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Vocabulary & Academic Success in University Undergraduate Students

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Much of the literature recognizes the critical role that vocabulary knowledge plays in school readiness and achievement. Influences such as vocabulary knowledge disparities and maternal education have significant correlations on academic performance (Baer et al., 2006; Ouellette, 2006; Pascarella et al., 2004). It is crucial that researchers investigate the presence of longitudinal disparities and reportedly widening socioeconomic and status-related gaps (Duncan & Murnane, 2016). As the field of communication disorders and sciences embraces students of various economic and educational backgrounds, educators must understand the correlation that variables such as socioeconomic status and vocabulary have on vocabulary learning and the capacity in which these relationships correspond with achievement.

The purpose of this study is to examine the relationships between socioeconomic status and vocabulary knowledge with word learning and academic achievement. The first portion of this study is to identify the relationship between socioeconomic status (SES) and receptive vocabulary knowledge in college students. It will also examine vocabulary's relationship with academic success. The second portion of this study will identify the relationship between college students' vocabulary and word learning.

In this study, we will use maternal education as a proxy for SES. Previous research reveals that maternal education is a component of SES that is significantly correlated with receptive language development and is a significant predictor for outcomes in vocabulary development and educational attainment (Haveman & Wolfe, 1995; Raviv et al., 2004; Walker et al., 1994).

Literature Review

Factors that Influence Vocabulary Disparities. From a child's first words around twelve months to the tens of thousands of words learned by adulthood, the mind voraciously absorbs language. Just as quickly as the lexicon grows in the early years, so does the lasting gap between top learners and their peers. Before age one, receptive vocabulary development can differ greatly. One study found that 10-month-old children in the lowest 10th percentile understood fewer than a dozen words. In contrast, those in the highest 10% understood 154 words or more (Fenson et al., 1994). As children become older, disparities between children and their peers become greater. Children with more advanced language skills know nearly 1,000 more words than children with less developed vocabularies by the second grade (Biemiller & Slonim, 2001). Though the acquisition rate slows down during adolescence, the early language differences between children persist into adulthood. A longitudinal study was able to document the individual language journeys of children. Differences caused by language delays reported at ages 2 and 6 were still evident at 21 years of age (Rice & Hoffman, 2015).

Many environmental and biological factors influence child development; however, biological connections to vocabulary acquisition are not as significant or long-term as environmental influences. Vocabulary growth tends to accelerate faster in girls than boys (Huttenlocher et al., 1991). However, this relationship tends to dissipate around two years old (Huttenlocher et al., 1991). Many areas of language and literacy can be affected by biological factors. Biological predispositions to language impairment have significant correlations with skills associated with later reading abilities (Harlaar et al., 2008). However, differences in young children's vocabulary

and grammar are primarily due to environmental influences (Harlaar et al., 2008; Hayiou-Thomas, 2008).

A highly researched environmental factor- and the area of concern for this study- is socioeconomic status and maternal education. Decades of research have found that maternal education corresponds with many factors influencing language development and school readiness. However, the literature lacks consistent findings of this relationship in adulthood. Studies have found that children from low SES families are likely to have a more limited vocabulary and poorer phonological awareness (Conant et al., 2017; Fernald et al., 2013; Hart & Risley, 1995; Morgan et al., 2015). One study found that 65% of low SES preschoolers in Head Start programs had clinically significant language delays (Nelson et al., 2011). Maternal speech, language exposure, parenting variables, and cognitive stimulation are the primary functions for vocabulary differences across SES (Hoff, 2003; Jones & Rowland, 2017; Raviv et al., 2004; Weisleder & Fernald, 2013). Classic work by Hart & Risley documents the contrasts of parent-child interaction across SES with the most significant disparities between the extremes of advantage (Hart & Risley, 1995). The most substantial impact of socioeconomic status is evident among the poorest households. Deprivations in a child's environment affect more than experiences. Children among the poorest families show structural differences in several areas of the brain associated with school readiness. "Regional gray matter volumes of children below 1.5 times the federal poverty level were 3 to 4 percentage points below the developmental norm" (Hair et al., 2015, p. 825).

Maternal education is commonly associated with children's language development; however, the literature lacks consistent findings of this relationship in adulthood. In a longitudinal study, Rice and Hoffman (2015) were able to find a significant but modest (almost minimal) relationship between maternal education and vocabulary in adulthood. However, other research shows that the maternal education effect was only significant at 4 years of age and no longer significant in subsequent years (Taylor et al., 2013).

