (Li et al., 2022; Prinsloo et al., 2018; Rinsveld et al., 2016). Consequently, advocating for the use of most pupils' L1 as the medium for teaching science concepts is recommended, facilitating a smoother transition to L2 comprehension.

Table 3. Results of Hierarchical Regression Analysis of Student motivation, teacher support and school environment on pupils' performance in SPT

	Model	Unstandardized Coefficients		Std. Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.832	0.920		4.167	0.013
	SchoolEnvironment	0.354	0.041	0.464	8.554	0.000
2	(Constant)	11.601	1.184		9.797	0.000
	SchoolEnvironment	0.374	0.036	0.491	10.290	0.000
	Studentmotivation	-0.422	0.047	-0.428	-8.966	0.000
3	(Constant)	6.649	1.653		4.021	0.017
	SchoolEnvironment	0.326	0.037	0.428	8.780	0.000
	Studentmotivation	-0.378	0.047	-0.384	-8.064	0.000
	TeacherSupport	0.175	0.042	0.207	4.166	0.019
4	(Constant)	4.985	1.765		2.824	0.084
	SchoolEnvironment	0.281	0.041	0.368	6.842	0.000
	Studentmotivation	-0.367	0.047	-0.372	-7.868	0.000

Model	Unstandardized Coefficients		Std. Coefficients	T	Sig.
	B	Std. Error	Beta		
TeacherSupport	0.152	0.042	0.180	3.575	0.038
Language	0.112	0.044	0.137	2.517	0.012

Table 3 showed that each of student's motivation, teacher support, school environment, and language use had a relative influence on science performance test of pupils in the study area. Furthermore, there was a statistically significant joint influence of school environment and student motivation on SPT ($R^2 = 0.22$, $p < 0.05$) for the first model. Also, for model two, there was a joint influence of on SPT ($R^2 = 0.42$ $p < 0.05$). A notable significant joint influence of ($R^2 = 0.20$, $p < 0.05$) was also observed from the regression table. The result suggested that student motivation, teacher support, and school environment have a significant contribution on pupils' SPT. In addition to language considerations, the research examined student motivation as a cognitive variable and social variables influencing academic performance on the SPT. It was shown that the relationship is significant which aligns with findings from a prior motivation study (Kristi, 2022). Parental support was identified as an independent factor influencing SPT performance, while teacher support exhibited both independent and interactive influences. The latter finding correlates with existing literature highlighting the significance of teachers' mindsets and attitudes in shaping academic outcomes (Al-Tameemi et al., 2023; Daher et al., 2017). Moreover, the study underscores the crucial role of the school environment in shaping pupils' performance on the SPT. A conducive environment was found to influence student performance independently and interactively, aligning with research emphasizing the impact of the learning environment on academic outcomes (Al-Tameemi et al., 2023). Contrary to previous assertions, the regression analysis identified the school environment as the most influential factor, challenging existing perceptions regarding the dominance of English language proficiency.

CONCLUSION

In conclusion, this study illuminates the intricate web of social and cognitive determinants shaping the learning of science concepts among primary school pupils. In a diverse nation like Nigeria, where multiple languages coexist, our findings emphasize the imperative of initially exposing pupils to science concepts in their L1. This approach fosters positive teacher-student interactions, creating an inclusive and supportive learning environment conducive to effective science instruction. Recognizing the intricate dynamics of language proficiency, cognitive development, and social factors is pivotal for optimizing science learning experiences and facilitating the acquisition of scientific knowledge among primary school pupils, thereby contributing to the broader goal of societal change through education.

ACKNOWLEDGMENTS

REFERENCES
Abamba, I. K. (2021). The effects of School location on students' academic achievement in senior secondary physics based on the 5E learning cycle in Delta State, Nigeria. *LUMAT International Journal on Math Science and Technology Education* 9(1), 56-57.

Adebusuyi, O. F., Bamidele, E. F., & Adebusuyi, A. S. (2022). The Role of Knowledge and Epistemological Beliefs in Chemistry Teachers STEM Professional Development and Instructional Practices: Examination of STEM-Integrated Classrooms. *European Journal of Science and Mathematics Education*, 10(2), 243-255. https://doi.org/10.30935/scimath/11799

Agbofa, F. J. K. (2023). Exploring the Difference in Academic Performance Determinants between Public and Private Junior High Schools. *Creative Education*, 14, 182-196. https://doi.org/10.4236/ce.2023.141013

Akinloye, G. M. Adu, K. O., & Adu, E. O. (2015) A Comparative Analysis of Students' Performance in Economics in Private and Public Secondary Schools in Lagos State, Nigeria, *Journal of Social Sciences*, 44(3), 144-151, DOI: 10.1080/09718923.2015.11893473

Akaygun, S. & Aslan-Tutak, F. (2016). STEM Images Revealing STEM Conceptions of Pre-Service Chemistry and Mathematics Teachers. *International Journal of Education in Mathematics*, Science and Technology, 4(1).

