

Reaching gender equity in the classroom: A case study on the choice of language in tests in Senegalese rural schools

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The present study explores the impact of the choice of language in tests for girls' academic performance at monolingual primary and secondary schools in Sub-Saharan Africa. For that purpose, students in grades 3, 6, and 10 (140 girls and 139 boys) from schools in rural Senegal were given a test consisting of three mathematics problem-solving tasks. They were randomly divided into an experimental group if they received the test in a local language, their mother tongue (Sereer for grades 3 and 6, and Joola for grade 10), and into a control group if they received the test in French, the unique language of instruction in the traditional Senegalese public education system. The findings suggest that using a local language familiar to students may contribute to girls' attainment at school: Girls in the experimental group in grades 3, 6 and 10 outperformed girls in the control group, therefore narrowing the existing gender gap in education. The present study also explores the application of Cummins' (1979, 2009) theories of language acquisition: The data shows that girls might take advantage of bilingual education systems that promote the transfer of language skills and knowledge. The results presented in this paper show the benefit of introducing local languages familiar to students in the education system of Senegal and other Sub-Saharan countries where only a European language is employed as the language of instruction, especially for girls, by improving their academic performance and contributing to gender equity in education.

Keywords: Senegal, girls, students' L1, language of tests, academic achievement, gender equity.

1 Introduction

Girls' academic achievement in Sub-Saharan Africa is influenced by established cultural and social habits adopted from a very young age, especially in rural areas (Benson, 2001; Tuwor & Soussou, 2008). Besides, in some countries such as Senegal, students have no other choice but to take tests and receive formal education in a language of instruction (*Lol*) that they scarcely understand,

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generally, an exogenous European language inherited from colonial times (French in Senegal, L2), at the expense of a local language, their mother tongue (L1). These two limitations seem to influence negatively on girls' achievement at school. According to Romaine (2013), girls living in rural areas and receiving education in a language not familiar to them are the most marginalized people. The present study seeks to contribute to the already existing debate on language choice in education in multilingual African countries by focusing on the language of tests and its effect on girls' results at school. In most cases, children in Sub-Saharan Africa are multilingual: They are proficient in the language of their community, their L1, but due to close contact with other linguistic groups, they may speak other local languages (Brock-Utne, 2017).

The first section of the paper is a review of literature subdivided into two parts. The first provides a general picture of the features of education systems in some Sub-Saharan countries that use a LoI not familiar to students and their impact on their school achievement, especially on girls living in rural areas. Also in this first part, there are examples of studies claiming the benefits for girls when their L1 is used in education. The second part of the literature review is a summary of Cummins' (1979) theories of the Threshold and the Interdependence Hypotheses, which are the basis for the methodologies used in experimental bilingual schools in Senegal. The study carried out is described in the second section: First, there is a brief overview of the social and linguistic context of Senegal. There follows a description of the participants, the instruments used, the data collection procedure, and the analysis. After that, the results are presented by grades for the sake of clarity, leading to the discussion, the concluding remarks, and the pedagogical implications. The final section highlights the limitations of the study and suggests further research.

2 Review of the literature

2.1 *Learning through a language not familiar: Particular pitfalls for girls*

Several countries in Sub-Saharan Africa established the language of the colonizer as official despite the rich linguistic diversity of the region. This is also the case in Senegal, the focus of the present study, where French remains the unique official language of the State's institutions, including education (Sall, 2009). Today, French is the LoI in primary and secondary education in Senegalese schools, except for a few experimental bilingual primary schools, for instance, the 98 conducted by the NGO Associates in Research and Education for Development (ARED) and the 12 included in the *Projet Éducation Multi-Langue* (EMiLE).

Among Senegalese people, knowledge of French is believed to be associated with better opportunities and higher social positions (Darby & Dijkstra, 2021). However, most students follow an education model known as submersion where they are taught and assessed through a language they may have never had contact with before they entered school (Heugh, 2011). The consequences are poor linguistic skills in French, the language in which they are supposed to understand both the lessons and the tests (see Martín-Chazeaud & Celaya, 2020). This fact is especially relevant for children living in rural areas as shown in the report *Programme d'Analyse des Systèmes Éducatifs de la CONFEMEN* (2020): In Sub-Saharan countries where French is an official language (among them, Senegal),

students living in urban contexts outperformed those living in rural environments in literacy and mathematics in grades 2 and 6. Similarly, after testing Senegalese students in mathematics, reading, and knowledge of general culture when the language of tests was French, Cissé et al. (2021) claimed that children living in rural areas had the worst results in all domains. As argued by Mohanty et al. (2009), the submersion model generates a circle of failure because language, which is supposed to be the means to gain knowledge, becomes “the enabling factor for access to quality education” (p. 209).

Different studies conducted in Sub-Saharan Africa and Senegal indicate the benefits of using local languages in schools. A case in point is the study carried out by Martín-Chazeaud and Celaya (2020) in traditional public secondary schools in a rural region of southern Senegal. After giving participants a test consisting of mathematical problem-solving tasks in Joola (experimental group) or French (control group), the authors found out that students obtained better academic results when the language of tests was their L1. Similarly, also in Senegal, but in an experimental bilingual programme, Benson (2020) analysed the benefits of using a local language in primary education. In that programme, coordinated by ARED, students received education in both French and a local language (Wolof or Fula) from grade 1 up to grade 4. Throughout these grades, teachers designed and used pedagogical tools in the classroom to promote the transfer of language skills and academic content, based on the theories developed by Cummins (2009). The rate of students who passed the *Certificat de Fin d'Études Élémentaires*, the test given at the end of primary education in French, was higher for the students who attended the experimental bilingual programme as compared to the students in the control group who attended traditional monolingual schools. Also, students in grade 5 attending the bilingual programme showed advantages in writing skills in both French and the local language, a fact attributed to the Interdependence Hypothesis developed by Cummins (1979).

The Senegalese government has taken several initiatives in the last two decades to promote formal education for girls. For instance, they have built schools in rural environments and have tried to raise parents' awareness about the importance of education for their daughters (UN Women, 2023). These efforts have had a positive impact on girls' net-attendance rates and gender equity (see Ministère de l'Économie, du Plan et de la Coopération, 2020). As an example, according to the UNESCO Institute for Statistics (n.d., see Table 1), the net-attendance rate difference between girls and boys from 2015 to 2019 is slightly higher for girls in both primary (grades 1 to 6) and lower secondary education (grades 7 to 10) in both urban and rural contexts, with a few exceptions. However, a significant difference exists in the net-attendance rate among students according to their environment.

Table 1. Total net-attendance rate in Senegalese primary and lower secondary education (UNESCO Institute for Statistics, n.d.)

			2015	2016	2017	2018	2019
Primary education	Girls	Rural	50.28	48.72	52.43	53.41	50.06
		Urban	81.84	81.94	85.96	84.63	80.83
	Boys	Rural	48.92	47.73	49.19	50.31	48.11
		Urban	78.50	77.75	80.41	82.14	79.41
Lower secondary education	Girls	Rural	49.06	47.83	51.26	50.13	52.53
		Urban	77.74	76.19	78.34	77.10	77.26
	Boys	Rural	50.32	51.07	48.78	55.19	47.50
		Urban	75.41	78.53	73.97	73.99	71.39

Some studies have shown similarities between the academic performance of girls and boys, for instance, the report *Programme d'Analyse des Systèmes Éducatifs de la CONFEMEN* (2020). When comparing the results obtained by girls and boys in grades 2 and 6 in literacy and mathematics, both genders obtained similar mean scores in the two areas of study. However, other studies show that girls seem more negatively affected by learning through a LoI unfamiliar to them, especially if they live in rural areas of Sub-Saharan Africa (Benson, 2001; Romaine, 2013; UNESCO Institute for Statistics, 2015). According to the *Agence Nationale de la Statistique et la Démographie* (2020), the percentage of girls who passed both the *Certificat de Fin d'Études Élémentaires* (test at the end of primary education) and at the *Brevet de Fin d'Études Moyennes* (test at the end of lower secondary education) in 2017 and 2018 is in all cases lower than that of boys (see Table 2).