Reading Comprehension and Student Performance. Vocabulary acquisition is a key component of many areas of school readiness and academic success. Individual differences in vocabulary have a significant relationship with student differences in achievement and academic-related cognitive skills. Different facets of vocabulary knowledge facilitate literacy development (Ouellette, 2006) and, in turn, success in school (Bigozzi et al., 2017). Duff et al. (2015) reported that fourth graders with above-average reading skills learned more vocabulary words. These students also improved reading skills at a higher rate over time than did below-average readers. Higher vocabularies facilitate other academic skills, such as increased knowledge monitoring abilities. Students with higher vocabularies can more accurately distinguish what they know from what they do not know. They are, therefore, more likely than their peers to accurately target the materials and concepts they need to study more closely to improve performance (Tobias & Everson, 1996). Though cognitive skills are a significant factor in a student's success, vocabulary knowledge remains critical in reading comprehension and performance. Chall et al. (1990) found that even children who performed well on cognitive tasks still experienced limitations in reading comprehension when they had smaller vocabularies.

The academic impact of limited vocabulary becomes apparent in early schooling and remains significant for years; disparities continue to influence outcomes throughout a child's education. Early language development (below 2 years) can significantly predict educational outcomes and

literacy achievement up to the fifth and sixth grade (Bleses et al., 2016; Lee, 2011). Further, reading and vocabulary deficits identified in the first grade continue through adolescence and act as one of the most significant factors of variance in reading comprehension in years as late as the eleventh grade (Cunningham & Stanovich, 1997; Ferrer et al., 2015).

College Readiness and Language. Research shows evidence that vocabulary disparities persist through adulthood. Still, the literature has an inconsistent understanding of the degree to which these gaps continue to exist. Seashore and Eckerson (1940) examined the size and composition of vocabularies of college undergraduates. Their study found that the students with the highest vocabularies had twice the vocabulary size of the lowest, ranging from 100,000 to 200,000 words. More recent estimates for the typical young adult, however, are much less. Estimates for the average vocabulary inventory for first-year college students is closer to 16,785 and even as small as 10,000 words (D'anna et al., 1991; Treffers-Daller & Milton, 2013). Unlike Seashore and Eckerson's enormous range estimate, more recent studies found a more modest variance of about 2,000 words (Treffers-Daller & Milton, 2013).

Research suggests that these disparities may significantly impact collegiate level academic performance, especially for students whose vocabulary levels are lower than the normal range. Verbal ability is the most accurate predictor of success on exams and variance in spelling proficiency in college students (Dollinger et al., 2008; Ocal & Ehri, 2017). Over 80% of college-level tasks involve reading. A critical factor in college readiness is comprehending complex texts (ACT, 2006; Nist & Simpson, 2000, as cited in Holschuch, 2019). The minimum estimated vocabulary size to comfortably read a newspaper is between 8,000 and 9,000 words (Nation, 2006). In comparison, the minimum for more complex academic texts is approximately 10,000 base words plus proper nouns (Hazenberg & Hulstijn, 1996). These findings suggest that most university students, with average vocabulary size only just meeting the minimum, may be at risk of finding difficulty with college-level texts (Treffers-Daller & Milton, 2013). These findings are especially pertinent for understanding the academic performance of students whose lexicons do not meet the projected minimum. According to the National Survey of America's College Students, between 20 and 30 percent of college students had basic or below literacy levels- with first-generation college students having lower literacy rates and earning lower grades than their peers (Baer et al., 2006; Pascarella et al., 2004). Students with more inadequate vocabulary likely struggle to learn novel academic concepts when reading materials and textbooks with high-tier language.

Vocabulary and Word Learning. According to research, prior vocabulary knowledge becomes increasingly important for refining linguistic and, consequently, word learning skills for adult learners. Receptive vocabulary size and phonological short-term memory are significant factors in fast mapping and word-learning skills for students with and without specific language impairment (Jackson et al., 2016). Phonological skills and receptive vocabulary refine each other, creating an interrelationship that facilitates word learning. Receptive vocabulary significantly predicts variance in phonological awareness, and phonology plays a significant role in auditory and visual word learning in adults (McDowell et al., 2013; Meade, 2019). Further, as people age, vocabulary size becomes a better predictor of word learning ability than memory or other language skills (Long & Shaw, 2000). This relationship supports evidence for the effect language exposure has on vocabulary knowledge and the skills used to learn new words. Extensive language exposure aids in the recognizing features and regularities of future language input, such as word forms (Ellis,

2006; Schmitt, 2008). As learners become more familiar with sound sequences, they more rapidly learn new words that contain them (Storkel, 2001). This process is true for terms of different grammatical classes (Storkel, 2003). The more words one knows, the more exposure they have to different word forms. This linguistic sharpening from language exposure allows the brain to become attuned to various characteristics, such as semantics and sound sequences, and facilitates better word learning.

