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# Declines in vocabulary among American adults within levels of educational attainment, 1974–2016

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ABSTRACT

We examined trends over time in vocabulary, a key component of verbal intelligence, in the nationally representative General Social Survey of U.S. adults ($n$ = 29,912). Participants answered multiple-choice questions about the definitions of 10 specific words. When controlled for educational attainment, the vocabulary of the average U.S. adult declined between the mid-1970s and the 2010s. Vocabulary declined across all levels of educational attainment (less than high school, high school or 2-year college graduate, bachelor's or graduate degree), with the largest declines among those with a bachelor's or graduate degree. Hierarchical linear modeling analyses separating the effects of age, time period, and cohort suggest that the decline is primarily a time period effect. Increasing educational attainment has apparently not improved verbal ability among Americans. Instead, as educational attainment has increased, those at each educational level are less verbally skilled even though the vocabulary skills of the whole population are unchanged.

## 1. Introduction

Are Americans more intelligent than a few decades ago, or less intelligent? In this paper, we examine one key aspect of this question: trends in American adults' verbal ability between the 1970s and the 2010s via a measure of vocabulary skills, an important indicator of the verbal component of intelligence (e.g., Carroll, 1993) and one of the highest-loading tests of $g$ (general intelligence; Johnson, Bouchard, Krueger, McGue, & Gottesman, 2004; Lehrl & Fischer, 1988).

A theoretical case can be made for both an increase and a decrease over time in verbal ability. In support of increasing verbal skills, studies have consistently found rising IQ scores in the general population across several countries, known as the Flynn effect (Flynn, 1987; Sundet, Barlaug, & Torjussen, 2004). If IQ is increasing, and vocabulary is an important marker of IQ, then vocabulary should increase over time. In addition, educational attainment has risen. More students finish high school, and more attend college (U.S. Census, 2016). If education increases verbal intelligence, vocabulary should rise (Baker et al., 2015; Ceci & Williams, 1997; Nisbett et al., 2012).

There are also several arguments in support of vocabulary decreasing over time. The U.S. population has continually gotten older, and aging may account for a drop in verbal ability. However, past research has reported that aging is not strong enough to account for all the variance in verbal ability (Alwin & McCammon, 1999, 2001). The ethnic composition of the U.S. has also shifted, and increases in immigrant ethnic minority populations with lower verbal skills in English may lead to lower English vocabulary on average. In addition, scores on the verbal section of the SAT have declined over this time period (College Board, 2016). However, SAT scores are an imperfect measure of trends in ability because the population of students who take the test has changed over time. More high school students now take the SAT than in the 1970s, and thus the population may include more of lesser academic ability. Finally, fewer young people now read books, magazines, and newspapers, which may have a direct suppressive effect on vocabulary skills (Bauerlein, 2006; Twenge, Martin, & Spitzberg, 2019).

### 1.1. The present research

In this paper, we examine scores on a vocabulary test included in the General Social Survey (GSS), a nationally representative survey administered since 1974. The test includes 10 multiple choice items, each asking the participant to define a word. The ten items were taken from the Gallup-Thorndike Verbal Intelligence Test, Form A (Thorndike, 1942). Vocabulary is highly correlated with overall IQ (Carroll, 1993; Jensen, 2001; Sattler, 2008).

Previous research examining the GSS vocabulary test over time found that scores on the vocabulary test did not increase between 1974 and 2008 (Beaujean & Sheng, 2010). However, this study did not control for educational attainment, and educational attainment has

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**Table 1**
Average number correct on the GSS vocabulary test (out of 10), raw means and controlled for years of education completed, American adults, 1974–2016.

