

LONG TERM RETENTION OF SCHOOL CONTENTS ON PORTUGUESE LITERATURE AND GEOGRAPHY*

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Abstract: Two studies were carried out to assess the rate of forgetting of academic contents in secondary school over a period of 3-4 years using recall, cued recall and recognition tests. The first study tested two groups in Portuguese literature, one before exam and the other 3 years later. Significant differences were obtained with memory tests, but not with retention intervals. The second study tested 3 groups in geography, one group before exam and the other two groups 3 and 4 years later. The same pattern of results were revealed with an additional significant interaction between retention intervals and tests. It was suggested that some sporadic exposure to the school materials selected might explain the results obtained.

Key words: long-term retention, school knowledge, memory tests

In the past decade there was a growing interest in what students remember from course contents after long retention intervals (Bahrick, 1984; Naveh-Benjamin, 1990; Semb, Ellis, 1994, for a review). Although the thrust of this research was energized by the Bahrick's (1984) study, there was already a large number of studies on knowledge taught in school going back to the 1930s, as Semb and Ellis (1994) reminded us recently.

From an educational point of view, the study of long-term retention rates for different academic contents seems to be a valid research effort to pursue. Teachers and instructors would organize class contents in different ways, according to their assumptions about what are the most likely forgetting rates for a given course. If forgetting rate is very fast, some topics taught once may have to be lectured

again. If forgetting rate is negligible, such course contents can be addressed differently or more quickly.

Most studies on long term retention of academic contents showed, among other results, that knowledge taught in school was well retained after long retention intervals going from a few years to several decades. Furthermore, it was revealed that retention was significantly lower when measured by recall than by recognition memory tests (Bahrick, 1984; Conway, Cohen, Stanhope, 1991; Pinto, 1989, 1991). Meanwhile, other tests have shown mixed results (e.g., Semb, Ellis, 1994).

One of the purposes of this research was to directly compare retention differences among recall, cued recall and recognition for the same answer items. Although retention performance is invariably lower for recall, it is not clear how performance in cued recall tests compares with other retention functions. It could be as lower as the recall performance, as higher as recognition, or somewhere in between.

The other research purpose was to study long term retention for two different

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course contents, taking into account Neisser's (1984) comment on Bahrick's (1984) study. Neisser (1984) suggested that it was plausible to think that forgetting rates would be different for different academic contents. Thus one could expect that retention function for Spanish language would be different from other academic contents, such as mathematics, music or motor skills. In order to explore this hypothesis further, two different academic contents were selected, namely Portuguese literature and geographical information. Since these courses were taught at the secondary school, it is presumed that pupils had no or negligible prior knowledge on these subjects.

Previous studies have shown that prior knowledge has a profound effect on academic retention by supplying a better qualitative schema or structure to acquire new related knowledge (e.g., Semb, Ellis, 1994). In contrast to university students, the favorite samples for studies of this kind, pupils in secondary school acquire most of their academic knowledge for the first time in such setting. It seems reasonable to claim that extending this kind of research to samples of secondary students represents an attempt to increase the external validity of the effects found in this research domain.

EXPERIMENT 1

This experiment investigated retention of academic contents from two well known Portuguese literature books, lectured in detail during the first and second semesters of the 9th-grade in Portuguese secondary schools. Reading and understanding these books is a requisite to successfully achieve a positive score in Portuguese literature in the 9th-grade. Two groups of secondary pupils were tested

about these book contents, one at the end of the 9th-grade and the other group at the end of the 12th-grade.

METHOD

Subjects

A sample of 38 secondary school pupils were selected from a state secondary school, located in a small city. Half were 9th-graders, aged 14 - 15 years, and the other half were 12th-graders, aged 17 - 18 years. Age range in each group was kept to within two years and gender was roughly balanced.

Design and questionnaire

A 20-item questionnaire was built to assess academic contents of two well known Portuguese literary books, studied in detail in classes of Portuguese literature when pupils are in the 9th-grade. The books were «O Auto da Barca do Inferno» (The play of the hell's boat) by Gil Vicente and «Os Lusíadas» by Camões. Retention intervals selected were the end of the academic year and three years later. The questionnaire had three versions, each designed for the following test formats: Recall, cued recall from the first letter of the correct answer and 4-choice recognition. Questionnaires were always presented in this order. In contrast to previous studies that used different answer-items for each memory test (e.g., Conway et al., 1991), the same answer-items for all three tests were selected for this research.

Typical item-questions for recall were: "Where was the setting of «The play of the hell's boat»?" and "Who was the hero of «Os Lusíadas»?"; for cued recall: "The setting of «The play of the hell's boat» was by the R____" and "The hero of «Os

Lusíadas» was P___"; for recognition: "The setting of «The play of the hell's boat» was by the: 1. River; 2. Sea; 3. Lake; 4. Well" and "The hero of «Os Lusíadas» was: 1. Vasco da Gama; 2. Infante D. Henrique; 3. Camões; 4. Povo Português".