Table 2. Percentage of girls and boys who passed the *Certificat de Fin d'Études Élémentaires* and at the *Brevet de Fin d'Études Moyennes* (Agence Nationale de la Statistique et de la Démographie, 2020)

	2017		2018	
	Girls	Boys	Girls	Boys
<i>Certificat de Fin d'Études Élémentaires</i>	54.6%	59.4%	53.9%	57.3%
<i>Brevet de Fin d'Études Moyennes</i>	42.5%	48.3%	49.2%	55.6%

Benson (2001) and Tuwor and Sossou (2008) argue that girls' schooling in Sub-Saharan Africa is limited by language barriers and social and cultural factors, among them, the traditional role of women in the community. From a very young age, girls are assigned physically demanding household responsibilities; when they get to school, girls feel exhausted and are usually depicted as less efficient academically when compared to boys. Consequently, girls lose motivation, leading to school failure and early dropout. Also, Lopez Calix et al. (2018) argue that child marriage and early childbearing are two causes of girls' school dropout

and low attainment in West and Central Africa. The authors add that keeping girls in school may contribute to reducing the number of girls who marry young and increasing their empowerment. As Angrist (2019) claims, using local languages as LoI in schools may help girls enhance their school performance.

Data from the UNESCO Institute for Statistics (n.d.) revealed that in 2017, the mean years of schooling for the female population in Senegal aged 25 or above was 1.66 years (4.11 years in the case of males). Also, according to data from the UNESCO Institute for Statistics (n.d.), the percentage of illiterate women in 2017 aged 15 to 24 and living in rural areas of Senegal was 61.29%; the percentage of illiterate women aged 15 years or older and living in rural areas of Senegal was 63.96%. Apart from home responsibilities and other social factors that may influence African girls' school attendance, Angrist (2019) claimed that several historical reasons make girls living in former French colonies particularly vulnerable in terms of education. Angrist (2019) argued that French colonisers established an education system with poor resources in African colonies where French was the unique LoI. Due to the belief that mastery of French was related to obtaining employment outside their community, girls were not meant to be schooled because first, learning French was irrelevant since they were not expected to leave their village, and second, such jobs were attributed only to men. Angrist (2019) claimed that French as a unique LoI does not favour girls' education in multilingual Francophone countries in Africa.

Hovens (2002) is an example focusing on girls living in rural areas of Sub-Saharan Africa. The author aimed to analyse the benefits of experimental bilingual projects in Niger. For that purpose, Hovens (2002) gathered participants in grades 3, 4 and 5, and compared their results to students from traditional schools where French was the unique LoI. All participants were given tests of mathematics and reading comprehension that were completed in a local language (Hausa, Zarma, Fula, Tamajaq or Kourani) or French, the official language. When Hovens (2002) compared the results obtained by girls and boys, he observed a gap in favour of boys in all tests, but he noticed that differences shortened when students were tested in a local language.

Benson (2001) aimed to analyse the possible benefits that the use of the students' L1 in education may have on the academic results of girls living in rural areas in Mozambique. In her study carried out in bilingual schools, Benson (2001) argued about the existence of a possible connection between gender and the LoI at school. The researcher observed that girls in grade 5 outperformed boys in disadvantaged rural schools. Also, Benson (2001) claimed that girls attending bilingual schools were more interactive during lessons than those girls who attended monolingual Portuguese schools. The author suggested that girls attending bilingual programmes and receiving instruction in their L1 would increase their motivation, attend school more regularly, get better results, and decrease repetition and dropout rates. Both Benson (2001) and Angrist (2019) claimed that further research was required concerning gender and language issues in the Sub-Saharan context.

2.2 Cummins' theories in the multilingual Senegalese context

Heugh (2011) claimed that the longer students in Sub-Saharan Africa are exposed to their L1 in school (a minimum of six years), the better their proficiency in both the L1 and the L2 is. On the contrary, when an education system considers students' L1 during a short period, linguistic skills are not fixed strongly, and students show poor mastery of the L2 because transfer is inadequate and insufficient. This is what Cummins (1979) developed as the Threshold and the Interdependence Hypotheses. According to Cummins (1979, 2001, 2009), the level of development that students have of their L1 at the moment that they start learning their L2 influences the level of proficiency attainment in their L2. If the mastery of their L1 does not reach a minimum threshold of development, the mastery of the L2 remains poor. Cummins (1979) added that there were two types of thresholds in language proficiency: a lower threshold (low demanding) and a higher threshold (cognitively demanding). The researcher argued that the attainments of the lower threshold and the higher threshold were sequenced: The higher threshold cannot be attained if the lower threshold is not reached. Cummins (1979; 1986; 2005) also claimed that through the Interdependence Hypothesis, knowledge and linguistic skills are transferred from the L1 to the L2 and saved in a Common Underlying Proficiency or storage common to the learners' languages. Cummins (2005) explained that language transfer occurs at both cognitive and linguistic levels, thus encouraging literacy in all the languages of the learner and promoting knowledge learning. In other words, adequate development of literacy skills and a good acquisition of knowledge stored in the Common Underlying Proficiency ensures language proficiency in both the L1 and the L2, and academic attainment. One step further, Cummins (2001) claimed that transfer may also occur from the L2 to the L1. In the Sub-Saharan context, Hovens (2002) found out that participants who attended Nigerien traditional monolingual schools and who had never learnt to read or write in their L1 showed signs of transfer from French to the local language in reading comprehension tasks. In his study, Hovens (2002) suggested that "literacy skills do cross linguistic boundaries within the individual" (p. 206). However, as suggested by Paxton (2009), the transfer of specific academic concepts and language skills may not happen automatically. At the pedagogical level, teachers need to promote it by designing activities implicating all the learner's languages so that students can "use their entire linguistic repertoires in meaningful ways" (García & Hesson, 2015, p. 229).

An interesting study giving evidence of Cummins' theories is Darby and Dijkstra (2021). The researchers compared the literacy skills of students in grades 2 and 3 from twelve schools in Sereer-speaking areas of Senegal: six experimental bilingual schools following the project *Enseignement Multi-Langue* (EMiLE) and six traditional monolingual schools. The test consisted of reading comprehension tasks: the number of words understood from a list of familiar words and also from a text, and the number of correct answers given after reading a text. Darby and Dijkstra (2021) found that students who attended bilingual schools obtained better results than those who attended traditional schools in both grades 2 and 3. The interesting point was that, despite the short period during which students in grade 2 who attended the bilingual programme had been learning literacy in their L1 (five months), their results in Sereer were only slightly lower than the results in French. The researchers suggested that their findings provide evidence for the Interdependence Hypothesis and the storage of literacy skills in the Common

Underlying Proficiency in bilingual programmes. As mentioned above, Benson (2020) also claimed that the success of ARED's bilingual programme was attributed to the transfer of language skills and knowledge between the learner's languages.

Taking into consideration the above-mentioned ideas, the following research questions are posed:

- a) Is the language of tests a determining factor for girls' academic attainment in grades 3, 6 and 10 in Sereer and Joola-speaking areas of rural Senegal?
- b) Is there any evidence of language and knowledge transfer specific to girls who attend monolingual traditional public schools when tested in their L1?

3 The study

3.1 Social and linguistic context

Senegal is a West African country with a population of 17.73 million people: 52.4% live in rural areas while 47.6% are settled in cities. There are 8.91 million women and 8.82 million men (Ministère de l'Économie, du Plan et de la Coopération, 2022). After Senegal gained its independence from France in 1960, the language of the former coloniser, French, was established as the official language of the country and, therefore, the unique language to be employed in administration and education (Cissé, 2011). In 1971, six local languages were given the status of *langue nationale*: Joola, Fula, Malinké, Sereer, Soninké and Wolof (Diallo, 2005). Some years later, in 2001, the state approved the new constitution, recognising more languages with this status: "*la langue officielle de la République du Sénégal est le français. Les langues nationales sont le diola, le malinké, le pular, le sérère, le soninké, le wolof et toute autre langue qui sera codifiée*" (Fall, 2007, p. 99). According to Diouf et al. (2017), there are twenty-one local languages in Senegal with a written form and recognised as *langues nationales*. In line with Bamgbose (2011), these languages have no place in administration and none of them are employed formally as LoI in public education (except for some experimental primary schools, see Benson, 2020; Darby & Dijkstra, 2021). The most widely spoken of these *langues nationales* are employed by the media in the oral domain in television and radio programmes, especially Wolof, together with French (Dior, 2022; Samb, 2008). The Ministry of Education has recently announced the intention of the government to introduce local languages in the early grades of primary school. In the present study, two *langues nationales* were involved: Sereer (the variety called Sine-Saloum or Singandoum) and Joola (the Kasa variety).

