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Measuring Learning in a Second Language:
Assessing cognitive outcomes of primary schooling in Burundi

Abstract

This paper examines the measurement of student achievement in the mother tongue and in a second language used for instruction in primary schools in Burundi. Data were obtained from a probability sample of forty-seven schools in twenty-four school directorships in rural areas, and from about two thousand (1, 946) grade 6 students in 1989. The students were tested in language arts, mathematics, and science/agriculture in French as well as in their mother tongue, Kirundi. Students performed better in Kirundi in most subjects. Interestingly, item analyses revealed that testing in French produced the poorest estimates of achievement for students of high ability. In mathematics, however, there were no significant differences in the results of the Kirundi and French tests. This suggests that both students' proficiency in French and the policies relating to the use of Kirundi to teach subjects like mathematics in earlier grades may greatly influence learning and transfer of knowledge between the language of instruction and the mother tongue. The concluding section presents implications of the study for implementing educational reforms emphasizing the ***Kirundisation*** *and* ***ruralisation*** *of primary schooling.*

Résumé

Cet article examine les résultats des élèves des écoles primaires du Burundi dans leur langue maternelle et leur deuxième langue. Les données ont été recueillies en 1989 auprès d'un échantillon de probabilité de quarante-sept écoles réparties dans vingt-quatre districts scolaires de régions rurales, ce qui correspond à mille neuf cent quarante-six (1 946) élèves de sixième année. Les élèves ont subi des tests de langue, d'art, de mathématiques et de science/agriculture en français ainsi que dans leur langue maternelle, le kirundi. Ils ont obtenu de meilleurs résultats en kirundi, dans la plupart des disciplines. Il est intéressant de constater que les analyses

révèlent que les tests en français donnent lieu à des prévisions assez médiocres pour les élèves les plus doués. En mathématiques, néanmoins, il n'existe aucune différence significative dans les résultats obtenus pour les tests en kirundi et en français. Cela donne à penser que la facilité qu'ont les élèves à s'exprimer en français et que les politiques se rapportant à l'utilisation du kirundi pour l'enseignement de disciplines comme les mathématiques exercent une influence considérable sur l'apprentissage et le transfert des connaissances entre la langue d'instruction et la langue maternelle. La conclusion porte sur les implications de l'étude sur la mise en place de réformes pédagogiques notamment en ce qui concerne la ***kirundisation*** *et la* ***ruralistion*** *de l'enseignement primaire.*

While a great deal of attention has been given to documenting the poor quality of African primary schools and the need to improve them, the supporting evidence is often drawn either from international studies of educational achievement or from national research which uses a metropolitan (European) language to measure achievement. African students, it seems, have not learned very much at primary school, or even in secondary schools, which select students on the basis of rigorous national examinations that are generally administered in a metropolitan language (World Bank, 1988, pp. 154-156). What such results indicate is not entirely clear.

According to Berry (1985), two types of language-related learning problems occur in African schools; type A problems that reflect poor metropolitan language proficiency, and type B problems that result from the "distance between the cognitive structures natural to the student and implicit in his mother tongue and those assessed by the teacher" (p. 20). Type A and type B problems are, of course, reinforcing since much of the knowledge transmitted through instruction in a metropolitan language is incongruent with the knowledge obtained from social experience. Measurements of student achievement in a metropolitan language and in the mother tongue have been shown to produce different estimates of learning outcomes in African countries (e.g., Zepp, 1982). More proficient metropolitan language learners possess more linguistic and substantive knowledge to assimilate new information and carry out information-processing tasks which, of course, contributes to a higher level of performance measured in the metropolitan language. Greater metropolitan language proficiency is usually thought to facilitate the transfer between the mother tongue and the metropolitan language. However, previous research suggests that there may be little integration of knowledge (Lemon, 1981) and cognitive skills (Zepp, 1982) because of mother-tongue "interference." A better understanding of how language may affect learning outcomes and measurement of individual differences is the objective of the research reported in this paper.

The Policy Context

With a population of about 5 million, Burundi is one of the most densely populated countries in Africa. It has few natural resources other than

fertile soil to support its rapidly growing population (about 3% per year). Although Burundi is among the poorest countries of the world in terms of per capita income (estimated at US$250. or less per year in the 1980s), it is almost entirely self-sufficient in food production. More than 90% of the population depends on subsistence agriculture; most farmers also grow some coffee for cash income. The country is unusual in Africa in that, except for immigrants and refugees from nearby countries, all of the people speak the same mother tongue, Kirundi.

