

PAPER P-660

THE CLOZE PROCEDURE: A CONVENIENT READABILITY TEST
FOR TRAINING MATERIALS AND TRANSLATIONS

G. R. Klarc
H. W. Sinaiko
L. M. Stolurow

January 1971



INSTITUTE FOR DEFENSE ANALYSES
SCIENCE AND TECHNOLOGY DIVISION

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PETER M. SWARTZ
WASHINGTON
1 1972

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G. R. Klare
Ohio University

H. W. Sinaiko
Institute for Defense Analyses

L. M. Stolurow
Harvard University

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INSTITUTE FOR DEFENSE ANALYSES
SCIENCE AND TECHNOLOGY DIVISION
400 Army-Navy Drive, Arlington, Virginia 22202

Contract DAHC15 67 C 0011
Task T-77

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SUMMARY

The Problem. There are many times when it is useful to know if people can understand certain written material. In military settings, for example, men are required to read many types of documents. If the words are not understood--or if they are misunderstood--the consequences can be serious. There are very few convenient ways to test readability or comprehensibility directly. One procedure--known as cloze--which is little known outside a small circle of educational research specialists, promises to be useful in many applied military situations. This paper is both a tutorial and a report of two experiments. It describes the cloze technique: what it is, its attractions and limitations, and how it works.

The Technique. Cloze measures readability or understandability by having readers fill in blanks where words have been deleted from a test passage. It has been shown that cloze scores, based on the number of words correctly filled in, correlate very highly with indices from other more complicated ways of testing readability. Cloze material is easily prepared, according to established rules, and inexperienced aides can score it with high reliability.

Results. In the first of two experiments, done at Harvard's Graduate School of Education, adult basic education students and a control group of college students were tested using cloze procedures. The method was shown to be inherently interesting to such diverse groups of reader-subjects. The most effective deletion ratios or patterns were also determined; the best deletion rate was every fifth word.

In the second experiment, done at the Institute for Defense Analyses, the cloze procedure was used to learn which of two Vietnamese translations of a U.S. Army technical manual was more easily understood

by Vietnamese airmen. (Control data were obtained for a sample of U.S. Army subjects.) Cloze was quickly and easily adapted to the translation evaluation problem. It satisfactorily discriminated the two translations; cloze scores supported two previous and independent evaluations of the documents. The independently judged better translation, which also produced higher scores on the knowledge test, resulted in higher cloze scores than did the poorer translation. The subjects who took the English cloze test received considerably lower scores than the Vietnamese subjects. Two tentative explanations for this are (a) linguistic differences between the two languages, favoring short, monosyllabic Vietnamese word deletions, and (b) changes introduced by translators.

Finally, specific rules and procedures for using cloze are given in detail.

INTRODUCTION

Do it yourself. Please try to fill in each blank, in all three sentences, with the single word that has been deleted. Guess if you are not sure what a word should be.*

Sentence 1. _____ and seven years ago _____ forefathers brought forth upon _____ continent a new nation, _____ in liberty and dedicated _____ the proposition that all _____ are created equal.

Sentence 2. _____ the warm spring days _____, everyone thinks what fun _____ would be to go _____ a picnic.

Sentence 3. _____ warm. His right hand _____ more slowly went over _____: choice blends, made of _____ Ceylon brands.

Sentence 4. _____ clip ejector in position _____ trigger housing with short _____ toward the body, tip _____ long arm in its _____ in vertical face wall _____ trigger housing and the _____ on top of its _____ on left side of _____ housing.

*The following words were deleted from the passages: Sentence 1-- Fourscore, our, this, conceived, to, men. Sentence 2--When, come, it, on. Sentence 3--So, once, again, finest. Sentence 4--Place, in, arm, of, slot, of, loop, stud, trigger.

These are examples of a technique used to measure readability or reading comprehension. The remainder of this report describes the procedure and shows how it has been used. We consider

- Different situations in which cloze can be used
- Its attractive features
- Data from two experiments using cloze

Measuring Readability. Cloze is much researched and written about by people concerned with human communication. A book by one of the authors (Klare, 1963) lists nearly 500 references to readability studies. At least 30 formulas have been developed to measure readability, some of them dating to the early 1920s. Many factors are used to calculate readability, including word frequency, sentence length, word length, vocabulary "interest," proportion of words beginning with certain letters, and level of abstraction. Nearly every formula produces an index of reading difficulty that is designed to make it possible to predict whether or not readers will be able to comprehend a given text or passage. But the readability formulas are frequently cumbersome to apply and difficult to interpret.

In recent years there has been a growing interest in the cloze procedure as a convenient test of readability. Its major departure from other methods is that performance on a cloze test is a criterion of readability; it is not a predictor of readability. Further, the technique is easily and reliably applied to text, and the tests are simple to administer.

What Cloze Does. Scores derived from cloze tests measure how well a reader understands a given passage. More specifically, the tests are prepared by deleting words on a regular (every nth) basis and replacing them with blanks that the reader fills in to the best of his ability. Responses are usually scored by counting as correct only those words that are identical to the deleted words (disregarding minor misspellings).

How does cloze work? As in sentence 1, it can measure how well the reader already knows something. In this case, it is like the sentence completion test devised by the German psychologist Ebbinghaus in

1897. When the cloze procedure is applied to something already known or recently read, the memory factor is very important. In this application, it is sometimes referred to as a test of literal comprehension.

Cloze can measure other things. In sentence 2, it is possible for the subject to fill in most if not all of the blanks even though the material is unfamiliar. In this case, cloze is probably measuring something that might be called "redundancy utilization" (Weaver and Kingston, 1963). The term comes from the writings of communication engineers, who say that something is redundant to the extent that it is predictable. This redundancy may come from previous experience with the English language (e.g., a blank just before a noun is most likely to need an article) or with particular subject matter (e.g., "run" may be appropriate for a story about baseball or women's hosiery or a stream or the stock market). The cloze procedure measures both content words (nouns, verbs, adjectives, etc.) and structure words (articles, conjunctions, prepositions, etc.).

