

How adults read: A statistical analysis

by Linda M. Phillips and Yu Lei

■ In evidence-based research, descriptive and inferential statistics offer a way to explain the relationships between and among variables. These explanations lay the groundwork for validating or confirming descriptions. Krathwohl defined description as “The perception, naming, organizing and verbally portraying of a situation to highlight its important features, to put these features in context, and to show the interrelations among them” (p. 733). Similarly, descriptive or summary statistics also describe data by presenting, for example, the number of instances and the frequency of some scores in order to provide a summary. These summaries may be quantitative, such as counting reading miscues, or qualitative such as identifying demographic characteristics. Together, descriptions and descriptive statistics provide a better understanding of the data. Various types of summaries and reductions help make the data manageable and thus interpretable.

Three common measures in descriptive statistics include:

- mode (the most frequently occurring score among a set),
- median (the middle score in a set of scores), and
- mean (the average of a set of scores).

Together with the range (the distance between the highest and lowest scores), these three descriptive statistics provide measures of central tendency and variability (the spread of scores around the mean). In other words, they provide another picture that can complement a qualitative description.

Inferential statistics, multivariate relationships and statistical tools assume random sampling and homogeneity of variance, that is, that the groups being studied differ by no more than expected if they were selected randomly or by chance. Otherwise, the results are suspect and must be treated with extreme caution. To guard against nonhomogeneity of variance, research requires careful design and analysis (Glass and Stanley). Design and analysis builds upon descriptive and inferential statistics to allow researchers ways of understanding the nature of the relationships between and among the variables being studied. How variables relate to each other is critical to understanding. For instance, the presence of a correlation does not mean that there is a causal link between two variables.

There are numerous examples of studies in education using combined research methods. However, few undertook a goal as ambitious as identifying how adults with low literacy skills read. Of particular interest to *Literacies* and a study worthy of revisiting is “The Reading Strategies of Adult Basic Education Students” by Pat Campbell and Grace Malicky, published in 2002 in *Adult Basic Education*.

Purpose and methodology of the study

The purpose of the Campbell and Malicky (2002) study was to investigate how adult learners in basic educational programs used word identification and reading comprehension strategies. Data collection and analyses appeared to be conducted in two stages. Stage 1 included 344 students and learners (219 females, 125 males) from 34 adult learning programs in colleges and schools,

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This column highlights a 2002 study by Campbell and Malicky that used **descriptive and inferential statistics** to analyse how adult literacy students read.

and 24 community-based programs. The participants were all English-speaking with an average age of 33 years (range of ages was not provided) and their reading ranged from beginning to high-school levels. Passages from an informal reading inventory, the *Canadian Adult Reading Assessment (CARA)* (Campbell and Brokop) were selected as reading materials for the study. The CARA includes 49 passages at nine levels of difficulty and varies in length and readability (ranging from beginning to advanced). Based on their teachers' or program co-ordinators' judgments as well as their performance on standardized tests administered prior and within their program, adult learners were assigned narrative and informational passages to read. Each student was asked to read orally two passages. Their oral miscues while reading aloud were recorded. They were also asked to orally retell each passage and to answer factual and inferential comprehension questions.

To find out whether the adult literacy students and learners understood the information that they read, the researchers assigned their miscues to one of four categories:

- print-based miscues containing half or more of the same letters as in the text word,
- meaning-based miscues indicating sense-making of the text,
- integrative miscues combining print-based and meaning-based cues, and
- non-integrative miscues failing to combine print-based and meaning-based cues.

The adult literacy students' and learners' retellings were analyzed into six clausal units:

- explicit (a clause containing specific references from a single sentence within the passage);
- summary (a clause combining specific references from one or more sentences in a passage);
- synthesis (a generalization or a main idea statement that contained information from more than one sentence);
- inference (a clause containing information that filled the gaps in the text);
- experiential (a clause based on the student's or learner's personal experiences rather than on information in the text); and
- erroneous (a clause containing specific errors such as incorrect dates or proper nouns) (Campbell and Malicky pp. 8-9).

The researchers computed the means and standard deviations for uncorrected miscues, retelling

categories and responses to inferential and factual comprehension questions.

Stage 2 seems to have occurred after the data was collected in order to equalize sample sizes at each of the nine reading levels for inferential data analyses. From the overall sample of 344, three groups of 34 students at each reading level were selected at random (levels 1-3 beginning; levels 4-6 intermediate; and levels 7-9 advanced).

In addition to these descriptive statistics, the authors conducted a Multivariate Analysis of Variance (MANOVA) to determine whether significant differences existed across nine reading levels on four types of miscues, six categories of retellings and two types of comprehension questions. It is unclear whether the sample size for the MANOVA was 102 (3 x 34) or 306 (9 x 34), and impossible to confirm whether Campbell and Malicky meant the nine reading levels or the three randomly created groups (beginning, intermediate and advanced levels). In addition, they report "When significant differences were found on MANOVA, Tukey's post hoc test was used to determine which reading levels differed" (p. 9). It is important to point out that MANOVA with significant differences is followed by a discriminant analysis. Tukey's post hoc test is usually used in a univariate (one dependent variable) analysis (ANOVA) and not in a MANOVA. Moreover, the authors pointed out that, "even with equal sample size, our data did not meet the assumption for MANOVA of homogeneity of variance" (p. 9). Therefore, Campbell and Malicky cautioned against interpretations based on the inferential analyses and relied more on description and descriptive statistics.

