

Second Language Retention: Language Use as a Contributing Factor

**Daphne A. Ducharme, Marjorie B. Wesche,
and Johanne S. Bourdages**

University of Ottawa

Using data collected by Wesche (1993), this study examines the effect of the use of French as a second language on the performance of subjects in receptive skills (listening and reading comprehension) and productive skills (speaking and writing). The results establish a link between the use of the language after learning has occurred and the difference between pre- and post-test measures. A number of specific independent variables are examined, the most influential of which seem to be the number of university courses taken in French and the number of books read in French. The results also seem to confirm earlier findings that the initial level of proficiency promotes maintenance and even improvement.

L'utilisation des données de Wesche (1993) a permis l'étude de l'influence de l'utilisation du français langue seconde sur la performance de sujets quant aux habiletés réceptives (compréhension orale et écrite) et productives (expression orale et écrite) dans cette langue. Les résultats établissent un lien significatif entre l'utilisation de la langue une fois les connaissances acquises et la différence entre les mesures aux pré- et post-tests, selon les données de Wesche (1993). Plusieurs variables indépendantes ont été contrôlées, dont les plus influentes semblent être le nombre de cours universitaires suivis en français et le nombre de livres lus en français. L'analyse des données semble également confirmer les résultats d'études antérieures qui suggéraient que le niveau initial de compétence pouvait promouvoir le maintien de l'acquis et même l'amélioration de la performance.

Introduction

Over the years, most memory research related to second language retention has been based on a laboratory or traditional approach and has yielded results that have little application in everyday life (Bahrick and Phelps, 1988). More recently, however, researchers have begun to focus on naturalistic and longitudinal research, which studies the use and maintenance of a second language over longer periods of time. One such study was done by Bahrick (1984) who claims that the process of forgetting does not continue indefinitely. Bahrick's interest was in determining what external factors or conditions are important to promote retention. On the other hand, Neisser and Winograd (1988) have

focused on the internal process of recalling knowledge. They distinguished between two processes of remembering: the first, reappearance, can be equated with verbatim recall; the second, reconstruction, requires that the subject piece together elements to construct a message. The hypothesis behind this second process holds that remembering is like problem solving. That is, instead of acquiring, and reproducing, a set of isolated responses, second language (L2) learners discover a structured system of relationships. This is in contrast to reappearance, which views remembering not as the creation of something new but as the arousal of something that already exists, based on the premise that the same memory, image or cognitive unit can disappear and reappear over and over again (Neisser, 1967). Neither of these theories has yet served to satisfactorily explain why second language attrition occurs and how best to promote retention.

The present research seeks to explore the role of language use in long-term retention. Although the focus is on retention, it would not be possible to ignore the terms “attrition” and “maintenance” which are commonly used in the field. The former usually refers to the opposite of “retention”, language loss, and the latter is considered a synonym for “retention”. “Maintenance” can be considered to have occurred in terms either of competence being preserved or of performance which persists over time. In both cases, a time interval must pass after a learning experience before retention or maintenance can be measured. The term “language maintenance” is also used in the area of language planning to refer to a situation where minority speakers keep using their language rather than adopting the majority language. In order to avoid terminological confusion, the term “retention” will be used in this article to designate the phenomenon under study.

In the current study, “retention” was equated with maintenance. We were mainly interested in measuring whether L2 users’ performance level recorded prior to a time interval, had remained constant or had improved. Treatment (in this case, formal intensive language learning) had ceased prior to the time interval. We measured the durability of the behaviour (French second language performance) as a function of second language use, during an interval of three years (from pre-test to post-test). Maintenance or improvement of performance was measured by a comprehensive battery of French language tests (Wesche, 1993). Retention was said to have occurred if no loss in performance was observed from pre-test to post-test. As a secondary interest, we were hoping to explain some of the differences theoretically, through the construct of reappearance or reconstruction.

Review of the literature

A number of studies have examined the role of three categories of variables in promoting the maintenance of second language skills. These categories are: initial level of proficiency, motivation and language use (Harley, 1994). Investigations by Edwards (1977), Bahrick (1984) and Clark and Jordan (1984) demonstrated that the level of proficiency may influence long-term retention of second language knowledge. Similarly, the role of motivation in retention has been studied extensively (Gardner, 1982; Gardner, Lalonde and MacPherson, 1985; Gardner, Lalonde, Moorcroft and Evers, 1985; Gardner, Moorcroft and Metford, 1989; Gardner and Lysynchuk, 1990) and it is now generally accepted that positive attitudes support motivation which in turn promotes the long-term retention of learned material (Moorcroft and Gardner, 1987). Just as motivation is seen as a crucial component in language retention, the importance of a supportive external environment has also been demonstrated (Edwards, 1977; Weltens, Van Els and Schils, 1989). Furthermore, the more practice opportunities that are available to subjects who wish to maintain their skills, the greater the likelihood that they should, through continued use of the language, be successful in doing so (Snow, Padilla and Campbell, 1988; Raffaldini, 1988). A recent study of graduates of French immersion programs (Wesche *et al.*, 1990; Wesche, 1993) which compared the performance of subjects on measures of receptive skills (listening and reading comprehension) and productive skills (speaking and writing) over a three year period, while showing L2 maintenance at a group level, offered the possibility of investigating the role of subjects' continued use of the language in promoting maintenance of performance as measured by a number of subtests.