Finally, cloze measures readability, as indicated by the difficulty most people experience with sentence 3. Sentence 2 comes from a primary reader, while the third is from James Joyce's stream-of-consciousness writing in Ulysses. Sentence 4 is taken from a 1943 U.S. War Department basic field manual for the M-1 rifle, intended for a readership of several million GIs.

Taylor (1953), who developed the cloze procedure, felt that what a reader does is related to the concept of "closure," the tendency to "cloze" incomplete figures, such as an almost-but-not-quite-complete circle or a letter A with a break in it. If a subject is asked about such figures, he tends to report them as complete (unless under special instructions or conditions). Taylor felt that readers tend to close incomplete sentences in somewhat the same way. The measurement of differences in the readability of texts was Taylor's primary intention in developing the cloze procedure.

As is true of many things, we can go only so far in describing how cloze works. The procedure is not fully understood as yet. We

can say, however, where it works and why it can be attractive to developers of training materials and other potential users.

Summary. In brief, the cloze procedure involves three factors:

1. The deletion of every nth word, usually every 5th word, in passages
2. The request that readers fill in the blanks
3. The scoring of a word as correct only if it is the same as the word that was deleted from the original text (disregarding minor misspellings).

APPLICATIONS OF THE CLOZE PROCEDURE

This section first indicates some of the military problems to which the cloze procedure might be applied, then specifies particular applications.*

Military Applications. Work with the cloze procedure to date suggests that it can provide an easy, fast, and inexpensive way of comparing the understandability of different versions of instructional material. Alternative versions of material that has proved or seems likely to be difficult for readers might be prepared, and then compared using cloze procedures to identify the best one to use. Such materials include technical manuals, technical orders, and other operational and maintenance documents.

Understandability is clearly of special importance in communications where danger is present and warnings are in order. This suggests the use of the cloze procedure for orders of the day, instructions to troops, warning information, and other such printed notices. In psychological operations, which depend greatly upon printed messages that often will be read by people of limited literacy, cloze would be useful. The speed with which cloze passages can be prepared and used makes the use of cloze highly practical in such situations.

Among other special uses is the evaluation of audiovisual instructional materials, where cloze procedures can be applied to sound tracks for instructional films. It may be possible to modify the cloze procedure for use in a variety of listening situations. Another possibility suggested by our use of the cloze procedure with good and poor English-to-Vietnamese translations is to use it for evaluation of

*The best reviews to date of various users are in the articles of Rankin (1965a) and Potter (1968).

instructional materials in other languages. Still another possibility is to use it where the usual methods of evaluation, such as multiple-choice tests, are difficult and time-consuming to construct, validate, and use.

Readability and Comprehensibility of Language. As we noted, Taylor (1953) developed the cloze procedure originally as a readability device with an intended purpose similar to the so-called "readability formulas." There is a difference, however, in that a readability formula predicts the readability of material for intended readers, on the basis of a few simple counts like word length (in syllables) or sentence length (in words) of a sample of the material;* while the cloze procedure measures readability by averaging the results of a sample of intended readers who take a cloze test.** The cloze procedure provides a criterion against which formulas used to predict readability can be checked. It might be best to say that cloze measures the relative comprehensibility or understandability of written material; this is, in fact, what most advocates claim. All indications are that it does this measurement job well. From the first it has been shown to differentiate texts according to their comprehensibility for readers.

Other Language Characteristics. Just as the cloze procedure can differentiate written passages in terms of readability, so it can also differentiate orally presented passages in terms of listenability. Other studies have shown that the cloze procedure can be used to differentiate what might be called language style. For example, after passages have been altered in several different ways, cloze scores have been higher for those that approximate standard English most closely and those that are "least disorganized." Cloze scores have even been shown to be related to readers' abilities to detect differences in literary styles.

*For a review of the field of readability, see the book by Klare (1963) and for a quick overview look at the first section.

**The results can then, of course, be generalized from the sample to a larger population and in this sense provide a prediction of readability.

Reading Abilities. The cloze procedure has been shown to measure both general and specific reading comprehension. The former refers to the kind of reading skill measured by standardized reading tests containing short passages followed by a set of objective questions. Almost all studies also show that cloze measures specific reading comprehension (comprehension of particular passages) very well. One recent study, however, seems to indicate that the cloze procedure is not as sensitive to passage difficulty at the lower end of the scale as at the upper, i.e., around fifth grade (Mosberg et al., 1968). More investigation is needed here, but the cloze procedure's general value does not at any rate seem to be in question, only the limits of its applicability.

Another kind of study even seems to show that the cloze procedure can be of some use at high-school level for diagnosis of individual reading skill, which is a different and relatively sterner test. In the original use, as a measure of comprehension, the scores of many readers are used to tell whether one passage is more understandable than another. In the usage just mentioned, the cloze procedure is used to tell whether one individual reader is better than another--a more complex and difficult task. One writer has suggested another related use, which is that modified versions of cloze tests might even be employed to detect individual creativity and writing skill (Hafner, 1965).

Information on Reading Gain. Some writers have argued that what we really wish to know about readers is not what they can comprehend of a passage but rather what information they gain from reading it. What we need is some measure of how much information a reader has before reading the passage, and how much afterward, with the difference being the amount he has gained. The cloze procedure, with its possible equivalent forms, is appropriate for this use, since one form can be used before and one after reading of a passage. The studies of information or reading gain, though not conclusive, are positive enough to suggest that cloze as a measure of gain can work under proper conditions (Coleman and Miller, 1968).