| Year | n (all) | Raw mean (SE) | n (all with education variable) | Estimated marginal mean (SE) with years of education as covariate | n (non-Hispanic Whites with education variable) | Estimated marginal mean (SE) with years of education as covariate – non-Hispanic Whites |
|---|---|---|---|---|---|---|
| 1974 | 1449 | 5.99 (0.058) | 1337 | 6.37 (0.051) | 1196 | 6.53 (0.052) |
| 1976 | 1442 | 5.99 (0.058) | 1240 | 6.36 (0.053) | 1140 | 6.51 (0.053) |
| 1978 | 1488 | 5.94 (0.058) | 1738 | 6.27 (0.045) | 1540 | 6.45 (0.046) |
| 1982 | 1430 | 5.94 (0.057) | 1656 | 6.19 (0.046) | 1452 | 6.39 (0.047) |
| 1984 | 1397 | 6.04 (0.059) | 1625 | 6.19 (0.046) | 1398 | 6.38 (0.048) |
| 1987 | 1382 | 5.93 (0.060) | 1644 | 6.03 (0.046) | 1389 | 6.29 (0.048) |
| 1988 | 911 | 5.78 (0.069) | 1035 | 5.90 (0.058) | 882 | 6.09 (0.061) |
| 1989 | 988 | 5.86 (0.071) | 1149 | 5.94 (0.055) | 979 | 6.14 (0.057) |
| 1990 | 871 | 6.12 (0.074) | 981 | 6.09 (0.059) | 840 | 6.27 (0.061) |
| 1991 | 954 | 6.04 (0.068) | 1107 | 6.10 (0.055) | 929 | 6.32 (0.059) |
| 1993 | 1036 | 5.96 (0.067) | 1177 | 5.91 (0.054) | 990 | 6.17 (0.057) |
| 1994 | 1843 | 6.10 (0.048) | 2103 | 6.02 (0.040) | 1750 | 6.25 (0.043) |
| 1996 | 1877 | 6.01 (0.048) | 2137 | 5.89 (0.040) | 1723 | 6.13 (0.043) |
| 1998 | 1304 | 6.06 (0.058) | 1468 | 5.96 (0.048) | 1165 | 6.21 (0.053) |
| 2000 | 1316 | 5.91 (0.059) | 1488 | 5.87 (0.048) | 1147 | 6.13 (0.053) |
| 2004 | 1452 | 6.17 (0.054) | 1310 | 5.91 (0.051) | 1056 | 6.14 (0.055) |
| 2006 | 1399 | 6.11 (0.053) | 1314 | 5.96 (0.051) | 975 | 6.20 (0.058) |
| 2008 | 1202 | 5.96 (0.055) | 1077 | 5.83 (0.056) | 855 | 6.16 (0.061) |
| 2010 | 1389 | 5.96 (0.055) | 1273 | 5.83 (0.052) | 967 | 6.15 (0.057) |
| 2012 | 1283 | 5.91 (0.056) | 1284 | 5.71 (0.052) | 957 | 5.95 (0.058) |
| 2014 | 1642 | 5.98 (0.048) | 1443 | 5.72 (0.049) | 1084 | 5.97 (0.054) |
| 2016 | 1858 | 6.02 (0.044) | 1679 | 5.83 (0.045) | 1267 | 6.06 (0.050) |