Objective

This research attempts to establish the role of language use over the 3-year period after initial learning has occurred as mediated by subjects' performance on measures at university entry and L2 performance three years later. A number of specific independent variables were examined, including a) the number of university courses taken by subjects in French during this period, b) the number of books read in French, c) the number of movies seen in French, d) habits of television viewing in French, and e) an estimate of participation in other activities in French. It was hoped that we could comment on differences in performance in light of the process of remembering viewed theoretically as reappearance or reconstruction.

Method

The study by Wesche and colleagues (Wesche, *et al.*, 1990; Wesche, 1993) provided a valuable database¹ from which to pursue the main objective of the study, since it allowed for investigation of the language use factor in retention. Participants had been asked to fill out a *French Language Attitudes and Use Questionnaire* which included information on a number of variables that might influence performance. The questionnaire section considered pertinent for our current research was titled *Specific Current French Use* and is described below.

Specific Current French Use referred to activities that occurred during the three-year interval from 1988 (end of high school) to 1991 (third year university). Data were collected on five variables—courses taken in French, books read in French, hours of television watched in French, movies seen in French, and hours spent at other activities in French—to determine what influences might have acted on the retention process. The ‘courses taken in French’ variable emerged as a result of data provided by subjects on the number of courses in French, each year, on various topics without specifying whether these courses were actually language learning courses. Each of the five independent variables of interest in the current study were taken from this inventory and specifically analyzed for their influence on the results recorded on each of the tests in the battery (Wesche, 1993). Responses were categorized in terms of yes or no answers, given the fact that few affirmative answers were recorded and that groupings of subjects according to number of courses or hours were not possible. Table 1 (see Appendix 1 for all tables) shows the number of subjects who gave an affirmative or a negative answer for each of the five variables.

Research Questions

The following research questions were posed:

On the basis of varying use of the second language, can one observe a change in the performance in French as a second language of graduates of bilingual high schools studying in university, from the time they graduated from high school (1988) to third-year university (1991)?

- a) Did subjects who took courses in French during any of their three years of university study show better retention than those who did not take courses in French?
- b) Did those subjects who reported reading at least one book a month in French (*not related to classroom study*) during their years of university study show better retention than those who did not?
- c) Did those subjects who reported watching at least one hour per week of television in French, seeing at least one movie a month in French and doing other activities in French for at least one hour per week during their years of university study show better retention than those who did not?

Sample

Subjects for the original study were graduates of bilingual high schools in the Ottawa-Carleton region. Before entering high school, all had completed a full sequence of early-entry or late-entry immersion. The graduates chosen for the study were attending one of four universities, the University of Ottawa, Carleton University, Queen's University, and McGill University.

In the original study (Wesche, 1993), a number of 1988 graduating bilingual high school students were located, with the help of the Ottawa and Carleton Boards of Education, and information was collected, which included family addresses and future plans. Those who were enrolled in the four universities and who were willing to participate were contacted in the fall, at university entry, and were convoked for testing. The 1988 sample included 154 graduates who completed tests in 1988. It was possible to locate and re-administer the battery to 76 of these students in the spring of 1991, at the end of their third year of university studies. Some measures were obtained only from subgroups of these 76 subjects.

Instruments

The instruments used to measure proficiency were either specifically developed for the immersion follow-up study or were part of already existing batteries developed for high school and university students at advanced levels of French proficiency by the University of Ottawa's Second Language Institute, the Ottawa Board of Education Research Centre, the University of Western Ontario Research Group, and the Modern Language Centre of the Ontario Institute for Studies in Education. The test battery used in 1988 and 1991 (Wesche, 1993) was a revised version of the initial test battery used in a pilot study (Wesche *et al.*, 1986) and included three types of measures—*French Proficiency Subtests*, a *Self-Assessment Questionnaire* and a *French Language Attitudes and Use Questionnaire*. Acceptable levels of validity and reliability for these instruments were established through a number of statistical measures, including initial item analysis as well as alpha coefficient and corresponding standard error of measurement scores (see Appendix 2).