Language Research. Just as the equivalent versions in terms of deletion ratio of cloze passages make the procedure convenient for studies of information gain, so they provide a convenient tool for language research, since they generally produce equivalent results. Suppose, for example, that a researcher wishes to know what kinds of word categories (nouns, verbs, conjunctions, etc.) are easiest or hardest to fill in correctly. Using, say, an every-fifth-word deletion pattern, he can present each of the five versions of the material to five different groups of readers. This way all of the words in the passage can be used in helping to answer his question. Using the cloze procedure in this way has helped researchers gain an understanding of what contributes to language ease or difficulty (Bormuth, 1966 and 1969; Coleman, in press).

Use With Foreign Languages. Most of the research on the cloze procedure to date has been done with English. There have been studies, however, that show that the cloze procedure can be effectively used in measuring various aspects of foreign language achievement. One study also shows that it can be used to differentiate Japanese and Korean language passages for difficulty (Shiba, 1957; Taylor, 1954). We have shown experimentally that the cloze procedure can be used to differentiate good and poor translations of military training material from English to Vietnamese (see pp. 24-28).

SOME ATTRACTIONS OF THE CLOZE PROCEDURE

The cloze procedure, while developed primarily to measure the readability or understandability of texts, particularly instructional material, also has appeal for many other uses and other kinds of text. Why is it so attractive to potential users? There are a number of reasons, but a brief statement should be made about reliability and validity before going into them.

Several studies have been made of the reliability of the cloze procedure, with both adults and children as subjects. Most of the results have ranged from "fairly high" to "very high" reliability coefficients (e.g., .76 to .94), but occasionally they are "moderate" (e.g., .52).^{*} Even when they are only moderate, however, this is serious only if the cloze procedure is used for "individual diagnosis or placement," not for evaluation of readability, as one author points out. In summary, then, the reliability of the cloze procedure is satisfactory for all except rather unusual purposes not considered in our present study.

The kinds of uses to which the cloze procedure may be put are best shown through studies of its construct validity. Again, a number of such studies have been made, with both child and adult subjects. Those applications that the validity studies have shown to be valid have already been covered. (Correlations between cloze scores and various validity criteria have ranged from .5 to .8+.)

Ease of Construction. The cloze procedure does not require the construction of test items; instead, it is based on the material being tested. It is easy to delete words and thus prepare a cloze passage;

^{*}The articles by Bormuth (1968a), Potter (1968), and Rankin (1965a) review these studies.

in fact, a computer program is available that can generate cloze formats automatically.* If a typist is to prepare a passage manually, information for most circumstances is given in the next section of this paper.

Avoidance of Equivalence Problems. When a multiple-choice comprehension test is constructed to cover a passage, the user must be sure that the test and the passage are about equal in difficulty. In other words, it is possible to write difficult questions on easy passages or easy questions on difficult passages, and either can give misleading results. This problem is avoided with the cloze procedure, since the questions (blanks) are part of the passage itself.

Ease of Scoring. The scoring of cloze tests is unequivocal if one uses the standard method and avoids synonyms. Studies show that the rank orders of subjects are very consistent whether only exact words are accepted or whether synonyms also are accepted as correct. (Correlations as high as .99 have been found--Miller and Coleman, 1967.) Acceptance only of exact words simplifies the scoring task. All that is necessary is to score a reader's responses as correct if they are identical with the deleted words (except for minor misspellings). All other responses, including blanks, are wrong.

Avoidance of Knowledge Problems. A maker of multiple-choice tests must be something of an expert in the subject matter and/or the language of the passage his test will cover. The same may be said, for language familiarity at least, of the scorer of the test. In the case of the cloze procedure, a person unfamiliar with either the subject matter or the language of a passage can construct a cloze-deleted passage and score it accurately. An experiment using cloze to assess English-to-Vietnamese translations demonstrated that accurate scoring could be done by a reader unfamiliar with Vietnamese. (The experiment

*There is no published reference to this computer program, only a report given at the New England Educational Research Organization convention at Boston College in June 1969, and listed in the references under Klare, Rowe, St. John, and Stolurow (1969). If you have a large amount of material to test and would like to consider using the program, consult one of the authors of this article.

is reported in detail further on. A secretary unfamiliar with both the subject matter, helicopter maintenance, and the language, Vietnamese, scored the papers.) The scoring can be simplified by superimposing scoring templates on the test sheets. There may sometimes be test situations in which expert knowledge is necessary for their construction, if not for their scoring; but such knowledge is not essential in most uses of the cloze procedure, whereas it is in most uses of multiple-choice or other such tests.

Availability of Equivalent Forms. A test user frequently wants to have at least two equivalent forms of a test so that he can give one before written material is learned and one after. Or he may want to give a test just after learning and one later, to see how much is remembered. The cloze procedure is very helpful in such cases, since it provides for a number of forms. For example, a passage from which every fifth item is deleted might have words 1, 6, 11 ... removed, it might have words 2, 7, 12 ... removed, or it might have words 3, 8, 13 ... removed, etc. In fact, there are n possible forms or versions of every passage from which every n th word has been removed, i.e., five forms from which every fifth item has been removed, six from which every sixth item has been removed, etc. These different possible forms have been found to give roughly equivalent results unless the passage is very brief (under 250 words). The evidence available shows that once the deletion rate is equal to or greater than 1:5 (1:6 and up), the rank order of passages does not change significantly. It is easily possible to get greater accuracy by using several forms in the same testing (with different subjects, of course). This, in fact, is how researchers frequently use the cloze procedure in large-scale studies. For example, they will use all possible forms, so that they can collect information on all of the words in a passage.

