

Engineering Students' Academic Reading Comprehension: The Contribution of Attitude, Breadth and Depth of Vocabulary Knowledge

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Abstract

The objectives of this study were to investigate Engineering students' attitudes and problems in academic reading comprehension and to determine the contribution of academic reading attitude, breadth and depth of vocabulary knowledge to academic reading comprehension. The participants were 122 undergraduate students of Engineering at Iran University of Science and Technology. The Vocabulary Levels Test, the Word Associates Test, a reading section of an academic IELTS sample followed by one open-ended question about reading problems, and an academic reading attitude survey were the instruments of this study. The results of the study showed that (a) the global value the learners placed on the academic reading was the most frequent factor in their attitude towards academic reading; (b) the breadth and depth of vocabulary knowledge were the statistically significant contributors to academic reading, while the contribution of attitude to academic reading was not statistically significant; and (c) 'weak vocabulary knowledge' was the most frequent problem reported by the learners.

Keywords: Academic Reading, Academic Vocabulary, Breadth, Depth, Reading attitude

1. Introduction

According to Isakson, Isakson, Plummer, and Chapman (2016), a big concern of today's educational system is the reading ability of college students, since many students do not tend to read when they are assigned to do so. As stated by Spence and Liu (2013), in today's world, English language reading competencies are necessary, particularly for engineers since they make use of them in their emails, reports, letters, memos, and academic tasks. Academic reading is a complicated activity, since in this process readers simultaneously use several skills, including the ability to notify the links, relationships, and associations between different elements of a written passage (Zulu, 2007).

A number of researchers (e.g., Gold & Albert, 2006; Hui-Yin & Wang, 2011; Poole, 2008; Wilcoxson, Cotter, & Joy, 2011) have argued that the students' ability to read effectively is the key to their success in college. In fact, the ability to read and learn from texts is a basic academic skill, which its influence on academic success in all areas of study is well proved (Cox, Frienser, & Khayum, 2003). As Cox et al. (2003) argue, failure in reading efficiently is the most important obstacle, which prevents college students from success.

Factors influencing successful academic reading are reported to be the knowledge of academic vocabulary (Qian, 1999), general vocabulary knowledge (Qian, 2002), the breadth and depth of vocabulary knowledge (Rashidi & Khosravi, 2010), and academic reading attitude, which is emphasized heavily in studies on reading (Bastug, 2014). One mostly cited categorization of vocabulary knowledge has divided it into breadth and depth (Haastrup & Henrikson, 2000; Milton, 2009; Read, 1993, 1998, 2000). According to Read (2004), breadth of vocabulary knowledge determines how many words the learner of a language knows, while the vocabulary depth determines the quality of a person's knowledge about a given vocabulary. As Mehrpour, Razmjoo, and Kian

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(2011) indicate, each of these two dimensions of the learners' knowledge about a given vocabulary has been shown to have a strong positive relationship with reading comprehension. This means that if the students know more words, and if their knowledge of words is deeper, they can comprehend the texts better (Mehrpour et al., 2011).

Reading attitude is an important issue studied in educational environments. Mahato (2016) defines reading attitude as the person's feeling and interest about reading, which makes the learners decide whether to read or not to read. Oostdam, Blok, and Boendermaker (2015) similarly assert that positive attitude towards reading leads to higher motivation for the students, while negative attitude may prevent them from making sufficient effort and practice for reading tasks.

Considering the importance of attitude, several studies (e.g., Alexander & Filler, 1976; Brooks-Harris, Heesacker, & Mejia-Millan, 1996; Mahato, 2016; McKenna & Kear, 1990) have explored attitudes to reading. With regard to the importance of breadth and depth of vocabulary knowledge, the correlation between these two variables and the reading comprehension is well documented in some studies (e.g., Qian, 1999, 2002; Shen, 2008); however, there seems to be no research on the academic reading attitude and contribution of the depth and breadth of vocabulary knowledge to the comprehension of academic texts by undergraduate students of Engineering. The purposes of this study thus were (a) to explore the undergraduate students' problems and attitudes about academic reading and (b) to determine the contribution of the depth and breadth of vocabulary knowledge to academic reading. The following research questions were formulated in this research:

Research Question 1: What are engineering students' attitudes towards academic reading?

Research Question 2: What are engineering students' problems in academic reading comprehension?

Research Question 3: To what extent do attitude, breadth, and depth of vocabulary knowledge correlate to academic reading comprehension?

Research Question 4: To what extent do attitude, depth, and breadth dimensions of vocabulary knowledge contribute to performance in academic reading comprehension?

2. Review of the Related Literature

2.1. Academic Reading

The reading which occurs in academic settings, as Qian (2002) states, has four basic purposes, including reading in search for information, reading with the goal of comprehension, reading in order to learn something, and reading to relate the information presented in the different texts. Academic reading refers to the strategies people use to appropriately read the texts, which belong to specific disciplines (Gorzycki, Howard, Allen, Desa, & Rosegard, 2016; McWhorter, 2014). Reading academic passages with comprehension involves prediction of what a person will decide to read and knowing the goals of reading. In addition, it is a search for main ideas, general and specific concepts, being critical, determining the writer's purpose and attitudes, and identifying discourse patterns and markers (Zulu, 2005).