When assigning the task of learning higher tier language to university students, it is essential to examine the preexisting factors that affect students' ability to learn vocabulary. The field of speech-language pathology requires students to study and understand new words from multiple disciplines. Students must learn the jargon, basic knowledge, and theories of numerous areas to meet standards for certification in practice (Council for Clinical Certification in Audiology and Speech-Language Pathology [CFCC], 2016). Learning new concepts in any field requires that students learn higher-tier vocabulary and professional jargon. Knowing how prior knowledge interacts with academic learning is vital in informing professors' decisions on instructing students from diverse backgrounds with varying verbal ability and vocabulary knowledge.

A study by Kullmar and Blankenship (2020) examined how students best learn content-related higher-tier vocabulary. Participants learned target vocabulary in either the context of connected text (i.e., the textbook) or in a wordlist (i.e., words listed with definitions). This study also examined whether there were differences in vocabulary learning when comparing verbal ability as defined by entrance exam scores (i.e., ACT reading composite score). This study could not find a significant effect on the learning modality of how new terminology was presented. Individuals performed similarly in the connected text condition (target words embedded in text) and the wordlist (listed with definitions). The researchers evaluated word-learning in the strictest form, dictionary definition, where the participant was required to provide a written definition of the terms. The researchers assessed responses on accuracy and amount of information, which acted as a significant limitation. The response format was theorized to be too challenging to measure word-learning effects accurately because most participants lacked accuracy and amount of information in their definitions. Furthermore, this evaluation method did not allow the researchers to assess the preliminary or initial representation of learning target vocabulary, which is known to occur within fast-mapping. The current study plans to address evaluation limitations by requiring participants to demonstrate their initial representation of word-learning by using the new vocabulary in context rather than through definition. Another limitation of the Kullmar and Blankenship (2020) study was using ACT verbal composite to describe verbal abilities and evaluate the impact it has on word-learning. Kullmar and Blankenship (2020) found no significant difference between the word-learning abilities among students with high ACT verbal composite scores (i.e., ACT score above 22) and students with low ACT verbal composite scores (i.e., ACT score below 21). The ACT score is not an accurate representation of verbal abilities and was not sensitive enough to capture possible differences in word learning. The current study aims to address this limitation by evaluating the receptive vocabulary skills of the participants by using a standardized measure and correlating that to word-learning abilities. Finally, the researchers were interested in assessing the influence of maternal education and vocabulary knowledge in college-age students. Research has extensively documented that maternal education directly impacts the vocabulary knowledge of young children. However, the researchers are interested in observing if this relationship continues to exist in adulthood. The following research questions were posed:

1. Does maternal education affect students' vocabulary knowledge? (Hypothesis one: There will be a significant positive correlation between maternal education and standardized scores on the Peabody Picture Vocabulary Test, 4th edition [PPVT-4; Dunn & Dunn, 2007].)
2. Does vocabulary knowledge, as measured by the PPVT, affect academic performance in university students? (Hypothesis two: There will be a significant positive correlation between standardized scores on the PPVT-4 and GPA.)
3. Does vocabulary knowledge as measured by the PPVT affect students' ability to learn words? (Hypothesis three: There will be a significant positive correlation between standardized scores on the PPVT-4 and gain scores on vocabulary learning measure.)

Methods

Participants. Thirty-nine undergraduate students from a four-year university participated in this study. The data of three participants were not included because of scores higher than 20% on the pretest or outlier scores on the PPVT and posttest (negative gain score). Participants were recruited from speech-language pathology and audiology (SLPA) classes and the SLPA department. Participants were offered extra credit for their participation. Participants were primarily female (91.6%) speech language pathology majors (77.8%). Other majors included social work ($n = 1$), special/elementary education ($n = 4$), integrated studies ($n = 1$), Communication Studies ($n = 1$), and English and German ($n = 1$). Participants ranged in age from 19 to 45.33 ($M = 22.29$) and academic achievement with students' GPAs from 2.19 to 4.0 ($M = 3.40$). On the receptive vocabulary measure, PPVT-4, scores ranged from 80 (moderately low) to 123 (moderately high), with a mean score of 102.75 (average). Participants also gave information indicating highest level of maternal education. Nineteen percent of participants' mothers had a high school level education, 22% some college, 19% associate degree, 17% bachelor's, 17% master's, and 6% of participants had mothers with doctorate/professional level education.

Materials: PPVT-4. The PPVT-4 (Dunn & Dunn, 2007) assessed the receptive vocabulary knowledge of participants. The researchers chose to use the PPVT-4 because of its status as a standardized vocabulary test, and it is the most common receptive vocabulary assessment (Caesar & Kohler, 2009; Spaulding et al., 2013).