In the 1960s when African countries were becoming independent, school expansion was presented as an instrument through which new states might acquire legitimacy and demonstrate capacity to govern. In making primary schooling widely available, governments could bring the polity within the influence of the modern state and, simultaneously, provide evidence of its ability to deliver public goods. But after obtaining independence from Belgium in 1962, Burundi moved slowly to expand primary schooling. When the government did begin to expand primary schooling in 1982, it demonstrated political capacity in increasing rates. By 1987-88, the primary school enrollment rate had reached a reported 70%, up from 28% only six years earlier (Ziarati, 1989). Nevertheless, this accomplishment has created many problems which stem from the discordance between the objectives that have guided the development of primary schooling and the means adopted to expand schooling and raise the level of educational attainment.

The objectives set out in the 1973 educational reform continue to be cited in support of government policy at the primary level. The reform presented a plan to make six years of primary schooling universal and to orient instruction to the teaching of Kirundi and skills to improve rural life (Greenland, 1974). Educational practices inherited from the colonial period were criticized as elitist and alienating (Ministry of National Education, 1988a, p. 6). Government schooling, reserved formerly for an elite which received academic training in French in preparation for entry into colonial administrative or technical cadres, was made available to all. That meant diminishing the role of voluntary organizations in the provision of schooling. Church schools had provided instruction in Kirundi for religious participation as well as for practical training in modern agriculture. This was now the responsibility of government schools. The Kirundisation and ruralisation of primary schooling were the key features of the 1973 reform.

The policies of **Kirundisation** and **ruralisation** were predicated on two unrealistic assumptions. The first was that access to schooling could be increased without raising aspirations for academic rather than practical training, and for instruction to be in French, the language of secondary and higher education, instead of Kirundi. Many parents, it turned out, did not send their children to government schools to learn the vernacular language and thus to

become better farmers. They wanted an education for their children that would afford them a much better life off the farm, preferably in government employment. That usually required a secondary education and knowledge of French.

Second, it was assumed that the curricular objectives of the 1973 reform would continue to guide instruction despite less instructional time, higher class sizes, and heavier teacher workloads that resulted from the introduction of double shifts and collective promotion. The scope of the school curricula had to be reduced. The teaching of agriculture was one casualty. The amount of agriculture instruction was cut to one period of thirty minutes per week (Eisemon, 1989).

Kirundi was intended in the 1973 reform to become the medium of instruction at the primary level and, eventually, of lower secondary schooling. However, French has been retained as the medium of instruction for grades 5 and 6 due largely to fears that students would be unable to cope with French in secondary school (Ministry of National Education, 1988b). The fact that double shifts reduced the amount of instruction students receive in French, both as a subject and as a medium of instruction, prompted the government in 1989 to begin instruction in French in the first grade. Previously, French was taught as a subject from the third grade.

Educational quality has been equated with achievement in academic subjects which is assessed mainly in French in the rigorous *concours national*, the national secondary school entrance examination. The small proportion of students admitted to secondary schools on the basis of their examination results (less than 10%) has not increased since the introduction of double shifts to expand school enrollments, though the number has increased in absolute terms.

The *concours national* consists of examination papers in French, Kirundi, Mathematics, and Science/Social Studies. Two hundred points are awarded. French and mathematics are the most important papers, accounting for 80% of the possible marks. Examination papers are constructed to identify the most able students, not to measure what most students have learned. A consequence of the selectivity of the *concours national* is the high reported repetition rate in grade 6, which was 51% in 1989 (Ministry of Primary and Secondary Education, personal communication, 1989). As students are not given unique inscription numbers when registering for school, repetition can not be easily monitored. Students wishing to repeat grade 6 often enroll in other schools.

Study Design

Sixth grade students in rural areas of Burundi were the focus of data collection. Of the 31 school cantons in the country, 3 were excluded as

predominantly urban, 2 were excluded because they were still disrupted from recent (1988) ethnic violence, and 5 were excluded because they were judged to contain too many inaccessible schools. From the remaining 21 cantons a multistage cluster sample was drawn by probability methods. All students in the sampled classes were tested. Thus, a total of 47 classes in 24 directorships were surveyed during a two-month period, mid-March through mid-May 1989 prior to administration of the *concours national*. The number of units drawn at each stage of sampling was a compromise between efforts to make the data collection manageable and an attempt to acquire all the data needed for the envisaged analyses. In the analyses of student data reported below, weights have been used to compensate for the fact that the sampling was not self-weighting in the final stage.

