

## THE EFFECTS OF FAMILIARIZATION ON COMPETENCY IN A LEARNING TASK

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This experiment investigated the effects of familiarizing Ss on initially unfamiliar verbal materials (paralogs) which were used in a reading paragraph as names of component parts of a fictitious machine. Half of the 120 fourth, fifth and sixth grade Ss received relevant and half received irrelevant familiarization. The relevant familiarized group exhibited a marked superiority on the test of recall of information learned from the paragraph. Analysis extended to ascertaining whether the competency imparted by familiarization extended beyond mere expressional fluency. The results indicate that although the relevant familiarized children are better able to express (spell) what they have learned, they answer more questions correctly even when the exactly correct spelling criterion is waived in scoring the recall test. In this situation, of course, the advantage of any added expressional fluency is largely eliminated.

In his presidential address to the Society for the Psychological Study of Social Issues, Jerome Bruner remarked, 'the idea of "readiness" is a mischievous half-truth. It is a half-truth largely because it turns out that one *teaches* readiness or provides opportunities for its nurturance, one does not simply wait for it. Readiness, in these terms, comprises mastery of those simpler skills that permit one to reach higher skills' (1).

Of course, it remains to discover those simpler skills on which performance at higher levels in any given task depends (that is, the hierarchies of competence) and to discover the means by which the various prerequisite competencies may be imparted. A beginning has been made in analyzing hierarchies in mathematics (8) and reformulating the principles of learning so as to make explicit the conditions upon which the acquisition of competence at the various levels depends (6). Out of these new developments has grown the 'process approach' to science instruction (7).

One readiness drill invoked in verbal learning experiments involves familiarizing Ss with materials to be encountered later in a learning task. Research has shown that not only is serial learning facilitated by such familiarization (15, pp 103-104) but that the effect can be obtained with

relatively few familiarization trials provided pronouncing, not spelling, instructions are used (9, 10)

In terms of a hierarchical analysis, further investigation (12) has disclosed that familiarization seems to affect the associative as well as the response-acquisition stages (17) of the serial task. This fact of a somewhat general effect attainable with few familiarization trials led Murray and Gillooly (14) to inquire if familiarization on unfamiliar terms embedded in a reading paragraph enhanced adult reading comprehension (as reflected by a recall test). An affirmative answer, although showing the fruitfulness of pursuing familiarization's effect on literacy instruction, left unanswered the question of the locus of the effect in terms of a competence hierarchy.

Linguists (13) distinguish between two components of an utterance (whether spoken or written) the form the expression takes, and its content. These two components, in turn, give rise to two kinds of competency. Expressional competency, as the phrase is used here, refers to the ability to emit a response in appropriate form whereas conceptual competency depends on knowledge of the content of a communication and, therefore, refers to the ability to emit the response in any form. The distinction is made, then, between those who have acquired some information but who are unable to express it appropriately under certain circumstances (conceptual but not expressional competency), and those who have not only learned some information but can express themselves (conceptual as well as expressional competency).

This research seeks to determine whether familiarization merely enhances pupils' ability to express the correct answer to a question or whether it facilitates their learning the answers, or both. By analogy with the earlier Gillooly study (12), it may be hypothesized that familiarization will enhance both expressional and conceptual competency.

#### METHOD

*Experimental Design.* A  $2 \times 3$  treatments by levels design was used in which there were two familiarization conditions and three grade levels (4th, 5th, and 6th). The treatment groups differed only in the familiarization materials each was given prior to exposure to the reading paragraph. One group was exposed to paralogs which were included in the reading paragraph and which constituted the correct answers to the questions asked in the recall, recognition and spelling tests (the relevant familiariza-

tion condition, RF) whereas the other group was exposed to materials which, although paralogs, were not included in the reading paragraph (the irrelevant familiarization condition, IF)

Three tests (recall, recognition, and spelling), correct performance on which is thought to involve the different competencies, were administered in that order. The spelling test data are considered an indicant of expressional competency, the recognition test data an indicant of conceptual competency (since one does not have to be able to spell the answer to be correct), and the recall test data reflect both expressional and conceptual competency (when a correct spelling criterion is enforced in scoring)

There were four dependent variables for the analysis of variance: (i) the number of questions answered correctly in a recall situation when a correct spelling criterion was enforced, (ii) the number of correct answers to the recall questions when the correct spelling criterion was waived, (iii) the number of questions answered correctly in a recognition test, and (iv) the number of relevant familiarized terms recognized as being spelled correctly

Analysis of the data was primarily by means of anova. However, the Mann-Whitney *U* test was used to monitor the effects of equalizing the number of replicates in the  $T \times L$  matrix as described more fully below