Procedures

The subjects ($N = 76$) were those for whom test data were available from both 1988 and 1991.² Statistical analyses were performed on the results from all the measures, with the exception of the written essays, which were only administered in 1988. First, descriptive analyses were performed on all pre- and post-test measures (listening comprehension, listening dictation, reading comprehension, cloze, elicited imitation and oral interview tests). Then, analyses

of variance with repeated measures were performed on all test scores, with the exception of oral interview scores on which t-tests were performed. The aim was to verify whether differences observed between pre- and post-test measures might be significant. The results were analysed quantitatively in terms of the research questions of this study, to observe any differences between the performance of students at the end of high school (1988) and in their third year of university (1991). A number of sub-questions also were addressed, each one targeting the effect of specific language use variables on the students' performance.

Our intention was to see whether the pre- and post-test results on each of the subtests were significantly different when the five language use variables (see Table 1) were controlled. None of these variables had been specifically controlled in the study by Wesche (1993). The scores of all subjects on each subtest were examined for each of the five variables.

Results

The results of the analyses performed are presented for each research question. The first two research questions dealt respectively with the role played by courses taken in French and by reading books in French in promoting retention of performance on each of the subtests. The third research question dealt with television, movies, and other activities in French and the role these variables might play in promoting retention on each subtest. In reporting the results, we present each of the research questions as a main heading. This allows us to examine the role of each variable, for example, courses taken in French or books read in French, in promoting retention of skills language. The role of each variable was examined for each subtest, presented as a subheading. Only those subtests for which significant differences were obtained are presented. In these cases, both descriptive statistics and ANOVA or t-test results are given in separate tables.

First Research Question

Did subjects who took courses in French during any of their three years of university study show better retention than those who did not take courses in French?

As previously discussed, language use, as evidenced by whether or not courses were taken in French during the three-year interval between pre- and post-tests, was examined. The Reading Comprehension, Elicited Imitation and Oral Interview results were all related to this variable. The subjects who reported taking courses in French all performed better on the post-test when compared

to their peers who had not taken any courses in French. The results for each of these subtests are presented below.

Reading Comprehension Subtest

The performance on the Reading Comprehension subtest (Tables 2 and 3) of students who took French courses, versus those who did not, not only provides some insight into the role of language use, but also provides evidence of the importance of motivation and initial proficiency in the promotion of retention and improvement in a second language. Differences were found in scores between the two groups on the pre-test measures in terms of their subsequent enrollment in courses in French. In fact, subjects who seemed to show the greatest motivation in maintaining their skills by taking courses in French are those who had lower baseline scores.

Elicited Imitation Subtest

A different pattern from that observed with the Reading Comprehension subtest was evident with the Elicited Imitation subtest (Tables 4, 5, 6 and 7). Subjects who reported taking courses in French were better able to reproduce the sentences verbatim (i.e., “exact” reproduction) on the post-test. When compared with their peers, these subjects scored higher on the post-test although their performance had been lower than that of their peers on the pre-test. The results are particularly interesting in terms of providing some insight into the process of remembering since the test is specifically designed to elicit reappearance (Wesche, 1993).

Oral Interview Subtest

In the case of the Speaking subtest, t-tests revealed significant differences between subjects who had taken courses in French and those who had not, on the second of three tasks (Tables 8, 9, 10 and 11). This task (Oral 2) required subjects to tell a story from a series of pictures. A list of questions was given to each subject to assist them in their narration. The Oral 1 task required subjects to explain a program of activities in a role-play situation to a group of senior citizens. The Oral 3 task required subjects to select a summer job by discussing the differences between two job descriptions. Each of the tasks was scored by the interviewer on a scale of 1 to 5, based on performance descriptions (Wesche, 1993). It is particularly interesting to note that only the second task, the one involving pictures, produced a significant difference. This could suggest a relationship between visual cues and long-term retention, to be investigated further.

As the results of subtests show, the relationship between ‘courses’ and performance was significant when we analyzed Reading Comprehension, Elicited Imitation, and Oral Interview measures. The most interesting observation here

is that those subjects who had lower baseline results seemed to improve the most. This finding would indicate that not only does taking courses in French help maintain performance but indeed it also seems to promote improvement as well.

Second Research Question

Did those subjects who reported reading at least one book a month in French (not related to classroom study) during their years of university study show better retention than those who did not?

Reading of non-textbook works in French during the three-year interval between pre- and post-tests also seemed to be related to language retention and improvement. This finding is evidenced by the results on the Reading Comprehension and Elicited Imitation tests. Subjects who reported reading such books in French all performed better on the post-test when compared to their peers who had not read books in French.

Reading Comprehension Subtest

It should not seem surprising that subjects who reported reading at least one book per month in French during the three-year interval between pre- and post-test measures performed better on the Reading Comprehension post-test than did their peers who did no leisure reading in French (Tables 12 and 13). The subjects who read showed greater improvement on this subtest than their peers.