Information was collected from all students in the selected sixth grade classes who were present at the time of data collection, nearly two thousand (1946) in all. The majority (59%) of these grade 6 students were males. The sample ranged in age from eleven to nineteen years. More than half (54%) of the students were fourteen or fifteen years of age. Only 10% started school at age six and progressed to the sixth grade without repeating. A majority (55%) were repeating the sixth grade and half (50%) repeated previous grades.

Two sets of test instruments were developed for administration to students, one assessing performance in the domains of text comprehension and production, and the other dealing with problem-solving in mathematics and science. The tests were prepared in English and then translated into French and Kirundi. In the case of the French comprehension tests, two versions were developed. One employed standard French vocabulary, similar to the vocabulary contained in the *fichiers* prepared and distributed by the Bureau of Rural Education. The text of the comprehension test dealt with the filtration of water and how to construct a water filter from ordinary household materials. The Bureau of Rural Education has promoted use of home-made water filters through health instruction in home economics classes. The comprehension tasks elicited skills involving locating and recalling information as well as making inferences from text propositions or prior knowledge. The tasks were constructed in the multiple-choice format used for the *concours national*.

The *concours national* examines knowledge of French and Kirundi production rules with tasks requiring students to select answers that are grammatically, syntactically, or semantically correct. However, knowledge of production rules may have little to do with skills in applying them to composition tasks, particularly if the method of assessment discourages teaching of composition. Thus, a picture task was constructed to stimulate production of a narrative composition in French or Kirundi. Nine pictures

were used for the story composition task in an effort to increase the amount of text students produced for subsequent analysis. Three scores were derived. The first and second dimensions correspond to the IEA characterization of writing competence as having two aspects, "text-producing or inscribing competence and discourse-structuring or meaning-making competence" (Purves, Gorman, & Takala 1988, p. 43). The third captures production characteristics such as imagination and originality but, of course, incorporates the two others.

A test of mathematics was developed measuring computational skills and problem-solving. Four of the nineteen questions dealt either with computations or operations involving numerical transformations (for example, representing common fractions as decimals), and required little or no text processing for successful performance. Most were story problems with one- or two-step solutions. They test application of text processing and problem-solving skills imbedded in practical tasks requiring numeracy and literacy such as calculating correct application rates for an agricultural pesticide.

Another test was developed for measuring learning in science, health, and agriculture which are covered in different parts of the school syllabus. Science and health are taught in *étude du milieu* which includes geography, history, and civics. Agriculture is a practical subject and unlike *étude du milieu*, it is not an examination paper in the *concours national*. Other questions examined nutritional knowledge which is part of the home economics syllabus and also is not examined in the *concours national*. Most test items, nineteen altogether, measured students' ability to make observations or assemble scientific information in such a way that inferences could be drawn consistent with a scientific principle. Some questions elicited knowledge of physical laws and their application in problem-solving; for example, a question on how much force will be needed to lever an object of known weight, given the distance to and from the fulcrum. All items were reviewed by the Bureau of Rural Education for curriculum validity.

Again, each set of tests was produced in French and Kirundi. In all, five versions of the tests were produced: French comprehension and composition (with standard French text); French comprehension and composition (with simplified, colloquial French text); Kirundi comprehension and composition; French mathematics, science, and agriculture; and Kirundi mathematics, science, and agriculture. The tests were prepared in English and then translated, first into French and from French into Kirundi. Within the tested classes, these five forms were distributed in a predetermined order to avoid bias in the selection of the subsamples taking each version of the tests. Students were given two hours to finish the test sets.

Results of Analyses

Language of assessment, French or Kirundi, profoundly influenced the measurement of achievement in most of the subjects tested, as Table 1 indicates. The mean number of correct answers was significantly higher for the Kirundi versions of the language comprehension, composition, and science/agriculture tests. The variations in performance under the different language conditions were greatest for scores on the science/agriculture test and the three ratings of the student compositions. Only in mathematics were the results for the French and Kirundi tests similar. The lowest scores were obtained for the student compositions. For instance, the mean score (2.27) for the overall quality of the French compositions represents an evaluation of "poor". The Kirundi compositions received higher scores, but the mean scores (4.11) were also low (for overall quality), suggesting that they have little practice with such tasks.