3.2 Participants

The present study involved students from five primary schools (grades 3 and 6) in the regions of Fatick and Koalack whose L1 was Sereer, and from three secondary schools (grade 10) in the region of Ziguinchor whose L1 was Joola. All the participants had in common that they lived in a rural environment in communities for whom the primary sources of income depended on agriculture, farming and fishing. In line with Brock-Utne (2017), children in Sub-Saharan

countries are mainly multilingual as they come into contact with people from other linguistic groups since their early childhood. In the context of the present study, participants may also speak other local languages such as Wolof, Fula, Bambara or Mandinka.

With information from a questionnaire, those students who had repeated a school grade and those who were not fully fluent in Sereer (for grades 3 and 6) or Joola (for grade 10) were discarded. The reason was that all participants had to share the same features regarding the time of exposure to French at school (3, 6 and 10 years, with respect to their corresponding school grade), and be fluent in the local language. The final number of participants was 279: There were 154 in the experimental group (76 girls and 78 boys) and 125 in the control group (64 girls and 61 boys). Students were randomly distributed into groups according to the testing language: the experimental group (Sereer or Joola) and the control group (French). To study the effect of the language of tests on girls' academic achievement, each group was divided into two subgroups according to gender (see Table 3).

Table 3. Distribution of participants in the present study

	Experimental group (L1)			Control group (L2)		
	Girls	Boys	Total	Girls	Boys	Total
Grade 3	30	24	54	23	12	35
Grade 6	19	18	37	11	12	23
Grade 10	27	36	63	30	37	67

3.3 Instruments

Bearing in mind the objective of the present study (analysing the effect of the language of tests on girls' academic achievement), the test consisted of three mathematics problem-solving tasks (henceforth, M). The reason for this test is that language comprehension is a critical factor in answering correctly. All the tests were designed according to the Senegalese curricula for each grade, and also taking into consideration the social and cultural environment of the students. The researcher also made sure that there were no elements showing gender disparity or discrimination. Tests were designed in French and translated into Sereer for grades 3 and 6 and into Joola for grade 10. The translation was carried out by education experts who had Sereer or Joola as their L1 and who had received instruction in those languages. When designing the tests, local differences were taken into consideration since there might exist isolated linguistic differences in the vocabulary or the pronunciation of some words. For example, the phoneme [f] is equivalent to the phoneme [p] as in the word *afalom* (or *apalom*), meaning "my friend". Each M task was translated backwards to verify reciprocity in both languages and checked by local education experts. Tests were piloted before the data collection procedure in the same target areas and adjustments were made when required.

Because students attended monolingual traditional schools and had never received formal instruction in local languages at the moment they took the tests, M tasks were administered orally by native speakers of each target language who took into account the local pronunciation. With the purpose of analysing language comprehension, participants were asked to draw what they understood on an answer sheet. To avoid undesired effects of short memory on the results, the instructions for each task were repeated as many times as required by the students.

With the purpose of collecting sociolinguistic information, the researcher asked participants to complete a questionnaire. The answers allowed to discard those students who did not match all the requirements for the present study, as explained above: Students for whom Sereer (grades 3 and 6) or Joola (grade 10) was not their L1 and those students who had repeated a grade so that participants had the same number of years of exposure to French at school.

3.4 Data collection procedure

Before the data collection procedure, the principal of each school signed a consent form specifying his or her agreement with the researcher to administer tests to the students. Participants were classified into groups and placed in different rooms according to the language of tests (local language or French). The procedure was explained to the participants in the language in which they received the M test, one example was given with illustrations on the board. Volunteer teachers and the researcher himself made sure that all students understood the instructions.

As explained above, the tests were administered orally by native speakers of each language: The author of the present study read the problem-solving tasks in local French while volunteer teachers did so in Sereer or Joola. The teachers were very helpful with the supervision of the data collection procedure. After tests were administered, a questionnaire was given to the participants. When the process was finished, students and teachers were rewarded with refreshments. There is no electricity in some rural areas of Senegal, so the printed material was previously prepared and brought to the schools.

3.5 Data analysis

After the data collection procedure was completed, the tests were corrected by the researcher of the present study and supervised by an expert in teaching and assessing mathematics. The correction and codification of the results obtained in tests followed specific criteria (see Appendix 1 for examples):

- There is not any element or number showing the comprehension of M or any intention for calculating: 0 points.
- One, two or three elements appear on the answer sheet and show some comprehension of M: 0.5 points.
- There are more than three elements or numbers on the answer sheet; the participant tries to calculate: 1 point.
- Most of the numbers and elements of M appear on the answer sheet, a fact which shows that the participant has understood the task. There is calculation, but the answer is not correct: 1.5 points.

- All the elements and numbers of the problem-solving task appear on the answer sheet. The given answer is correct (or very close): 2 points.

The best possible score that students could obtain was 6 points (2 points for each task). Therefore, the level of 3 points was considered the threshold for determining academic attainment.

Once tests were codified, the data obtained was analysed according to two variables in each grade: the language of the M test and the gender of the participant. In order to answer the research questions previously posed, girls' results in each experimental group were compared to those obtained by their female colleagues in the respective control group, and the same was done for boys. After that, the results were compared between girls and boys when they received M in their local language (experimental group), and also between girls and boys when the test was administered in French (control group).

The study began by calculating the percentage of participants in grades 3, 6 and 10 based on their score obtained in M. After that, the percentage of participants who reached the threshold achievement (3 points or above) was established, and participants were classified along a rating scale according to their score. Mean scores for each subgroup were calculated and compared. Finally, the data were submitted to statistical analysis through SPSS 29: One-way ANOVA was applied to the data for each grade, separately. Then, Levene's test for equality of the variances was conducted to check the homogeneity of the variance. The data were submitted to the appropriate post-hoc test: Bonferroni when the variances were homogeneous and Games-Howell when there was a significant difference between the variances.

4 Results

4.1 *The effect of the students' L1 on the gender gap in grade 3*

In order to have a general picture of the students' achievement in M, first of all, the percentage of students who reached the level of 3 points (or threshold achievement) was determined. After that, participants were classified along a rating scale (from 0 to 6 points) according to their score.

As of grade 3, 80% of girls and 95% of boys in the experimental group, and 0% of girls and 16.67% of boys in the control group obtained scores equal to or above the threshold achievement. As shown in Figure 1, a large percentage of girls who took the test in Sereer obtained scores between 3 and 4 points. On the contrary, none of the girls who took the test in French obtained scores above 1 point. Compared to boys who also received the M test in Sereer, percentages in the rating scale are similar; however, a slightly higher percentage of girls scored 6 points.

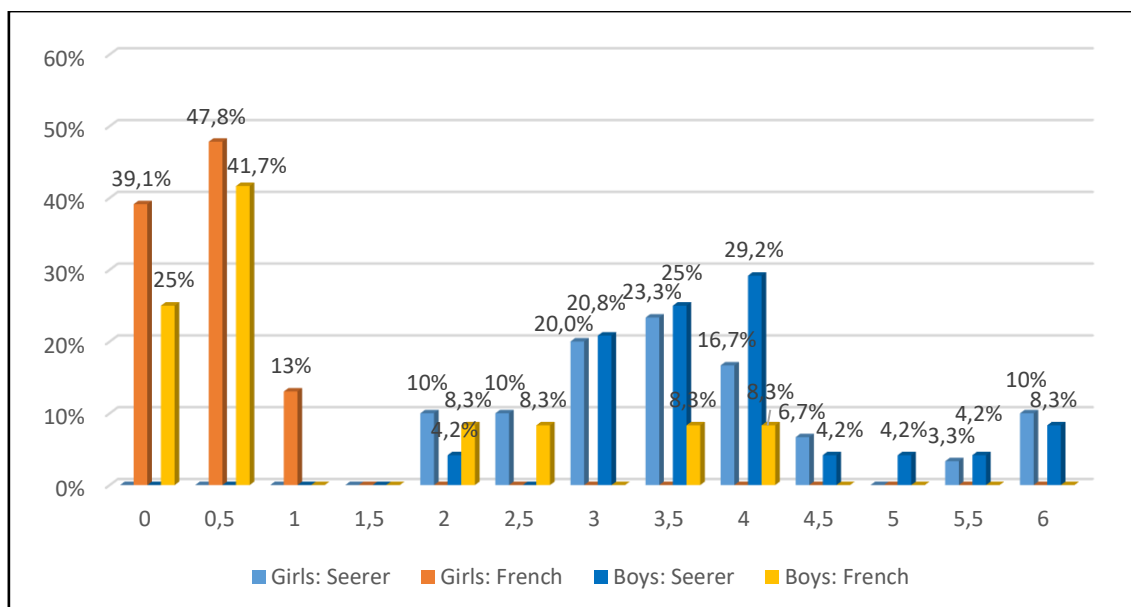


Figure 1. Distribution of participants' scores in the ranking scale in grade 3

The data obtained from the participants in grade 3 was used in inferential analysis. As shown in Table 4, the one-way ANOVA revealed statistically significant differences between the four subgroups, $F(3, 85) = 70.45, p < .001$.

