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EFFECT OF GRADES ONE AND TWO LANGUAGE OF INSTRUCTION ON PERFORMANCE IN MATHEMATICS AMONG GRADE THREE PUPILS IN RULINDO DISTRICT, RWANDA

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ABSTRACT

Introduction: Prior research has indicated that poor performance in Mathematics may be attributed to the inability of candidates to express ideas in English. There has been little focus on the effect of language use on the learners' performance in Rwanda schools, where the Language Policy for Education has changed drastically since the country's independence in 1962.

Purpose: This paper sought to find out how the language used for instruction at Grade One and Grade Two could be used to envisage subsequent performance in Mathematics at Grade Three.

Methodology: A causal comparative research design of *Ex-post facto* nature was adopted. The study involved 188 pupils and 6 Mathematics teachers randomly selected. A Mathematics Achievement Test and teachers' interview guide were used to collect data. Data was analysed using a One-way ANOVA and thematic analysis.

Results: The study revealed that pupils whose Language of Instruction was English from Grade One and Grade Two performed significantly better in Mathematics at Grade Three than their counterparts whose Language of Instruction was Kinyarwanda at Grade One and Two.

Conclusion and Recommendations: The Language of Instruction at Grades One and Two was the origin for the gap existing among Grade Three pupils who went through the same learning experiences. The findings of this study could help teachers, The Ministry of Education as well as the schools' management to focus on suitable Language of Instruction to improve the quality of learning. The results of this study could also serve as a springboard for further study in the same area.

Keywords: Government Sponsored Private Primary School, Language Policy for Education, Self-Sponsored Private Primary School, Language of Instruction.



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PUBLIC INTEREST STATEMENT

The findings of this study may inform countries that are changing or reviewing their Language Policies. Individual students transitioning to school where they are compelled to change the language of Instruction may also use the findings in choosing the most appropriate school. The findings of the present study, besides contributing to existing knowledge may contribute immensely to literature.

INTRODUCTION

In Rwanda the Language Policy for Education has drastically changed since independence in 1962 up to 1994 before the Tutsi genocide. In 1994, after the Genocide against the Tutsi, large numbers of Rwandan English speakers who had fled into exile, to the neighbouring Anglophone countries: Uganda, Kenya and Tanzania began to return home. In response, the Ministry of Education (MINEDUC) in 1996 announced new education reforms that recommended that Rwanda should adopt both Francophone and Anglophone systems, and that English and French be used as the Languages of Instruction in the respective schools from the Fourth Grade through to university to accommodate the education needs of these returnees. As a result, Rwandan returnees from Anglophone countries adopted English as the Language of Instruction, whereas those coming from Francophone countries as well as those who were in Rwanda before the 1994 Tutsi genocide, were taught in French.

In 2008 the Rwanda Ministry of Education implemented another change of the Language Policy for Education effectively making English the sole medium of instruction from Grade One to university (Trudell, 2016). This was followed by another change of the Language Policy for Education in 2011 that made Kinyarwanda the Language of Instruction from Grade One to Grade Three in public and Government Sponsored Private Primary Schools and English from Grade Four upwards. The change was made following the realisation that using English at all levels of Education was impossible to implement (Sibomana, 2020). However, Rwandan self-sponsored private schools were allowed to use English or French as the Language of Instruction depending on whether the school was Anglophone or Francophone (Mwasa, 2019). In 2021, after months of learning from home due to the Covid-19 pandemic, the Rwandan Government implemented a new Language Policy for Education that required all teachers to instruct in English at all levels of education (Williams, 2021).

The Mother Tongue model results from UNESCO (2014)'s report advocates the use of learners' Mother Tongue for teaching and learning activities with (a) second and/or foreign language(s) being taught as school subjects (when required). However, in spite of the theoretical and empirical evidence for the UNESCO model, this may not be practically possible due to a wide range of social, political, educational and logistical factors. Owing to the above mentioned factors, teachers used any language that they deemed suitable with the consequent impact on all the teaching and learning activities in all subjects, including Mathematics (Sibomana, 2020). This results in rote learning of information. Consequently, learners move to the next level of education with gaps, which impede further learning. Mondoh (2005) observes that in most cases students are pushed to accept an already organized intellectual discipline which they may or may not understand.