Academic reading comprehension is considered by Zulu (2005) as a complex behaviour consisting of a variety of strategies, which depend on both conscious and unconscious mind. One of these strategies is problem-solving strategy, which helps the reader to reconstruct the meaning similar to the one intended by the writer. According to Gorzycki et al. (2016), academic reading is a complicated process, which follows a predetermined goal requiring the reader to be critical enough to analyze the text. The reader should also interpret what he/she reads and be able to relate together the discrete subjects, which are described in the text (Sengupta, 2002). Academic reading consists of some processes, including attention, data encoding, and retrieval, which may not be required in reading for pleasure or that for general purposes (Shih, 1992). Furthermore, reading requires the reader to understand vocabulary and to be able to decode words (Dagostino, Carifio, Bauer, Zhou, & Hashim, 2014).

Many researchers (e.g., Gold & Albert, 2006; Holschuh, Nist, & Olejnik, 2001; Hui-Yin & Wang, 2011; Wilcoxson, Cotter, & Joy, 2011) have argued that it is of vital importance for the college students to be prepared for the tasks, which are at the college-level, and to be able to read effectively is crucial for gaining success at university. Moreover, the inability to read efficiently is the most important factor, which prevents the students from success in college, indicating that students who lack appropriate ability to read are more likely to encounter deficiency in other skills than those who are underprepared for skills other than reading (Gorzycki et al., 2016). According to Mahato (2016), developing efficient writing styles, sufficient vocabulary, advanced grammar, and becoming a skilled speller are all possible through reading.

Even English native speaker students have serious problems in their reading abilities, and it is claimed that comprehension is not always the primary goal of the students while they read (Lei, Rhinehart, Howard, & Cho, 2010). According to Perin (2013), the problems which students may have while dealing with written texts are related to vocabulary knowledge, choosing suitable approaches to reading, becoming aware of the main purposes of the writer, determining the global idea of the text, and writing a summary of the text. Zulu (2007) argues that the majority of the students who enter college with poor schooling background have significant reading difficulties, as they are able to decode but are not skilled enough in comprehension, and consequently they cannot construct meaning from the text. This occurs mostly because they lack information about the text structure, do not pay attention to clues, and have limited vocabulary knowledge (Zulu, 2007).

According to Zulu (2007), the greatest source of difficulty for college students is that they see the elements of a text as separate from one another and cannot see the connections between them. Carrell and Eisterhold (1983) also state that L2 readers cannot successfully transfer the strategies they use in L1 reading to their L2 reading process. Sibold (2011) argues that English language learners encounter difficulty in reading comprehension mainly because they have difficulty with understanding the words. Thus, the smaller the size of the students' vocabulary, the more disadvantaged their learning will be, and this lack of knowledge prevents them from the comprehension of the texts they are supposed to read (Sibold, 2011).

Reading attitude is primarily an important factor in reading comprehension because it influences the learners' reading behaviors as well as their choices about what texts to pick up for reading (Smith, 1990). As Alexander and Cobb (1992) state, the attitude to reading should be positive if other essential requirements, including motivation and comprehension are to occur efficiently. An attitude may come from past experiences and may change as new experiences emerge (Isakson et al., 2016). One of the concerns of the students and the educational system is the learners' reading habits and attitudes, and it is found that adults with richer educational background and those with higher status in their jobs have more positive attitude towards reading (Smith, 1990).

A number of reasons are suggested for the students' lack of interest in reading: (a) lack of ability to comprehend and learn from college texts, (b) not enjoying reading (Mokhtari, Reichard, & Gardner, 2009), and (c) not valuing reading as a suitable medium for learning (Sikorski et al., 2002); however, what students want is to receive good grades without reading (Berry, Cook, Hill, & Stevens, 2011).

According to Sainsbury (2004), educating the students in reading mainly occurs with the goal of developing two factors, which are reading skills and positive reading attitudes. According to Shahriza Abdul Karim and Hasan (2007), negative reading attitude can lead to negative reading experience and ultimately has the disadvantage of poor academic success and performance. As Isakson et al. (2016) argue, the learners' feelings about reading can also be affected by their past experiences of reading and can be dependent on whether that experience was disappointing or satisfying.

Attitude, as Isakson et al. (2016) state, is not a unidimensional concept; rather, it is a multi-dimensional factor consisting of behavioral, cognitive, and affective aspects, which are all gained by experience and are applicable to attitudes to academic reading as well. They also indicated that the

three main constructs underlying reading attitude are (a) global value for academic reading: this aspect refers to the value the students place on reading, (b) self-efficacy for academic reading referring to how confident students are in their skills and abilities regarding academic reading, and (c) behaviours related to academic reading, which refer to the behaviours the students choose to approach and complete reading assignments.

2.2. Dimensions of Vocabulary Knowledge

One framework for vocabulary knowledge was introduced by Qian (2002), who developed a model consisting of the depth of vocabulary knowledge, the breadth or vocabulary size, the lexical organization, and the automaticity of receptive-productive knowledge. But after all, the distinctions consisting of breadth and depth are commonly accepted (Afshari & Tavakoli, 2016).