Table 4. Results of the one-way ANOVA analysis for grade 3

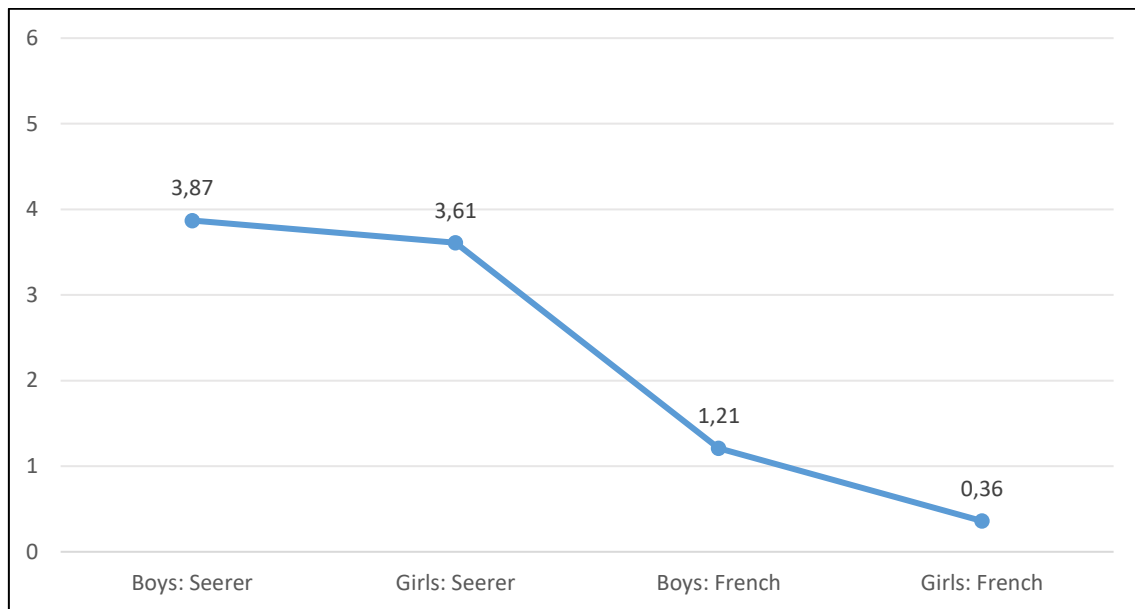
	Girls		Boys	
	Sereer	French	Sereer	French
Mean	3.61	.36	3.87	1.21
SD	1.13	.34	.97	1.42
F	70.45			
p	< .001			

As shown by Levene's test for equality of variances, there was a significant difference between the variances for grade 3 ($p < .001$). Hence, the Games-Howell post-hoc test was applied to mean scores at grade 3 in the M test to identify any significant differences (see Table 5). The test showed that the mean score difference between girls in the experimental group and girls in the control group was significant ($p < .001$); the same was true when comparing the mean difference between boys in the experimental group and those in the control group ($p < .001$). When the language of tests was the same for both genders, no statistically significant differences were found. It should be noted that the mean difference between girls who received the M test in Seerer and those who received it in French was the largest among the groups compared.

Table 5. Output of the Games-Howell test at grade 3

	Girls: Sereer vs Girls: French	Boys: Sereer vs Boys: French	Girls: Sereer vs Boys: Sereer	Girls: French vs Boys: French
Mean difference	3.25	2.66	0.26	0.85
p	< .001	< .001	.802	.238

The four subgroups in grade 3 (according to gender and the language of tests) were ordered according to their mean score in the M test. As shown in Figure 2, both genders in the experimental group obtained mean scores above the threshold achievement whereas those in the control group obtained mean scores below this threshold. Of special concern are the poor results obtained by girls who were given the M test in French.

**Figure 2.** Participants' mean scores in grade 3

4.2 The effect of the students' L1 on gender gap in grade 6

After analysis of the results, 73.68% of girls in grade 6 who received the M test in Sereer scored equal to or above the threshold achievement as compared to 36.36% of girls who received the test in French. Concerning boys, 83.33% of those who were given the M test in Sereer reached the threshold, and only 25% of them did so when the language of the test was French.

Students in grade 6 were distributed along a rating scale (from 0 to 6 points) according to their results (see Figure 3): The best scores were reached by participants in the experimental group, with a higher percentage of girls than boys who obtained 5 points. It is worth noting that girls in the control group had a slightly better score (4.5 points) than boys (4 points).

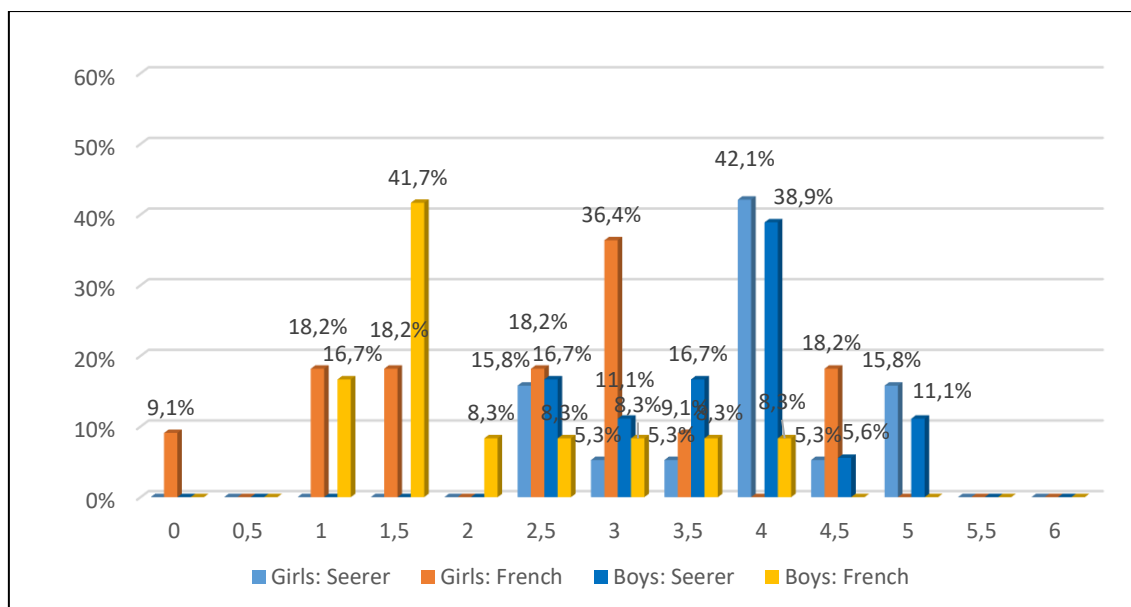


Figure 3. Distribution of participants' scores in the ranking scale in grade 6

The one-way ANOVA was performed to analyse the effect of the language of tests on students' results: Mean scores were significantly different among the four subgroups, $F(3, 56) = 14.06$, $p < .001$ (see Table 6).

Table 6. Results of the one-way ANOVA analysis for grade 6

	Girls		Boys	
	Sereer	French	Sereer	French
Mean	3.63	2	3.69	2.04
SD	1.03	1.05	.77	.99
F	14.06			
p	< .001			

After applying Levene's test for equality of the variances to the data obtained from students in grade 6, homogeneity of the variances was found ($p = .409$). The Bonferroni post-hoc test showed that the mean difference between girls who received the M test in Seerer and those who received it in French was statistically significant ($p < .001$), and the same was true for boys ($p < .001$). However, no statistically significant differences were found when girls and boys took the M test in the same language (see Table 7).