Results of the study

Oral reading miscues

The differences in the nature of the uncorrected miscues across the nine reading levels were not significant. The majority of the uncorrected miscues were meaning-based (40 per cent) and integrative miscues (38 per cent) regardless of the adult literacy learners' reading levels. These miscue findings suggest that the adults appeared to use similar reading strategies regardless of reading level. In fact, only 15 per cent of their miscues fell into the print-based category, which suggests that the adult learners tended to rely more on their background knowledge than printed information to interpret texts. However, the high percentage of integrative miscues revealed that adult literacy learners were able to read by

using their background knowledge and text information in some contexts. Given that the range of scores was not provided, it is difficult to confirm whether indeed the means, though reported as similar, were skewed. Means for different passage genres (narrative, informational) were not reported and thus, differences may have existed given that narrative is generally assumed to be easier to read than informational text. Two of the most interesting oral reading miscue findings are:

- there is a discrepancy between the proportion of meaning-based and print-based miscues, which implies that learners depend more on their own background knowledge than on the information in the text; and
- differences in reading strategies seemed to be as great within the same level of reading as across reading levels.

The authors concluded that knowing the reading level of an adult learner tells little about the nature of the reading strategies being used. This conclusion calls for further confirmatory research especially in light of the fact that variance (individual reading differences) between and among the learners was high.

Oral retellings

The proportion of clauses reported by the adult learners within each of the retelling categories and across the nine reading levels was similar and the information source for their retellings was primarily explicit (49 per cent), that is, based on information in the text. MANOVA results showed significant differences across the three reading groups; however, post hoc (after-the-fact) comparisons were significant for only one of the six retelling categories (experiential). Campbell and Malicky reported that the adult learners provided gist-like statements in their retellings rather than detailed statements. They proposed two speculations about the discrepancy between adult learners' dependence on text in their retelling and their dependence on their background knowledge in their oral reading miscues. One is that the adult learners may have interpreted the retelling task as quite different from retelling stories in daily life, and the other is that the prompts by the testers to provide more information may have influenced the adult learners to appeal to the text. These are interesting and important hypotheses for further research. The retelling results indicate that the adult learners at all reading levels are able to make limited



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effective use of both text-based and knowledge-based information to construct meaning. These results are important but raise many questions for further study before we can reach any valid conclusions about the nature of the relationships between adult learners' miscues, oral retellings, comprehension responses, genre and familiarity with a given text.

Inferential and factual comprehension questions

MANOVA results showed significant differences in the proportion of correct responses to factual and inferential questions. Post hoc (after-the-fact) comparisons revealed the most consistent difference across the three reading groups was on inferential questions and that adult literacy learners at Level 1 reading were less successful in providing correct responses than those at Levels 2 to 9. Several speculations were proffered to account for why Level 1 adult learners answered 86 per cent of the factual questions correctly and only 63 per cent of the inferential questions. Campbell and Malicky wondered whether performance was more of a

reflection of how adult learners were taught in literacy classes than of their ability to make inferences, especially since they did not differ in their ability to make inferences on the retelling tasks. They further wondered whether Level 1 adult literacy students and learners had developed expectations about how to answer questions based on their experiences in beginning literacy classes, but had not yet learned how to retell passage content. In other words, adults at the beginning stages of literacy learning may have developed an expectation that inferential questions usually require the recall of details from text, rather than from their background knowledge integrated with the text information to construct inferences. Whether the types of comprehension questions asked required responses based on local (within the same paragraph) or global information (across several paragraphs), why Level 1 adults responded differently, and whether genre and text familiarity make a difference to performance, are topics for further study.

Implications

Campbell and Malicky studied how adult learners in basic educational programs used word identification and reading comprehension strategies. The results on the miscues, retellings and comprehension questions revealed that adults across different reading levels used similar strategies in reading: they tended to use their background knowledge more readily than text information. This strategy has limited effectiveness when text material is not familiar. Campbell and Malicky suggested several implications for adult literacy programs and pedagogy. However, since insufficient information is reported on the MANOVAs, it is not possible to interpret the results. Consequently, any replication of this study is not possible. Thus, we report some general implications reported by Campbell and Malicky that are not based on MANOVA results:

- Focus on what adult learners know and emphasize the role of both text information and background knowledge in word identification and comprehension.
- Teach students how to integrate their background knowledge with text information through a variety of strategies rather than rely on any one specific strategy.
- Incorporate individualized instruction in adult literacy programs. Diagnostic and effective ways to assess adult learners' needs are critical for good teaching and program development.
- Select reading materials on topics relevant to and at a level appropriate for adult literacy learners in order to make it possible for them to integrate their knowledge with printed information.
- Teach different strategies such as integration of text information and relevant background knowledge to learners at different reading proficiency levels. The complexity of teaching materials needs to change as students' reading proficiency increases.

It is important to revisit the reading strategies used by adult literacy learners. The study by Pat Campbell and Grace Malicky is an exploratory and descriptive study of adult literacy learners' oral reading miscues, oral retellings and responses to inferential and factual comprehension questions. There is still much to learn about which reading strategies are most effective and under which circumstances. Moreover, the evidence is building that strategic reading is the route to effective reading. The challenge is to continue to study the most effective ways and means to identify what constitutes strategic reading, what reading strategies are most effective and in which contexts, and how to develop effective reading strategies regardless of whether adult learners are familiar or unfamiliar with what is being read. In summary, the goal is to teach adult literacy learners to be strategic and effective readers regardless of what they are reading. ■

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