Vocabulary Learning Measure. Participants took a vocabulary test created to evaluate vocabulary learning. The pretest and posttest consisted of twenty-five vocabulary words (7 nouns, 10 adjectives, 8 verbs) taken from online study material for the GRE (Magoosh, n.d.). The pretest was in a matching format with all twenty-five definitions given a letter to be matched to each corresponding word. During testing, the authors of the study saw evidence of ceiling effects in word learning scores and changed the format of the posttest. The original posttest was in a matching format identical to the pretest. The posttest was then modified into a fill-in-the-blank format. The new testing structure was chosen based on the design of upper-level entrance exams, the verbal portion of the GRE, as well as past research. Cronbach (1942) stated that knowing a word involves multiple dimensions of knowledge including the ability to use it productively and the ability to select the correct situations in which the word can be correctly applied. Testing only word recognition did not appropriately measure word learning; research has also found that

measuring word learning via definition writing tasks was too difficult in a limited exposure setting (Kullmar & Blankenship, 2020). Students were given sentences with a blank in place of the vocabulary word in each sentence. A word bank of the vocabulary was provided.

Before testing, a group of undergraduate students assisted the researcher by taking a survey of fifty GRE words to narrow-down the twenty-five words that were the most unfamiliar. These students did not participate in the testing portion of this study. Students self-reported fifty GRE words as (a) words they know, (b) do not know, or (c) words that sound familiar. Students were also asked to match words to definitions regardless of their knowledge of the words. All fifty words were divided into two sections of twenty-five words and corresponding definitions. The matching format was to ensure students' knowledge of the words and mimic the vocabulary test structure for the study. Twenty-five of the most unfamiliar words (i.e., categorized as unknown and matched incorrectly) would be selected for the pretest/posttest experiment. This selection process was to justify word choices and increase the probability that the words would be unknown or new to participants. The researcher cross-examined both formats of the PPVT-IV to avoid multiple exposures and skewed PPVT scores.

Study Materials. Participants were given two types of study material: a vocabulary list and flashcards. The vocabulary list provided the words in alphabetical order with their definitions and parts of speech. The flashcards were created with the vocabulary word displayed on the front of the card and the part of speech and definition on the reverse side. The study materials provided were chosen for multiple reasons. The researchers mainly wanted to provide commonly used study materials as to not introduce an unfamiliar study strategy in a time-constrained testing environment. Rote memorization is a common study strategy. Past studies show that up to 70% of undergraduate students reported using flashcards for exams in class (Golding et al., 2012; Wissman et al., 2012). Flashcards in particular can act as simple and effective tool when used for retrieval and self-testing (Miyatsu et al., 2018).

Procedures. IRB approval was obtained prior to testing and recruitment. All participants provided consent for the authors to obtain information and for the faculty advisor to verify information by accessing student records per the requirements set by the institution's review board. Participants were tested individually in either the Speech Pathology and Audiology Clinic or the library in a quiet room. Once the participants gave documented consent (i.e., both verbal and written), they took the vocabulary pretest designed by the researcher. The facilitator gave participants instructions on how to complete the multiple-choice pretest. Participants were also told to answer all items. Participants were informed that this portion of the test was not timed but were encouraged to take no more than fifteen minutes in order to keep momentum and student motivation. After the pretest, participants were given an hour to study GRE vocabulary words. The facilitator explained to the participants that they would be provided two types of studying material (i.e., wordlist with definitions and flashcards). Students could write on the study material if they wished to do so. The facilitator also explained that the hour of studying was required and standardized. Students were allowed to walk around the room and verbalize while studying. Once the allotted study time had finished, participants had a standardized thirty-minute delay between studying and taking the posttest. During the thirty-minute delay, participants took the PPVT-4. After the 30-minute delay, the participants took the posttest on the GRE words they studied. Students were informed that the posttest section of the study was also untimed but were also encouraged to take no more than fifteen minutes. The facilitator gave instruction on how to complete the fill-in-the-blank post-test.

Participants were told not to be concerned about tense or plurality. After the posttest, students were debriefed and released. The faculty advisor verified self-reported data on credit hours, GPA, and major by accessing student accounts.