Procedure

Pupils were tested in the classrooms by their own teachers in the final weeks of the academic year. Pupils were asked to fill in three questionnaires about the contents of two Portuguese literary books studied during the present academic year for the 9th-graders (or three years ago for the 12th-graders) and were informed that the questionnaires were only for research purposes and their scores will not affect their final marks. The recall test was always given in the first place to all pupils in the classroom and the recognition test at the end. When the recall test was completed, it was collected by the teacher and the cued recall test was given out. The

same procedure was followed for the third test. There was no time limit, but each test was completed in less than 10 minutes. The number of pupils tested was larger than the sample selected. Pupils were excluded from the final sample if they did not comply with the following criteria: (1) Attendance of Portuguese literature classes in the same secondary school; (2) Available marks for Portuguese literature and end-of-year-average examinations from all disciplines.

RESULTS AND DISCUSSION

One point was given to each correct answer, the maximum being 20 points. Retention interval for the 9th graders, whose academic knowledge tested was acquired during the present academic year is labeled "0" and for 12th graders, whose academic knowledge was obtained 3 years earlier, is labeled "3". Mean percent of correct responses for the three memory tests at the two retention intervals are shown in Figure 1.

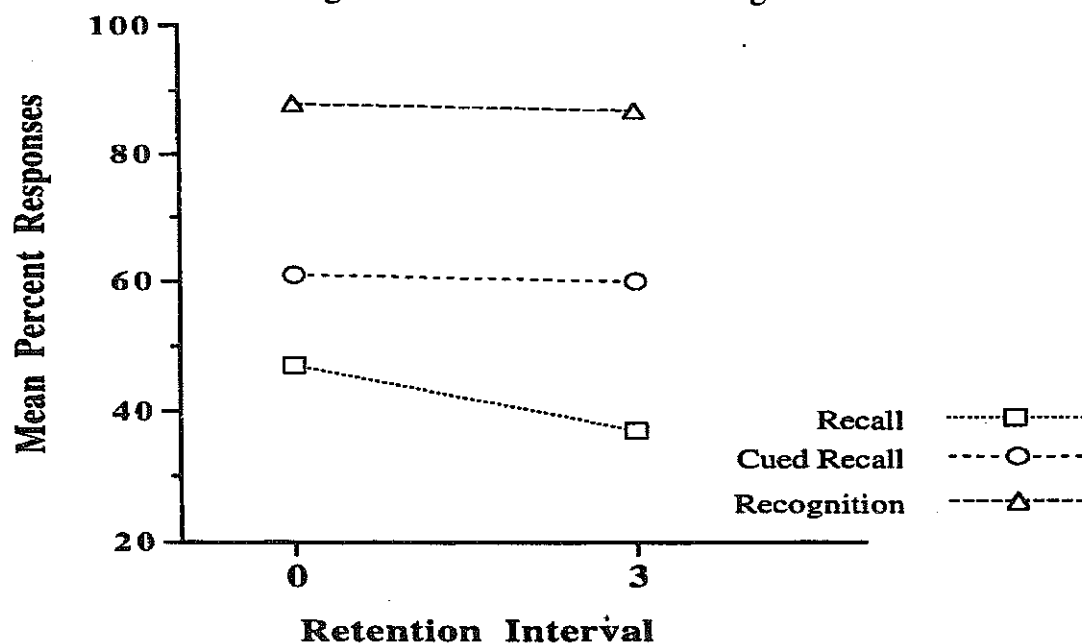


Figure 1: Mean percent of correct responses obtained in Portuguese literature before the end-of-year exam (0) and three years later (3) in memory recall, cued recall and recognition tests

A 2-way ANOVA indicated that the only significant effect was the type of test given, $F(2, 72) = 182.6$, $p < .001$, $MSe = 4.40$. Post hoc Tukey-test comparisons revealed that all means differ among them, $p < .01$. Thus retention performance was significantly higher for recognition than for the other two memory tests, with cued recall somewhere in between. Both retention interval, $F(1, 36) < 1$, and the interaction between the two main effects, $F(2, 72) = 2.2$, $p > .10$, $MSe = 4.4$, were not significant.

The results of this study showed that pupils reveal little or virtually no forgetting after 3 years for the academic knowledge tested. Although unexpected, such similar retention rates across the 3-year period could be due to occasional references in Portuguese language courses in subsequent grades, keeping therefore this kind of academic knowledge at a high level of retention rate.

Pearson's r correlation coefficients were obtained for the three memory tests, end-of-year examination in Portuguese literature at the 9th-grade and end-of-year academic average score for all courses enrolled at the 9th-grade. It was found that all three memory tests correlated highly with each other, with alpha levels of significance at $p < .001$. Recall test correlated with Portuguese end-of-year examination, $r(36) = .35$, $p < .05$; Also, Portuguese course correlated with end-of-year average score, $r(36) = .55$, $p < .001$.