*Subjects* One hundred and twenty 4th, 5th, and 6th grade students were assigned within classrooms by an unbiased procedure to one of the two treatment conditions (sixty per condition). The number of Ss which belonged to each grade level by treatment cell was as follows: 6th grade, 24 Ss (12 per condition), 5th grade, 47 Ss (23 IF, 24 RF), and 4th grade, 49 Ss (25 IF, 24 RF). For the purposes of the anova, one S was randomly deleted from the 4th grade IF group and the cell mean was added to the 5th grade IF group. The effect of this adjustment on the main treatment effects was monitored by means of the Mann-Whitney *U* test computed without regard for grade levels (that is, for the purposes of this analysis, the design was considered to be a two randomized group design of the type Campbell and Stanley (2) call the 'posttest-only control group design')

The Lida Lee Tall School from which the Ss were drawn is a laboratory school, whose population is heavily weighted by the inclusion of children of the staff at the Towson (Maryland) State College

*Materials* The experiment required the use of verbal materials which, although as 'word-like' as possible, were initially unfamiliar to the Ss. It was decided to use paralogs from the list provided in Woodworth and Schlosberg (19, p. 703). The 'relevant' paralogs (those included in the

reading paragraph) were TARUP, MEDON, GOKEM, RUNIL, LATUK, and KUPOD TWIC(s) and CRAD(DING) were added to serve as verbs. These were obtained from a list of four letter syllables in the same source from which the paralogs were obtained. The 'irrelevant' materials were BABAB, DEFIG, FIMUR, NIGAT, POLEF, ZUZUZ, SARK(s) and THOG(GING).

The to-be-familiarized materials were arranged in six columns of eight items (hence, there were six familiarization trials). The order of items in familiarization was invariant across columns and Ss. A line was provided beside each item on which Ss were to write the terms. The instructions were 'Pronounce each word three times as you write it in the space to the right.' Both groups read the same (136 word) story about a fictitious invention in which the paralogs served as the names of component parts of the machine (14). The story was presented in upper case letters above a line-drawing of the machine.

Both the recall and the recognition tests asked the same questions. They differed only in the fact that the recognition test included a list of all the possible answers to the questions (and, thereby, enabled those Ss to profit who were unable to spell the correct answers in the recall situation). Guessing was rendered more hazardous than it might otherwise have been by the use of two more questions (ten) than there were answers. In other words, two answers were used twice.

The spelling test was entirely written. This was thought to be necessary in the light of the obvious Experimenter-Subject pronunciation differences which could produce interference in such a situation where novel verbal materials were being used. The eight correctly-spelled paralogs were presented along with four misspellings of each form by substituting alternative vowels for the correct ones. Ss were instructed to circle the correctly spelled 'word' on each line.

The materials (familiarization sheet, either RF or IF, the paragraph including the line drawing, the recall, recognition, and spelling tests) were assembled into a five page booklet. Booklets for the RF and IF groups differed only in the first sheet.

*Procedure* Familiarization—The assembled materials were distributed randomly within classes (that is, there were  $n/2$  Ss per condition within each classroom). The instructions to pronounce each word silently three times while writing it were emphasized to the Ss.

*Learning*—When the students had finished familiarization (in about ten minutes), they were instructed to turn the page 'all the way over and under the other sheets' and to read the story about the machine and to study the picture. E forewarned Ss of the impending questions and

instructed them to use all of the available time (5 minutes) reading and studying

**Testing**—Upon completion of the study period, Ss were instructed to turn the page as before and answer the recall questions doing the best they could at spelling the answers. Four minutes were allowed for recall.

Immediately after completing the recall test, Ss were put to work on the recognition test and instructed to answer the questions again. Attention was called to the correct spellings of the answers at the top of the page. Three minutes were allowed for this task.

Upon completion of the recognition test, Ss were instructed to turn the page as before and to circle the word on each line that is correctly spelled. Each S was given as much time as needed to complete this spelling test, rarely more than a minute was required.

In all, the experiment lasted approximately thirty minutes.

### RESULTS

The mean scores on the four dependent variables for the various groups by treatments and levels are presented in Table 1.

TABLE 1  
MEAN SCORES OF GROUPS BY TREATMENTS AND LEVELS

Dependent Variables	Treatments		Independent Variables			Over-All
	RF	IF	4	5	6	
Recall (spellings considered)	3.37	1.57	1.42	3.11	3.29	2.47
Recall (spellings ignored)	3.93	2.41	1.87	3.95	4.21	3.17
Recognition	5.62	4.86	4.04	5.68	6.75	5.24
Spelling	7.00	6.38	6.23	6.79	7.42	6.69

*Recall Test* The analysis of variance performed on the number of questions answered correctly in the recall situation when spellings were taken into consideration (that is, when only the correctly spelled responses were accepted) showed significant main effects due to both familiarization ( $F = 16.96$ ,  $df = 1, 114$ ,  $p < .001$ ) and grade level ( $F = 7.81$ ,  $df = 2, 114$ ,