Results

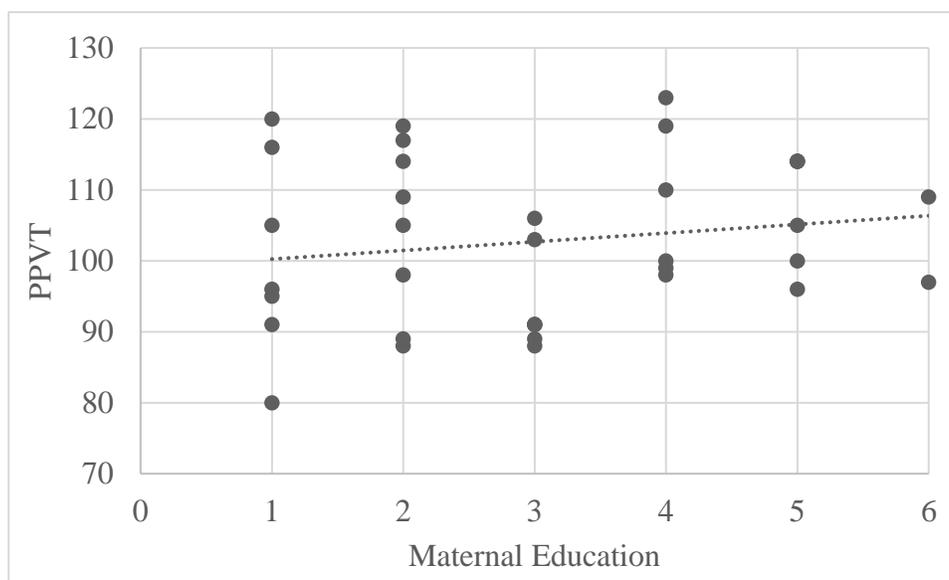
The purpose of the first portion of this study was to identify the relationship between maternal education and receptive vocabulary knowledge in college students as well as the relationship between receptive vocabulary knowledge and academic success.

Research question one: Does maternal education affect students' vocabulary knowledge?

Hypothesis one stated that participants' vocabulary scores would be positively related to their mother's education level. A Pearson correlation was used to test the hypothesis. The results presented in Figure 1 show that there was *not* a significant correlation between these two variables, $r = .17, p = .33$.

Figure 1

Maternal Education and Participants' Standardized Receptive Vocabulary Score



Note: Maternal education- 1 = high school, 2 = some college, 3 = associates/2-year degree, 4 = bachelor's, 5 = Master's, 6 = Professional/Doctoral

The investigators analyzed data on a different scale of maternal education. When education below bachelor's was merged into a single group, there was still no significant correlation between maternal education and PPVT, $r = 0.23, p = .17$. Students whose mothers had at least a bachelor's degree did not have significantly higher vocabularies. There was no support for the first hypothesis.

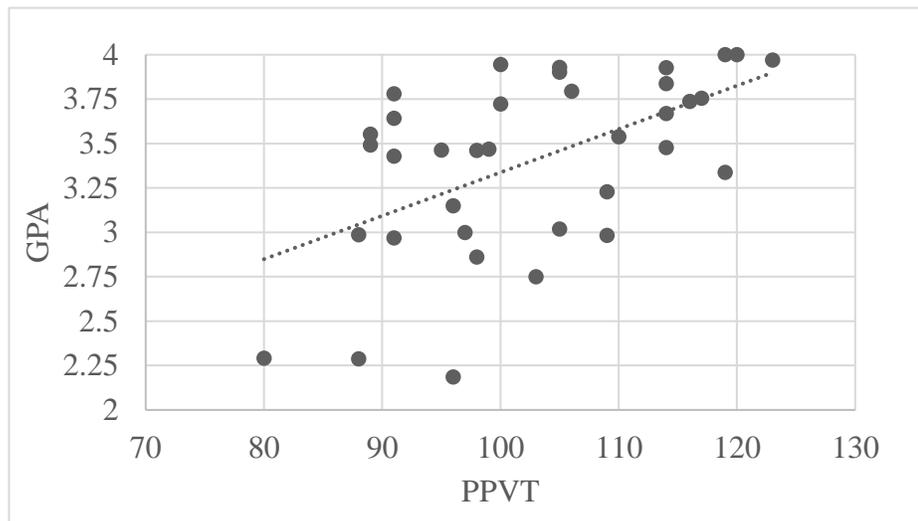
Research question two: Does vocabulary knowledge affect academic performance in university students?

Hypothesis two stated that there would be a significant correlation between GPA and PPVT scores. A Pearson correlation was used to find a moderate positive correlation between GPA and PPVT scores, $r = .55, p < .001$. Figure 2 presents the relationship between

overall grade point average and standardized receptive vocabulary scores. This finding supports the hypothesis that participants with higher PPVT-4 scores had higher undergraduate GPA, suggesting that stronger language skills (i.e., vocabulary) are related to better academic success.