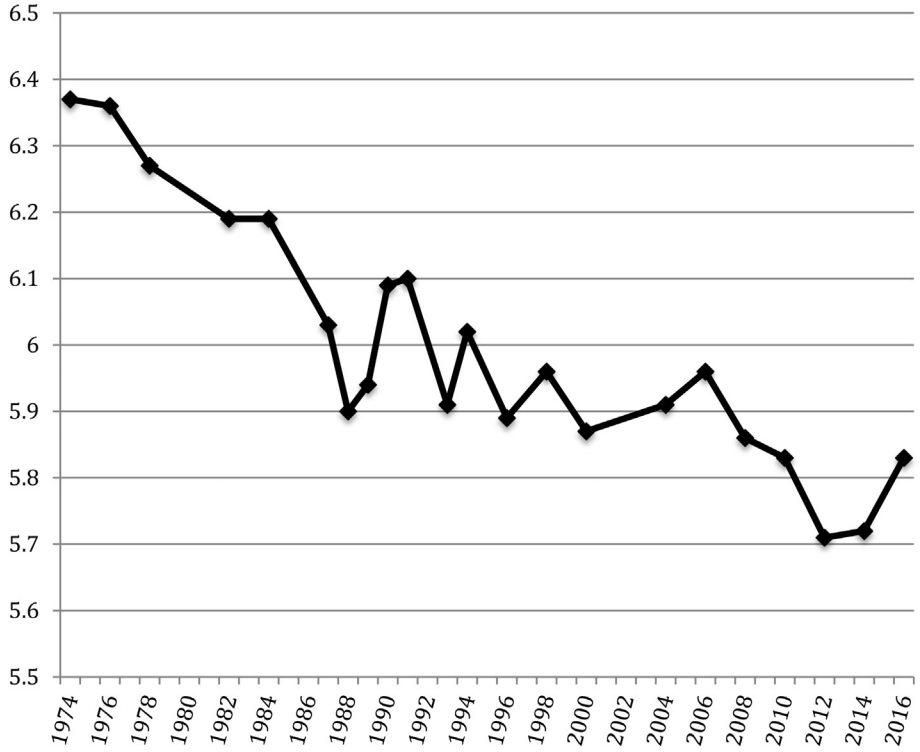


**Fig. 1.** Average number correct on the GSS vocabulary test (out of 10), controlled for years of education completed, American adults, 1974–2016.

risen considerably among American adults, and thus among the GSS participants (U.S. Census, 2016).

In addition, the origin of trends over time in vocabulary are unknown. It is important to determine if any changes over time are caused by time period (a cultural change that affects people of all ages), birth cohort or generation (a cultural change that affects young people the most), or age (a change with development; Campbell et al., 2015; Schaie, 1965). Mixed-effects models based on hierarchical linear modeling (HLM) allow the separation of the three effects using a technique known as age-period-cohort analysis (APC: Yang & Land, 2006, 2008; for sample papers, see, e.g., Schwadel, 2011; Twenge, Sherman, & Wells, 2017; Wilson & Abbott, 2018; Yang, 2008). One study used an APC analysis on the GSS vocabulary data through 2000 and found age effects, a small time period effect, and also a cohort effect (Yang & Land, 2006). However, that study did not examine educational attainment as a control or a moderator variable or examine data between 2002 and 2016. Studies that have controlled for education (e.g., Dorius, Alwin, & Pacheco, 2016) have not used APC analysis or examined trends within education groups.

**Table 2**
Average number correct on the GSS vocabulary test (out of 10) by highest educational degree completed, American adults, 1974–2016.

| Highest degree | 74–79 | 80–84 | 85–89 | 90–94 | 95–99 | 00–04 | 05–09 | 10–16 | *d* (1st to last) | *d* (max) |
|---|---|---|---|---|---|---|---|---|---|---|
| No high school degree ($n$ = 5521) | 4.67 (2.01) 1395 | 4.62 (2.04) 718 | 4.21 (2.07) 691 | 4.41 (1.97) 766 | 4.32 (1.98) 414 | 4.42 (1.97) 395 | 4.62 (1.97) 364 | 4.28 (1.99) 778 | − 0.20* | − 0.20* |
| High school or junior college degree ($n$ = 17,627) | 6.20 (1.92) 2367 | 6.09 (1.89) 1667 | 5.90 (1.86) 1953 | 5.95 (1.80) 2844 | 5.85 (1.82) 1990 | 5.90 (1.86) 1613 | 5.93 (1.79) 1541 | 5.79 (1.71) 3653 | − 0.23* | − 0.23* |
| Bachelor's or graduate degree ($n$ = 6718) | 8.06 (1.72) 612 | 7.85 (1.78) 438 | 7.60 (1.84) 629 | 7.53 (1.96) 1079 | 7.41 (1.93) 774 | 7.24 (1.94) 752 | 7.04 (1.82) 695 | 7.12 (1.76) 1740 | − 0.54* | − 0.59* |

NOTE: Standard deviations in parentheses, n's within each cell following.
* *t*-Test yields p < .001.

