

# 以試題反應理論分析專業英文字彙之困難度

張雯馨、曹秀蓉

E-mail: 9800819@mail.dyu.edu.tw

## 摘要

本研究旨在探討專業英文字彙的困難度，同時確認試題反應理論模式在字彙研究上的適用性，以及導致單字習得困難的可能因素。本研究之研究對象為二百三十八名台灣地區的大學學生。依據試題反應理論模式所提供的能力指數將其分為高能力組、中能力組、以及低能力組。所有受試者皆須完成四份英翻中字彙測驗。研究結果顯示，試題反應理論模式能有效評估單字困難度。另外也發現，字彙的困難度可由該單字的字長，語音干擾程度，以及字義可意象性預測得知。此外，字彙困難度和學習者本身的英語文能力對於其單字測驗的表現有相當大的影響。本研究根據結論提出幾點建議，以供實際教學及相關研究參考之用：一、採用切合學生英文程度的教材。二、培養相關字彙學習策略與技巧。三、考量其他可能影響字彙困難度的因素。

關鍵詞：試題反應理論、字彙困難度、專業英文

## 目錄

COVER PAGE	i
SIGNATURE	ii
AUTHORIZATION	iii
ABSTRACT (Chinese)	iv
ABSTRACT (English)	v
ACKNOWLEDGEMENT	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES	xi
LIST OF TABLES	xii
Chapter I.	
INTRODUCTION	1
1.1 Background and Motivation of the Study	1
1.2 Purposes of the Study	3
1.3 Research Questions	5
1.4 Significance of the Study	5
1.5 Limitations of the Study	6
1.6 Organization of the Study	7
1.7 Definitions of Terms	8
Chapter II.	
LITERATURE REVIEW	11
2.1 Knowledge of Vocabulary	11
2.1.1 Definition of Vocabulary Knowledge	11
2.1.2 Taxonomies of Vocabulary Knowledge	12
2.2 Word Difficulty	18
2.2.1 Word Form	18
2.2.2 Word Meaning	19
2.2.3 Word Position	20
2.3 Academic Words and the Academic Word List	21
2.3.1 Academic Words	21
2.3.2 The Academic Word List	24
2.4 Item Response Theory	28
2.4.1 Basic Ideas and Assumptions of Item Response Theory	28
2.4.2 Models of Item Response Theory	30
2.4.3 Applications of Item Response Theory Models	34
2.5 Summary	35
Chapter III. METHODOLOGY	36
3.1 Research Design	36
3.2 Participants	37
3.3 Research Assistants	38
3.4 Materials and Instruments	39
3.4.1 Vocabulary Translation Tests	39
3.4.2 Grading Rubrics	41
3.5 Procedure and Data Collection	41
3.6 Data Analysis	42
3.7 Summary	45
Chapter IV. RESULTS AND DISCUSSION	46
4.1 Inter-rater Reliability	46
4.2 Descriptive Statistics for Original Raw Translation Scores	47
4.3 IRT Word Difficulty Indices	49
4.4 Agreement between Word Difficulty Measures	50
4.5 Learner Proficiency and Vocabulary Translation	52
4.6 Learner Proficiency and Word Difficulty	56
4.7 ANOVA Analysis on Word Characteristics	58
4.7.1 Word Length	59
4.7.2 Phonetic Distractability	60
4.7.3 Frequency	62
4.7.4 Imageability	64
4.7.5 Meaning Multiplicity	65
4.8 Regression Analysis on Word Characteristics	66
4.9 Summary	67
Chapter V. CONCLUSIONS AND SUGGESTIONS	69
5.1 Summary of the Main Findings	69
5.2 Conclusions	72
5.3 Pedagogical Implications	72
5.4 Suggestions for Further Research	74
CHINESE REFERENCES	76
ENGLISH REFERENCES	77
APPENDICES	
Appendix A Vocabulary Translation Tests	90
Appendix B Grading Rubrics	94
Appendix C Raw Score Average Modeling Results	95
Appendix D IRT Difficulty Index Modeling Results	98
Appendix E IRT Ability Indices	100
Appendix F Imageability Rating Results	103
LIST OF FIGURES	
Figure 2.1 ICCs of One-Parameter Logistic Model	31
Figure 2.2 ICCs of Two-Parameter Logistic Model	32
Figure 2.3 ICCs of Three-Parameter Logistic Model	33
Figure 3.1 Word Selection in Test Development	40
Figure 3.2 Testing Procedure	42
Figure 3.3 Steps of Data Analysis	43
Figure 4.1 Mean Scores and Correctness Response of Participants	53
Figure 4.2 Correct Responses for Easy, Moderate, and Hard Words	54
LIST OF TABLES	
Table 2.1 Text Coverage of Vocabulary in English	22
Table 2.2 Subject Parts in Faculty Areas of Coxhead's Academic Corpus	26
Table 2.3 Sublists of the Academic Word List	27
Table 3.1 Distribution of Participants	38
Table 4.1 Correlation between Scores of Raters	46
Table 4.2 Mean Translation Score Average for Word Groups	47
Table 4.3 Differences in Means among Word Groups (Raw Score Average)	47
Table 4.4 The Easiest and Hardest Words (Raw Score Average)	48
Table 4.5 Mean Difficulty Indices for Word Groups	49
Table 4.6 Differences in Means among Word Groups (IRT Difficulty Indices)	49
Table 4.7 The Easiest and Hardest Words (IRT Difficulty Indices)	50
Table 4.8 Correlation between Raw Score Averages and IRT Difficulty Indices	51
Table 4.9 Correlations of Easy, Moderate, and Hard Words	51
Table 4.10 Correlations of Easiest and Hardest Words	52
Table 4.11 Mean Ability indices for Learner Groups	53
Table 4.12 Differences in Proficiency among Learner Groups	54
Table 4.13 Means Converted Translation Scores	57
Table 4.14 Effects of Learner Proficiency and Word Difficulty	57
Table 4.15 Scheffe Test Results of Learner Proficiency and Word Difficulty	58
Table 4.16 Mean Difficulty of Word Length Groups	59