Figure 2

Grade Point Average and Standardized Receptive Vocabulary Scores



Research question three: Does vocabulary affect students' ability to learn words? Hypothesis three stated that there would be a significant positive correlation between standardized scores on the PPVT-4 and gain scores on vocabulary learning measure. Participant data were divided into two groups based on which posttest they completed. Group one was given the original posttest in a matching format. Part-way through the study, the researchers noticed ceiling effects. This was believed to be caused by the composition of the posttest, which seemed to be too simple for the participants in the context of this study and tested memorization of key terms rather than achievement of vocabulary knowledge (as reported through informal feedback from participants). The posttest was then modified into fill-in-the-blank (text completion), which the researchers believed would more accurately test the participants' word learning by requiring them to insert the words into a productive scenario. This method allowed the researchers to test application rather than recognition.

Table 1*Demographic Information for Participants*

	<i>M</i>	<i>SD</i>
Group one (<i>n</i> = 19)		
PPVT	102.05	11.99
GPA	3.34	0.56
Maternal ED.	3.32	1.73
Group two (<i>n</i> = 17)		
PPVT	103.53	10.64
GPA	3.47	0.44
Maternal ED.	2.76	1.30
Comparison Data on Significant Variables Between Groups		
	T value	P score
PPVT	$t(34) = -0.39$	$p = .70$
GPA	$t(34) = -0.80$	$p = .43$
Maternal ED.	$t(34) = 1.06$	$p = .29$

Note: Maternal education- 1 = high school, 2 = some college, 3 = associates/2-year degree, 4 = bachelor's, 5 = Master's, 6 = Professional/Doctoral

Prior to analysis, *t*-tests were used to ensure that the two groups were not significantly different on variables other than gain scores. Analysis found that there was no significant difference between group one and group two on PPVT scores, $t(34) = -0.39$, $p = .70$, nor was there a significant difference in GPA, $t(34) = -0.80$, $p = .43$. The researchers were also able to confirm that there was also no significant difference in maternal education between the groups, $t(34) = 1.06$, $p = .29$. See Table 1. However, significant differences in gain scores between the two groups were observed. Due to ceiling effects on the matching posttest format, group one had significantly higher gain scores, $t(34) = 7.14$, $p < .00001$ compared to group two, tested with the fill-in-the-blank (text completion) posttest. Mean scores and standard deviation are represented in Table 2.

Table 2*Gain Scores from Group One and Group Two*

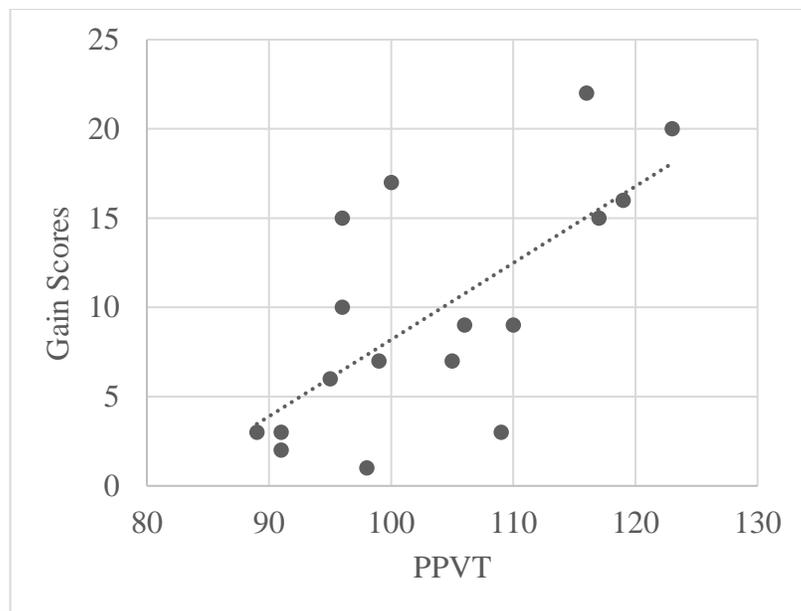
	<i>M</i>	<i>SD</i>
Group one (<i>n</i> = 19)	21.63	2.85
Gain score		
Group two (<i>n</i> = 17)	9.71	6.64
Gain score		

Hypothesis three stated that PPVT scores would positively relate to gain scores. For Group one (i.e., matching posttest), the results indicate that there was *not* a significant correlation between PPVT scores and gain scores, $r = .07$, $p = .79$. This might be a result of the ceiling effects of the initial matching posttest, in that it was most likely measuring memorization skills and not word-learning abilities of the participants. Therefore, it is not surprising that this analysis was

insignificant for Group one participants. However, the results for Group two (i.e., fill-in-the-blank posttest) supported hypothesis three. A Pearson's r correlation revealed a strong positive correlation, $r = .69$, $p = .002$. See Figure 3. The findings suggest that participants with higher vocabulary knowledge as measured by the PPVT-4 achieved greater word learning in an experimental vocabulary task as measured by gain scores.