Table 7. Output of the Bonferroni test at grade 6

	Girls: Seerer vs Girls: French	Boys: Seerer vs Boys: French	Girls: Seerer vs Boys: Seerer	Girls: French vs Boys: French
Mean difference	1.63	1.65	.06	.04
p	< .001	< .001	1	1

The four subgroups of participants in grade 6 were ordered concerning their mean scores. As shown in Figure 4, girls and boys for whom the language of tests was Seerer, on average, obtained mean scores above the threshold achievement. This was not the case for the participants who took the M test in French.

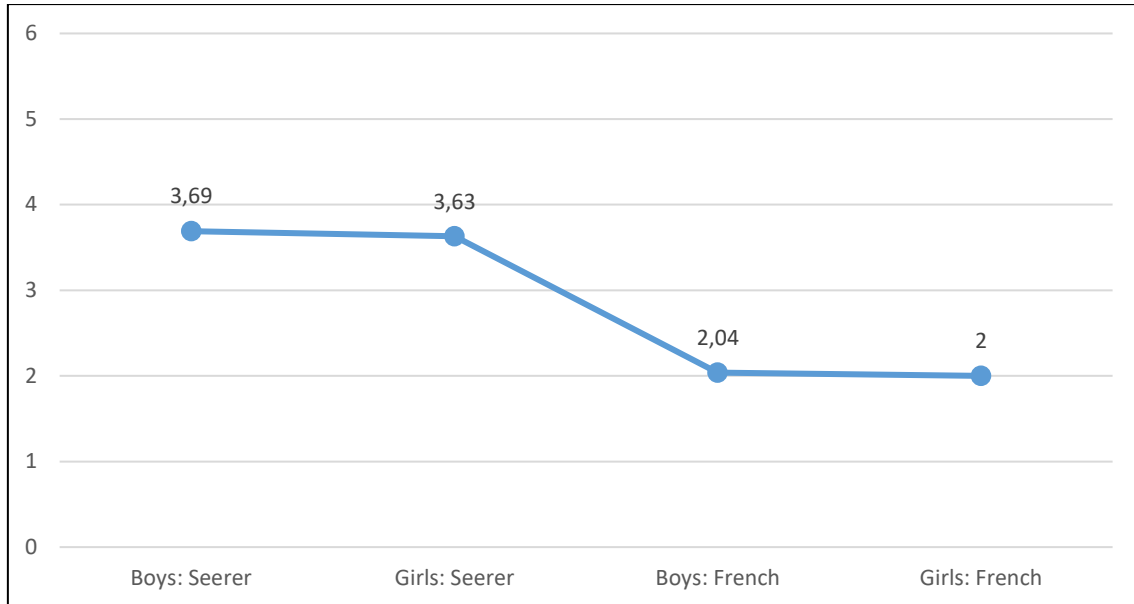


Figure 4. Participants' mean scores in grade 6

4.3 The effect of the students' L1 on the gender gap in grade 10

Concerning the participants in grade 10, the percentage of girls who obtained scores equal to or above the threshold achievement (level of 3 points) was 62.96% when they received the M test in Joola, while only 30% of girls who received the test in French achieved the same threshold. The percentage of boys who were given the M test in Joola is larger than that of boys who were given it in French: 77.78% and 62.16%, respectively. As noticed, and different from girls, the majority of boys reached the threshold achievement in both languages.

Students in grade 10 were classified along a ranking scale (from 0 to 6 points) according to gender and to the language in which they took the M test (Joola or French). As shown in Figure 5, the percentage of girls in the experimental group who obtained 4 or 4.5 points is larger than that of boys also in the experimental group. It should be added that despite their poor average results, a few girls in the control group obtained better scores than boys.

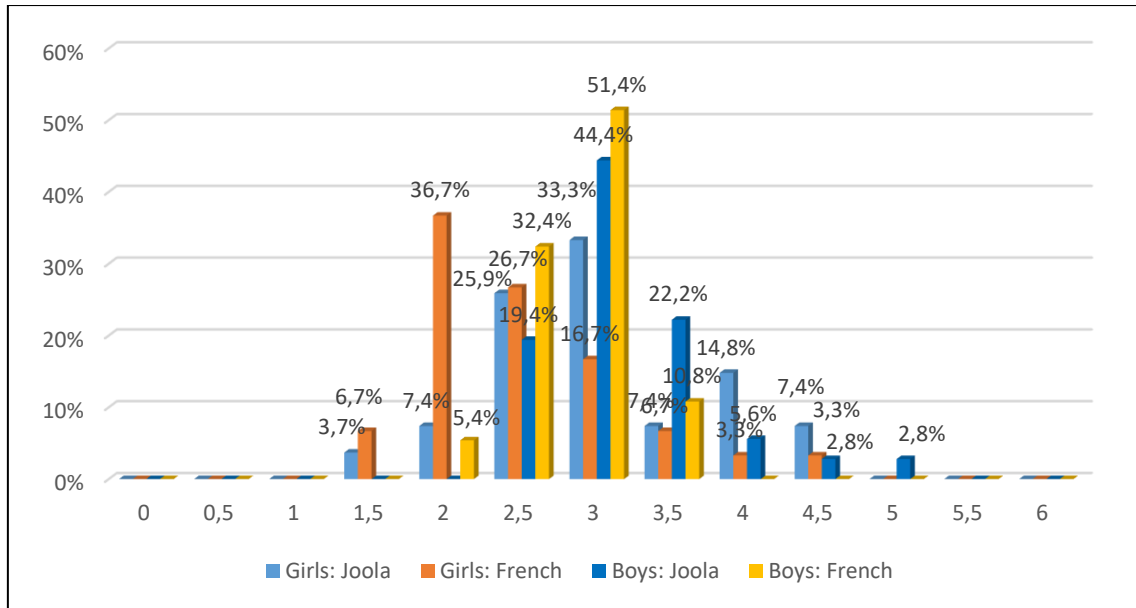


Figure 5. Distribution of participants' scores in the ranking scale in grade 10

As shown in Table 8, the one-way ANOVA revealed statistically significant differences among the four subgroups, $F(3, 126) = 6.40, p < .001$.

Table 8. Results of the one-way ANOVA for grade 10

	Girls		Boys	
	Joola	French	Joola	French
Mean	3.04	2.52	3.14	2.84
SD	.76	.36	.59	.73
F	6.41			
p	< .001			

Levene's test for equality of the variances found a significant difference between variances for grade 10 ($p = .041$). Post-hoc comparisons using the Games-Howell test confirmed that the difference between mean scores obtained by girls when the language of tests was Joola or French was statistically significant ($p = .047$). Contrary to grades 3 and 6, the mean score difference between boys in the experimental group and boys in the control group was not statistically significant. When the language of tests was the same for participants, the mean score difference between girls and boys did not appear to be significant (see Table 9).

Table 9. Output of the Games-Howell test at grade 10

	Girls: Sereer vs Girls: French	Boys: Sereer vs Boys: French	Girls: Sereer vs Boys: Sereer	Girls: French vs Boys: French
Mean difference	.52	.30	.10	.32
p	.047	.057	.938	.123

As shown in Figure 6, the mean scores obtained in the M test by the four subgroups in grade 10 were arranged in order. Both genders obtained mean scores

above the threshold achievement when they took the test in Joola, but it was not the case when students took the test in French.