Some Criticisms. The cloze procedure has some limitations. The three chief current criticisms indicate that cloze scores (a) will not measure separately all the different kinds of comprehension abilities that multiple-choice or similar test items will; (b) may depend on general knowledge of the language more than on special knowledge of

the material being read; and (c) may depend too much on "short-range constraints," that is, almost entirely on the four or five words on each side of a blank. These problems do not invalidate cloze for many kinds of uses, but indicate that it should be used with discrimination.

HOW TO USE THE CLOZE PROCEDURE

Preparing and scoring cloze passages is a relatively easy procedure, but there are a few steps necessary in order to obtain reliable results. These apply primarily to the standard use of cloze: measuring the understandability of written material. Experimental applications may, of course, require modifications. Suggestions have been grouped into the categories below: selecting test passages, preparing cloze versions, selecting subjects, administering passages, scoring responses, and analyzing results.

Selecting Test Passages. When measuring the understandability of written material, it is best to use the entire piece of material. This is obviously not possible, or at least not practical, for long tests; sampling is then in order. Sampling need not involve loss of accuracy if it is done carefully. Here are some steps to follow.

- a. If the material is short, use the entire piece of material. "Short" means anything below 500 words or so.
- b. If the material is long, divide it into sections (such as chapters), and take at least two samples per section.
- c. When taking samples, use some random scheme or some numerical scheme; do not select what appear to be "typical" samples, since this may give misleading results.
- d. Begin each sample at the beginning of a paragraph; word patterns may be different if you begin elsewhere, and the subject's task may be harder. From that point on, use as much continuous text as necessary to get at least 50 blanks in each sample.

Preparing Cloze Versions. Words can be deleted in test passages either manually or by using the computer program previously mentioned. For a short passage, manual preparation is easy enough if one follows the suggestions below. For more extensive work, it may be advantageous both for speed and reliability to use the computer program, particularly if the text is already in machine-readable form. The program will delete words according to any deletion pattern from 2 to 99, and will prepare all possible versions of each passage.

- a. Delete the words according to the pattern selected. The most common pattern used for measuring comprehension is every fifth word. One reason is that if there are fewer than four words between deletions, then completion of a blank becomes more dependent upon previous blanks. This is undesirable, since if a person misses an earlier blank he is almost certain to miss some later ones. With a deletion pattern of every fifth word, this is not a significant problem. Another reason for using this pattern is that if more than four words appear between blanks, the total number of blanks in the passage is reduced; this is undesirable because it may reduce the reliability of the test, particularly if the text is short. There may, however, be good reasons for using a different pattern. (For example, we used a pattern of every seventh word in our English-to-Vietnamese translation study because it was a new, untried situation and we did not wish to make the task too difficult for our Vietnamese subjects.) The more closely the blanks are spaced in a passage, of course, the harder the task becomes. Note that if a pattern of deleting every fifth word is used, around 250 words are needed to provide 50 blanks. If every sixth word is deleted, there should be around $6 \times 50 = 300$ words in the passage; if every ninth, around 450 words; and so on. It is more important to end each test passage at the end of a sentence than it is to get the same number of words for each passage. All passages need not include the same number of words, since a "percentage correct" score can be used rather than absolute number of responses correct in order to compare scores.

- b. If every fifth word is deleted, omit words 1, 6, 11 ..., 2, 7, 12 ..., 3, 8, 13 ..., 4, 9, 14 ..., or 5, 10, 15 The 5, 10, 15 pattern is usually preferred because it gives the subject four words on each side of the first blank to help him. Otherwise there is little difference. Some writers suggest that no words be deleted from the first and last sentences of a passage, in order to help the subject. This seems unnecessary, however, except for subjects like young children, near-illiterate adults, and such who need a good deal of help.
- c. A word is usually defined by the white spaces separating it from other words (e.g., don't, U.S.A., 2,182, and re-enter would all be single words). Commas, apostrophes, and hyphens should be deleted along with the rest of the word.
- d. Hyphenated words are deleted as units only when one of their elements represents a bound (rather than a free) morpheme, e.g., the co- morpheme in co-chairman. Note that hyphens are not deleted when dividing free forms.
- e. Numerals are deleted as a unit unless they are spelled out, in which case they are treated like any other word (i.e., deletions take place by single words even though the number may be represented by several words).
- f. Replace each deleted word with a standard-sized blank. The most commonly used blank is 15 spaces long. Use of blanks that are the same length as the deleted words provides undesirable cues.

Selecting Subjects. Sometimes it may be possible to test all subjects who will be using a particular passage or set of written material. Usually, however, only a sample of all those for whom the passage or material is intended can be tested.

- a. Be sure the sample of subjects is truly representative of the entire population of interest.

- b. If possible, draw a random sample from the total population. This may not be easy, of course, if the group is scattered or cooperation is hard to get.
- c. Because populations and intended purposes differ, it is not easy to provide rules on how many subjects are needed. At least 25 to 30 are usually desirable, however, for regular use of cloze for measurement purposes. (For research purposes the number might well rise to 100 per blank.)

Administering the Passages. Various kinds of directions to subjects have been used, and these depend to some extent on the educational level and background of subjects. The following items are usually mentioned, however, for the purpose of standardization. Note also that the test should be untimed--or as nearly so as possible. Subjects are usually told to do the following:

- a. Write only one word in each blank.
- b. Fill in every blank if possible, guess if uncertain.
- c. Skip hard blanks and come back to them later if necessary (with young or inexperienced readers).
- d. Write down a word even if unsure of its spelling.
- e. Note that all blanks are the same length and that the lengths of the blanks and of the desired words are not related.
- f. Remember that although the passage looks like a test, it is not a test of the subjects but rather of the material itself. (Sometimes, of course, such a remark is not appropriate.)