Figure 3

PPVT and Gain Scores, Group 2



Discussion

Socio-economic Status. Contrary to previous research findings with younger children, this study did not support the correlation between maternal education and vocabulary nor academic achievement. Maternal education did not significantly correlate with receptive vocabulary knowledge in adult college students. These findings may suggest that the influence of maternal education on vocabulary diminishes over time as students gain more experiences and become more independent from the effects of the home environment.

Another possible contribution to our findings is the increased access to educational materials. Research has found that the socio-economic gap for access to enriching early- childhood experiences and educational resources has narrowed (Bassok et al., 2016). Children entering kindergarten after 1998 spent more time reading with parents and had more books, with most gains made in the lowest socio-economic levels (Bassok et al., 2016). This finding is especially relevant for current traditional university students who would be a part of this cohort.

Our findings in the present study do not seem to parallel other research concerning students' SES and their academic success. Past research shows a relationship between SES or maternal education and academic achievement. However, the results from this study do not support this relationship.

There was no relationship between parent's degree attainment and vocabulary, a significant factor of academic achievement. There was also no direct relationship between maternal education and GPA ($r = .11$, $p = .54$). Comparable results surfaced in a previous study that found that parental education level did not significantly correlate with academic achievement for first-year college students (Schlechter & Milevsky, 2010).

One study found that a knowledge of academic culture and university resources rather than language skills was a significant factor in first-generation college students' academic performance (Stephens et al., 2014). Students unfamiliar with university culture (specifically first-generation college students) did not perform as well as their peers (Stephens et al., 2014). However, participants in the 2014 study were students attending a higher-ranking private university. While participants did not provide ACT/SAT scores, the average score of the English portion of the ACT for the previous study's university was a 33 compared to a 27 for the 75th percentile of the university of this study. Likely, the average student from these two universities would not experience equivalent difficulties with academic language. Future research should consider the unique challenges of low-income and first-generation college students from multiple demographics, including grade-school environments (low-income or high-income schools), non-traditional students, and students with a varying history of academic achievement.

Vocabulary and Academic Success and the Ability to Learn New Words. The present study was also able to find further support for the relationship between prior vocabulary knowledge and learning novel words. Students with higher vocabularies learned more words (i.e., achieved higher gain scores on the experimental measure) than students with lower vocabularies. This finding supports research that states learners with higher vocabularies have an increased word learning ability compared to peers with lower vocabularies. It also supports research that suggests this effect lasts into adulthood (Long & Shaw, 2000).

This study provides evidence that vocabulary knowledge has a significant positive correlation with undergraduate GPA, supporting the correlation between academic success and verbal ability. The implications of these findings suggest that an essential factor in learning material and basic terms is beyond students' immediate control. This finding supports previous research (Dollinger et al., 2008). Although the present study was performed at the undergraduate level, previous research has determined that standardized vocabulary measures, such as those in the GRE, are significant predictors of grades and degree attainment in various graduate programs (Klieger et al., 2014; Klieger et al., 2018; Kuncel et al., 2001; Kuncel et al., 2010). However, other evidence suggests that entrance exams like the GRE are not adequate predictors of graduate-level performance. Verbal ability is also not a significant predictor of student productivity, such as the number of first-author publications (Hall et al., 2017).

Vocabulary Testing. An unintentional finding from this study was the differences observed in the two ways vocabulary learning was measured. Initially, participants' word-learning was measured using a matching task, which proved to be too simple and yielded ceiling effects. The researchers surmised that memorization was a key contributor to the ceiling effects. Consequently, the researcher recognized this trend and decided to alter the posttest to potentially capture more in-depth word-learning by using a fill-in-the-blank task, which required the participant to have more knowledge of the target vocabulary to complete the task. The students who did not have significant differences in GPA or prior vocabulary knowledge (PPVT scores) had significant

differences in gain scores on the two vocabulary learning posttests. Students achieved significantly higher scores on multiple choice questions posttest than the fill-in-the-blank questions posttest. The implications of this finding suggest that multiple choice questions for vocabulary tests and exams may not give a valid indication of students' learning and understanding of key terminology. Therefore, educators should consider using application questions, such as fill-in-the-blank, when testing students on terminology learning.

Limitations. While the researchers were able to find support for two of three hypotheses, there are several limitations that the researchers identified in this study. The first limitation is motivation and internal study methods. The differences in participant performance may reflect student motivation. Students who have a history of success in school may be more likely to be motivated to do well in the experimental measure and may also practice better study methods. Although students were given the same study material, there is no proof that the participants were actively internally studying or using effective mental strategies while using the materials. Given the difficulty of accurately measuring individual motivation, researchers were not able to measure internal study strategies. A resolution to this problem could be a survey to measure the participants' motivation regarding their performance in this study. This might have provided some insight to their level of motivation. Participants were offered external incentive (extra credit) to increase the quantity of participants; however, this cannot guarantee to provide internal incentive to achieve higher quality performance.