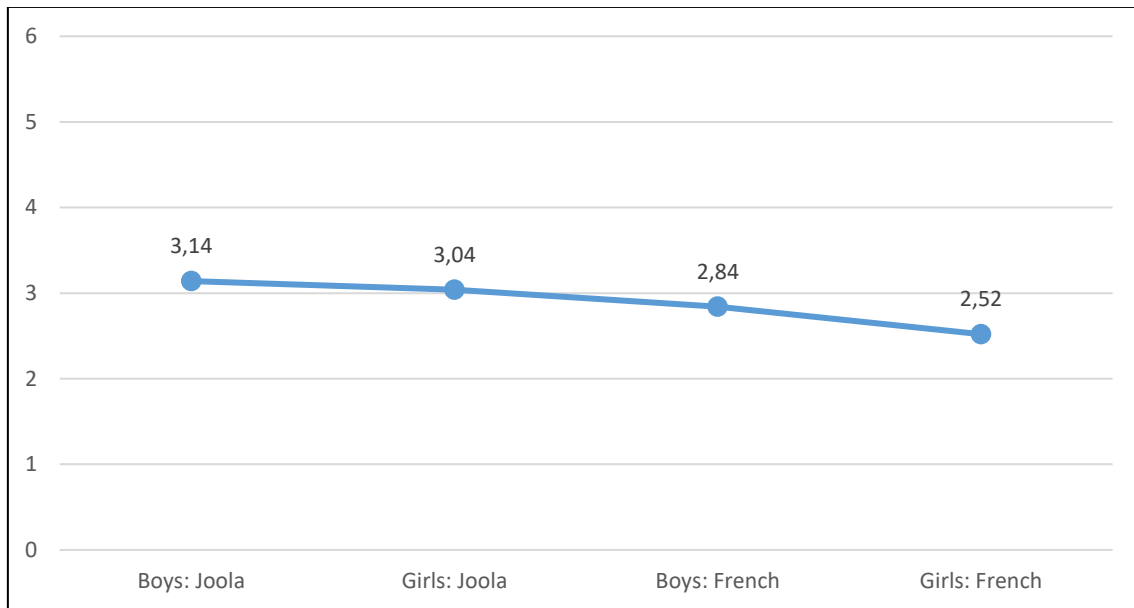


Figure 6. Participants' mean scores in grade 10

5 Discussion

The present study aimed to analyse the effect of the language of tests on girls' achievement at school and give an answer to Benson's (2001) and Angrist's (2019) suggestion about a possible connection between language and gender in primary and secondary schools in Sub-Saharan Africa, in this case, in rural areas of Senegal. Also, the present study intended to explore Cummins' (1979) theories of language acquisition and tried to find evidence of the transfer of linguistic skills and knowledge in girls' results in monolingual traditional public schools, so that they could benefit from a future bilingual programme. To this aim, students in grades 3, 6 and 10 were given three mathematics problem-solving tasks. Participants in the experimental group took the test in their L1 (Sereer for students in grades 3 and 6, Joola for students in grade 10). Participants in the control group took the test in the LoI, French.

What regards the first research question, there is an important finding that was common to grades 3, 6 and 10, and which should be pointed out: Girls who were given the M test in their L1 (experimental group) outperformed those girls who were given the test in the L2 (control group), especially in grade 3. Moreover, girls in the experimental group in grades 3, 6 and 10 obtained a mean score above the threshold achievement, while the mean score obtained by girls in the control group did not reach the threshold. In line with Benson (2001) and Hovens (2002), these results suggest that girls living in rural areas of Senegal have an advantage when they receive tests in their L1. The girls in the control groups in grades 3, 6 and 10 are of special concern: Despite receiving instruction in French for three, six and ten years, respectively, they obtained the poorest results. Notably, girls in grade 3, who received the M test in French, scored much below the threshold

achievement. In line with Benson (2001), Romaine (2013) and Angrist (2019), these findings suggest that using a language not familiar to students living in rural areas of Sub-Saharan Africa may affect girls in particular, especially the younger ones. It should be added that, as suggested by the findings of Benson (2001) and Tuwor and Soussou (2008), girls' poor results in the control groups could be influenced negatively by the fatigue caused by demanding tasks at home. However, girls in the experimental groups in grades 3, 6 and 10 obtained mean scores above the threshold achievement. Also, a few girls in grade 3 even got the highest score (6 points), contrary to their mates in the control group. This fact suggests that girls' L1 as the language of tests may have a positive effect on their achievement, compensating for the demands of their sociocultural context.

In the present study, there is another finding common to the three grades analysed: When comparing the results obtained between girls and boys in the experimental group, no statistically significant differences were found, it was the same for participants in the control group. That is to say, girls and boys obtained the same results in grades 3, 6 and 10 when they took the M test in the same language. These results tie well with Hovens (2002) who claimed that the use of students' L1 in tests shortened the advantage of boys over girls. However, the analysis in the present study found specific evidence in line with Benson's (2001) claim that gender and language are related when she observed that girls' academic achievement in bilingual programmes in rural areas of Mozambique was in general better than that of boys. First, a larger percentage of girls in grades 3 and 6 in the experimental group obtained the best score (6 points) as compared to boys. Second, in grade 10, the mean score difference yielded significant results when comparing girls in the experimental group and girls in the control group, but no difference was observed for boys. This suggests that the language of tests still affects girls' achievement after ten years of academic exposure to French, but does not affect boys' achievement. Additionally, difficulties for girls in the control groups seemed to be harder since they scored lower on average, but they took advantage when the language of tests was their L1 as shown by the mean score difference when compared to girls in their respective experimental group. In other words, it seems that the use of the students' L1 as the language of tests in education may contribute to reaching gender parity in rural schools of Senegal.

Taking into consideration Cummins' (1979) ideas of the Threshold and the Interdependence Hypotheses, and considering that participants in the present study had to understand language to apply knowledge and give an answer to the three mathematics problem-solving tasks, the objective of the second research question was to determine if there is evidence of transfer of linguistic skills and knowledge in girls' results. As described above, there are common traits between girls and boys. The number of students with results above the threshold achievement when the M test was given in the L1 decreased from grade 3 to grade 6, and then to grade 10. On the contrary, the number of students with results above the threshold achievement when the M test was given in the L2 increased from grades 3 to 10. Similarly, mean scores obtained by students in the experimental group in grades 3, 6 and 10 decreased and tended to get closer to the threshold achievement as they got older. The opposite happened with students in the control group in grades 3, 6 and 10: The mean scores increased. In other words, the results obtained by students who received the M test in their L1 decreased, and the results obtained by students who received the M test in French increased according to the number of years of exposure to French at school. It should be said that the mean scores obtained by students in the experimental

group in grades 3, 6 and 10 always remained above the threshold achievement whereas the mean scores obtained by students in the control group always remained below. When comparing these results with those in Darby and Dijkstra (2021) or Benson (2020) who claimed that the positive attainment of students attending experimental bilingual programmes in Senegal could be explained within the framework of Cummins' (1979) theories when students got similar achievement in the L1 and the L2, some observations are possible. In the present study, participants attending public traditional schools in grades 3, 6 and 10 where French is the unique LoI could not show clear evidence of transfer of language and knowledge: Both, the experimental and the control groups in the three grades behaved differently depending on the language of tests because, as proposed by Cummins (1979) and suggested by the results, transfer of language skills and knowledge could not take place due to first, a poor mastery of French which did not reach the lower threshold, and second, to a lack of development of the higher threshold in the L1. Nevertheless, in line with Hovens (2002), who found signs of language transfer from the L2 to the L1 even though participants had never been schooled in their L1, there is also evidence of language transfer specific to girls in the present study: A slight percentage of girls who took the M test in the L1, and also a few girls who took the M test in the L2 in grades 6 and 10, got the best scores. This fact suggests that girls, especially, might benefit from starting a bilingual programme in traditional public schools in rural Senegal, if applying Cummins' (1979, 2009) theories when using both the students' L1 and the L2 as LoI.

6 Concluding remarks and pedagogical implications

The present study aims to analyse the effect of the language of tests on girls' achievement in traditional rural primary and secondary public schools in Senegal, where French is the unique LoI. Additionally, the study aims to explore the possible benefits for girls if Cummins' (1979) theories on language acquisition were applied when using both a local language and French as LoI.

First, the results presented above indicate benefits for girls living in rural areas when using their L1 in tests, as compared to the sole use of the current official language, French. In line with Benson (2001), these results suggest that introducing local languages in the education system of Senegal may enhance girls' academic achievement by motivating them and balancing the negative impact of physically demanding household chores. Despite gender parity in attendance rates, further efforts should be made to promote gender equity concerning girls' academic achievement. The results of the *Certificat de Fin d'Études Élémentaires* (test at the end of primary education) and the *Brevet de Fin d'Études Moyennes* (test at the end of lower secondary education) show that a lower percentage of girls passed the tests as compared to boys. The results of the present study suggest that introducing local languages in education may contribute to reaching gender equity in school: Although the students' L1 was shown to be advantageous for both girls and boys, especially taking into account the sociocultural context, the minor findings indicate that girls may benefit more than boys.

Second, it seems that the transfer of language and knowledge in traditional monolingual schools, especially in deprived rural areas, is hindered by both an

absence of L1 development and poor mastery of French, as also claimed by the Programme d'Analyse des Systèmes Éducatifs de la CONFEMEN (2020), Cissé et al. (2021) and Martín-Chazeaud and Celaya (2020). There is an urgent need to introduce local languages with adequate teaching strategies which, according to Cummins (1979), allow students to fix language skills in the L1 for transfer to the L2. This will help students achieve first, the lower threshold, and second, the upper threshold, to save linguistic skills and knowledge in the common storage for languages. As shown in the present study, girls might take advantage of using pedagogical tools that promote the transfer of language skills and knowledge to encourage language development, contributing to the achievement of gender equity in classrooms throughout the country.