Mathematics provides a foundation for our modern society as it forms the conceptual matrix on which emerging sciences, such as Computer Science, Information Technology, Computer Engineering and related fields are built upon. High performance in Mathematics indicates tangible confirmation of meaningful horizontal relationship between various curricula areas. This is consistent with the goals of the Competence Based Curriculum (CBC) which, is to promote application of acquired knowledge to different contexts in the day to day life.

The Rwandan Government acknowledges the importance of Mathematics in the achievement of the Sustainable Development Goals (SGDs). This is the reason why the Government has identified the learning of Mathematics as one of the core priorities aimed at improving the relevance of education (Rwanda Voluntary National Review, 2019). Despite all these efforts, pupils' performance in Primary School Leaving Examination in Mathematics continues to decline (MINEDUC, 2019). Researchers (Ndabaga & Tabaro, 2015; Getty, 2016; Sibomana, 2018; Sibomana, 2020; & Nzasabimfura & Andala, 2022) attributed the

problem to the Language of Instruction. Getty (2016) went on to suggest that given consecutive switches of the Language Policy for Education in Rwanda, it was important for further studies to be undertaken to track its impact on teaching and learning. The present study came as a response to this call.

Hitherto it has been asserted the level of mastery of the Language of Instruction forms the basis for differential performance among learners who have shared the same learning experiences (Nyiramafaranga, 2014; Maluleke. 2019). Studies (Novotná & Moraová, 2005; Algarni, birrell & Porter, 2012; Van Rinsveld, Schiltz, Brunner, Landerl & Ugen, 2016; Bermejo, Ester & Morale, 2021; Awopetu, 2016) found that children learn better using their Mother Tongue. Algarni, birrell & Porter (2012) further noted that 95% (n=21) of students who rated their Mathematics ability as fair/good, later rated their Mathematics ability as very poor/poor when the Mathematics subject was taught using English language. Further, 61% (n=11) of the students who rated their Mathematics ability as very good, later rated their Mathematics ability as fair/good when Mathematics was taught using English language. The researchers explained that it was a consequence of the additional cognitive load in Mathematics. Explicably, it was for the brain to work to translate the language while simultaneously trying to understand the new information. Van Rinsveld et al. (2016) and further pointed out that all participants in his study solved addition faster and more accurately in German than in French. The findings could be related to the fact that German was both their main language and their Language of Instruction in their early years of education. The researchers went further to explain that some steps of the complex addition relied on verbal processes that were more difficult to transfer to another language, than to the language in which they were initially learned.

In support of the above, Jaber and Daana (2020) added that pupils exposed to a second language in their early years of education, their performance in Mathematics declined. They further ascertain that children did not have the necessary second language skills. In that connection, children were required to focus on the new language and on the material they needed to learn at the same time. It is noteworthy that Jaber and Daana

(2020) sampled respondents from two schools with different teaching system. The present study made consideration that there may be differences in performance between these schools as a result of differing teaching systems. For this reason, to overcome this gap, the researcher sampled respondents from the schools that the Competence Based Curriculum (CBC) system.

However, the results of the analysis from Sosibo (2016)'s study showed that 28% of participants did not observe any relationship between second language and teaching and learning of Mathematics. Teachers in his study argued that Mathematics was not about English or Afrikaans language. According to them Mathematics was about understanding and logic. They claimed that it was the power within individual elements that could lead to success regardless of whether or not the individual learner had a predisposition to the cultural linguistic capital of English. Sosibo (2016) explanations are unjustifiable. Education and language are inseparable components of each other. The former is not possible without the latter (Beka, 2016).

University students involved in Beka (2016)'s study reported that the use of Mother Tongue at the Lower Primary Grades contributed to poor performance in other languages and highly contributed to writing, spelling, reading and pronunciation errors in English and other languages because of Mother Tongue interference. Beka (2016) went further to explain that children taught using their Mother Tongue at the early grades, could find problems in expressing themselves in the official language in the Upper Primary Grades as they could be thinking in their Mother Tongue before expressing themselves in English.