The size of learners' vocabulary or the breadth of vocabulary knowledge is used to refer to the quantity of words about which a person has at least some significant knowledge (Stæhr, 2009), or simply to the number of words a person knows (Vermeer, 2001). Afshari and Tavakkoli note that the breadth of vocabulary knowledge is the most important aspect of a learner's lexical competence and the larger a person's vocabulary size, the more linguistically proficient he/she can be. As Laufer, Elder, Hill, and Congdon (2004) argue, success in reading, writing, general language proficiency, placement tests, and admission to teaching programs can be determined by vocabulary size.

The depth of vocabulary knowledge is a unique aspect of word knowledge referring to the quality of a person's knowledge about a word (Anderson & Freebody, 1981). To define the concept another way, Quellette (2006) states that the depth of vocabulary knowledge has to do with "the extent of semantic representation" of vocabulary knowledge and is about the richness of a learner's word knowledge (p. 556). Quellette further notes that students with sufficient decoding proficiency can have deeper vocabulary knowledge. A more recent definition for the depth of vocabulary knowledge is suggested by Afshari and Tavakoli (2016) asserting that it is a factor, which determines how well the words are organized in the learners' mind.

According to Hadley, Dickinson, Hirsh-Pasek, Golinkoff, and Nesbitt (2016), the two overall key aspects of depth are "richness of semantic representation of words and knowledge of use in typical contexts" (p. 182). In contrast to Hadley et al. (2016), Afshari and Tavakoli take two other different dimensions of depth of vocabulary knowledge, including "a word-oriented perspective", which refers to the depth of a word in relation to other single words and "a holistic, lexicon-oriented perspective", which is a holistic approach to depth (p. 16).

As stated by Schmitt (2014), the breadth and depth of vocabulary are very similar in some aspects and may appear different if viewed from some other aspects. According to Qian (1999), they are two dimensions, which are closely related, and the development of one of which in mind is dependent on the development of the other; therefore, both breadth and depth of vocabulary play equally important roles in the process of vocabulary acquisition. Qian also stated that the depth and breadth of vocabulary are interdependent in a way that the development of one of these concepts can clearly predict the development of the other. Moreover, Nation and Coxhead (2014), however, argue that the size and depth do not necessarily develop to the equal level with parallel procedures, since some people may have little knowledge about many words, while some may know a lot about a few words.

Exploring the relationship between depth and breadth of word knowledge and linking them with frequency of language input and language acquisition, Vermeer (2001) revealed that as the learners' vocabulary size increased, their lexical knowledge became deeper, and depth and breadth were also found to be influenced by the same factors for both bilingual and monolingual speakers. In another study, Gyllstad, Vilkaitė, and Schmitt (2015) found the scores obtained on vocabulary size tests correlated significantly with those on a general proficiency test. The findings of their study also showed that a large vocabulary size was one of the prerequisites for achieving success in English

language proficiency, as it was assumed that a person's general proficiency in the language could typically be judged according to his vocabulary size.

Baleghizadeh and Golbin (2010) examined the effect of vocabulary size on reading comprehension of Iranian English language learners. For this purpose, 83 Iranian first-year university students (22 males and 61 females) participated in the study, and the reading comprehension section of TOEFL was used to assess the learners' reading proficiency, and the Vocabulary Levels Tests (Nation, 1990) was used to determine the size of their vocabulary knowledge. The results revealed that the vocabulary size and the reading comprehension correlated significantly ($r = .84$, $p < .05$), indicating that it was necessary to improve the learners' vocabulary size in order to cope with various reading passages.

Rashidi and Khosravi (2010) explored (a) the relationship among depth and breadth of vocabulary knowledge and reading comprehension of Iranian language learners, and (b) the extent to which the depth and breadth of vocabulary knowledge could predict the EFL learners' reading performance. To achieve these objectives, 71 senior university students majoring in English participated in the study. A language proficiency test, vocabulary size test, depth of vocabulary knowledge test, and reading comprehension test were the instruments of the study. The results showed that the depth and breadth of vocabulary knowledge positively correlated with reading comprehension. The results also revealed that the two groups gained different scores in reading comprehension (i.e., showing low and high breadth and depth of vocabulary knowledge) because of the difference between the two groups in their breadth and depth of vocabulary knowledge.

Mehrpour et al. (2011) investigated (a) the importance of learners' vocabulary knowledge in their reading comprehension and (b) the contribution and relationship between the breadth and depth of vocabulary knowledge and EFL learners' reading comprehension. The participants of the study were 60 advanced learners from five English language institutes in Shiraz. Vocabulary Levels Test, Word Associate Test, and a reading comprehension test were administered to the participants. The results revealed that while both depth and breadth of vocabulary knowledge could have crucial role in EFL learners' reading comprehension, the contribution of the depth of vocabulary knowledge was more significant.