Small-scale experimental studies where local languages are used as the LoI, and the results obtained by students attending experimental bilingual programmes in Senegal, may have contributed to the announcement recently made by the Ministry of Education about a change in language policy at schools, namely, the use of local languages in early primary education as LoI together with French. This important decision made by the government implies a well-detailed strategy, involving, among others, teacher training in the design of pedagogy tools promoting language and knowledge transfer, and in the literacy of local languages. This also implies actors who can assess the programme and suggest improvements for future cohorts. Young girls need to have women as teachers so that they have an immediate adult role model.

7 Limitations and further research

The findings of this study need to be viewed in light of some limitations. First, the organisation of the experimental and control groups was carried out at random, with, initially, a balanced number of students per group. However, a few students in each group whose L1 was not one of the target languages were discarded from the study based on the information obtained from the questionnaire. As a result, the number of participants was reduced irregularly and the groups were imbalanced. Future studies conducted in contexts such as rural Senegal should take into consideration the multilingual landscape and exclude those participants who do not meet the requirements of the study prior to data collection.

The second limitation concerns the fact that the study was carried out in monolingual traditional public schools where students learn to read and write only in French. Consequently, tests had to be given orally because students did not know the writing system of their own language. Further research is required concerning gender and the LoI in Sub-Saharan Africa. Researchers might consider analysing the impact of the LoI on gender equity in education in bilingual schools. Thus, the analysis could be conducted after collecting data from a reading comprehension or a written expression. It is of special concern in Senegal to assess the new cohorts of students in the early grades of primary education who receive instruction in both French and a local language.

Disclosure statement

The author declared no conflict of interest.

References

- Agence Nationale de la Statistique et la Démographie [National Agency of Statistics and Demography] (2020). *Situation économique et sociale du Sénégal 2017–2018* [Economic and social situation in Senegal 2017 – 2018]. Agence Nationale de la Statistique et de la Démographie [National Agency of Statistics and Demography].
- Angrist, M. P. (2019). Language policy and girls' education in francophone West and Central Africa. *Social Politics: International Studies in Gender, State and Society*, 26(3), 475–500. <https://doi.org/10.1093/sp/jxy036>
- Bamgbose, A. (2011). African languages today: The challenge of and prospects for empowerment under globalization. In E.G. Bokamba, R.K. Shosted, & B. Tesfaw Ayalew (Eds.), *Selected proceedings of the 40th annual conference on African linguistics* (pp. 1–14). Cascadilla Press.
- Benson, C. (2001). Bilingual education in Africa: An exploration of encouraging connections between language and girls' schooling. In M. Melin (Ed.), *Education - A way out of poverty: Research presentations at the poverty conference 2001* (pp. 80–96). Swedish International Development Cooperation Agency.
- Benson, C. (2020). An innovative 'simultaneous' bilingual approach in Senegal: Promoting interlinguistic transfer while contributing to policy change. *International Journal of Bilingual Education and Bilingualism*, 25(4), 1399–1416. <https://doi.org/10.1080/13670050.2020.1765968>
- Brock-Utne, B. (2017). Multilingualism in Africa: Marginalization and empowerment. In H. Coleman (Ed.), *Multilingualism and development: Selected proceedings of the 11th language & development conference, New Delhi, India 2015* (pp. 61–77). British Council.
- Cissé, M. (2011). Langues et glottopolitique au Sénégal [Languages and glottopolitics in Senegal]. *Ethiopiennes, Revue Nègro-Africaine de Littérature et de Philosophie*, 87, 206–209. <https://www.africabib.org/rec.php?RID=353450286>
- Cissé, R., Moussa, S., Lô, C. & Fall, A.S. (2021). *La qualité des apprentissages au Sénégal: Leçons de Jàngandoo 2019* [The quality of learning in Senegal: Lessons from Jàngandoo 2019]. Presses Universitaires de Dakar.
- Cummins, J. (1979). Linguistic interdependence and the educational development of bilingual children. *Review of Educational Research*, 49(2), 222–251. <https://doi.org/10.3102/00346543049002222>
- Cummins, J. (1986). Empowering minority students: A framework for intervention. *Harvard Educational Review*, 56(1), 656–675. <https://doi.org/10.17763/haer.56.1.b327234461607787>
- Cummins, J. (2001). Bilingual children's mother tongue: Why is it important in education? *Sprogforum*, 19, 15–20. <https://inside.isb.ac.th/nativelanguage/files/2015/11/Bilingual-Childrens-Mother-Tongue.pdf>
- Cummins, J. (2005). Teaching for cross-language transfer in dual language education: Possibilities and pitfalls. *TESOL symposium on dual language education: Teaching and learning two languages in the EFL setting, Istanbul, Turkey* (pp. 1–18).
- Cummins, J. (2009). Fundamental psychological and sociological principles underlying educational success for linguistic minority students. In T. Skutnabb-Kangas, R. Phillipson, A. K. Mohanty & M. Panda (Eds.), *Social justice through multilingual education* (pp. 19–35). *Multilingual Matters*. <https://doi.org/10.21832/9781847691910-005>
- Darby, C. & Dijkstra J. (2021). Applying theory successfully: The early impact of L1 instruction on L2 literacy confirms Cummins' Interdependence Hypothesis in Senegalese primary schools. In P. Harding-Esch & H. Coleman (Eds.), *Language and the Sustainable Development Goals: Selected proceedings of the 12th language and development conference* (pp. 79–87). British Council.

- Diallo, I. (2005). Historical perspective of language planning and language policy in Senegal. In D. Cunningham & A. Hatoss (Eds.), *An international perspective on language policies, practices and proficiencies* (pp. 181–198). Fédération Internationale de Professeurs de Langues Vivantes.
- Dior, H. (2022). La promotion des langues nationales au Sénégal: D'une nécessité au manque de concrétisation [The promotion of national languages in Senegal: From a necessity to the absence of realisation]. *Djiboul Revue des Arts-Communication, Lettres, Sciences Humaines et Sociales*, 3(2), 96–109. <https://djiboul.org/wp-content/uploads/2022/07/09.-Harouna-DIOR.pdf>
- Diouf, I., Ndiaye, C. T. & Dieme, B. N. (2017). Dynamique et transmission linguistique au Sénégal au cours des 25 dernières années [Dynamics and linguistic transmission in Senegal in the last 25 years]. *Cahiers Québécois de Démographie*, 46(2), 197–217. <https://doi.org/10.7202/1054052ar>
- Fall, I. M. (2007). *Textes constitutionnels du Sénégal de 1959 à 2007* [Constitutional law in Senegal from 1959 to 2007]. Centre de Recherche, d'Étude et de Documentation sur les Institutions et les Législations Africaines [Centre for the Research, Study and Documentation of Institutions and African Legislation] (CREDILA). Université Cheick Anta Diop, Faculté des Sciences Juridiques et Politiques.
- García, O. & Hesson, S. (2015). Translanguaging frameworks for teachers: Macro and micro perspectives. In A. Yiakoumetti (Ed.), *Multilingualism and language in education: Current sociolinguistic and pedagogical perspectives from Commonwealth countries* (pp. 221–242). Cambridge University Press.
- Heugh, K. (2011). Theory and practice - Language education models in Africa: Research, design, decision-making and outcomes. In A. Ouane & C. Glanz (Eds.), *Optimizing learning, education and publishing in Africa: The language factor. A Review and analysis of theory and practice in mother-tongue and bilingual education in Sub-Saharan Africa* (pp. 105–156). UNESCO.
- Hovens, M. (2002). Bilingual education in West Africa: Does it work? *International Journal of Bilingual Education and Bilingualism*, 5(5), 249–266. <https://doi.org/10.1080/13670050208667760>
- Lopez Calix, J. R., Lemiere, C. & Moller, L. C. (2018). *Disrupting the gender divide in Mali, Chad, Niger and Guinea*. World Bank Group. <https://documents1.worldbank.org/curated/en/605471541607872022/pdf/Disrupting-the-Gender-Divide-in-Mali-Chad-Niger-and-Guinea.pdf>
- Martín-Chazeaud, A. & Celaya, M.L. (2020). The Role of language for succeeding in tests: An experimental study in secondary schools of rural Senegal. *Journal of Popular Education in Africa*, 4(10), 202–221. <https://kenyasocialscienceforum.wordpress.com/wp-content/uploads/2020/11/pdf-martin-chezaeud-celaya-the-role-of-language-for-succeeding-in-tests.pdf>
- Ministère de l'Économie, du Plan et de la Coopération [Ministry of Economy, Planning and Cooperation] (2020). *Situation économique et sociale du Sénégal 2017–2018* [Economic and social situation in Senegal 2017 – 2018]. Agence Nationale de la Statistique et la Démographie [National Agency of Statistics and Demography].
- Ministère de l'Économie, du Plan et de la Coopération [Ministry of Economy, Planning and Cooperation] (2022). *Annuaire de la population du Sénégal* [Annual directory of population in Senegal]. Agence Nationale de la Statistique et la Démographie [National Agency of Statistics and Demography]. https://www.ansd.sn/sites/default/files/2023-04/ANNUAIRE%20POPULATION%202022_vf_DSDS.pdf
- Mohanty, A., Mishra, M. K., Reddy, N. U. & Gumidyala, R. (2009). Overcoming the language barrier for tribal children: MLE in Andhra Pradesh and Orissa, India. In T. Skutnabb-Kangas, R. Philippon, A. Mohanty & M. Panda (Eds.), *Social justice through multilingual education* (pp. 283–300). Multilingual Matters. <https://doi.org/10.21832/9781847691910-018>