Elicited Imitation Subtest

The results on the Elicited Imitation subtest (Tables 14 and 15) were similar to those on the Reading Comprehension subtest. Once again, those students who reported reading books had been the lower achievers on the pre-test. They were able, by reading books, to catch up to their peers who reported not having read any books. While all subjects showed improvement in their performance from pre- to post-test, the book readers showed greater improvement, to the point of even surpassing the mean score of their non-reading peers.

Third Research Question

Did those subjects who reported watching at least one hour per week of television in French, seeing at least one movie a month in French and doing other activities in French for at least one hour per week during their years of university study show better retention than those who did not?

Analyses were performed for each of the other three variables referred to in the research questions — movies seen in French, television watched in French,

and other activities practised in French. No significant difference was found on any of the sub-tests as a result of the influence of any of these three variables.

Discussion of results

The main objective of this study was to examine the role of language use in the retention of a second language, both in terms of productive skills and receptive skills. The original research (Wesche, *et al.*, 1990; Wesche, 1993) established that overall performance of subjects was maintained during the three years following graduation from high school, while studying at university. Individual language use variables had not been controlled, however, and this provided an opportunity to further probe the previously collected data. It was hypothesized that differences would be found in terms of retention of second language skills when differences in second language use by subjects were taken into account. The results obtained, both by Wesche (1993) and by the present analysis, provide some insight concerning the roles of the independent variables discussed earlier (courses taken in French, books read in French, television, movies and other activities practised in French).

In the current investigation, two of the independent variables, courses taken in French and books read in French, seemed to have promoted better performance by subjects on some subtests. For these two variables, significant pre- and post-test differences were found on the Reading Comprehension and Elicited Imitation sub-tests, but no significant differences were found for the other subtests. Differences on the Speaking sub-test were also observed between post-test measures. No significant results were found for the third research question involving movies, television and other activities.

Three factors (initial level of proficiency, motivation and language use) had been previously identified in the literature as having a possible role in promoting long-term retention. The importance of the initial level of proficiency and of motivation had been discussed extensively in earlier studies. Since earlier studies had not examined specific language use variables, this research sought specifically to increase our knowledge of the role of language use in long-term retention. The results of this study help pinpoint some of the activities that may help promote retention of second language skills (and even their improvement, in some cases). Some of the findings of the current investigation also conform to the outcomes of these earlier studies on other factors. In the discussion that follows, these findings are related to other studies involving three categories of factors that promote retention: Language Use, as well as Initial Level and Motivation.

The role of language use

Two particular variables were shown to have helped maintain proficiency: courses taken in French and books read in French. Other studies (Edwards, 1977; Weltens, Van Els and Schils, 1989; Wesche, 1993) had examined retention while taking into account whether language use might be a factor. Berman and Olshtain (1983) and Godsall-Myers (1982) had found that lack of practice caused a decline in performance. Snow, Padilla and Campbell (1988) and Raffaldini (1988) had also showed that practice with the language could help maintain skills. None of these studies, however, had combined two aspects that made the current research original: interruption of treatment prior to the retention interval and focus on individual variables as indicative of language use.

Courses taken in French

Not surprisingly, the results indicate that taking courses through the medium of French is related to the retention of reading comprehension skills (receptive skills). Other studies (Weltens, Van Els and Schils, 1989) have indicated that receptive skills remain stable even without practice. However, the outcome of this study shows that production skills are also influenced by taking courses in French. Both the Oral Interview and the Elicited Imitation subtests indicated that those students who had taken courses given in French were significantly better at maintaining their performance than their peers who had not taken any courses in French. This finding differs from earlier studies by Raffaldini (1988) and Snow, Padilla and Campbell (1988) who had studied the influence of continued French language training on long-term retention.

Books read in French

The second variable shown to be related to long-term retention was language use in the form of reading books in French. Performance on two subtests was linked to this variable: Reading Comprehension and Elicited Imitation. Again, these findings support results obtained in earlier research that show that both receptive and productive skills are better maintained as a result of language use (Snow, Padilla and Campbell, 1988; Raffaldini, 1988). The results of our study, however, have isolated the book reading variable as one which, alone, seems to promote the retention of two particular skills (reading and speaking).

In addition to suggesting the importance of taking courses and reading books in French, some of the results of our study seem to reinforce the findings of earlier studies regarding the influence of the two other factors on long-term retention. These two other factors will now be discussed.

Initial level of proficiency and motivation

An interesting observation was made during analysis of the scores on the Reading Comprehension and Elicited Imitation subtests. The ongoing reading of books in French was significantly related to change in learners' performance on both these tests. However, it was also observed that, on both these subtests, the subjects who read books had lower initial baseline results than their counterparts who did not read books. On the post-test, both groups (readers and non-readers) had similar scores. These results could be interpreted in three ways.