## 2. Method

The GSS is a nationally representative sample of Americans over 18, collected in most years between 1972 and 2016 ($N$ = 61,602; for the variables in the current analysis, $N$ = 29,912). The GSS data and codebooks are available online (Smith, Davern, Freese, & Hout, 2018). As suggested by the GSS administrators, we weighted the descriptive statistics by the variable WTSSALL to make the sample nationally representative of individuals rather than households. The weighting variable primarily corrects for the greater probability of those in smaller households to be included, as only one person per household is surveyed. Also as recommended by the survey administrators, we excluded the black oversamples from 1982 and 1987.

Since 1974, the GSS has included a vocabulary test designed to measure verbal ability. The items are introduced as follows: "We would like to know something about how people go about guessing words they do not know. On this card are listed some words–you may know some of them, and you may not know quite a few of them. On each line the first word is in capital letters – like BEAST. Then there are five other words. Tell me the number of the word that comes closest to the meaning of the word in capital letters. For example, if the word in capital letters is BEAST, you would say "4" since "animal" comes closer to BEAST than any of the other words. If you wish, I will read the words to you. These words are difficult for almost everyone – just give me your best guess if you are not sure of the answer." The example card read: "BEAST 1. afraid 2. words 3. large 4. animal 5. separate." Because the National Opinion Research Center uses this set of items in other surveys, they do not list the specific words in the codebook. The GSS file contains a variable (wordsum) identifying the number of vocabulary words (out of 10) that the participant was able to define correctly. For participants with a score on that measure, $n$ = 29,912. To measure educational attainment, we relied on the GSS variable "educ" identifying the highest grade of school completed. For analyses within levels of educational attainment, we used the GSS "degree" variable, comparing those with less than a high school education, a high school or junior college degree, and a bachelor's or graduate degree.

Following the recommendations of Yang and Land (2013), we conducted a hierarchical APC with cross-classified random effects (HAPC-CCREM). We specified both cohort and period as random effects, leaving age – with linear, quadratic, and cubic terms – as a fixed effect. This specification creates an identified statistical model without imposing any additional constraints (e.g., assuming no effects of age, etc.). We specified age as the fixed effect because age-related phenomenon, such as physical size or cognitive growth/decline, routinely fit linear, quadratic, or cubic patterns and can be modeled as fixed effects. Cohort and period effects on vocabulary are less well known and may have more complex, non-linear patterns and are therefore better modeled as random effects. While we believe that this the most logically coherent specification of the model, other specifications (e.g., cohort effects as fixed) may yield different patterns of results (see Bell & Jones, 2015; but see also Reither et al., 2015; Reither, Masters, et al., 2015). The model has three variance components: One for variability in intercepts due to cohorts (τu0), one for variability in intercepts due to period (τv0), and a residual term containing unmodeled variance within cohorts and periods. Variance in the intercepts across time periods and cohorts indicates period and cohort differences, respectively. Effectively, this allows us to estimate the vocabulary score for each year and cohort, with year and cohort independent of each other and of age. All APC analyses were conducted using the lme4 package (Bates, Maechler, Bolker, & Walker, 2014) in R (R Core Team, 2014) All code can be found here: https://osf.io/73zvw/.

## 3. Results

First, we verified the assumptions that educational attainment had increased and that educational attainment is correlated with