Frequently included in the directions is a trial sentence with easily guessed deleted words; it gives subjects a chance to try the cloze procedure and to ask questions, if necessary.*

Scoring Responses. The simplest and best scoring rule is to accept as correct only those words that match the deleted words. This procedure is, of course, for standard use of cloze, but it may be

*Appendix C contains Bormuth's (1964b) standard set of instructions.

modified for some other purpose, such as teaching. Here are some sub-rules to cover common problems.

- a. Accept minor misspellings as correct unless they happen to result in homonyms that could also be grammatically correct in the same context, such as "bear" and "bare."
- b. Do not accept synonyms as correct unless there is some special purpose for doing so; synonyms create scoring problems (Spolsky, 1969).
- c. Do not accept as correct words that differ in grammatical inflection or form (e.g., past tense) from the deleted word.

It is useful to prepare a template to help the person hand scoring the test passages. A computer program is highly convenient for scoring a large amount of material, since it can be programmed to accept common misspellings.

Analyzing the Results. While analysis will, of course, depend upon the researcher's purposes, the following suggestions cover many possibilities.

- a. Compare two or more passages for understandability. All that is necessary is to calculate the average percentage of correct responses on each passage and make the comparisons.
- b. Determine an individual subject's comprehension level on a passage. Over the years reading experts have usually said that if any individual (particularly a child) reader can answer 75 percent of the objective questions on a passage it is suitable for his use in supervised instruction. If he can answer 90 percent, he is said to be able to work on the passage independently. Research has shown that, for the cloze procedure with an every-fifth-word-deletion pattern, the corresponding scores are roughly 44 percent and 57 percent correct (Bormuth, 1967a). Further work should be done to verify this relationship. This is particularly true if readers in a military situation are tested, because we know less about

adult readers than about young ones. Two (or more) individuals can be compared with each other merely in terms of which has the higher score.

- c. Assign a reading grade level to a passage. A user will sometimes wish to know the grade level of a passage, so he can decide which readers can probably handle it successfully. This is the basis on which most readability formulas are constructed. Grade levels can be assigned to passages by statistically relating the cloze scores of a group of subjects to their scores on a reading test that yields reading grade levels. (See Bormuth, 1969a, for a graphic solution.)

THE CLOZE PROCEDURE APPLIED TO TRAINING MATERIALS:
A FIRST EXPERIMENT*

One of the common problems faced by instructors everywhere is the development of a particular text or lesson. This was recently the problem faced at the Harvard Computer-Aided Instruction Laboratory, where a research program in adult basic education (ABE) was carried out. Most ABE students, having already been defeated once by the regular educational system, are known to be both test-shy and critical of any educational approach that seems childish or irrelevant. Would the cloze procedure be both acceptable to ABE students and adequate for measurement purposes? The study described below was an attempt to answer this and related questions.

Method. The test material used was a 292-word passage at fourth-grade reading level on the subject of the dangers of smoking. Four deletion patterns were used: every fifth word, every eighth word, every eleventh word, and every fourteenth word. All possible versions of each pattern were prepared and randomly assigned to reader-subjects.

The material was first used in a preliminary study with 23 ABE students from the area of Boston. All had between fourth- and sixth-grade reading ability. Also as part of the preliminary study, the same material was administered to 23 students, all of whom were either in college (Harvard) or had had at least one year of college; more than half were college graduates, and most of these, in turn, were graduate students. Following the preliminary study, the same material was used in the major study with a larger group of 77 ABE students from the area of Cincinnati. All were, again, between fourth- and sixth-grade level in reading ability.

*Based on an unpublished study designed and carried out at the Harvard Graduate School of Education by G. R. Klare et al., 1970.

Following the test, all ABE students were given a short four-item attitude scale. A score below 4 on the scale indicated a positive attitude toward cloze testing on the part of the student; a score of 4 indicated a neutral attitude; and a score above 4 showed a negative attitude. The cloze test itself was scored using the rule that responses had to be identical with the words deleted (except for minor misspellings) to be counted as correct. This rule was applied with both ABE and college subjects.

Results. Because the number of subjects taking each pattern in the preliminary study was small, the results are presented here for the ABE and college groups as a whole, not by pattern.

TABLE 1. PRELIMINARY STUDY

<u>Subjects</u>	<u>Average Cloze Score (Percentage Correct)</u>	<u>Average Attitude Scale Score</u>
23 ABE students	30	2.97
23 college students	69	--

More details are given below on the effect of various deletion patterns on cloze scores for a group of 77 ABE students. A misunderstanding reduced somewhat the number of students taking the pattern in which every eighth word was deleted, and suspicion of cheating on the part of two students reduced the useful number still further, as shown below. Even here, however, the trend seems clear.

TABLE 2. MAJOR STUDY (77 ABE STUDENTS)

<u>Deletion Pattern</u>	<u>Number of Subjects</u>	<u>Average Cloze Score (Percentage Correct)</u>	<u>Average Attitude Scale Score</u>
Every fifth	20	32	2.90
Every eighth	11 ^a	50 ^a	2.64 ^a
Every eleventh	26	42	2.65
Every fourteenth	20	50	1.75

^aTwo subjects were under suspicion for cheating. With their scores removed, the cloze score value becomes 40 and the attitude score value 3.22.

Further analyses showed that for all deletion patterns except every fifth, the majority of ABE students attempted (placed some response in) every blank. They also showed, again with the exception of the every fifth pattern, that there is a significant relationship between a subject's cloze score and his attitude score (i.e., the higher the score, the more favorable the attitude). Both findings cast doubt on the advisability of using the every fifth pattern with ABE students.