4.17 ANOVA on Word Length 59 Table 4.18 Mean Difficulty of Phonetic Distractability Groups 62 Table 4.19 ANOVA on Phonetic Distractability 62 Table 4.20 Mean Difficulty of Frequency Groups 63 Table 4.21 ANOVA on Frequency 63 Table 4.22 Mean Difficulty of Imageability Groups 64 Table 4.23 ANOVA on Imageability 65 Table 4.24 Mean Difficulty of Meaning Multiplicity Groups 65 Table 4.25 ANOVA on Meaning Multiplicity 66 Table 4.26 Regression of Difficulty on Word Characteristics 67

## 參考文獻

- Joe, S. G. (周碩貴) (2003)。科技大學學生英文字彙量與閱讀補救教學研究。行政院國家科學委員會專題研究成果報告 (報告編號: NSC91-2411-H-224-008), 未出版。 Yu, M. N. (余民寧) (1991)。試題反應理論的介紹 (一):測驗理論的發展驅勢。研習資訊, 8(6), 13-17。 Yu, M. N. (余民寧) (1992)。試題反應理論的介紹 (三):試題反應模式及其特性。研習資訊, 9(2), 6-10。 English References Aitchison, J. (1987). *Words in the mind*. Oxford: Basil Blackwell. Alderson, J. C. (2007). Judging the frequency of English words. *Applied Linguistics*, 28(3), 383-409. Alderson, J. C., & Urquhart, A. H. (1984). Introduction: What is reading: In J. C. Alderson & A. H. Urquhart (Eds.), *Reading in a foreign language* (15-28). New York: Longman. Alvermann, D. E., & Phelps, S. F. (1998). *Techniques in teaching vocabulary*. Oxford: Oxford University Press. Anderson, R. C., & Nagy, W. E. (1991). Word meaning. In R. Barr, M. L. Kamil, P. Mosenthal, & P. D. Pearson (Eds.), *Handbook of Reading Research* (512-538). New York: Longman. Anderson, J. P., & Jordan, A. M. (1928). Learning and retention of Latin words and phrases. *Journal of Educational Psychology*, 19, 485-496. Baddely, A. D., Thomson, N., & Buchanan, M. (1975). Word length and the structure of short-term memory. *Journal of Verbal Behaviour*, 14, 575-589. Baker, M. (1988). Sub-technical vocabulary and the ESP teacher: An analysis of some rhetorical items in medical journal articles. *Reading in a Foreign Language*, 4(2), 91-105. Barnard, H. (1961). A test of P. U. C. students' vocabulary in Chotanagpur. *Bulletin of the Central Institute of English*, 1, 90-100. Barron, R. W. (1980). Visual and phonological strategies in reading and spelling. In U. Frith (Ed.), *Cognitive processing in spelling* (335-370). London: Academic Press. Bensoussan, M., & Laufer, B. (1984). Lexical guessing in context in EFL reading comprehension. *Journal of Research in Reading*, 7, 15-32. Bernhard, H. D. (1991). *Principles of language learning and teaching*. NJ: Longman. Bowey, J. A. (2001). Nonword repetition and young children's receptive vocabulary: A longitudinal study. *Applied Psycholinguistics*, 22, 441-469. Bransford, J. D., Franks, J. J., Morris, C. D., & Stein, B. S. (1979). Some general constraints on learning and memory research. In L. S. Cermack & F. I. M. Craik (Eds.), *Levels of processing in human memory* (331-354). Hillsdale, NJ: Erlbaum. Brinton, D. M., & Holten, C. A. (2001). Does the emperor have no clothes: A re-examination of grammar in content-based instruction. In J. Flowerdew & M. Peacock (Eds.), *Research perspectives on English for academic purposes* (239-251). Cambridge: Cambridge University Press. Brown, J. D., & Hudson, T. (1998). The alternatives in language assessment. *TESOL Quarterly*, 32(4), 653-675. Burroughs, G. E. R. (1957). *A study of vocabulary of young children*. Birmingham: Oliver Boyd. Carey, S. (1978). The child as word learner. In M. Halle, G. Miller, & J. Bresnan (Eds.), *Linguistic Theory and Psychological Reality* (264-293). Cambridge, MA: MIT Press. Chall, J. S., & Dale, E. (1995). *Readability revisited: the new Dale-Chall readability formula*. Cambridge, MA: Brookline Books. Chang, H. I. (2002). A comparative analysis of the quantity of the new words in senior high school English textbooks. Unpublished master's thesis, National Kaohsiung Normal University, Taiwan. Chen, C. M., & Chung, C. J. (in press). Personalized