First, it could be inferred that the higher achievers on the pre-test had achieved a proficiency level (possibly a critical threshold) that allowed them to maintain their performance despite not reading books. Other researchers (Bahrck, 1984; Clark and Jordan, 1984) have discussed the possibility that the attainment of this critical threshold or level might ensure long-term retention. A second interpretation of the results is in line with research done by Gardner, Lalonde and MacPherson (1985) as well as Edwards (1977) which showed the importance of motivation in maintaining second language skills. It could be, in the current investigation, that those students who had not done well on the pre-test were motivated to read books as a way of improving their abilities. Finally, it should be considered that those students who reported on their book reading activities may also have been practising other activities in French. Absence of reading would not necessarily mean absence of language use. This might account for the fact that maintenance was achieved by those who did not report any reading, however we were unable to verify this information in the data.

Theoretical issues: Reappearance vs. reconstruction

At the outset of this article, it was suggested in discussing the process of remembering that two views have dominated memory research during the past century: reappearance and reconstruction. The reappearance hypothesis proposes that previously learned concepts lie in a dormant state in storage until called upon to become aroused. The reconstruction hypothesis would view the process of remembering as an act of creating something new each time the memory is activated. Although this study was not designed to examine the process of remembering in terms of reappearance or reconstruction, it was nevertheless hoped that we could comment on the performance differences observed in light of these two constructs. The results do not allow us to draw any conclusions on the nature of the process of remembering. However, based on theoretical work aimed at defining reappearance and reconstruction, we might suggest possible links between language use and remembering. For example, Ebbinghaus (1885, 1964) showed that memory for nonsense syllables was enhanced when increasing the number of repetitions of these syllables.

The implication of these findings and of other subsequent experiments with rote learning, particularly by behaviourists, is that language use, defined as repeated practice with words, would promote reappearance (Tulving, 1972). This argument could be taken one step further to infer that second language retention, defined as a process of reappearance, could be aided by repeated practice with a concept or word.

On the other hand, reconstruction has become popular since the 1960's, with a revival of the ideas first presented by Bartlett (1932, 1995). He contended that memory was dependent upon the ability to reconstruct previously learned material by mastering a structured system of relationships between elements of a past learning experience. According to Neisser (1967), how well one is able to remember would depend upon one's ability to master this system and the more one was able to use the language, the better one would remember. It could then be inferred that language use would promote language retention, defined as reconstruction.

These inferences about the process of remembering remain purely hypothetical. The data collected in this study lead us no closer to understanding how reappearance or reconstruction, or both of these hypotheses, might explain the occurrence of second language attrition and how best to promote retention. In fact, a number of constraints precluded any firm conclusions from being drawn about the nature of this process. Rather, we can only speculate and suggest avenues for future research.

Constraints

No research project is ever conducted in ideal conditions and the current investigation was no exception to this rule. For several reasons, a number of constraints were present from the beginning to the end of the study. There are two particular considerations that mitigate the results of this study. The first concerns the presence of a variable, the number of second language courses taken, which could not be directly controlled. The second concerns the small size of the subsamples, which limited the data analyses that could be performed and make it difficult to draw firm conclusions with any degree of confidence.

As previously discussed, subjects were not specifically asked on the *Attitudes and Use Questionnaire* to distinguish between courses taken in French and language learning courses (i.e., grammar or conversation). We sought, through statistical means, to ascertain that the number of courses reportedly taken in French did not include language learning courses. The non-significant results of these analyses allowed us to dismiss the influence of language learning courses on long-term retention. The 'courses taken in French' variable, on the other hand, was significantly related to retention for some sub-tests.

A second problem with the data, however, could not be so easily solved. This concerns the limited size of the sample (and subsamples) which did not allow complex data analysis involving several independent variables. As a result, we are only able to conclude that some change in performance has occurred (or that no change has occurred). We are unable to know whether several types of language use interacted to produce retention. Further research, allowing control of individual language use variables with samples large enough to allow cross-referencing between them, would be recommended.

Conclusion

This study was aimed at investigating the role of specific language use variables in promoting second language retention. Based on earlier research, it had been determined that three main categories of factors were influential in enhancing long-term retention. Previous findings had pointed to the importance of the initial level of proficiency as a factor (Bahrick, 1984; Clark and Jorden, 1984; Weltens, Van Els and Schils, 1989). It had also been shown that motivation was desirable, if not essential, for individuals to maintain their level of performance over a long period of time (Edwards, 1977; Gardner, Lalonde and MacPherson, 1985). The role of language use in promoting retention had also been taken into account in several studies (Weltens, Van Els and Schils, 1989; Raffaldini, 1988; Snow, Padilla and Campbell, 1988). Wesche (1993) had also discussed language use as a factor in her study of graduates of bilingual high schools. None of these studies, however, had controlled specific language use variables and taken into account the absence of language training during the time interval between pre- and post-tests. Our study combined both these aspects.