A second limitation is the participant pool for this study. The study's sample is not representative of the population. The majority of participants were female SLPA majors and all participants' parents had at least high school level education. This may not represent a population with broad enough socio-economic status. The results found in this study also do not indicate that this sample is representative of a larger population of students. Past studies have revealed evidence of an academic achievement gap for first generation university students and students from low-income homes (Duncan & Murnane, 2016; Pascarella et al., 2004; Sirin, 2005). The lack of a significant difference in achievement may reflect a nonrepresentative sample rather than a true absence of an achievement gap. A larger pool with a more diverse group of students would be necessary to answer this question.

A third limitation of the study is that students may have felt uncomfortable to use other study strategies (reading out loud, etc.) or felt obligated to appear to be studying while in the room with the moderator. Future studies may want to utilize observation rooms when asking students to study.

A fourth limitation was both a limitation and indirect support for our third hypothesis. It became apparent to the investigator that some students did not know the meaning of some of the words in the definitions, such as the word *meager* in the definition for *exiguity*. Students who did not understand the words in the definition were likely hindered in their ability to completely learn the words. Efforts to duplicate results similar to this study should ensure that definitions are composed of lower-tier words to encourage full participant understanding.

A fifth limitation was the inability to pilot the original vocabulary learning measure before testing. Recreating testing materials took time from potential data collection and limited the use of the data the researchers collected. Although this limitation affected the process of the study, the groups

were only significantly different in one area, and most of the data was utilized for analysis and produced significant correlations and useful information.

A final limitation was that parental education was the only indicator of SES. Education level, though an indication of SES, may not fully represent household income. The researchers are also not aware of specific family environments and whether students lived with either or both parents (divorced families, etc.). Future studies might want to obtain more demographic information regarding SES, such as housing and parental profession.

Future Directions. The results of this study support previous research and further emphasize the importance of receptive vocabulary knowledge in academic performance. Research provides practical strategies for implementing vocabulary instruction and improving studying strategies. For educators, effective strategies for teaching and instructing vocabulary are through context-driven learning taught by mixing directed instruction with incidental learning and choosing words that students can use in various contexts (Kelley et al., 2010). Students also employ morphological strategies for understanding unknown terms, such as recalling similar words and breaking words down into root words and affixes (Pacheco & Goodwin, 2013). Instruction should focus on teaching the meaning of morphemes and the ability to recognize root words and affixes (Kelley et al., 2010; Pacheco & Goodwin, 2013). For students, reading texts such as the newspaper or other short texts can introduce novel vocabulary (Kelley et al., 2010). For those study materials for classes or standardized tests, common study strategies such as flashcards can be helpful when used optimally. For effective studying, students should keep studying even after recalling a definition or word correctly and should space out the time between study sessions to facilitate better self-testing (Miyatsu et al., 2018).

As discussed, it became apparent to the investigator that some students did not understand some of the definitions. Students who do not understand the full definition may have experienced a disadvantage in word learning. Although there was no formal documentation or analyses of these findings, the observation contributes to a broader discussion on simplifying language in class materials and textbooks. Simplifying vocabulary in books and materials has improved course grades and comprehension (Schoerning, 2014). Complex concepts become more approachable when students can fully understand the definitions and descriptions of the concepts.

Future research should examine these concepts with a demographic that includes an equal distribution of sex, a wider variety of student majors, a more racially and ethnically diverse participant pool, and a larger number of participants to have a more representative sample of a greater population of students. Future research should also follow a larger demographic of students longitudinally to investigate early education achievement and early language development's relationship with university level achievement and vocabulary knowledge.

The lack of measures used to document more facets of vocabulary knowledge still leave certain questions unanswered. This study measured receptive vocabulary in isolation. The existing relationships between expressive vocabulary and word-recognition as well as depth of vocabulary and reading comprehension (Ouellette, 2006) should continue to be considered in future research investigating college-level academic success. Future studies should explore how multiple levels of vocabulary knowledge as well as varying measures of vocabulary learning relate to one another and academic achievement.

Finally, future studies should measure multiple facets of vocabulary knowledge and verbal ability as well as multiple indicators of academic success. The success of students is not strictly defined by GPA. Measures of academic success should include various areas of student productivity such as extra-curricular involvement, research experience, and other valuable experiences and knowledge gained through undergraduate level education.

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