EXPERIMENT 2

Experiment 2 was designed to determine if retention rates behave differently or not across a 4-year retention period by selecting a secondary school course that had no follow up within the same academic discipline until the end of the secondary school

system. The academic knowledge tested was Portuguese geography. This course is part of the 8th-grade and its contents are only examined at the end of this grade. It is unlikely that exposure to geographical academic contents takes place in subsequent academic years. In addition to the retention intervals selected for Experiment 1, a 4-year interval was added in order to observe more closely the forgetting rates for geography.

METHOD

Subjects

Fifty one pupils from the same secondary school of Experiment 1 were selected. None of them participated in the previous Experiment. There were 26 pupils from the 8th-grade, 14 pupils from the 11th-grade and 11 from the 12th-grade. The age range for each group was 13-14 years old for the 8th-grade; 16-17 years old for the 11th-grade and 17-18 years old for the 12th-grade. Previously applied criteria for age and gender were followed again.

Design and questionnaire

Knowledge on geography was tested with a 20-item questionnaire. The question items were typical of the end-of-year exam. Retention intervals selected were the end of the academic year, three and four years later. Like Experiment 1, there were three test formats: Recall, cued recall and 4-choice recognition. These tests had the same answer items.

Typical item-questions for recall were: "Give the name of the highest mountain in the country" and "The majority of rivers in the country runs from East to West, but there is one that runs from South to North.

Name it"; for cued recall: "The name of the highest mountain in the country is P____" and "The majority of rivers in the country runs from East to West, but there is one that runs from South to North. The river is S____"; for recognition: "The name of the highest mountain in the country is: 1. Estrela; 2. Peneda; 3. Pico; 4. Caldeirão" and "The majority of rivers in the country runs from East to West, but there is one that runs from South to North. The river is: 1. Sado; 2. Sorraia; 3. Sabor; 4. Sousa".

Procedure

Testing took place in the final two weeks of the academic year in geography classes for the 8th-grade and in Portuguese language classrooms for the 11th and 12th grades. The order of tests given was identical to Experiment 1, as well as all other procedure matters. For the 11th- and 12th-grades, all students attending two classrooms were given the three Geography questionnaires, but scores were only considered for those pupils who previous-

ly attended Geography classes in the same school and whose end-of-year marks were available.

RESULTS AND DISCUSSION

The maximum score for each subject in each test was 20 points. Retention intervals for the 8th-, 11th- and 12th-graders were labeled "0", "3" and "4" years respectively. Mean percent of correct responses for the three memory tests at the three retention intervals are shown in Figure 2. In order to determine if the differences observed are statistically significant, a 2-way ANOVA was selected. Statistically significant results were obtained for memory tests, $F(2, 96) = 452.66$, $p < .001$, $MSe = 2.71$ and for the interaction between memory tests and retention interval, $F(4, 96) = 2.54$, $p < .05$, $MSe = 2.71$. The retention interval factor was far from being significant, $F(2, 48) < 1$, $MSe = 15.27$. Post hoc Tukey-test comparisons on memory tests revealed that all means differed among them, $p < .01$.