In future research endeavours that might aim at defining retention in terms of reconstruction (Bartlett, 1932, 1995) or reappearance (Ebbinghaus, 1885, 1964; Neisser, 1967), it would be possible to reduce limitations, specifically by collecting new data. None of the tests used in the study by Wesche (1993), with the possible exception of the Elicited Imitation subtest, were specifically designed to measure reconstruction or reappearance. It was not possible to make any inferences as to the process of remembering as a function of either of these hypotheses. A future investigation would therefore be advised to inquire further into the nature of the processes involved in retention.

Notes

- ¹ The original database (Wesche, 1993) presented advantages and disadvantages. The most notable advantages were the large sample and the fact that the data had been collected over a three-year interval. Such a longitudinal study could not have been replicated in the context of an M.A. thesis. The secondary analysis of the data

presented some problems, however, namely that when the original sample was subdivided for further analysis, some of the numbers were very small. The original data also limited the nature of the questions that could be asked. In particular, we were unable to comment on the nature of the process of remembering, whether through reappearance or reconstruction since the subtests had not been designed with this objective in mind. Only the elicited imitation subtest, by its design, offered a glimpse of the process of reappearance. None of the other subtests can be directly tied to one process or the other.

² An initial sample of 154 subjects had been tested in 1988 (pre-test) but approximately half of these subjects were not available for post-testing.

Bibliography

- Bahrnick, H.P. 1984. "Fifty years of second language attrition: Implications for programmatic research." *Modern Language Journal*, 68, pp. 105-118.
- Bahrnick, H.P. and E. Phelps. 1988. "The maintenance of marginal knowledge". In U. Neisser and E. Winograd (eds.), *Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory*, pp. 178-192. New York: Cambridge University Press.
- Bartlett, F.C. 1932, 1995. *Remembering: A Study in Experimental and Social Psychology*. Cambridge: Cambridge University Press.
- Berman, R. and E. Olshtain. 1983. "Features of first language transfer in second language attrition." *Applied Linguistics*, 4, pp. 222-234.
- Clark, J.L.D. and E.H. Jorden. 1984. "A study of language attrition in former U.S. students of Japanese and implications for design of curriculum and teaching materials." *Final Project Report*, Washington, D.C., Center for Applied Linguistics.
- Ebbinghaus, H. 1885, 1964. *Memory: A Contribution to Experimental Psychology*. New York: Dover Publications, Inc.
- Edwards, G. 1977. *Second Language Retention in the Public Service of Canada*. Ottawa: Research Section, Official Languages Directorate.
- Gardner, R.C. 1982. "Social factors in language retention." In R.D. Lambert and B.F. Freed (eds.), *The Loss of Language Skills*, pp. 24-43. Rowley, MA: Newbury House.
- Gardner, R.C., R.N. Lalonde and J. MacPherson. 1985. "Social factors in second language attrition." *Language Learning*, 35, pp. 519-540.
- Gardner, R.C., R.N. Lalonde, R. Moorcroft and F.T. Evers. 1985. *Second Language Attrition: The Role of Motivation and Use. Research Bulletin #638*, London, Ontario: Department of Psychology, University of Western Ontario.
- Gardner, R.C. and L.M. Lysynchuk. 1990. "The role of aptitude, attitudes, motivation, and language use on second-language acquisition and retention." *Canadian Journal of Behavioural Sciences*, 22, pp. 254-270.
- Gardner, R.C., R. Moorcroft and J. Metford. 1989. "Second language learning in an immersion program: Factors influencing acquisition and retention." *Journal of Language and Social Psychology*, 8, pp. 287-305.

- Godsall-Myers, J.E. 1982. "The attrition of language skills in German classroom bilinguals — A case study." Dissertation, Bryn Mawr College. *Dissertation Abstracts International*, 43, 157-A.
- Harley, B. 1994. "Maintaining French as a second language in adulthood." *The Canadian Modern Language Review*, 50, pp. 688–713.
- Moorcroft, R. and R.C. Gardner. 1987. "Linguistic factors in second language loss." *Language Learning*, 37, pp. 327–340.
- Neisser, U. 1967. *Cognitive Psychology*. New York: Meredith Publishing Company.
- Neisser, U. and E. Winograd (ed.) 1988. *Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory*. New York: Cambridge University Press.
- Raffaldini, T. 1988. "Attrition of communicative ability among former year abroad students of French." Doctoral thesis, University of Indiana. *Dissertation Abstracts International*, 49, 807A.
- Snow, M., A.M. Padilla and R.N. Campbell. 1988. "Patterns of second language retention of graduates of a Spanish immersion program." *Applied Linguistics*, 9, pp. 182–197.
- Tulving, E. 1972. "Episodic and semantic memory." In E. Tulving and W. Donaldson (eds.), *Organization of Memory*, pp. 381–403. New York: Academic Press.
- Weltens, B., T.J.M. Van Els and E. Schils. 1989. "The long-term retention of French by Dutch students." *Studies in Second Language Acquisition*, 11, pp. 205–216.
- Wesche, M. 1993. "French immersion graduates at university and beyond: What difference has it made?" In J.M. Alatis (ed.), *Language, Communication, and Social Meaning: Georgetown University Round Table on Languages and Linguistics*, pp. 208–240. Washington: Georgetown University Press.
- Wesche, M., F. Morrison, C. Pawley and D. Ready. 1986. "Post-secondary follow-up of former French immersion students in the Ottawa area: A pilot study." Final Report to the Secretary of State, Canada.
- Wesche, M., F. Morrison, D. Ready and C. Pawley. 1990. "French immersion: Post-secondary consequences for individuals and universities." *Canadian Modern Language Review*, 46, pp. 430–451.