3. Methodology

3.1. Participants

This study was conducted with 122 Iranian undergraduate students of Engineering at Iran University of Science and Technology (IUST). They were 66 male and 56 female students, ranging in age from 17 to 21. The participants' majors were Electrical Engineering (n=67), Industrial Engineering (n=12), Mechanical Engineering (n=11), Industrial Designing Engineering (n=10), Civil Engineering (n=8), Railway Engineering (n=5), Chemical Engineering (n=5), Computer Engineering (n=2), and Metallurgy Engineering (n=2).

Nonprobability convenient or availability sampling was chosen in this research. In other words, the researchers did not choose the participants randomly and had to administer the questionnaire and the tests to some Engineering students attending the English for General Academic Purposes (EGAP) courses offered in the Foreign Languages Department of IUST.

3.2. Instruments

3.2.1. IELTS Reading Comprehension Test

Five instruments were used in this study. The first instrument was a reading sample of an academic IELTS test, which was adopted from academic IELTS 11, developed by the Cambridge University Press. The reason for the selection of the reading section of an academic IELTS test is related to the fact that academic IELTS test as a standard test examines academic language proficiency level in terms of the four language skills, including reading, listening, writing and speaking. The test consisted of three passages, each with a specific topic about the history of silk production, migration of

pronghorns, and the mathematical reasoning. For each of the first two passages, the students were required to read the text and answer 13 questions. The last passage was followed by 14 questions, and altogether the test consisted of 40 items. At the end of the reading test, the participants were asked to answer an open-ended question, describing their problems in answering the three academic reading tasks in English.

3.2.2. *Vocabulary Levels Test (VLT)*

The learners' vocabulary size was assessed through the revised version of Nation's (1983) Vocabulary Levels Test (Schmitt, Schmitt, & Clapham, 2001). Schmitt et al. (2001) indicated that the test was designed to enable the administrators to estimate the vocabulary size of L2 learners of both general and academic English. The test included five sections, each with 30 items relating to the most frequent general (i.e., 2000, 3000, 5000, & 10000) and academic lexical items.

3.2.3. *Word Associates Test (WAT)*

Learners' depth of vocabulary knowledge was measured through Word Associates Test (WAT) developed by Read (1993). This test was the most widely used instrument by many researchers for measuring the depth of vocabulary knowledge (Mochizuki, 2012). The test consisted of 50 vocabulary items, each followed by eight words, four of which in each question had the semantic relationships with the target word, while the other four words did not have such a relationship. The semantic relationship consisted of paradigmatic (i.e., the word and its associates were synonyms), syntagmatic (i.e., the two words co-occurred in similar contexts), and analytic (i.e., the associate represented one dimension of the meaning of the given word).

3.2.4. *Isakson's Reading Attitude Questionnaire*

The academic reading attitude questionnaire developed by Isakson et al. (2016) was also used in this study. This questionnaire was comprised of 20 items on a six point Likert scale (1=strongly disagree, 2=generally disagree, 3=sort of disagree, 4=sort of agree, 5=generally agree, & 6=strongly agree). The survey was created based on the three constructs underlying attitude towards academic reading, including value toward academic reading (items: 3, 4, 7, 10, 13, 14, & 17), self-efficacy toward academic reading (items: 2, 5, 11, 16, 18, & 19), and behavior toward academic reading (items: 1, 6, 8, 9, 12, 15, & 20).

3.3. *Procedure*

The study took place during the second semester of the academic year of 2017. The first researcher administered the instruments to the participants of this study in one session of her classes, and the data were collected from 122 students who were all passing EGAP course in which academic reading was one of the main skills being taught. Necessary information was given to all participants before administering the instruments. The instruments used in this study were piloted with 20 students before its administration with the actual participants.

The learners were required to do three reading tasks chosen from an academic IELTS test. It included three sections taking learners 60 minutes; 20 minutes for each task. The learners were required to read each passage and answer its following questions. Considering one point for the correct answer to each question, the score of the academic reading test was 40, and no negative mark was given for the wrong answers. Ten minutes were given to students to answer the open ended question exploring their problems in academic reading, and their answers to this question were then analyzed.

Schmitt et al.'s (2001) Vocabulary Levels Test (VLT) was another instrument consisting of five sections, each with 10 parts, which for its administration 15 minutes were devoted. In each part, the learners were required to choose the right word out of 6 words, which went with each of the three definitions, while three words were left out in each part. Considering one point for each item, the score of the VLT was 150, and no negative mark was considered for the wrong answers. As reported by Schmitt et al., the reliability coefficients of the sections were 0.922, 0.927, 0.927, 0.924, and 0.960, respectively.

The fourth instrument in this study was Read's (1993) Word Associates Test, measuring the learners' depth of vocabulary knowledge for which 15 minutes were given to students to answer this test. For each of the 50 items, there were four correct responses out of eight options. Considering one point for each correct response, the score on WAT was 200, and no negative point was given to the wrong answers. According to Mochizuki (2012), WAT had a high correlation coefficient ($r=0.88$) with VLT, indicating that the two tests shared more than 77% of their variance. Moreover, it was found that the test was highly correlated with the second language reading comprehension and was reported to have a high internal reliability (Nassaji, 2006).