$p < .001$ ) The RF group supplied 337 answers to the ten questions, on the average, whereas the IF group supplied only 157 answers. The results of the Mann-Whitney  $U$  test performed on the unadjusted data concur with the anova ( $U = 2505, z = 3.70, p = .001$ )

The data from the recall tests scored without regard for spelling (that is, when any reasonably accurate or recognizable answer was accepted) showed the same results. Both the treatment ( $F = 11.34, df = 1, 114, p < .005$ ) and grade level main effects ( $F = 10.98, df = 2, 114, p < .001$ ) were significant although there was no interaction. And, as before, the  $U$  statistic is in agreement with the anova ( $U = 2386, z = 3.08, p = .001$ )

Understandably enough, relaxing the spelling criterion led to an increase in the number of questions answered correctly by both groups, however, the increase was greater for the IF (82 items) than for the RF group (57 items) ( $U = 2121, z = 1.69, p = .05$ ). Apparently, enforcing the spelling criterion depresses the scores of the IF group more than the RF group.

The rank-order correlation between the scores generated by both scoring criteria (spelling criterion enforced/waived) was very high ( $\rho = .93$ ) and, of course, significant ( $t = 27.43, df = 118, p < .001$ )

**Recognition Test** As expected, performance on the recognition test (where the correct spellings were supplied) was higher than on the recall test for both treatment groups. However, the recall (spelling criterion enforced)/recognition test difference was greater for the IF (329 items) than for the RF group (225 items) ( $U = 2245, z = 2.34, p = .01$ ). The use of a test in which spelling proficiency is superfluous operated to the advantage of the IF group. As a result, RF/IF group differences have diminished.

The anova performed on the number of questions answered correctly on the recognition test showed only a significant main effect due to grade level. However, the  $U$  test computed on the *unadjusted* data (i.e., the original data before the number of replicates in the  $T \times L$  cells were equalized) leads to a different conclusion ( $U = 2055, z = 1.35, .08 < p < .09$ ). Since the results of the  $U$  test performed on the *adjusted* data agree with the anova ( $U = 2021.5$ , for which  $z = 1.16, p = .12$ ), it appears as though the disparity is due to the adjustment process and not the use of a different statistic. This conclusion is supported by an inspection of the adjustment process which revealed that both changes operated to inflate the IF group's performance.

The decision to reject the null hypothesis, however, reflects not only this but evidence collected in a pilot study of 59 children of the same age.

There,  $U=490$ , for which  $z=88$ ,  $p=.19$ . Combining probabilities (.09 and .19) in accordance with the procedure presented in Winer (18, pp 43-45) produces a  $\chi^2=8.14$  which for  $df=4$ , yields an overall significance level of  $.05 < p < .10$ . Far more persuasive, however, is the fact that in the pilot study as here the RF group was superior on the recognition test at each grade level (4th, 5th, and 6th). Nevertheless, it must be stressed that the reader may choose to accept, quite justifiably, the null hypothesis in this instance and await further research that might reveal a more compelling relationship between familiarization and recognition than the one presented here.

*Spelling Test* Since relaxing the spelling criterion in scoring the recall test as well as the use of a recognition test (where spelling proficiency was largely superfluous) operated to the advantage of the IF group, it may be inferred that the RF group was superior in spelling. This conclusion is supported by the results of the spelling test. As shown in Table 1, the RF group attained a score of 7.00 out of a maximum possible score of 8, whereas the IF group's mean score was 6.38. The results of the anova show that the difference was significant ( $F=5.10$ ,  $df=1, 114$ ,  $p<.05$ ) and, the results of the  $U$  test are in agreement ( $U=2253$ ,  $z=2.38$ ,  $p=.009$ ). Further, the grade level main effect as well as the familiarization by grade level interaction was significant. Inspection showed that the interaction was ordinal with the greatest difference between treatment groups occurring at the fourth grade level (for the 4th grade,  $RF=6.96$ ,  $IF=5.50$ , 5th grade,  $RF=6.83$ ,  $IF=6.74$ , 6th grade,  $RF=7.42$ ,  $IF=7.42$ ). Since the fifth and sixth grade groups were operating close to the maximum score attainable on the test, it is believed that the interaction is artifactual, a result of this 'ceiling effect'. In other words, it appears as though the fifth and sixth graders could spell so well that there was little room for an improvement due to treatment (familiarization).

#### DISCUSSION

There was a clear-cut superiority in recall (when the spelling criterion was enforced) which favoured the RF group. The effect was so pronounced, in fact, that the RF group answered about twice as many questions as the IF group.