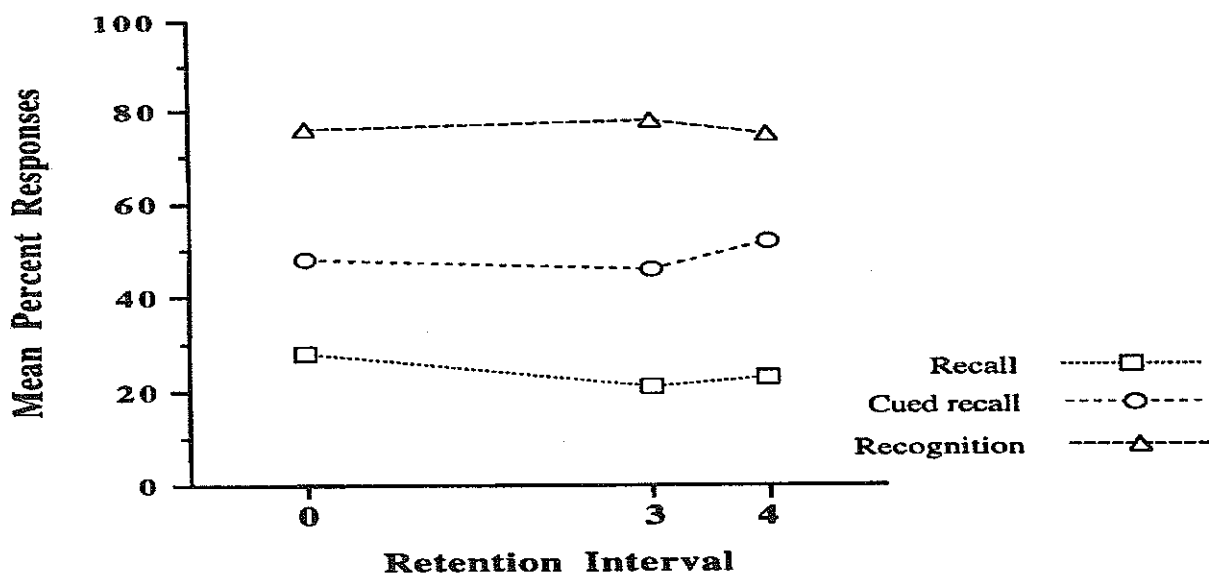


Figure 2: Mean percent of correct responses obtained in Geography before the end-of-year exam (0), three (3) and four (4) years later, in memory recall, cued recall and recognition tests

As in Experiment 1, retention was equivalent across the retention intervals as long as 3-4 years. Unlike Experiment 1, however, there was a significant interaction between retention interval and type of memory tests, where it was found that retention declined when tested by a recall test, but not when tested by recognition and cued recall.

Pearson's r correlation coefficients were obtained for the three memory tests, end-of-year examination in geography in the 8th-grade and end-of-year academic average score from all courses enrolled in the 8th-grade. It was found that all three memory tests correlated highly with each other, with alpha levels of significance at $p < .001$. Academic scores in geography correlated significantly only with the end-of-year average score, $r(49) = .91$, $p < .001$, but not with any memory tests.

GENERAL DISCUSSION

In general, the results of this study showed that pupils reveal little or virtually no forgetting after 3-4 years for two different academic courses taught in the secondary school, but this information is affected by the test given.

Taken together, retention rates for the academic contents selected in these two Experiments tend to be similar for periods of 3-4 years, more precisely until pupils complete their secondary school degree.

Such equivalence on retention rates across this period could be due to further exposures, either in an academic context or incidentally in daily life. Although the contents of the two literary books were not subject to formal teaching after the 9th-grade, it is likely that in Portuguese literature classes, teachers made occasional references to their contents from the

10th to the 12th-grades. Similarly, the same might have occurred in geography in more fortuitous ways. Although geography taught at the 8th grade did not have a follow up course in the same academic area at the 9th through the 12th grades, it could happen that some of its contents is mentioned in the media and in occasional conversations, thus generating new learning events and preventing a possible decline in retention rates.

This pattern of results, although unexpected, is not at odds with results obtained from previous studies. Conway et al. (1991) observed that recognition rates were equivalent over six years at a level of about 77% for a course on Research Methods (see Conway et al., 1991, Fig 5), and Pinto (1991) found equivalent retention rates at 1-, 12-, and 24-month retention intervals for academic contents from practical classes on cognitive psychology.

It is fair to say that this research used a between-subject design, often followed in studies of long term retention of academic knowledge (e.g., Bahrick, 1984; Conway et al., 1991). Since subjects are not randomly assigned to groups, these groups differ by age besides the retention intervals being investigated. Whatever the confounding effect of the age variable might have with the age period investigated in this study, these results should be interpreted carefully. Nevertheless a within subject design, if used, would have its own risks associated with repeated memory tests, each of which would produce supplementary learning occasions.

Finally, this research revealed lower retention rates for recall than for recognition tests on memory for academic knowledge. This seems to be a strong effect observed across many previous studies (e.g., Pinto, 1991; Semb, Ellis, 1994 for a review). In addition, this research showed

that performance on cued recall tests was somewhere in between the other two memory tests. This result can be an important aspect to take into account in studies of this kind, since the cued recall test is barely used, as far as we know.

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DLHODOBÁ RETENCIA ŠKOLSKÝCH VEDOMOSTÍ Z PORTUGALSKEJ LITERATÚRY A ZEMEPISU

A. C. P i n t o

Súhrn: V dvoch výskumoch sa pomocou reprodukcie, navodenej reprodukcie a testov znovupoznania sledovalo zabúdanie stredoškolských vedomostí po 3-4 rokoch. V prvom výskume sa skúšali dve skupiny z portugalskej literatúry, jedna pred koncoročnou skúškou a druhá po 3 rokoch. Zistili sa významné rozdiely v pamäťových skúškach, ale nie v retenčných intervaloch. V druhom výskume sa skúšali 3 skupiny zo zemepisu, jedna skupina pred koncoročnou skúškou a ďalšie dve skupiny po 3 a 4 rokoch. Získali sa podobné výsledky, pričom sa zistila aj významná interakcia medzi retenčnými intervalmi a skúškami. Predpokladá sa, že získané výsledky by mohli vysvetliť sporadické stretnutie sa so zvolenou učebnou látkou.