In order to measure the participants' attitudes towards academic reading, Isakson et al.'s (2016) academic reading attitude questionnaire was translated and administered to the participants who were given 15 minutes to answer this questionnaire. Cronbach's alpha was used to estimate the consistency of the participants' responses to the attitude questionnaire, which was equal to 0.93. According to Isakson et al., the attitude scale showed an acceptable internal consistency with a Cronbach's alpha coefficient which was reported to be .85. In this study the reliability coefficients of the three categories of the attitude questionnaire, including the values, self-efficacy, and the behavior towards academic reading were 0.67, 0.82, and 0.87, respectively. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity were also calculated to determine the internal consistency of the items of the questionnaire. KMO value was .862, and the Bartlett's Test of Sphericity value was significant ($p=.000$). In order to condense the variance in a correlation matrix in factor analysis, eigenvalues were used. The factor with the largest eigenvalues had the most variance, while factors with small or negative eigenvalues were usually omitted (Tabachnic & Fidell, 2001).

Using Kaiser's criterion, components with eigenvalue of 1 or more were considered. Only the first five components reported the eigenvalues above 1 (7.698, 2.069, 1.399, 1.114, & 1.031), explaining a total of 66.553 percent of the variance. Often, using the Kaiser's criterion, too many components are extracted, so it is suggested to look at the scree plot, too (Pallant, 2010). Looking for a change in the shape of the plot, the researchers could obtain only three components. Components one (7.69), two (2.06), and three (1.399) captured much more variance than the remaining components. Considering the unrotated loadings of the items on the three components, most of the items loaded quite strongly on the first and third components and very few items loaded on the second component, indicating that a 3-factor solution was likely to be more appropriate.

3.4. Research Design

This study was conducted using a quantitative and qualitative research methodology to illustrate the contribution of attitude, depth, and breadth of vocabulary knowledge to academic reading comprehension. It entailed a descriptive and correlational research design. In the current study, the predictability of the dependent variable by the independent variables was computed. The independent variables were attitude, breadth, and depth of vocabulary knowledge, while the academic reading comprehension served as the dependent variable.

3.5. Data Analysis

Descriptive statistics for the reading tasks were conducted based on the score categorization suggested by IELTS 11. In order to investigate the learners' perceptions of items and categories of the academic reading attitude questionnaire, descriptive statistics were conducted. Pearson product moment correlation was also run to determine the relationship between the independent variables and the dependent variable.

Moreover, to determine the extent to which academic reading attitude, depth, and breadth of vocabulary knowledge predicted academic reading comprehension, multiple regression analysis was performed. Content analysis was also conducted on the students' responses to the open-ended question exploring their problems in reading academic texts. In other words, the learners' problems were identified and then organized into some categories, and then the frequency of each category was calculated.

4. Results

4.1. Learners' Attitudes towards Academic Reading

With regard to learners' attitude towards academic reading, in order to determine which items received more positive replies, and which ones received less positive replies, the percentage of the participants' agreement and disagreement about each item of the questionnaire was determined. It is important to note that in this section the combined results for 'strongly agree' and 'generally agree' categories are considered as positive responses, while 'generally disagree' and 'strongly disagree' categories are considered as negative responses. The results are presented in Table 1.

Table 1: Percentage of Students' Perceptions of their Academic Reading

Statements	Strongly Disagree	Generally Disagree	Sort of Disagree	Sort of Agree	Generally Agree	Strongly Agree
1. I am motivated to complete my academic reading assignments.	5.7	6.6	12.3	41	24.6	9.8
2. I am a capable academic reader.	3.3	10.7	27	36.9	16.4	5.7
3. I read materials from the library or online to enhance what I'm learning in class.	9.8	6.6	19.7	31.1	24.6	8.2
4. I value reading as an important way of learning in college.	8	3.3	9	33.6	30.3	23
5. I usually get what the instructor wants me to get out of the reading.	.8	3.3	18.9	29.5	32.8	14.8
6. During class, I can tell that I am a person who completes the reading assignments more often than other members of the class.	8.2	13.9	24.6	32	13.9	7.4
7. I find myself reading beyond the minimum requirement for class because I get interested in the topic.	23	18	19.7	23.8	10.7	4.9
8. I usually go to class having completed the assigned reading.	9.8	8.2	31.1	32	13.9	4.9
9. When I receive an academic reading assignment, I am able to accomplish the reading efficiently and on time.	4.9	4.9	19.7	36.9	28.7	4.9
10. I want to continue to learn from academic reading after I complete college.	6.6	3.3	9.8	34.4	20.5	25.4
11. I am confident in my abilities as an academic reader.	4.1	11.5	19.7	33.6	20.5	10.7
12. Even though some reading assignments take a lot of time, I go to class having completed them.	6.6	9	23.8	39.3	14.8	6.6
13. I can see how being an effective reader is important to success in college.	1.6	1.6	4.7	22.1	38.5	28.7
14. I find my academic reading to be relevant and rewarding.	.8	4.1	7.4	27.9	35.2	24.6