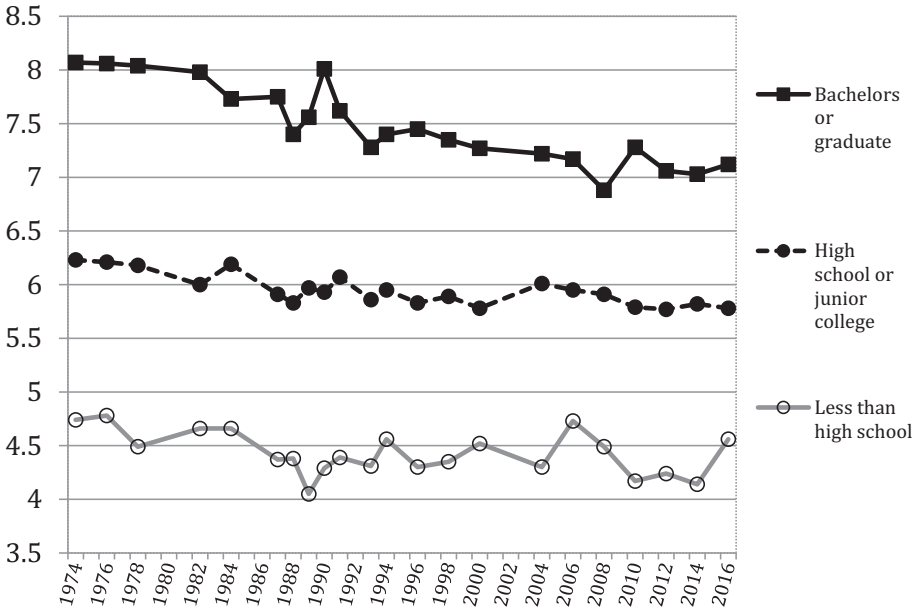


**Fig. 2.** Average number correct on the GSS vocabulary test (out of 10), by education level, American adults, 1974–2016.

vocabulary. Both were confirmed: The average number of years of school completed rose nearly two years over this time period, from 11.83 in 1974 to 13.68 in 2016, and years of education correlated $r$ (29,860) = 0.47, $p < .001$ with vocabulary.

We then turned to the question of trends in verbal intelligence over time. Americans' scores on the GSS vocabulary test did not vary much between 1974 and 2016. However, when years of education was included as a covariate, vocabulary declined substantially. This was also true when the sample was restricted to White non-Hispanic respondents to rule out demographic shifts as a possible confound (see Table 1 and Fig. 1).

In addition, vocabulary declined within each level of educational attainment (see Table 2 and Fig. 2). For example, college graduates' vocabulary declined $d = -0.54$ between the late 1970s and the 2010s, with the average college graduate in the 2010s answering 71% of the vocabulary questions correctly, down from 81% in the late 1970s. The slight uptick in vocabulary between 2014 and 2016 (see Fig. 1) was almost exclusively due to a rise in vocabulary skills among those without a high school degree. Overall, education and vocabulary became less associated with each other: The correlation between vocabulary and years of education was lower in 2010–16, $r(6165) = 0.44$, $p < .001$ than it was in 1974–79, $r(4371) = 0.52$, $p < .001$, $Z = 5.26$, $p < .001$.

Next, we examined whether these trends were due to time period, cohort, or age using APC analysis, controlling for educational attainment. These results revealed primarily a time period effect (SD = 0.21), in which people of all ages change as the culture changes. Vocabulary peaked in the mid-1970s and declined thereafter, with the effect size between the highest score in 1976 and the lowest in 2014 $d = -0.35$, and $d = -0.33$ between 1976 and 2016. Cohort effects (SD = 0.11) were smaller and inconsistent; the cohort born in the 1910s scored the highest and the cohort in the 1960s the lowest, with $d = -0.19$ between these two cohorts (see Fig. 3b). There was also a large effect of age (both linear and quadratic effects were statistically significant at $|t| > 6.68$); after age 50, vocabulary steadily declined (see Fig. 3c).

## 4. Discussion

When controlled for educational attainment, American adults' vocabulary (a key indicator of verbal ability) declined between the mid-1970s and the mid-2010s. The vocabulary of American college graduates declined more than a half a standard deviation over this time period, and vocabulary also declined among those without a four-year college degree.