Beka (2016)'s study involved university students and used questionnaire and focus group to measure performance, yet questionnaire and focus group have the intrinsic weakness of being predisposed to biases of the respondents. The present study made consideration and used the Mathematics Achievement Tests to triangulate data collected from the teachers' interview. Further, Beka (2016) did not consider any intervening variable. This suggested need to conduct a related study that focused on primary school pupils and considered intervening variables (Pupils' Mathematics knowledge background, Teacher qualification, gender of pupils and

pupils' socio-economic status) as to effectively investigate the effect of the Language of Instruction on pupils' performance. An earlier research conducted in Kenya by Orwenjo (2012) explained Beka (2016)'s findings. Orwenjo (2012) argued that learners exposed to instruction in English language performed well only, when their English proficiency was high. Orwenjo (2016) proposed that in order to produce learners who are capable in Mathematics, learners should be exposed to English only instruction. With respect to Rwanda, Sibomana (2017) reported that 90% of teachers were not proficient in English, the Language of Instruction, thus the effective teaching and learning of Mathematics using a second language became threatened.

The reviewed studies in this section revealed that there are many methods and countless research instruments that could be used to study the effect of Language of Instruction on pupils' performance. Arguably, it is also acceptable to use more than one tool to study the effect of the Language of Instruction on pupils' performance. It is also possible to design, adopt and/or adapt research instruments to suit a specific interest of the study. The present study, used a Mathematics Achievement Test adapted from a Grade Three Mathematics textbooks recommended by Rwanda Education Board (REB) and Teachers' Interview Guide to collect data.

The studies reported in this section sampled respondents without taking into consideration the background of their Language of Instruction. The present study made consideration that they might be pupils who at Grade One used the Language of Instruction that is different from the one used at Grade Two as a result of changing schools. Therefore, the sample of this study was limited to pupils who had attended the same school since their first day of joining school.

The reviewed literature showed that the effect of the Language of Instruction on performance in Mathematics has not been exhaustively researched on. This study therefore sought to find the effect of the language of instruction at Grade One and Grade Two, on performance in Mathematics at Grade Three in Rulindo District, Rwanda.

This study was guided by Jean Piaget's (1936) Cognitive Theory. Piaget (1936) argued that human beings built new knowledge upon their previous one and emphasised that each new stage of intellectual development

incorporated and retained the earlier stages. Piaget emphasised that children developed their reasoning throughout their varying stages of life and that there was a link between the current and the subsequent intellectual development stage. Effective attainment of the learner's next level depends on the developmental level of the learner (Ohta, 2000). When children enter school, they already have some Mathematics concepts understood in their First Language (L1). The best option should be that they continue learning in that language and then transition gradually to the use of second language (OJose, 2008). This is what Piaget called adaptation (Lefa, 2004). Teachers are responsible for this smooth transition. Teachers assist learners to move from a position where they cannot understand the language of instruction to a point where they use it to talk about Mathematics (Setati, 1998). This is achieved through accommodation and assimilation.

STATEMENT OF THE PROBLEM

The Rwandan Language policy for Education recommends English as the sole medium of instruction from Grade One to university. information based on empirical studies on whether the language used for Instruction affects performance in Mathematics in the Rwandan setting is lacking. Studies related to the effect of the Language of Instruction on learners' performance presented contradicting findings, were not exhaustive and have been carried out in outside Africa. Little has been conducted in Africa with few conducted in East Africa. Further, researchers (Getty, 2016; Sibomana, 2020) recommended that further studies be undertaken to track the impact of the language of Instruction on teaching and learning in different settings in Rwanda. It is in this realisation that this study sought to find out the effect of the Language of Instruction at Grade One and Grade Two on pupils' performance at Grade Three in Rulindo District, Rwanda.

THE PURPOSE OF THE STUDY

This paper sought to find out how the Language of Instruction at Grade One and Grade Two could be used to envisage subsequent Performance in Mathematics at Grade three given other variables such as pupils' Mathematics knowledge background,

teacher qualification, gender of pupils and pupils' socio-economic status.

HYPOTHESIS

1. There was no significant difference in Performance in Mathematics pre-test between Grade Three pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda and their counterparts whose Language of Instruction at the same grades was English.
2. There was no significant difference in Performance in Mathematics post-test between Grade Three pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda and their counterparts whose Language of Instruction at the same grades was English.
3. There was no significant gender difference in Performance in Mathematics post-test between Grade Three pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda and their counterparts whose Language of Instruction at the same grades was English.