- Paxton, M. I. J. (2009). It's easy to learn when you using your home language but with English you need to start learning language first before you get to the concept: Bilingual concept development in an English medium university in South Africa. *Journal of Multilingual and Multicultural Development*, 30(4), 345-359. <https://doi.org/10.1080/01434630902780731>
- Programme d'Analyse des Systèmes Éducatifs de la CONFEMEN [Programme for the Analysis of the Education Systems of the CONFEMEN (2020). PASEC 2019: qualité des systèmes éducatifs en Afrique Subsaharienne francophone: Performances et environnement de l'enseignement-apprentissage au primaire [PASEC 2019: Quality of the education systems in Sub-Saharan Francophone Africa: Performance and teaching-learning environment in primary education]. Conférence des Ministres de l'Éducation des États et Gouvernements de la Francophonie [Conference of Ministers of Education of French-speaking States and Governments]. https://pasec.confemen.org/wp-content/uploads/sites/2/2022/08/RapportPasec2019_Rev2022_WebOK.pdf
- Romaine, S. (2013). Keeping the promise of the Millennium Development Goals: Why language matters. *Applied Linguistics Review*, 4(1), 1-21. <https://doi.org/10.1515/applirev-2013-5001>
- Sall, A. O. (2009). Multilingualism, linguistic policy, and endangered languages in Senegal. *Journal of Multicultural Discourses*, 4(3), 313-330. <https://doi.org/10.1080/17447140903395001>
- Samb, M. (2008). Medias et langues nationales au Sénégal: Le long chemin de croix de l'information régionale [Media and national languages in Senegal: The long arduous journey of regional news report]. *Revue Électronique Internationale de Sciences du Langage Sudlangues*, 9, 104-115. <http://www.sudlangues.sn/spip.php?article133>
- Tuwor, T. & Sossou, M. T. (2008). Gender discrimination and education in West Africa: Strategies for maintaining girls in school. *International Journal of Inclusive Education*, 12(4), 363-379. <https://doi.org/10.1080/13603110601183115>
- UNESCO Institute for Statistics (2015). *Fixing the broken promise of Education for All: Findings from the global initiative*. UIS.
- UNESCO Institute for Statistics. (n.d.). Education. Retrieved February 14, 2024, from <http://data.uis.unesco.org/Index.aspx?lang=fr&SubSessionId=&themetreeid=-200>
- UN Women (2023). *Bulletin statistique sur l'accès différentiel à l'éducation des filles et des garçons au Sénégal* [Statistical report about differential access to girls' and boys' education]. UN Women Office Publishing. <https://africa.unwomen.org/fr/digital-library/publications/2023/10/bulletin-statistique-sur-laces-differentiel-a-leducation-des-filles-et-des-garcons-au-senegal>

Appendix 1

Examples of scores given to participants in grade 3 in the experimental group:
 Problem-solving task: Mrs Ndong bought one kg bag of rice at the market. For this, she paid three hundred francs. Help Mrs Ndong find the price of a fifty kg bag of rice.

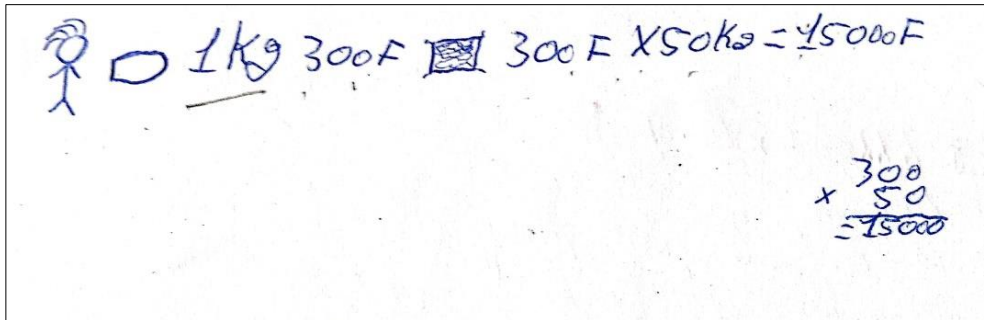


Figure 7. Example of an M problem-solving task with a score of 2 points

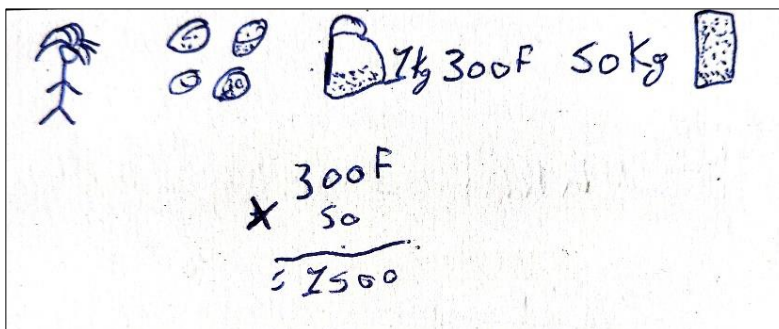


Figure 8. Example of an M problem-solving task with a score of 1.5 points

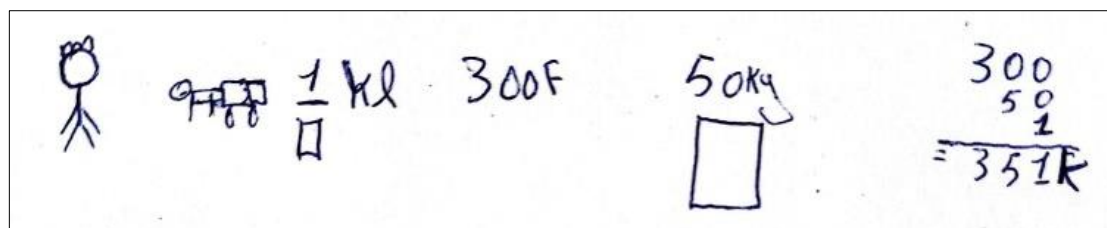


Figure 9. Example of an M problem-solving task with a score of 1 point

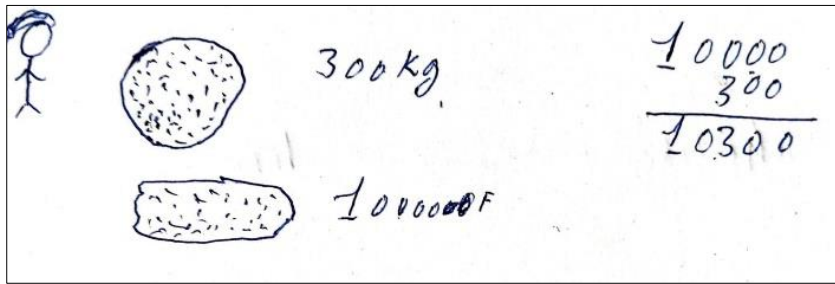


Figure 10. Example of an M problem-solving task with a score of 0.5 points