Why might this have occurred? First, Americans' vocabularies might be shrinking despite the increase in education. This is plausible given the steep decline in the amount of time high school students spend reading (Bauerlein, 2006; Twenge, Martin, & Spitzberg, in press) and the decline in SAT verbal scores over time (College Board, 2016). This explanation could account for the narrowing of abilities between those without high school educations and those with college educations. The difference in vocabulary by education was approximately 3.4 correct answers in 1974–79 but dropped to 2.9 correct answers by 2010–16. However, this explanation would not account for the decline in performance in all educational groups.

Second, education may not do much to improve verbal ability. For example, Arum and Roksa (2010) found few gains in reasoning ability over the first two years of undergraduate education. Similarly, a study on Dutch students found that parental cultural advantage was important for predicting children's vocabulary. However, across time, children's vocabulary scores declined at all levels of parental cultural advantage, similar to our findings (Gesthuizen & Kraaykamp, 2002). If education does not improve vocabulary, but educational attainment increases, those with higher ability will be increasingly selected into the higher education groups, leaving those with lower ability in the lowest educational attainment groups. Thus, the no high school degree group will be left with those of lowest ability, and the college graduate group will have absorbed more with only moderate ability. College does not improve their ability any further, so ability within college graduates declines. Most studies finding that education improves intelligence examine the effect of primary and secondary school, not higher education (Ceci & Williams, 1997; Nisbett et al., 2012). Overall, the decline may be an artifact of the increasing education level of Americans, assuming that vocabulary is relatively fixed and not substantially improved by education, even college. This is also supported by the result that the correlation between vocabulary and years of education was lower in recent years than in the past.

The decline in vocabulary among college graduates may have practical consequences. The average college graduate now has considerably lower verbal ability than the average college graduate 40 years ago. For employers, this means that a college degree does not have the same meaning as it once did for verbal ability. Employers can