The comprehension test mean score for standard French (6.04) was only slightly lower than that for colloquial French (6.53). Both were well below the score for Kirundi (8.05, or about 53% of the correct answers). Interestingly, the differences in total scores for the French and Kirundi tests mainly result from the answers to the questions eliciting comprehension of the **narrative** text on water filtration. The responses of students to the questions pertaining to the text on **how** to construct a water filter did differ significantly, but the absolute differences were very small. They were somewhat lower than those for the narrative text in both languages. **Procedural** texts are less often used for instruction and are more difficult for children to comprehend. Unfortunately, comprehension of procedural texts is perhaps a better measure of functional literacy.

The variations in the mean scores for the French and Kirundi tests of knowledge of science and agriculture were the largest for the four sets of tests. Still, the mean score for Kirundi (9.31) was less than half (47%) of the highest possible score. For the French test, students selected about a third (36%) of the correct answers ($M = 7.16$). The poor results may have to do with the fact that although the knowledge tested in this examination is supposed to be taught in science/social studies and in practical agriculture and home economics, the students' teachers reported that only half (53%) of the questions had been covered in class. Questions that were not covered dealt with agricultural topics. However, most (68%) of the teachers felt that the questions were identical or very similar to the kinds of question items selected for the *concours national*.

The results for the mathematics tests in French and Kirundi were nearly identical. Mathematics was the only subject in which students scored slightly higher in French. Most teachers had covered the topics examined in

Table 1
Student Performance in Reading Comprehension, Written Composition, Mathematics and Science/Agriculture in Kirundi and French

	Mean Scores (N=1,946)
Test:	M =
1. Comprehension Test (15 items)	
Standard French	6.04
Colloquial French	6.53
Kirundi	8.05
	F=44.6***
1.1 Narrative Text (subtest, 8 items)	
Standard French	3.02
Colloquial French	3.36
Kirundi	4.27
	F=47.86***
1.2 Procedural Text (subtest, 7 items)	
Standard French	3.01
Colloquial French	3.18
Kirundi	3.78
	F=21.48***
2. Composition Test (maximum score for each rating = 10)	
2.1 Overall Quality	
French	2.27
Kirundi	4.11
	F=137.32***
2.2 Coherency of Narrative	
French	1.96
Kirundi	3.06
	F=60.28***
2.3 Use of Language	
French	2.14
Kirundi	4.01
	F=147.11***
3. Mathematics (19 items)	
French	8.65
Kirundi	8.19
	F=2.56
4. Science/Agriculture (19 items)	
French	7.16
Kirundi	9.31
	F=168.67***

* $p < .05$
** $p < .01$
*** $p < .001$

class (89% of the questions) and most felt that the test items were similar to those appearing in the *concours national* (95% of the questions). Nevertheless, the mean scores for French and Kirundi were only 42% of the highest possible score, lower than the average scores for science and agriculture. Though the mathematics test had the highest instructional validity and the lowest differences in performance under the two language conditions, these favorable factors did not lead to better results.

Responses to the question items included in the comprehension, mathematics, and science/agriculture tests were examined using monotone regression-splines analysis (Ramsay & Abrahamowicz, 1989) to determine how language of assessment affects the performance for students of different ability. In this analysis, ability was estimated from the student's response pattern for each test, and the estimate compared to the student's response to individual questions. No independent estimates of student ability were obtained such as scores on related tests administered in the student's mother tongue. Since test difficulty affected the ability estimate, we believe that these initial results **understate** language effects.

Figures 1-3 present aggregate results for the three sets of tests. The vertical axis records the expected proportion of correct answers. Ability is estimated along the horizontal axis. The aggregate results sum the item analyses which used a one-knot spline function to produce the item characteristic curves. A question that is highly discriminating for students of varying levels of ability should have a curve that rises steeply with higher estimated ability and probability of successfully answering the question. In aggregating item results for each test, the probability of success is expressed as the expected proportion of correct answers. The curves representing the French and Kirundi results for each item and total test scores indicate how well they measured the students' knowledge and skills. Different curves for French and Kirundi reveal underlying differences in measurement. An important feature of monotone regression-splines analysis for this study is that it permits identification of which kinds of students are most affected by being tested in their mother tongue or in a second language.