METHODOLOGY

Research Design

The study used a causal comparative research design of *Ex-post facto* nature. The researcher sought to find out the effect of the Language of Instruction at Grade One and Grade Two, on Performance in Mathematics among Grade Three pupils by comparing the performance of two groups of pupils and then determined whether the two groups performed differently in Mathematics. The first group consisted of Grade Three pupils (from Government Sponsored Private Primary Schools [GSPPS]) whose Language of Instruction from Grade One to Grade Two was Kinyarwanda and English at Grade Three. The second group consisted of Grade Three pupils (from Self-Sponsored Private Primary Schools [SSPPS]) whose Language of Instruction from Grade One to Grade Two was English and continued to use English at Grade Three.

Population and Sample

All the pupils in primary schools in the Republic of Rwanda constituted the population of this study. The schools served as sampling

units. The study was conducted in Rulindo District, Rwanda and targeted all Rwandan primary school pupils. Schools were stratified as either Government Sponsored Private Primary or Self-Sponsored Private Primary Schools. Purposive sampling was employed to select Grade Three pupils. Stratified random sampling method was used to select pupils based on their gender. The researcher randomly selected the required sample size. Ninety-five (95) Grade Three pupils from classes that used Kinyarwanda at Grade One and Grade Two from GSPPS and other 93 Grade Three pupils from classes that used English at Grade One and Grade Two from SSPPS were selected. Six (6) Grade Three Mathematics teachers from 16 selected classes were randomly selected. The researcher limited the sample to pupils who had attended the same school since their first day of joining school. Only pupils from category B families were considered. Category B includes families that earn between Rwf 65, 000 (approximately \$56) and Rwf 600, 000 (approximately \$519) monthly or own between a hectare to 10 hectares of land for rural areas, or between 300 square meters and one hectare in cities (Bishumba, 2021).

Instruments for Data Collection

A Mathematics Achievement Tests (pre-test and post-test) adapted from the textbooks recommended by the Rwanda Education Board (REB), and an interview guide designed by the researcher were used to collect data. A table of test specification was used to ensure the content validity of the Mathematics Achievement Test. In addition, extensive review of all the research instruments by the supervisors, lecturers from the School of Education who are experts in the field, as well as Mathematics teachers in selected schools helped to ensure the achievement of construct validity. Further, the construct validity and reliability of the test items rested on the items, having adapted from a textbook acknowledged by Rwanda Education Board (REB). The textbook had gone through review and proof reading by boards of subject specialists from the Rwandan Ministry of Education. In addition, the reliability of the test was established through test-retest method. Pearson's correlation coefficient between two repeated scores of the same test to the same participants was calculated and a reliability of 0.8 was obtained and considered significant.

Procedures for Data Collection

Ethical principles were observed. Informed consent was obtained from all participants; permission was sought from the Government authorities, heads of the schools, teachers and the authorisation was obtained from the university where the researcher was affiliated. During the first week, the teachers were showed the content to be covered and the required teaching learning resources. During the second week, a pre-test was administered by teachers to the groups of pupils to determine the homogeneity of their knowledge in the topics. Immediately after exposing pupils to the last topic, the post-test was administered to obtain raw test scores as a measure of performance. Face to face teachers’ interviews were conducted on one-to-one basis. The voice recorder was utilised as a backup for the information written down during the interview session.

Methods of Data Analysis

Data collected was grouped according to the Language of Instruction used at Grade One and Grade Two. This resulted in two (2) groups of pupils which were used in analysing the effect of the Language of Instruction at Grade One and Grade Two on performance in Mathematics at Grade Three. The score sheets for the pre-test and post-test were prepared and edited for accuracy and consistency.

The data obtained from the pre-test and the post-test results of each group were

analysed using Statistical Package for Social Sciences (SPSS) version 23, in which descriptive statistics and a one-way ANOVA were used. The method was used to assess the mean difference between groups. In the overall interpretation, the significance difference was tested at $p < 0.05$ level. However, as Sekeran and Bougie (2010) mentioned that ANOVA cannot tell where the differences lie. Tukey’s Post hoc comparisons were used to confirm where the differences occurred among groups. Thematic analysis method was employed to analyse data collected from the interview.

RESULTS

Data analysis involved a group of 93 Grade Three pupils whose Language of Instruction was English at Grade One and Grade Two and another group of 95 Grade Three pupils who used Kinyarwanda as the Language of Instruction at the same grades. The two groups of pupils were subjected to Grade Three Mathematics Achievement Test and the results of performance on the pre-test MAT are presented in Table 1 and Table 2.