15. I usually DON'T procrastinate my academic reading assignments.	3.3	11.5	22.1	45.9	13.1	4.1
16. As I approach a reading assignment, I am confident that I will understand the important information in the text.	3.3	8.2	22.1	36.9	20.5	9
17. I wish more of my classmates would complete the assigned readings.	9.8	9	27	29.5	14.8	9.8
18. I can adjust my reading speed to get what I need from the text.	7.4	11.5	18.9	32.8	21.3	8.2
19. I am good at retaining and recalling the important information from an academic reading assignment.	7.4	6.6	20.5	42	17.2	8.2
20. Completing reading assignments for class is a high priority for me.	7.4	7.4	26.2	37.7	14.8	5.7

Table 1 shows that the highest agreements were obtained by the following statements, respectively: 'I can see how being an effective reader is important to success in college' (89.3%); 'I find my academic reading to be relevant and rewarding' (87.7%); 'I value reading as an important way of learning in college' (86.9%); 'I want to continue to learn from academic reading after I complete college' (80.3%); and 'I usually get what the instructor wants me to get out of the reading' (77.1%). However, as indicated in Table 1, students disagreed more with the following statements, respectively: 'I am good at retaining and recalling the important information from an academic reading assignment' (64.5%); 'I find myself reading beyond the minimum requirement for class because I get interested in the topic' (60.7%); 'I usually go to class having completed the assigned reading' (49.1%); 'during class, I can tell that I am a person who completes the reading assignments more often than other members of the class' (46.7%); and 'I wish more of my classmates would complete the assigned readings' (45.8%).

4.2. Learners' Attitudes towards Categories of Academic Reading

The descriptive statistics for the three categories of attitudes to academic reading are provided in Table 2.

Table 2: Descriptive Statistics of Categories of Academic Reading Attitude Questionnaire (N=122)

	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>SD</i>
Value	2.14	6.00	4.10	.74
Self-Efficacy	2.17	6.00	3.88	.90
Behaviors	1.00	6.00	3.69	.92

With regard to different subscales of academic reading attitude questionnaire, the highest mean was related to the *value* ($M = 4.10$), while the subscale of the *behaviors toward academic reading* received the lowest mean ($M = 3.19$). Table 2 also shows that the responses to the *value* category were the most homogeneous ($SD = .74$), whereas those to the items belonging to *behaviors* category were the most heterogeneous ($SD = .92$).

4.3. Learners' Level on IELTS Academic Reading Test

The developers of Academic IELTS 11 suggested that the learners' scores should be interpreted based on the three categories, which are presented in Table 3.

Table 3: Categories for Interpreting Learners' Scores on Reading Section of Academic IELTS

0-12	13-25	26-40
You are unlikely to get an acceptable score under examination conditions, and we recommend that you spend a lot of time improving your English before you take IELTS.	You may get an acceptable score under examination conditions, but we recommend that you think about having more practice or lessons before you take IELTS.	You are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Table 4: Frequency and Percentages of Students' Performance on Academic IELTS Reading Test

Categories	f	%	Cumulative %
1-12	68	55.7	55.7
13-25	27	22.1	77.9
26-40	27	22.1	100.0
Total	122	100.0	

As Table 4 indicates, the highest percentage (55.7%) was related to the first category (0-12), while the other two categories of scores (13-25 & 26-40) received equal percentages (22.1%). Table 4 indicates the percentage and frequency of the participants' raw scores, while the scoring format of IELTS is presented in terms of some band scores. The highest band score one could obtain on the academic reading test of IELTS was 9, which was obtained by only two students (1.6%). The highest percentage belonged to the band score 0, which was obtained by 28 participants (23%). The lowest percentage belonged to the band score 8.5, which was obtained by only one student (0.8%).

4.4. Students' Problems in Academic Reading Comprehension

Eighty-seven learners responded the open-ended question regarding their problems in academic reading comprehension. The most frequent problems in their responses were as follows: (a) weak vocabulary knowledge (f= 51, %=58.6), (b) difficulty in comprehension of the passages and questions (f=20, %=22.9), (c) the length of the passages (f=12, %=13.7), (d) lack of interest and not being in the mood of reading (f=12, %=13.7), (e) lack of time (f=9, %=10.3), (f) lack of concentration and fatigue (f=9, %=10.3), and (g) time of administration (f=4, %=4.5). Some examples of the learners' problems are listed below:

- a: "... I could understand the goal of the passages but because of the lack of vocabulary knowledge I could not find the answers to the questions..."
- b: "...I could not guess the meaning of the unfamiliar words of the passages..."
- c: "... I have limited vocabulary knowledge and cannot understand these texts..."
- d: "... I didn't know the meaning of many words in the text..."
- e: "... I had difficulty understanding the whole text..."
- f: "... I had difficulty in comprehending the questions and could not understand what is exactly asked..."
- g: "... the passages were so lengthy ..."
- h: "... unfortunately I was not in a good mood for reading the passages..."
- i: "... I could not concentrate on the texts..."

4.5. Relationship among Academic Reading Attitude, Breadth, and Depth of Vocabulary and Reading

The learners’ performance on the academic reading attitude, breadth, and depth of vocabulary knowledge was measured by testing the students’ performance on the academic reading attitude questionnaire, vocabulary levels test, and the word associates test. Table 5 indicates the learners’ performance on the tests.