mobile English vocabulary learning system based on item response theory and learning memory cycle. *Computers & Education*. Chen, C. M., Lee, H. M., & Chen, Y. H. (2005). Personalized e-learning system using item response theory. *Computers & Education*, 44, 237-255. Chen, Q., & Ge, G. C. (2007). A corpus-based lexical study on frequency and distribution of Coxhead's AWL word families in medical research articles (RAs). *English for Specific Purposes*, 26, 502-514. Chiu, Y. P., Fritz, S. L., Light, K. E., & Velozo, C. A. (2006). Use of item response analysis to investigate measurement properties and clinical validity of data for the dynamic gait index. *Physical Therapy*, 86(6), 778-787. Chung, T. M., & Nation, P. (2003). Identifying technical vocabulary. *System*, 32(2), 251-263. Clark, E. (1993). *The lexicon in acquisition*. Cambridge: Cambridge University Press. Coady, J. (1993). Research on ESL/EFL vocabulary acquisition: Putting it in context. In T., Huckin, M., Haynes, & J., Coady (Eds.), *Second language reading and vocabulary learning* (217-228). Norwood, NJ: Albex. Coady, J. A., & Aslin, R. N. (2003). Phonological neighbourhoods in the developing lexicon. *Journal of Child Language*, 30, 441-469. Sinclair, J. (Ed.) (2000). *Collins COBUILD English dictionary*. London: Collins COBUILD. Cohen, A., Glasman, H., Rosenbaum-Cohen, P. R. Ferrara, J., & Fine, J. (1979). Reading English for specialized purposes: Discourse analysis and the use of student informants. *TESOL Quarterly*, 13(4), 551-564. Coltheart, M. (1980). Deep dyslexia: A right hemisphere hypothesis. In M. Coltheart, K. Patterson, & J. C. Marshall (Eds.), *Deep dyslexia* (326-380). London: Routledge & Kegan Paul. Coltheart, V. (1993). Effects of phonological similarity and concurrent irrelevant articulation on short-term memory recall of repeated and novel word lists. *Memory & Cognition*, 4, 539-545. Conrad, R. (1964). Acoustic confusion and immediate memory. *British Journal of Psychology*, 55, 75-84. Conrad, R., & Hull, A. J. (1964). Information, acoustic confusion and memory span. *British Journal of Psychology*, 55, 429-432. Cowan, J. R. (1974). Lexical and syntactic research for the design of EFL reading materials. *TESOL Quarterly*, 8(4), 389-400. Coxhead, A. (2000). A new academic word list. *TESOL Quarterly*, 34(2), 213-238. Coxhead, A. (2006). *Essentials of teaching academic vocabulary*. Boston: Houghton Mifflin. Coxhead, A., & Nation, P. (2001). The specialised vocabulary of English for academic purposes. In J. Flowerdew & M. Peacock (Eds.), *Research perspectives on English for academic purposes* (252-260). Cambridge: Cambridge University Press. Coxhead, P., & Byrd, P. (2007). Preparing writing teachers to teach the vocabulary and grammar of academic prose. *Journal of Second Language Writing*, 16, 129-147. Craik, F. I. M., & Lockhart, T. D. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal*

Behavior, 11, 671-684. Crow, J. T. (1986). Receptive vocabulary acquisition for reading comprehension. *The Modern Language Journal*, 70, 242-250. De Groot, A. M. B., Dannenburg, L., & Van Hell, J. G. (1994). Forward and backward translation by bilinguals. *Journal of Memory and Language*, 33, 600-629. De Jong, P. E., Seveke, M. J., & van Veen, M. (2000). Phonological sensitivity and the acquisition of new words in children. *Journal of Experimental Child Psychology*, 76, 275-301. Dockrell, J. E., Braisby, N., & Best, R. M. (2007). Children's acquisition of science terms: Simple exposure is insufficient. *Learning and Instruction*, 17, 577-594. Dowling, R. M., & Braun, H. W. (1957). Retention and meaningfulness of material. *Journal of Experimental Psychology*, 54(3), 213-217. DuBay, W. H. (2004). *The principles of readability*. California: Impact Information.