Conclusions. The results of this study lead to the following conclusions:

- a. Cloze testing is acceptable, in fact enjoyable, for most adult basic education students with fourth- to sixth-grade reading ability. Such students would compare to the less able readers found in the armed forces.
- b. At the high end of the ability range, cloze tests were found to be sufficiently acceptable to challenge graduate students, even on a fourth-grade passage. The highest percentage score achieved by anyone was 89 percent. We should point out that the different deletion patterns were not, of course, discriminative when testing college-level subjects, probably because of the fourth-grade passage used. Nevertheless, the results suggest that the cloze procedure as such can be acceptable to the most able readers in the armed forces.
- c. The best deletion pattern for readers at fourth- to sixth-grade ability levels appears to be an every ninth or every tenth pattern, at least for first usage. An every fifth pattern is preferred when appropriate, however, since it provides the most efficient test. For average or above-average readers it would be appropriate in most cases.

USING CLOZE TO ASSESS TRANSLATIONS OF TECHNICAL ENGLISH:
A SECOND EXPERIMENT

As part of its work on technical training and translation, IDA has tested various methods for evaluating the quality of language translations (Sinaiko and Brislin, 1970). The emphasis in all of this research has been on the manuals produced by the U.S. Armed Forces for maintenance personnel who cannot read English or who read it with only marginal ability. Several methods of assessing translation quality proved to be useful, but each was relatively time consuming and expensive. (Particular evaluative techniques included back-translation into English, plus a phrase-by-phrase comparison with the original; reading comprehension or knowledge tests given in the target language; and performance tests requiring technicians to use translated manuals.) Because cloze is easily applied and scored, the technique was investigated in one of a series of short experiments on evaluating the accuracy of technical English translated into Vietnamese.

Method. Subjects were 28 airmen in the Vietnamese Air Force (VNAF) and 31 U.S. Army helicopter technicians, all of whom had recently completed the same training program at the Army Transportation School, Ft. Eustis, Virginia. The U.S. Army subjects served as an experimental control; they read the original passage in English that was then translated for the Vietnamese. There were two different translations of the same section of the Army's "Organizational Maintenance Manual, UH-1D/H Helicopter," TM-55-1520-210-20: about 250 words from the first part of Chapter 7, "Power Train." The translations, used in an earlier experiment, had been shown to be of different quality by two independent assessments: (a) an expert linguist, bilingual in English and Vietnamese, rated the work of 12 translators and selected two versions as being of very different quality; and (b) a knowledge test, given to two groups of Vietnamese airmen, who each read one of the passages,

differentiated the material (scores were significantly higher for the group using the higher quality translation than for the group using the lesser quality translation.)

Every seventh word of the Vietnamese translations, as well as the English text, was deleted and boxed-in to indicate that a response was desired. The three samples contained 44, 48, and 51 blanks, respectively, for the two translations and the English material. The text was familiar to both groups of subjects, since it formed part of the maintenance course they had taken. However, none of the Vietnamese subjects had seen the text in their own language prior to the experiment.

Responses were scored using the rule that they had to be identical with the deleted words to be counted as correct. This was a practical necessity, since neither the experimenters nor the IDA secretary who scored the tests could read Vietnamese. Simple templates were constructed to locate the correct term for each response. In spite of the unintelligibility of the language to the scorers, scoring was done with ease.

Results. The cloze procedure differentiated the two translations in the expected direction. That is, the independently judged better translation, which also produced higher scores on the knowledge test, resulted in higher cloze scores than the poorer translation. Performance by the control group was much lower than by either group of VNAF subjects. Table 3 summarizes these findings:

TABLE 3. CLOZE SCORES ON TECHNICAL MATERIAL

	Better Vietnamese Translation (N = 14)	Poorer Vietnamese Translation (N = 14)	English Control (N = 31)
Mean cloze score	26.5	21.6	17.8
Standard deviation	4.8	2.3	6.7
Percent correct	55%	49%	35%

Extrapolations from earlier cloze studies on English material suggest that the 6 percent difference in cloze scores that we obtained between the translations is a sizable one. However, it is probably not statistically significant because of the large variabilities and the small number of subjects.

We suggest two primary reasons why subjects working in Vietnamese had higher scores than those working in English. First, there are many inherent linguistic differences between Vietnamese and English, the most obvious of which is that most words in Vietnamese take a very brief, monosyllabic form. Thus, deletions of Vietnamese words in a cloze test might be more like deletions of only parts of English words or syllables. If this is so, Vietnamese subjects would be more likely than Americans to fill in blanks accurately.

The translation process itself might have influenced cloze scores. Earlier research (Sinaiko and Brislin, 1970) had demonstrated that translators of technical English terms into Vietnamese introduced certain changes into the text. Since there are very few equivalent terms in the two languages, translators typically use an "explain around" or functional description method. For example, there is no directly equivalent Vietnamese term for "tachometer" so a translator might use the phrase, "rotation measuring machine." The latter would result in three short words; we suggest that in a cloze test the deletion of any one of them would be more easily filled in than a single compound term like the original "tachometer." It is also possible that the translators could have improved the overall understandability of the original text. (It is possible that acceptance of minor misspellings as correct may have favored the American subjects. But it is also possible that the scorer, being unfamiliar with Vietnamese, may unwittingly have accepted misspellings in Vietnamese also.)

Second, there was an apparent difference in the educational backgrounds of the subjects and cloze measurements have been shown to be sensitive to differences in academic ability. All VNAF airmen are very highly selected; i.e., they are required to have had at least the equivalent of a high school education ("first baccalaureate" diplomas).

This was not the case for the American subjects: only 15 of the 31-man test group had completed twelfth grade, and many of the remaining claimed only seven, eight, or nine years of school. When the English cloze scores were analyzed in terms of educational level, there was a major difference, as shown in Table 4.

TABLE 4. CLOZE SCORES OF AMERICAN SUBJECTS

	<u>Completed Twelfth Grade</u>	<u>Less Than Twelfth Grade</u>
Mean cloze score	21.0	14.8
Percent correct	41%	29%

While the more highly educated group of Americans did not reach the mean scores of either Vietnamese group, it is clear that those men who had more formal education outperformed those who had not.