Hypothesis 1: There was no significant difference in Performance in Mathematics pre-test between Grade Three pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda and their counterparts whose Language of Instruction at the same grades was English.

Table 1: Comparison of the Pre-test MAT Mean Scores of Grade Three Pupils

Group	N	Mean	Std. Dev	SEM
Kinyarwanda (GSPPS)	95	2.926	2.626	0.269
English (SSPPS)	93	3.107	2.103	0.218

Table 2: Independent Samples t-Test of the Pre-test MAT Results of Grade Three Pupils

		T	Df	Sig (2-tailed)
PM pretest	Equal variances assumed	-0.522	186	0.603
	Equal variances not assumed	-0.523	178.999	0.602

The comparison from Table1 indicates that Grade Three Mathematics pupils whose LI was English from Grade One to Grade Two performed better ($M=3.107$; $SD= 2.103$) than Their counterparts whose Language of Instruction was Kinyarwanda ($M=2.926$;

$SD=2.626$). The results in Table 2 demonstrates that the mean scores of the two groups were not significantly different ($t= 0.522$, $p>0.05$). The findings ascertained that the two groups under study were comparable at the beginning of the study.

Hypothesis 2: There was no significant difference in Performance in Mathematics post-test between Grade Three pupils whose Language of Instruction at Grade

One and Grade Two was Kinyarwanda and their counterparts whose Language of Instruction at the same grades was English.

Table 3: Comparison of the Post-test MAT Mean Scores of Grade Three Pupils

Group	N	Mean	Std. Dev	SEMF
Kinyarwanda (GSPPS)	95	10.968	4.668	0.478
English (SSPPS)	93	13.688	5.858	0.607

Table 4: Independent Samples t-Test of the Post-test MAT Results of Grade Three Pupils

		t	Df	Sig (2-tailed)
PM Post-test	Equal variances assumed	-3.524	186	0.001
	Equal variances not assumed	-3.515	175.541	0.001

The results summarised in Table 3 revealed that Grade Three pupils whose Language of Instruction was English at Grade One and Grade Two recorded higher mean score in the post-test (M=13.688, SD=5.858) than did their counterparts who used Kinyarwanda as the Language of Instruction at the same grades (M=10.968, SD= 4.668). In order to find out whether the difference in performance in Mathematics of these groups was statistically significant, an independent samples t-test comparison of the mean scores for Grade Three pupils' post-test MAT was computed. The results from Table 4, indicates that pupils whose Language of Instruction from Grade One to Grade Two was English performed significantly better in Grade Three MAT Post-test than their counterparts whose Language of Instruction from Grade One to Grade Two was Kinyarwanda (t=3.524, p=0.001).

Therefore, the null hypothesis which stated that there was no difference in Performance in Mathematics at Grade Three between pupils whose Language of Instruction at Grade One and Grade Two was English and their counterparts whose Language of Instruction at the same grades was Kinyarwanda was rejected. It was necessary to find out the effect of the Language Instruction from Grade One to Grade Two and gender of pupils as well as their interaction on performance in the MAT post-test.

Hypothesis 3: There was no significant gender difference in Performance in Mathematics post-test between Grade Three pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda and their counterparts whose Language of Instruction at the same grades was English.

Table 5: Comparison of the Post-test MAT Mean Scores Based on Gender

Type of school	Group	N	Mean	Std. Dev	SEM
GSPPS	FK	48	10.812	4.670	0.674
	MK	47	11.127	4.711	0.687
SSPPS	FE	48	11.500	6.253	0.902
	ME	45	16.022	4.382	0.653
	Total	188	12.313	5.450	0.397

Grade Three male pupils whose Language of Instruction from Grade One to Grade Two was English, had the highest mean (M=16.022, SD=4.382). The least performing

were Grade Three male pupils whose Language of Instruction from Grade One to Grade Two was Kinyarwanda (M= 11.127, SD=4.711).