In Figure 1, these curves are represented for the expected scores on the standard French, colloquial French, and Kirundi comprehension tests. At the lowest levels of estimated ability, the curves follow a similar trajectory and then begin to diverge. At the highest levels of ability, the curves for the Kirundi and colloquial French tests are close together, with the Kirundi curve best estimating the expected proportion of correct answers for the students with the highest ability. The curve for the standard French test is much lower and flattens out at the high end of the ability range, meaning that the results for this test more poorly estimate the proportion of correct answers for the most able students. A similar finding was obtained from comparison of the

curves for the French and Kirundi science tests (see Figure 2) which were not nearly as successful in discriminating students in either language.

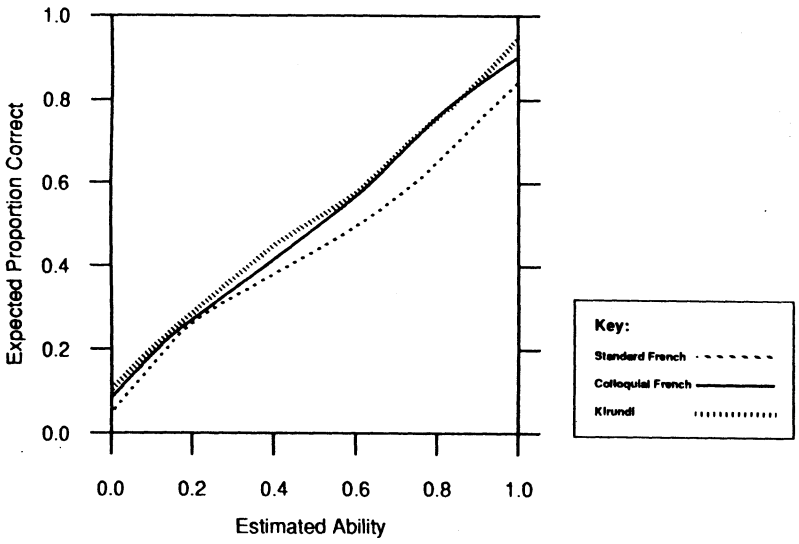

Figure 1
Comprehension Test Scores

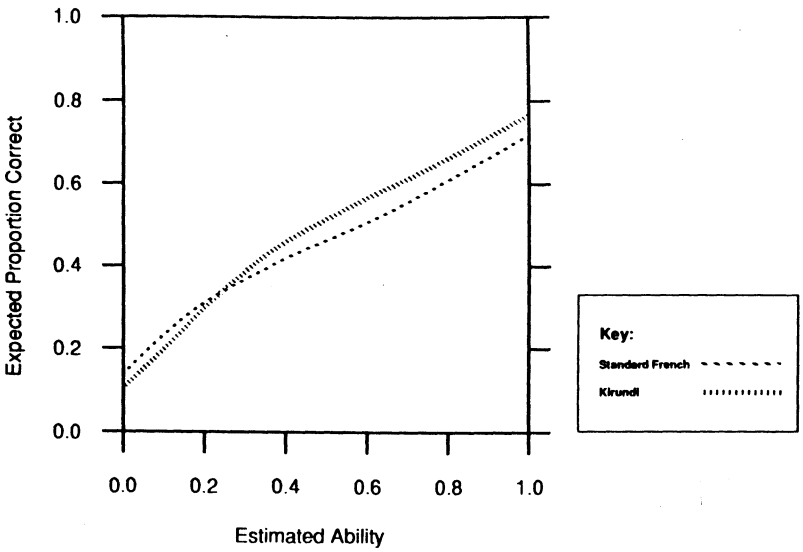

Figure 2
Science Test Scores

Because Figures 1 and 2 sum results, they necessarily conceal wide variations in responses to individual items and tend to suppress language effects. The item analyses revealed that several items on the French science test were not well translated into Kirundi. For instance, the second question asked students to select the most desirable rotation of food crops in order to control soil-borne plant diseases. The correct answer to this question required an inference from a complex set of premises regarding the vulnerability of crops to particular diseases. This was a good question in the French version of the test. In the Kirundi test, student responses peaked at a low level of estimated ability and levelled off. The most able students were not more likely to get the correct answer in Kirundi probably because they did not understand the question. On the other hand, for many questions, the Kirundi curves were substantially higher than those for French. This was particularly true of the questions in the comprehension tests requiring high level inferences. An example (see Figure 4) is a question requiring students to select an appropriate title for the procedural text. For this question, the curve for standard French peaked at the 30% level of probability of successfully answering the question and then plateaus. The curve for colloquial French reached 45%. The Kirundi curve was near perfect, reaching 100% probability of success for students at the highest level of ability.