Table 5: Engineering Students’ Performance on the Reading Test, Vocabulary Test (N=122)

	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>SD</i>
Academic Reading	.00	40.00	13.36	11.56
Breadth	21	126	72.58	25.02
Depth	.00	182	102.72	39.948

As Table 5 shows, the lowest score obtained on the Vocabulary Levels Test was 21, while the lowest score on the Word Associates test was 0. The mean score on the WAT ($M=102.72$) was higher than that on the VLT ($M= 72.58$). Before finding any possible relationship among the four variables (i.e., breadth of vocabulary knowledge, depth of vocabulary knowledge, academic reading attitude, and academic reading comprehension), preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity, and then Pearson product-moment correlation was conducted. The results are indicated in Table 6.

Table 6: Pearson Product Moment Correlation among Breadth, Depth, Attitude, and Academic Reading (AR)

		AR	Breadth	Depth	Attitude
Pearson Correlation	AR	-	.686*	.616*	.390*
	Breadth	-	-	.697*	.387*
	Depth	-	-	-	.432*
	Attitude	-	-	-	-

* $p=.000$

As indicated in Table 6, there was a strong, positive correlation between academic reading and the breadth of vocabulary knowledge, $r=.68$, $n=122$, $p=.000$ and academic reading and depth of vocabulary knowledge, $r=.61$, $n=122$, $p=.000$, while there was a moderate, positive correlation between academic reading and reading attitude, $r=.39$, $p=.000$. Table 6 also indicates that the breadth and the depth of vocabulary knowledge test scores had the highest correlation ($r=.69$), while the reading attitude and the breadth of vocabulary showed the lowest amount of correlation ($r=.387$).

4.6. Contribution of Academic Reading Attitude and Vocabulary Knowledge to Academic Reading

Multiple regression was used to determine the extent to which attitude, depth, and breadth of vocabulary knowledge predicted academic reading comprehension. Preliminary analyses were initially conducted to ensure that no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity was observed.

Table 7: Summary of Multiple Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.718 ^a	.516	.503	8.15394

a. Predictors:(Constant),total attitude, Breadth, Depth/ b. Dependent Variable: Academic Reading

As Table 7 indicates, attitude, breadth, and depth of vocabulary knowledge contributed to the model explaining 51 percent of the variance in the academic reading comprehension. To assess the statistical significance of these results, ANOVA was conducted. The result is shown in Table 8.

Table 8: ANOVA Results of the Attitude, Depth, and Breadth of Vocabulary Knowledge to Academic Reading

Model		Sum of Squares	df	Mean Square	F	p
1	Regression	8350.963	3	2783.654	41.868	.000*
	Residual	7845.439	118	66.487		
	Total	16196.402	121			

a. Dependent Variable: Academic Reading

b. Predictors: (Constant), attitude, Breadth, Depth

As shown in Table 8, the contribution of predictors (i.e., attitude, depth, & breadth of vocabulary knowledge) was statistically significant, producing $R^2 = 0.516$, $F(3, 118) = 41.868$, $p = .000$. To investigate the relative contribution of each of the predictors to academic reading comprehension, the coefficients of them were calculated. Table 9 presents the results.

Table 9: Coefficients of Different Factors to Academic Reading Comprehension

Model	Unstandardized Coefficients		Standardized Coefficients		95.0% Confidence Interval for B			Collinearity Statistics					
	B	Std. Error	Beta	T	Lower Bound	Upper Bound	Zero-order	Partial	Tolerance	VIF			
1 (Constant)	-15.963	4.001		-3.990	.000*		-23.88	-8.040					
Breadth	.223	.042	.483	5.357	.000*		.141	.306	.686	.442	.343	.505	1.98
Depth	.068	.027	.235	2.547	.012*		.015	.121	.616	.228	.163	.483	2.07
Attitude	1.575	1.107	.102	1.422	.158		-.618	3.768	.390	.130	.091	.799	1.25

a. Dependent Variable: Academic Reading

As shown in Table 9, the contribution of the breadth of vocabulary knowledge to academic reading comprehension was 34%, while the contribution of the depth of vocabulary knowledge was 16%. Moreover, the contribution of academic reading attitude was 9%. Of these three variables, breadth of vocabulary had the largest contribution (beta=0.483, p=.000), although the depth of vocabulary knowledge had a statistically significant contribution (beta=0.235, p=.012). It is worth noting that the contribution of attitude to academic reading was not statistically significant (beta=.102, p=.158).

5. Discussion

With regard to learners' reading attitude, the most important attitude was the value they placed on academic reading as a medium through which they could attain university success. This result

supported the finding of Guthrie and Klaudia (2014), who reported students' positive attitude towards reading, and the value was found to be a necessary skill for academic success. The result is also in line with that of Rasinski et al. (2017) who found that students were willing to improve their reading abilities, since they believed that in this way they could use literacy. Smith (2004) also argued that the students' perceptions of reading were reinforced when they felt that their educational attainment would be improved through academic reading.