Table 6: Results of a One-way ANOVA for the Four Groups Subjected to Post-test MAT

	Ss	Df	Ms	F	Sig
Between Groups	824.960	3	274.987	10.698	.000
Within Groups	4729.524	184	25.704		
Total	5554.484	187			

The results in Table 6 shows that the mean scores of the four groups on MAT Post-test are significantly different ($F(3,184) = 10.698$; $p=0.000$). Results revealed significant gender differences in the post-test.

Data from the teachers' interview were organised under three themes:

A Tukey's Post Hoc comparison was used to find out the group (s) responsible for the significance difference. The results are presented in Table 7.

Table 7: Tukey's Post Hoc Comparison of Post-test MAT Mean Scores Based on Gender

(I) Posttest	(J) Posttest	Mean Difference (I-J)	Std. Error	Sig.
FK	MK	-0.315	1.040	0.990
MK	FE	-0.687	1.034	0.910
	ME	-5.209*	1.051	0.000
FE	FE	-0.372	1.040	0.984
	ME	-4.894*	1.057	0.000
	ME	-4.522*	1.051	0.000

Table 7 revealed that the mean of the group of male Grade Three pupils whose Language of Instruction at Grade One and Grade Two was English was significantly different from that of Grade Three female pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda ($p=0.001$). Similarly, the mean of Grade Three male pupils whose Language of Instruction at Grade One and Grade Two was English was significantly different from that of Grade Three male pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda ($p=0.001$) and that of Grade Three female whose Language of Instruction at Grade One and Grade Three was English ($p=0.001$). The results clearly showed that the significant difference was due to the male pupils whose Language of Instruction at Grade One and Grade Three was English.

Data from the teachers' interview were organised under three themes:

English/Kinyarwanda Skills Required Were not well Developed

Most of Grade Three pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda, could not read and write sentences properly in Kinyarwanda when they were in Grade Two. Teachers went on to explain that the Language of Instruction changed to the language that learners were not conversant with. As a result, pupils found it challenging learning Mathematics. The teachers explained further that these learners were expected to learn new Mathematics topics using a new Language of Instruction. Their Performance in Mathematics was bound to be poor.

Numbers and Technical Language Need More Time to be Acquired

Interviewed teachers explained that the group of pupils who used Kinyarwanda

from Grade One through Grade Two and transitioned to English at Grade Three was still struggling with counting numbers and the mathematical terms in English. In addition, teachers were of the view that this group could take long to be grounded in English because the exposure to English as the Language of Instruction in Rwanda is confined to the classroom.

Effect of the Language of Instruction on Pupils' Performance in Mathematics

Grade Three pupils whose Language of Instruction at Grade One and Grade Two was Kinyarwanda, were expected to learn new topics in Mathematics using a completely new Language of Instruction. These pupils cannot construct and explain their world, express thought, and add new Mathematics concepts to what they already know because of the bigger mismatch existing between their daily language and the Language of Instruction. Thus, these pupils were liable to poor Performance in Mathematics. On the other hand, Grade Three pupils whose Language of Instruction at Grade One and Grade Two was English have been used to learning Mathematics using English as the Language of Instruction. Therefore, they are quite familiar and have gained the basic Mathematics prior knowledge required in the English language to help them coping with the Grade Three Mathematics content.

DISCUSSIONS

The findings implied that the use of English from Grade One through Grade Two was more effective in enhancing pupils' Performance in Mathematics at Grade Three (where English is the language of Instruction) than the use of Kinyarwanda from Grade One through Grade Two. Interviewed teachers explained that Grade Three pupils whose Language of Instruction was English from Grade One to Grade Two were quite familiar with the Language of Instruction and have gained the basic Mathematics prior knowledge required in the English language to help them coping with the Grade Three Mathematics content. On the other hand, the introduction of English as the Language of Instruction appeared to drive pupils whose Language of Instruction from Grade One through Grade Two was Kinyarwanda out of their comfort zone. Interviewed teachers explained further that Grade Three pupils whose Language of Instruction was Kinyarwanda from Grade One

to Grade Two, were expected to learn new Mathematics topics using a completely new Language of Instruction. Thus, these pupils were liable to poor Performance in Mathematics. These findings are in agreement with those of Nyiramafaranga (2014) as well as those of Maluleke (2019) who all found that the level of mastery of the Language of Instruction forms the basis for differential performance among learners who have shared the same learning experiences. The difference in their Performance in Mathematics could be attributed to the difference in cognitive burden. Piaget's 1936 Cognitive Theory explained the findings. The theory states that effective attainment of the learner's next level depends on the developmental level of the learner (Ohta, 2000).