The principal finding derived from the analyses presented in Figures 1 and 2 is that comprehension skills and knowledge of science and agriculture are more poorly measured in French than in Kirundi. Significantly, the performance of the most able students was the most affected by being tested in French. Conversely, testing in the mother tongue did not increase the performance of students with less ability. To reiterate, an independent Kirundi measure of student ability would probably magnify the language effects for these tests.

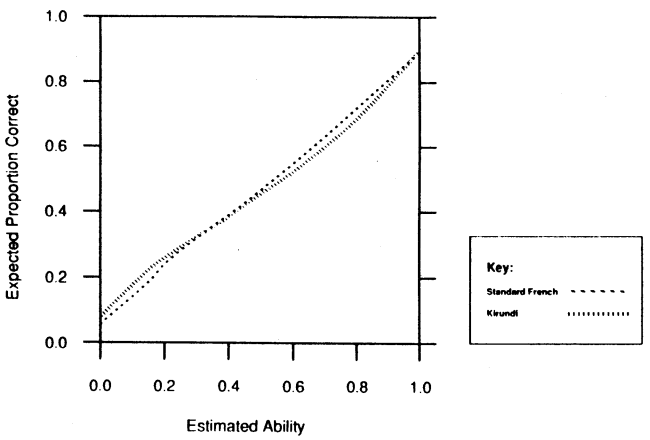

Figure 3
Mathematics Tests Scores

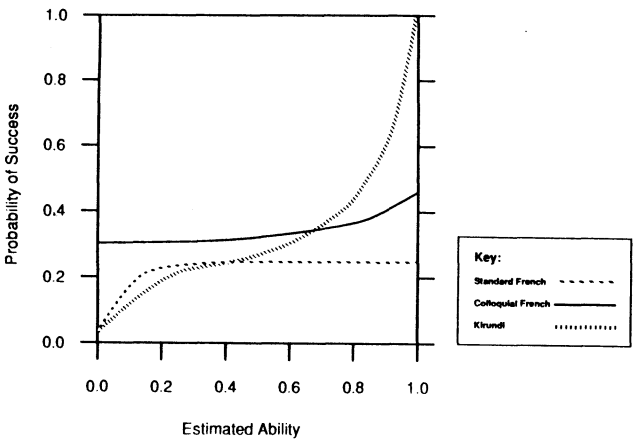

Figure 4
Comprehension Test Item 15: What is the Best Title for this Text?

Figure 3 presents a very different finding. There were no language effects for mathematics. The French and Kirundi curves follow the same paths indicating that the two tests performed similarly in discriminating students. Since most of the test questions were story problems, the similarity in the French and Kirundi results can not be explained simply in terms of the fact that the items required little language comprehension for correct solution. Linguistically demanding problems, such as one requiring students to solve an ordering problem using a set of "bigger/smaller than" premises, sometimes did produce differences between French and Kirundi – in favor of Kirundi. But many problems of comparable difficulty such as calculation of area problems necessitating multistep solutions requiring students to process a great deal of textual information for accurate problem representation did not produce differences.

Discussion

The Whorf-Sapir (1956, 1963) linguistic relativity hypothesis asserts that tasks will be comprehended and performed differently in different languages. This has been represented as a powerful critique of the theory of nominal equivalency which is central to cross-cultural testing (Cole & Means, 1981). The implication is that conventional measures of cognitive performance do not elicit universal skills. African educational literature provides many rich illustrations of problems in constructing comparable tasks in metropolitan and indigenous languages. Consider, for example, the seemingly simple task of finding the circumference of a circle given its radius. In the languages of Eastern and Central Africa, there is no word for centre that is semantically equivalent to this term, the nearest being "navel". There are

no equivalent terms for radius or circumference either (Mamari, 1975). Thus, no assumptions are made about the nominal equivalence of the test instruments in French and Kirundi. Nevertheless, it is assumed that differences in student performance on translated tests are meaningful enough to require explanation.