Although we cannot determine the extent to which any of these factors operated, we believe that each of them could have had some effect in differentiating the English from the Vietnamese cloze scores.

We did a brief item analysis of the English cloze responses and several points can be made. First, about half of the blanks (24 of 51) could be considered difficult because they were answered correctly by fewer than 10 percent of the subjects. Nearly a third (31 percent) of these 24 items were not answered at all; they were left blank. It is not easy to characterize the types of words in the "difficult" group, but five of the eight that were never answered correctly were qualifiers such as "reasonably," "below," and "available." (It is interesting to note that these words were found not to translate easily into Vietnamese from English; Sinaiko and Brislin, 1970.)

Second, six blanks could be considered "easy": they were correctly filled in by 87 percent or more of the subjects. Five of these words were nouns such as "output," "rotor," and "oil." Among these easy test items only 3 percent went unanswered versus 31 percent for the most difficult.

Finally, there is a close relationship between whether subjects attempt to fill in blanks and their accuracy:

- Of the 22 test blanks most often answered, responses were 17 percent correct;
- Of the 16 test blanks least often answered, responses were 3 percent correct.

Analysis of the data lends support to our scoring rule that rejects synonyms; subjects tend to leave unanswered those words they do not know and, conversely, they are much more likely to supply the right word if they answer at all.

Conclusion. The results reported here are encouraging about the use of cloze as a translation evaluation method. We might undertake further work to determine if a greater sensitivity could be obtained by modifying instructions or scoring and by using selected deletions instead of mechanical deletions. If this were done, however, it would put a new burden of language competence on the test technicians. That is, they would be forced to read (or learn to read) Vietnamese or, at the very least, they would have to be supplied with semantic information by a bilingual person.

Finally, cloze should not be viewed as a means of measuring equivalence of meaning between an original and a translated passage. However, the technique does measure readability of the translation.

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A COMPREHENSIVE CLOZE BIBLIOGRAPHY

As of January 1971*

Recently there has been a marked increase of interest in the cloze procedure. Since a single comprehensive list of references on cloze can be useful, we have compiled one from a number of sources. For the listing that follows, our sources included the papers by Rankin (1965), Potter (1968), and Bickley, Ellington, and Bickley (1970). Also of value were our own research and a bibliography of John Bormuth's research publications. Almost all references were checked against the original documents for accuracy and corrected when necessary.

*In addition, we have included several papers that are to be presented at the American Educational Research Association Annual Meeting, New York, February 4-7, 1971.

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APPENDICES

- A. CLOZE TEST: ENGLISH LANGUAGE VERSION
- B. CLOZE TEST: VIETNAMESE LANGUAGE VERSION
- C. BORMUTH'S STANDARD INSTRUCTIONS TO CLOZE EXAMINEES

APPENDIX A

CLOZE TEST: ENGLISH LANGUAGE VERSION

In this test you will have one page from the UH-1H Technical Manual to read. Some words have been taken out. This is shown by a box . Your job is to think of the correct word that should be in each box and to write one word in the blank space. Please write very carefully. Fill in every blank. Do not sign your name to the paper.

Here is an example:

Cumulative clogging of oil filter will not be shown by a drop of indicated oil pressure as may on some other aircraft or oil systems.

The words that have been taken out are: screens, gradual, it, and automobile.

7-1. PURPOSE

7-2. This chapter provides all the [] and information necessary for maintenance authorized [] be performed by organizational maintenance activities [] the power train system. The power [] is a system of shafts and [] boxes through which the engine drives [] rotor, tail rotor, and accessories which [] DC generator and hydraulic pump. The [] consists of a main drive shaft, [] main transmission which includes input and [] drives and the main rotor mast, [] a series of drive shafts with [] gear boxes through which the tail [] is driven. (See Fig. 7-1)

7-3. TROUBLESHOOTING--POWER []

7-4. Chart below is a brief summary [] power train troubles which may be [] in organizational maintenance. Conditions and possible [] listed have been limited to those [] probable (though not necessarily frequent in [] service) which could become known through [] reports or by inspection methods applicable [] organizational maintenance, and which would be [] to some evaluation at this level, [] final corrective action by a higher [] might be required in some instances. [] involving obvious major damage are omitted, [] are those caused by accident or [] unusual chain of events which would [] evaluation by a competent authority. Notes [] provide information in addition to that [] in troubleshooting chart and in [] instructions for systems and components of [] train.

APPENDIX B

CLOZE TEST: VIETNAMESE LANGUAGE VERSION

In this test you will have one translated page from the UH-1H Technical Manual to read. Some words have been taken out. This is shown by a box . Your job is to think of the correct word that should be in each box and to write one word in Vietnamese in the blank space. Please write very carefully. Fill in every blank. Do not sign your name to the paper.

Here is an example:

Yêu cầu viên đọc đoạn nói về phi trực thăng.

The words that have been taken out are: sinh and cơ.

7-1. MỤC ĐÍCH

7-2. Chương này cung cấp [] sự chỉ dẫn và tài liệu [] thiết cho công tác gìn giữ [] chạy băng điện. Chiếc tàu chạy [] điện là một hệ thống gồm [] nhiều trục và nhiều hộp số [] qua đó động cơ làm quay [] quạt chính, cánh quạt đuôi và [] bộ phận khác như là máy [] điện một chiều và máy bơm []. Hệ thống này gồm có một [] chính, một hộp số chính trong đó [] cả những ông trục truyền lực [] động và cột cánh quạt chính, và [] số những ông trục quay với [] hộp số mà nhờ đó cánh [] đuôi có thể quay được. (Xem [] số 7-1.)