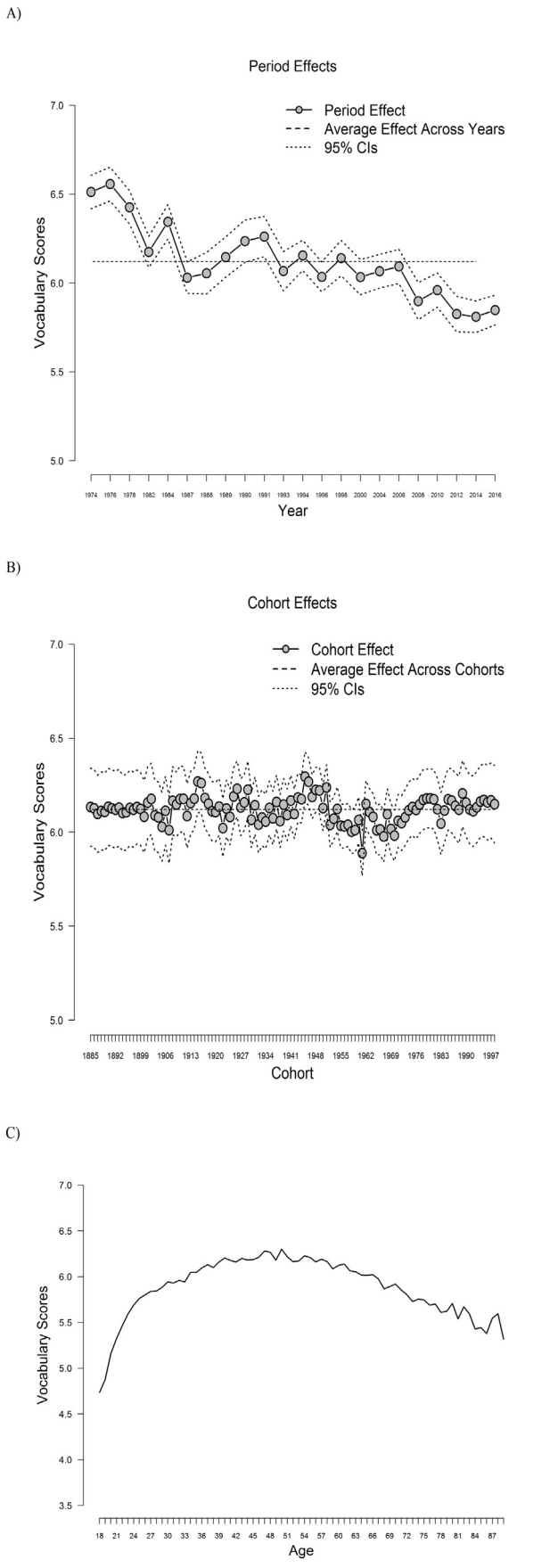


**Fig. 3.** Average number correct on the GSS vocabulary test (out of 10), controlled for years of education completed, by A) time period controlled for cohort and age, B) cohort controlled for time period and age, and C) age controlled for time period and cohort, American adults, 1974–2016.

no longer expect the high level of vocabulary once average for a college graduate. With more people going to college, the population of college graduates has become less skilled, and the college experience may not increase vocabulary skills. If true, educators might consider why higher education seems to have little impact on vocabulary. Those who provide educational materials such as textbooks might also keep in mind that the average vocabulary level of college students, even upper-division students, is now lower.

These findings are seemingly at odds with the Flynn effect finding increases in IQ across birth cohorts. However, the Flynn effect is strongest in nonverbal abilities and thus might not apply to verbal ability. Furthermore, the Flynn effect might be reversing. For example, there is recent evidence in Germany that the Flynn effect has reversed since the 1970's (Pietschnig & Gittler, 2015). Indeed, a recent survey of experts predicts that the U.S. will start seeing declining IQ, with Flynn effect experts estimating up to a 4.8 point decline by 2100 (Rindermann, Becker, & Coyle, 2017).

It should be noted that the GSS test is a measure of passive vocabulary (recognizing the words' meaning in a multiple-choice context) rather than active vocabulary (offering the definition of the word). This may be one reason why WAIS vocabulary, which assesses active vocabulary, has increased while GSS vocabulary has not (Flynn, 2012). This suggests that the gap between passive and active vocabulary may be larger now than it was in the past. This may be due to the decline in reading, if reading builds passive vocabulary more than active vocabulary.

The items on the GSS vocabulary test have remained constant since they were first asked in 1974. This is a strength as we can compare responses over a long time period with consistent measurement. However, an unchanging list of words has the disadvantage that the words might have become dated or used less frequently in books, making them more difficult for modern populations to define (Dorius et al., 2016). However, if vocabulary is to be measured over time using the same words, there may be no way around this limitation. In addition, it is difficult to determine if the use of these words has declined due to fashion (secular trends in popularity) or instead to a "dumbing down" of the words used in books. If the latter, that is a cultural explanation for the decline rather than a methodological one. Perhaps American culture became less intellectual, either because of or in response to a lowering of verbal ability among those who read books. Authors aim to sell more copies of their books, and thus may adjust their vocabulary level to the skills and preferences of a wider slice of the population. Or, perhaps authors lowered the vocabulary level of their books for some other reason such as an interest in getting out a message without linguistic complexity getting in the way. For example, the Bible has been revised repeatedly to make it more accessible with the *King James Version*, the most complex and lyrical English language version, being succeeded by the simpler *New International Version*, *Living Bible*, and *New Revised Standard Version* (Goff, Farnsley II, & Thuesen, 2016). As a result of the lowering of vocabulary in popular books, the population was exposed to a less advanced vocabulary.

Another limitation of the GSS vocabulary items is that they may not show measurement invariance over time. In particular, the items have shown evidence of differential item functioning (Beaujean & Sheng, 2010). If responses to certain items vary in ways confounded with the period effects, that could account for change over time rather than a true change in the latent trait of verbal intelligence.

In conclusion, Americans across all levels of educational attainment have become less able to correctly answer the questions on a standard test of vocabulary. Increased educational attainment has not led to increased verbal ability. Instead, those with higher ability have steadily obtained more education. As a result, the average vocabulary of an American college graduate is now lower than in the past.

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