Similarly, Jaber and Daana (2020) supported the findings and pointed out that the Performance in Mathematics of pupils who are exposed to second language in their early years of education declines. Jaber and Daana (2020) went further to explain that, at this level of education, pupils do not have the necessary second language skills. Consequently, children are required to focus on the new language and on the material they need to learn at the same time. The researchers seem not to have taken into account the impact of the time used to expose the learners to the second language and the nature of knowledge. Considering that the sampled pupils for the present study were all English second language users, Jaber and Daana's (2020) explanation would be totally indefensible. Their conclusion is not applicable in all tasks in Mathematics and at all levels of education.

A recent research conducted by Van Rinsveld et al. (2016) in a bilingual educational setting on the effect of first and second language in solving arithmetic problems explained further that some steps of the complex addition rely on verbal processes that are difficult to transfer to another language than the language in which they were initially learned. It could be more effective if a considerable amount of early literacy and numeracy development continue to be attended to in Kinyarwanda for later transfer into English as the Language of Instruction. Failure to provide support for the ongoing development of pupils' academic literacy in Kinyarwanda reduces the proficiencies available for transfer into English Mathematics instruction. This requires a systematic and

meaningful integration of both Kinyarwanda and English in the process of Mathematics teaching. The findings of this study revealed that early exposure to English both as the school subject and as the Language of Instruction also appear to be a very crucial factor for success in Mathematics. Consideration should be also put on the way to introduce English as the Language of Instruction. This has been supported by Orwenjo (2012). Orwenjo (2012) proposed that in order to produce learners who are capable in Mathematics, learners should be exposed to English only instruction from the first day of joining formal education.

The results of this study indicated that pupils whose Language of Instruction from Grade One through Grade Two was English performed significantly higher in Grade Three MAT than their counterparts whose Language of Instruction from Grade One through Grade Two was Kinyarwanda regardless of their gender. Performance in Mathematics was highly linked to the understanding of the Language of Instruction. Therefore, these findings have implications to the kind of instructional events that are to be adopted for setting up a conducive Mathematics teaching and learning environment that is suitable to both genders.

CONCLUSION

Pupils whose Language of Instruction from Grade One through Grade Two was English and continued with the same language of instruction at Grade Three performed significantly higher than their counterparts whose Language of Instruction from Grade One through Grade Two was Kinyarwanda and transitioned to English at Grade Three regardless of their gender. The difference in performance in Mathematics was explained by the difference in cognitive load.

RECOMMENDATIONS

1. The Language of Instruction should be stipulated early in the learners' educational journey (e.g. at Grade One) and the Government should ensure that pupils continue using the same Language of Instruction to make learning effective.
2. Primary school learners should not attempt, or be compelled, to change their Language of Instruction in an effort to match that of the new school.

3. The recommendations by many researchers who preferred Kinyarwanda to be used as the Language of Instruction in lower primary school level of education is acknowledged, given a reason that effective teaching and learning cannot be done by using the language that learners are not familiar with. This study suggests improvement of teaching and learning of English at lower primary school levels as to provide children with solid foundation of interacting with English and later enable them to use the language confidently and smoothly throughout their formal education. This will help them to understand Mathematics concepts and hence nurture Mathematics pupils who are well prepared to compete nationally, regionally and globally.
4. Most of the information is in English and the learning to learn is one of the Competence Based Curriculum ends. Learners need to acquire English in their early years for them to start learning independently during the early stages of life.
5. The Rwandan Education Board should ensure that schools place more emphasis on quality of learning, rather than covering the syllabus, as an indicator of quality education. A focus on suitable Language of Instruction would ensure such a change in emphasis is attainable.

RECOMMENDATIONS FOR FURTHER RESEARCH

1. The question that remains unanswered by the study is how the Language of Instruction affects pupils' performance of different primary school curriculum subjects.
2. It is not clear whether the poor performance in Mathematics due to learning in Kinyarwanda first at Grade One and Grade Two, and then transitioned to English only instruction at Grade Three fades away as pupils proceed to higher grades. The recommendation in this regard, is that the study be conducted to investigate whether poor performance in

Mathematics declines gradually as pupils move to higher grades.

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