Al-Daihani, H.A., Al-Yaman, A., & Ahmad, S.A. (2016). Review of factors affecting second language learning. *International Journal of Education, Learning and Development* 4(2), 26-34.

Al-Tameemi, R. A. N. Johnson,C., Gitay,R., Abdel-Salam,A. G., Al Hazaa,K, BenSaid,A., & Romanowski, M. H.(2023). Determinants of poor academic performance among undergraduate students—A systematic

literature review, *International Journal of Educational Research Open, 4,*

Baker, W. (2008). Social, experiential, and psychological factors affecting L2 dialect acquisition. Selected Proceedings of the 2007 Second Language Research Forum, ed. Melissa Bowles et al 187-198.

Benson, C. (2005). The importance of mother tongue-based schooling for educational quality. United Nations Educational, Scientific, and Cultural Organization.

Bhattacherjee, A. (2012). Social Science Research: Principles, Methods, and Practices. University of South Florida.

Creswell, J. W. (2017). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. SAGE Publications.

Daher, W., Al-khalili, F., & Abu-kayyas, Y. (2017). Psychosocial variables that affect students' effort in mathematics. Research Highlights in Education and Science

Duncan, K. C. & Sandy, J. (2007). Explaining the Performance Gap between Public and Private School Students. *Eastern Economic Journal*, 33(2), 177-191.

Fakeye, D. O., & Ogunsiji, Y. (2009). English Language Proficiency as a Predictor of Academic Achievement among EFL Students in Nigeria, *European Journal of Scientific Research*, 37 (3), 490-495.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2023.). How to Design and Evaluate Research in Education (11th ed.). McGraw Hill.

Huerta, M., Irby, B. J. & Lara-Alecio, R., & Tong, F. (2016). Relationship Between Language and Concept Science Notebook Scores of English Language Learners and/or Economically Disadvantaged Students. *International Journal of Science and Mathematics Education*, 14(2), 269-285.

Ipek, H. (2009). Comparing and Contrasting First and Second Language Acquisition: Implications for Language Teachers. *English Language Teaching*, 2 (2). 155 – 163

Jha K, Kumar Y, Kumar T, Singh R, &Dubey P. (2019). Role of language proficiency and personality traits upon the academic performance of undergraduate medical students. *J Edu Health Promot* 8:260. 1- 7

Kirui, J. M., & Kaluyu, V. (2018). Influence of selected psychosocial factors on learners' performance in science subjects: a case of public secondary schools in moyale sub-county, KENYA. *International Journal of Education and Research* 6(1)

Kontagora, H. L., Watts, M., & Allsop, T. (2018). The management of Nigerian primary school

teachers. *International Journal of Educational Development* 59, 128-135.

Krisi, M., Nagar, R., & Knoll, M. (2022). Psychological factors involved in the acquisition of a foreign language among students with visual impairments. *British Journal of Visual Impairment* 40(2), 196–208.

Kunwar, S. (2021). Academic Performance: A Comparative Study between Public and Private Secondary Schools in Nepal. A thesis submitted in the partial fulfillment of the requirement for the degree of Master's Oslo Metropolitan University.

Martirosyan, N. M., Hwang, E., Wanjohi, R., (2015). Impact of English Proficiency on Academic Performance of International Students. *Journal of International Students*, 5(1) 60-71.

Millen, N. R., & Supahar, S. (2023). The Effectivity Study: Implementation of the Physics e-Module with PjBL-STEM Model to Describe Students' Creative Thinking Skills and Learning Motivation Profile. Journal of Science Education Research,

Prinsloo, C.H., Rogers, S.C., & Harvey, J.C. (2018). The impact of language factors on learner achievement in science. *South African Journal of Education* 38(1), 1-14.

Rinsveld, A.V., Schiltz, C., Brunner, M., Landerl, K., & Ugen, S. (2016). Solving arithmetic problems in first and second language: Does the language context matter? *Learning and instruction* (42), 72-82.

Rollnick, M. (1998). The influence of language on the second language teaching and learning of science. *Socio-science perspectives on science education* 121-139.

Salamonson, Y., Glew, P. J., Ramjan, L. M., Jefferies, D., Maneze, D., Crook, B., & Everett, B. (2021). Psychometric evaluation of the 11-item English language usage scale in commencing nursing students. *Nurse Education Today*, 96, 104599.

Sari, L. I. (2019). Second/Foreign Language Learning from the Socio-psychological Perspective and the Implications in Language Classroom. *Advances in Social Science, Education and Humanities Research* (443), 411-417.

Safwat, R. F., & Sheikhany, A. R. (2014). Effect of parent interaction on language development in children. *The Egyptian Journal of Otolaryngology* 30(1), 255–263.

Thibaut, L., Knipprath, H., Dehaene, W., Depaepe, F. (2018). The influence of teachers' attitudes and school context on instructional practices in integrated STEM education. *Journal of*

Teaching and Teacher Education, 71, 190-205.