This difference is ambiguous, however, for it could have arisen from the two distinctly different competencies—one intellectual and the other having to do only with the expression of information. That is, it is possible that the RF/IF differences manifested in the recall data (when the correct

spellings were required) were due not so much to the fact that the RF group learned more about the content of the paragraph but rather to the fact that the IF group was unable to *express in writing* (i.e., spell correctly) what they had learned. The groans of students who, when undertaking any examination where constructed responses are required, are informed that points will be deducted for incorrect spellings attest to their awareness that expressional inadequacies may mask conceptual competence. The data from the other tests will be used to shed light on this issue.

The hypothesis that familiarization has done no more than merely provide the RF group with a means by which their responses can be transmitted (that is, enhance the expressional competence of the RF group) receives support from the spelling data which showed an RF group superiority.

One way to eliminate the advantage of any added expressional fluency and thereby determine whether the RF group superiority extended beyond expressional competence would be to examine the recall data waiving the correct spelling criterion. Accordingly, the recall test was re-scored accepting any answer as correct so long as it was recognizable as appropriate. Although the IF group profited more than the RF from this rescoring, the RF group maintained their superiority. These results suggest that expressional competence wasn't the only benefit derived from prior familiarization on task-relevant terms. Nevertheless, the recall data (even with the correct spelling criterion waived) may not be taken as conclusive evidence that the RF group acquired more information in the course of their study. For, the argument may be advanced that the IF group, being unsure of the correct spellings, perhaps attempted fewer responses (the set to mask spelling deficiencies—cf. 10). In fact, it is difficult to explain the fact that the difference between the recall test (with the correct spelling criterion waived) and the recognition test was greater for the IF (2.45) than for the RF group (1.69) ( $U=2122.5$ ,  $z=1.70$ ,  $p=.04$ ) without recourse to this or some other similar hypothesis. The recognition test data indicate that despite the fact that the correct spellings were equally available to both groups, the RF Ss slightly surpassed the IF by answering, on the average, .76 of an additional question. Although the lead originally enjoyed by the RF group has diminished, it has not entirely disappeared.

These data are interpreted as showing that the facilitating effects of familiarization (with pronouncing instructions) are comprised of two components. One, an expressional component, is important in situations where criterial performance includes the students' ability to emit a response



in an appropriate form. The second component seems to have little to do with emission behaviour but instead involves the ability to acquire information from a paragraph. This component, labelled 'conceptual competency' for want of a better name, seems semantic in nature and probably results from the development of recognition responses to the printed word during familiarization which then make it easier for S to integrate novel verbal elements into context.\* As a result of this two-fold effect, the superiority of the RF group was greatest where the groups were compared on a task in which correct performance depends on both expressional and conceptual competency (recall test, with the correct spelling criterion enforced). The superiority diminished, however, when other tasks were introduced on which correct performance depended on only one of these competencies (spelling test, recall test, with the correct spelling criterion waived, recognition test).

Since familiarization cannot enhance conceptual competency directly (as measured by the recognition test), the finding that the RF group's performance surpassed the IF on the recognition test suggests that expressional competency may be a prerequisite for conceptual competency, that is, that expressional competency is a component of 'readiness' for learning in this kind of situation. However, since this was not tested directly we must regard such a conclusion as being tentative at this time.

Since these findings do suggest that prior familiarity with task-relevant terms enhances children's learning as well as their ability to demonstrate that learning, teachers may find it profitable to spend some of their instructional time familiarizing students with the novel terms used in a lesson prior to presenting the content of the lesson. In this fashion, he/she may impart 'readiness' or at least provide an opportunity for its nurturance as Bruner (1) has suggested we do. Teachers of reading will find nothing new in this suggestion for, as far back as the 1849 edition of the Sanders Readers (cf. 16, p. 84), one can find some provision made for ensuring that novel words would not be encountered first in context.

The necessity for familiarization and the choice of words to be familiarized will, of course, depend on both student and subject matter characteristics. For this reason, familiarization may be found to be a

\*One linguist has referred to two competencies on the part of a recipient of a communication (instead of a transmitter as we are discussing here) as involving (i) a recognition response to the printed or spoken word and (ii) a semantic component consisting of experiences correlated with the sound or symbol pattern (5, p. 68). The latter notion seems relevant to conceptual competency as it is discussed here.

more profitable pedagogical device in some subjects, such as the sciences with their jargon, than in other disciplines. It may also be found to be more generally necessary for socially disadvantaged groups. For, there is a large corpus of research now available which indicates that the language of these groups may differ markedly from that of their more advantaged counterparts, especially in school relevant ways (3, 4). Therefore, for these groups, large portions of the language of the majority social class and, hence, the language of instruction may be unfamiliar. The extent to which classroom learning may suffer because of this unfamiliarity remains to be explored. But perhaps we should not be surprised if it is found that one of the benefits imparted by a middle class home life consists in an initial familiarity with the terms teachers use to convey and organize knowledge.

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