Appendix 1

Table 1: Responses given to questionnaire on activities performed in French (N = 76)

Variable	yes		no	
	#	%	#	%
Courses taken in French	9	11.8	67	88.2
Books read in French	12	15.8	64	84.2
Movies seen in French	29	38.2	47	61.8
Television watched in French	46	60.5	30	39.5
Other activities in French	24	31.6	52	68.4

Table 2: Means and Standard Deviations for Reading Comprehension subtest for courses taken in French during all three years of university study

Variable	Test scores			
	1988		1991	
	\bar{X}	SD	\bar{X}	SD
No course taken (N = 67)	12,93	3,45	13,79	3,01
Courses taken (N = 9)	8,77	5,95	12,33	3,46

Table 3: ANOVA with repeated measures for Reading Comprehension for courses taken in French during all three years of university study (N = 76)

Source	df	SS	MS	F
Between-subjects	74			
Group (courses taken or not)	1	124,64	124,64	7,18*
Error between	73	1267,23	17,36	
Within-subjects	74			
Test	1	77,55	77,55	12,03*
Interaction	1	28,70	28,70	4,45*
Error-within	72	464,35	6,45	
Total	148	1962,47		

*p < 0,05

Table 4: Means and Standard Deviations for Elicited Imitation subtest (exact responses) for courses taken in French during the first year of university study

Variable	Test scores			
	1988		1991	
	\bar{X}	SD	\bar{X}	SD
No course taken (N = 39)	2,97	2,99	4,92	3,41
Courses taken (N = 18)	1,94	2,48	6,78	3,35

Table 5: Means and Standard Deviations for Elicited Imitation subtest (equivalent responses) for courses taken in French during the first year of university study

Variable	Test scores			
	1988		1991	
	\bar{X}	SD	\bar{X}	SD
No course taken (N = 39)	4,54	3,32	11,82	2,56
Courses taken (N = 18)	2,89	3,29	13,11	1,53

Table 6: ANOVA with repeated measures for Elicited Imitation with exact responses for courses taken in French in the first year of university study (N = 57)

Source	df	SS	MS	F
Between-subjects	55			
Group (courses taken or not)	1	4,19	4,19	0,30
Error between	54	754,19	13,97	
Within-subjects	55			
Test	1	283,24	283,24	52,07*
Interaction	1	51,24	51,24	9,42*
Error-within	53	288,29	5,44	
Total	110	1381,15		

*p < 0,05

Table 7: ANOVA with repeated measures for Elicited Imitation with equivalent responses for courses taken in French in the first year of university study (N = 57)

Source	df	SS	MS	F
Between-subjects	55			
Group (courses taken or not)	1	0,79	0,79	0,07
Error between	54	596,70	11,05	
Within-subjects	55			
Test	1	1886,78	1886,78	351,17*
Interaction	1	53,23	53,23	9,91*
Error-within	53	284,68	5,37	
Total	110	2822,18		

*p < 0,05

Table 8: Means and Standard Deviations for Speaking sub-test (Oral 1, Oral 2, Oral 3) for courses taken in French during the first year of university

Variable	Test scores			
	1988		1991	
	\bar{X}	SD	\bar{X}	SD
Oral 1				
No course taken (N = 7)	3,58	0,38	3,21	0,27
Course(s) taken (N = 5)	3,60	0,42	3,60	0,42
Oral 2				
No course taken (N = 7)	3,33	0,41	3,07	0,35
Course(s) taken (N = 5)	3,60	0,55	3,90	0,42
Oral 3				
No course taken (N = 7)	3,67	0,41	3,29	0,49
Course(s) taken (N = 5)	3,80	0,45	3,90	0,82

Table 9: Means and Standard Deviations for Speaking subtest (Oral 1, Oral 2, Oral 3) for courses taken in French in second-year university