The finding of the study showed that learners' performance on academic reading was found to be too weak. As noted previously, although reading comprehension is an essential need for the undergraduate students worldwide, reading courses in Iranian universities do not enable the students to read their academic texts with the desired comprehension (Atai & Fattahi-Majd, 2014). This mainly occurs because the Iranian students do not have sufficient experience for academic reading, mostly receiving instruction on General English. Another reason could be that responding to IELTS academic reading test requires them to be familiar with its specific types of questions, while they do not have sufficient familiarity with these types of tests. Therefore, it is not surprising that learners' performance in the academic reading comprehension is not found to be satisfactory.

It is worth noting that learners' performance on the vocabulary tests was better than their performance on the academic reading test, since in Iran's educational system vocabulary is significantly worked on, and numerous instructional materials are dedicated to vocabulary instruction. For instance, as Zarrabi and Brown (2015) note, English language teaching in Iran's universities is mainly based on reading comprehension, with high emphasis on vocabulary and grammar, while no attention is given to communicative and interactional skills.

In this study, strong and positive correlation was found between the breadth and the depth of word knowledge and academic reading comprehension. The results of regression analysis also revealed significant contribution of these factors to academic reading comprehension. Regarding the relationship between the breadth and depth of vocabulary knowledge and academic reading comprehension, the finding of this study was in line with those of Mehrpour, Razmjoo, and Kian (2011), Rashidi and Khosravi (2010), Shen (2008), and Tavanpour and Biria (2017), emphasizing the importance of the size and depth of vocabulary knowledge for academic reading comprehension among university and school students. Academic reading was found to be the skill dependent on both size and depth of vocabulary knowledge. This may be related to the fact that vocabulary is the building block of language (Rashidi & Khosravi, 2010); therefore, if the learner's breadth and depth of vocabulary knowledge are satisfactory, he/she can understand a great amount of the written texts.

The findings of this study also showed that the breadth of vocabulary knowledge contributes more to academic reading than the depth of vocabulary knowledge. This may be caused by the fact that in Iran's educational system a great attention is given to enhancing the number of words a person knows regardless of how well he/she knows it and how the person can make use of it in various contexts. Further, the students' knowledge of vocabulary items is tested generally through recognition tests, multiple choice items, and true/false items without paying attention to how these items can be used. This finding is in contrast with that of Mehrpour et al. (2011) and Shen (2008) who found that the contribution of the depth of vocabulary knowledge is more than that of the breadth of vocabulary knowledge.

Given the results obtained from this study, the most troublemaking aspect of academic reading comprehension was the lack of vocabulary knowledge. This may be caused by the fact that in Iranian educational system a great deal of effort and time is dedicated to teaching general vocabulary, and academic vocabulary is only marginally worked on in university courses. On the other hand, IELTS academic reading comprehension requires strong vocabulary knowledge, and the weakness in such aspect would lead to failure in this test. With regard to the learners' problems in the academic reading comprehension, the findings of this study support those of Just and Carpenter (1992) and Zulu (2007), who found 'lack of vocabulary knowledge' as the most or one of the most important roadblocks to reading comprehension.

6. Conclusion and Implications

The objectives of this study were to examine Engineering students' attitudes towards academic reading, investigate their performance on academic reading, and uncover the contribution of the depth and breadth of vocabulary knowledge to academic reading comprehension.

The results revealed that the students' attitudes to academic reading were mostly constructed by the value they placed on the academic reading for attaining success in their academic affairs. The result also showed that the students' performance on the academic reading test was not satisfactory, indicating that reading comprehension courses are not effective enough to enable them to comprehend the academic texts; thus, to help Engineering students improve their academic reading, instructors should provide them with systematic instruction on the academic reading and vocabulary knowledge.

The finding also revealed that the contribution of the breadth of vocabulary knowledge to academic reading comprehension was higher than that of the depth of vocabulary knowledge. The overall goal of improving the learners' academic vocabulary knowledge and the reading comprehension is to make them succeed in their field-specific courses; therefore, there is a serious need for designing appropriate courses and materials in order to expand their knowledge of academic vocabulary and reading if they are to comprehend the academic texts successfully.

The results of this study call for the critical role that vocabulary plays in reading comprehension. Thus, intentional and incidental vocabulary learning should be embedded in systematic vocabulary learning programs to help learners expand their vocabulary knowledge. The instructors should raise learners' awareness of the associations existing among different words by using activities, including semantic analysis, graphic representation of the relationships that exist among the different meanings of a word, semantic mapping, word sorts, and concept anchoring, which help much in building in-depth vocabulary knowledge. With regard to reading attitude, it is important to reinforce the three constructs underlying students' attitudes in academic reading classes. For example, a student might value academic reading as a medium through which he/she can succeed in the academic affairs but do not know appropriate approaches to reading. Considering the learners' problems in academic reading, the instructors should make effort to improve the vocabulary knowledge of the learners.

Future researchers can consider other psychological factors, including motivation, self-regulation, self-directed learning, self-esteem, and self-concept determining the contribution of each of these factors to the learners' academic reading. They can also interview students about their problems in academic reading, vocabulary learning, and their reading attitude to have more in-depth views of the roadblocks to their success in academic reading. The instructors could also be interviewed about their perceptions, preferences, and strategy use for solving the learners' problems in all the above mentioned areas. Another study can also be conducted with larger sample from more diverse disciplines, including medicine, humanities, and English language.

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