7-3. TÌM KIẾM NHỮNG TRỤC [] - TÀU CHẠY BĂNG ĐIỆN.

7-4. Đồ biểu [] đây là một bản tóm tắt [] trực trực của một chiếc tàu [] băng điện mà có thể gặp [] trong công tác gìn giữ chiếc []. Những tình trạng và nguyên nhân [] kê ở đây chỉ giới hạn [] những tình trạng và nguyên nhân [] thể xảy ra (tuy không nhất [] là xảy ra luôn luôn) mà [] ta được biết nhờ ở những [] cáo của các viên phi công [] nhờ ở những phương pháp kiểm [] áp dụng trong công tác gìn [] tàu và sẽ được đem ra [] định ở đây, tuy rằng trong [] vài trường hợp vẫn cần phải [] những chuyên viên với trình độ [] biết cao hơn hoàn thành công [] sửa chữa cuối cùng. Những tình [] lam hư hại nhiều đến tàu [] được bỏ qua cũng như là [] tình trạng do tai nạn gây [] hay do một số những biến [] gây ra mà cần phải được [] nhân viên chuyên môn có tài [] định.

APPENDIX C

BORMUTH'S STANDARD INSTRUCTIONS TO CLOZE EXAMINEES
(Bormuth, 1964b)

INSTRUCTIONS

At the bottom of this page is a sample of a new kind of test. During the next three weeks you will take two of these tests each day. Each of these tests was made by copying a few paragraphs from a book. Every fifth word was left out of the paragraphs, and blank spaces were put where the words were taken out.

Your job will be to guess what word was left out of each space and to write that word in that space. It will help you in taking the test if you remember these things:

1. Write only one word in each blank.
2. Try to fill every blank. Don't be afraid to guess.
3. You may skip hard blanks and come back to them when you have finished.
4. Wrong spelling will not count against you if we can tell what word you meant.
5. Most of the blanks can be answered with ordinary words but a few will be numbers like3,427 or \$12 or 1954
contractions like.can't or weren't
abbreviations likeMrs. or U.S.A.
parts of hyphenated words like . .self- in the word self-made
6. Write neatly.

SAMPLE TEST

Below is a sample of one of these tests. Fill each blank with the word you think was taken out. You may check your paper when you finish it by looking at the answers which are written upside down at the bottom of the page. Write neatly.

The Beaver

Indians call beavers the "little men of the woods." But they _____ really so very little. _____ beavers grow to be _____ or four feet long _____ weigh from 30 to _____ pounds. These "little men _____ the woods" are busy _____ of the time. That _____ why we sometimes say, "_____ busy as a beaver."

_____ know how to build _____ that can hold water. _____ use their two front _____ to do some of _____ work. Cutting down a _____ with their four sharp-_____ teeth is easy. A _____ can cut down a _____ four inches thick in _____ 15 minutes.

ANSWERS: 1. aren't; 2. most; 3. three; 4. and; 5. 40; 6. of; 7. most; 8. is; 9. as; 10. Beavers; 11. dams; 12. They; 13. paws; 14. their; 15. three; 16. pointed; 17. beaver; 18. tree; 19. about.

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Institute for Defense Analyses 400 Army-Navy Drive Arlington, Virginia 22202		2a. REPORT SECURITY CLASSIFICATION Unclassified	
1. REPORT TITLE The Cloze Procedure: A Convenient Readability Test for Training Materials and Translations		2b. GROUP --	
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Paper P-660, January 1971			
5. AUTHOR(S) (First name, middle initial, last name) G.R. Klare, H.W. Sinaiko, L.M. Stolurow			
6. REPORT DATE January 1971		7a. TOTAL NO OF PAGES 53	7b. NO OF REFS 23
8a. CONTRACT OR GRANT NO DAHCL5 67 C 0011		8b. ORIGINATOR'S REPORT NUMBER(S) P-660	
b. PROJECT NO Task T-77		8c. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) None	
10. DISTRIBUTION STATEMENT This document has been approved for public release and sale; its distribution is unlimited.			
11. SUPPLEMENTARY NOTES N/A		12. SPONSORING MILITARY ACTIVITY Advanced Research Projects Agency Arlington, Virginia 22209	
13. ABSTRACT Situations constantly arise in which it would be helpful to measure readability or understandability of written material. Most of the available techniques for measuring understandability are difficult to apply and interpret. The present paper describes a little-known method - cloze--that offers considerable promise in readability measurement. In addition to describing the cloze procedure, the paper provides specific instructions for administering a cloze test and examples from the professional literature of cloze applications. Attractions, as well as limitations, of the technique are given. Finally, two experiments are described in which the cloze procedure was used. In the first, the technique was shown to be useful with samples of readers having extremely different educational backgrounds: adult basic education students and people in graduate school. The second experiment demonstrated the utility of cloze in measuring the readability of material in another language (Vietnamese), which the experimenters could not read. Cloze differentiated two Vietnamese translations of the same English passage, in agreement with an independent criterion. Although the test subjects who read the material were Vietnamese, neither the experimenters nor the staff people who scored the subjects' responses were proficient in that language.			

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Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Cloze procedure Readability measurements Translation evaluation techniques Vietnamese language translations						

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Security Classification

TIME-TASK SCHEDULE

STEPS	MONTHS											
	1	2	3	4	5	6	7	8	9	10	11	12
<u>STEP 1:</u> Preliminary Data Collection	[Solid Bar]											
<u>STEP 2:</u> Conduct of Interviews		[Dashed Bar]										
¹⁵ <u>STEP 3:</u> Administration of Questionnaires					[Dashed Bar]							
<u>STEP 4:</u> Analysis of Data: Results		[Solid Bar]				[Solid Bar]						
<u>STEP 5:</u> Interpretation of Results; Recommendations						[Solid Bar]				[Solid Bar]		