Students' proficiency in a metropolitan language used for instruction affects what they learn as this and other studies indicate. Poor proficiency in French interacts with poor understanding of the subject of instruction to depress average levels of student achievement. Surprisingly, it is the performance of the most able students that is most affected by being tested in French. Presumably, such students are better able to follow instruction in French. Yet much of what they learn in French may not transfer to their mother tongue. Although mathematics is often used to illustrate how the transfer of knowledge between metropolitan and indigenous African languages might be inhibited by the lack of equivalent vocabulary, these findings do not support the linguistic relativity hypothesis insofar as achievement in this subject is concerned.

Certain kinds of computation and mathematical problem solving may involve little "cognitive interference" when carried out in French because equivalent symbols, structures, or concepts now exist in Kirundi, having been imported into that language from French. The base-ten number system is an illustration. It has no traditional equivalent in Kirundi (Zaslavsky, 1973, pp. 240-41) or in many indigenous African languages (Gay & Cole, 1967; Reed & Lave, 1979) which use a base-five system. Consequently, complex computations are often performed in Kirundi with a number system and operations for manipulating numbers derived from French and taught in Kirundi in the lower stage of primary school. This may facilitate mathematical "thinking" in French and in part explain differences between performance in mathematics and the other domains. In brief, how metropolitan and indigenous languages are used for instruction may have a powerful influence on student learning and measurement of achievement.

Conclusions

Two conclusions are supported by the various data analyses. First, students exhibited low levels of achievement in all of the subject domains tested. Testing in the mother tongue improves the measurement of learning outcomes. But students performed poorly under both language conditions. The very low levels of performance in the language arts tests should be a serious concern to policy makers. Most students, for instance, had difficulty comprehending the kinds of procedural texts in French and Kirundi which they are likely to encounter in daily life. Students' skills in written communication were even poorer, particularly in French. That, of course, has serious impli-

cations for secondary schooling and may also contribute to the high repetition rate in the final year in primary school.

The performance of students was best in the test of knowledge of science and agriculture if they were examined in Kirundi. This might be seen as consistent with the objectives of the 1973 reform which stress practical studies and mother-tongue teaching. Unfortunately, practical studies have a subsidiary place in the primary school curricula, largely separated from science and other cognate academic subjects, and they are to be taught in French and not in Kirundi. Moreover, the content of the science and agriculture test was generally not covered by the students' teachers. In other words, the test results provide little evidence of the effectiveness of present practices; in fact, the tests may be considered to measure important but incidental learning outcomes.

Second, the policy of switching to French as the medium of instruction in grade 5 profoundly influences how much students learn. Even in grade 6, according to the teachers interviewed, only a small proportion of students can follow instruction in French. (Teachers estimated that less than one-third [30%] of their students understood French well enough to be taught in that language without frequent recourse to Kirundi.) This depresses test performance in both languages since French is used as the medium of instruction for most subjects taught in grades 5 and 6. The exception is mathematics. Although mean scores were below fifty percent of possible marks, some students obtained perfect scores. Student performance in mathematics is least affected by the use of French as the language of assessment. The implication is that language policy should be more sensitive to the subject domains which are to be taught in French and the mother tongue.

Progress toward Kirundization, an important objective of the 1973 educational reform, has been impeded by concern for the French language skills of students admitted to secondary schools who have experienced the double shift system. Whether today's graduates have less facility in French than earlier students is the subject of much controversy. Our study indicates that most students have poor French language skills, particularly in composition. Whether double shifts have adversely affected the quality of entrants into secondary schools cannot be determined. That many students are unable to benefit fully from instruction in French has been well established. Elsewhere (Eisemon, Schwille, & Prouty, 1990), we have proposed improvement and increasing the amount of teaching of French in the lower stage of the primary cycle. The government took an important step in this direction in 1989 by deciding to introduce French as a subject in grade 1 instead of postponing teaching it until grade 3.

At the same time, consideration should be given to expanding the use of Kirundi especially for teaching practical subjects like health, nutrition, and agriculture as well as science. On the tests developed for this study, students

exhibited little understanding of the scientific and agricultural knowledge that the question items elicited in French, but great improvement when Kirundi was used. The use of French for teaching most scientific and practical subjects in primary schools may inhibit the development of Kirundi as a language of ordinary scientific discourse and, in consequence, the dissemination of modern science in ways that facilitate better health, nutrition, and higher agricultural productivity.

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