Variable	Test scores			
	1988		1991	
	\bar{X}	SD	\bar{X}	SD
Oral 1				
No course taken (N = 8)	3,50	0,29	3,25	0,27
Course(s) taken (N = 4)	3,75	0,50	3,63	0,48
Oral 2				
No course taken (N = 8)	3,36	0,38	3,19	0,46
Course(s) taken (N = 4)	3,63	0,63	3,88	0,48
Oral 3				
No course taken (N = 7)	3,71	0,39	3,31	0,46
Course(s) taken (N = 4)	3,75	0,50	4,00	0,91

Table 10: T-tests performed on post-tests (1991) for Speaking subtest (Oral 1, Oral 2 and Oral 3) for courses taken in French during the first year

Variable	\bar{X}	SD	<i>t</i>
Oral 1 No course taken (N = 7)	3,21	0,267	-1,96
Courses taken (N = 5)	3,60	0,418	
Oral 2 No course taken (N = 7)	3,07	0,345	-3,76*
Courses taken (N = 5)	3,90	0,418	
Oral 3 No course taken (N = 7)	3,29	0,488	-1,63
Courses taken (N = 5)	3,90	0,822	

*p < 0,05

Table 11: T-tests performed on post-tests (1991) for Speaking measures (Oral 1, Oral 2 and Oral 3) for courses taken in French during the second year

Variable		\bar{X}	SD	t
Oral 1	No course taken (N = 8)	3,25	0,267	-1,78
	Courses taken (N = 4)	3,63	0,479	
Oral 2	No course taken (N = 8)	3,18	0,458	-2,42*
	Courses taken (N = 4)	3,88	0,479	
Oral 3	No course taken (N = 8)	3,31	0,458	-1,78
	Courses taken (N = 4)	4,00	0,913	

*p < 0,05

Table 12: Means and Standard Deviations for Reading Comprehension subtest for books read in French each month

Variable	Test scores			
	1988		1991	
	\bar{X}	SD	\bar{X}	SD
No books read (N = 64)	12,84	3,55	13,64	2,92
Books read (N = 12)	10,25	5,58	13,50	3,94

Table 13: ANOVA with repeated measures for Reading Comprehension for books read each month (N = 76)

Source	df	SS	MS	F
Between-subjects	74			
Group (books read or not)	1	7,78	37,78	2,04
Error between	73	1351,93	18,52	
Within-subjects	74			
Test	1	82,75	82,75	12,88*
Interaction	1	30,41	30,41	4,73*
Error-within	72	462,90	6,43	
Total	148	1925,77		

* p < 0,05

Table 14: Means and Standard Deviations for Elicited Imitation subtest (exact responses) for books read in French each month

Variable	Test scores			
	1988		1991	
	\bar{X}	SD	\bar{X}	SD
No books read (N = 47)	4,43	3,30	12,04	2,50
Books read (N = 10)	2,10	3,18	13,10	1,19

Table 15: ANOVA with repeated measures for Elicited Imitation with exact responses for books read each month (N = 57)

Source	df	SS	MS	F
Between-subjects	55			
Group (books read or not)	1	6,63	6,63	0,62
Error between	54	577,45	10,69	
Within-subjects	55			
Test	1	1428,94	1428,94	260,62*
Interaction	1	47,18	47,18	8,61*
Error-within	53	290,42	5,48	
Total	110	2350,62		

*p < 0,05

Appendix 2: French Proficiency Tests from which results were analyzed (Wesche, 1993)

Test	Description
Listening	
Listening comprehension	A listening comprehension test which measures the understanding of spoken French in an academic context. It consists of three tape recorded passages. Students listen twice to each passage, which followed by several content questions. They read the answer options in their test booklet, choosing the one that corresponds best to each question.
Listening dictation	A dictation test of the accuracy and completeness of listening comprehension of a passage from an introductory university textbook. Read three times, the second time in varied length segments meant to challenge short-term memory and require reconstruction. It is scored for the number of meaning units recorded in correct sequence.
Reading	
Reading comprehension [revised version used in 1988 and 1991]	A reading comprehension test which measures the understanding of written French in an academic context. It consists of three reading passages, students read the selections in their test booklet and answer the multiple choice questions following each one.
Cloze	A cloze test which provides a general measure of second language proficiency, including reading comprehension. It consists of a prose passage, based on an authentic text, in which selected words have been deleted to be filled in by students.
Oral	
Oral interview [administered to sub-samples in 1985/88; 1988/91]	An individually administered interview involving three tasks: [1] description of a sequence of drawings; [2] discussion of tourist brochures from two locales; [3] a simulated job interview for a summer tourism-related job in one of the locales. Each is scored by the interviewer on a scale of 1 to 5, based on performance descriptions.
Elicited Imitation [administered in 1988, 1988/91]	A sentence repetition task based on a French-language radio broadcast for an adolescent audience. Students first listen to the extended text, then listen to and repeat the individual sentences of varying length which compose it. Scoring is for accuracy of repetition and various oral grammar points.