Ellis, N. C., & Beaton, A. (1993). Psycholinguistic determinants of foreign language vocabulary learning. *Language Learning*, 43(4), 559-617. Emons, W. H. M., Meijer, R. R., & Denoleet, J. (2007). Negative affectivity and social inhibition in cardiovascular disease: Evaluating type-D personality and its assessment using item response theory. *Journal of Psychosomatic Research*, 63, 27-39. Farrell, P. (1990). Vocabulary in ESP: A lexical analysis of the English of electronics and a study of semi-technical vocabulary (CLCS Occasional publication No. 25). Dublin: Trinity College. (ERIC Document Reproduction Service No. ED 332551). Fries, J. F., Bruce, B., Bjomer, J., & Rose, M. (2006). More relevant, precise, and efficient items for assessment of physical function and disability: moving beyond the classic instruments. *Annals of the Rheumatic Diseases*, 65(3), 16-21. Gathercole, S. E., Gardiner, J. M., & Gregg, V. H. (1982). Modality and phonological similarity effects in serial recall: Does one's own voice play a role? *Memory & Cognition*, 10, 176 – 180. Gerganov, E., & Taseva-Rangelova, K. (1982). The impact of the factors "associate value" and "number of syllables" of English lexical items on word memorization in teaching English to Bulgarian students. *Contrastive Linguistics*, 7(4), 3-12. Gomez, R., & Fisher, J. W. (2005). Item response theory analysis of the spiritual well-being questionnaire. *Personality and Individual Differences*, 38, 1107-1121. Goulden, R., Nation, P., & Read, J. (1990). How large can a receptive vocabulary be? *Applied Linguistics*, 11(4), 341-363. Hambleton, R. K., Swaminathan, H., & Rogers, H. J. (1991). *Fundamentals of item response theory*. California: Sage. Harmer, J. (1991). *The practice of English language teaching*. London: Longman. Haycraft, J. (1978). *Teaching vocabulary: An introduction to English language teaching*. London: Longman. Haynes, M. (1993). Patterns and perils of guessing in second language reading. In T. Huckin, M. Haynes, & Coady (Eds.), *Second language reading and vocabulary* (46-64). Norwood, NJ: Ablex. Hays, R. D., Brown, J., Brown, L. U., Spritzer, K. L., & Crall, J. J. (2006). Classical test theory and item response theory analyses of multi-item scales assessing parent's perceptions of their children's dental care. *Medical Care*, 44, 560-568. Higgins, D. A. (1966). Observations on the canine transmissible venereal tumour as seen in the Bahamas. *Veterinary Record*, 79, 67-71. Hirsh, D., & Nation, P. (1992). What vocabulary size is needed to read unsimplified texts for pleasure? *Reading in a Foreign Language*, 8(2), 689-696. Hornby, A. (1999). *Oxford advanced learner's English-Chinese dictionary* (4th ed.)(B. D. Li, Tran.). Hong Kong: The Commercial Press LTD. Horst, M., Cobb, T., & Meara, P. (1998). Beyond A Clockwork Orange: Acquiring second language vocabulary through reading. *Reading in a Foreign Language*, 11, 207-223. Howell, P., & Natke, U. (2003). Predicting stuttering from linguistic factors for German speakers in two age groups. *Journal of Fluency Disorders*, 28(2), 95-113. Huang, C. C. (2000). A threshold for vocabulary knowledge on reading comprehension. *Proceedings from: The 7th Conference on English Teaching and Learning in the R. O. C.*, 132-144. Taipei: Crane. Huang, C. C. (2004). University students' vocabulary knowledge, content knowledge and reading comprehension, *Journal of National Tainan Teachers College*, 38(1) 125-153. Huang, K. C. (2002). Item response theory parameter estimate automatically and equate technique research. Unpublished master's thesis, National University of Tainan, Taiwan. Huckin, T., & Bloch, J. (1993). Strategies for inferring word meaning in context. In T. Huckin, M. Haynes, & Coady (Eds.), *Second language reading and vocabulary* (153-178). Norwood, NJ: Ablex. Huckin, T., & Haynes, M. (1993). Summary and future directions. In T. Huckin, M. Haynes, & J. Coady (Eds.), *Second language reading and vocabulary learning* (289-298). Norwood, NJ: Ablex. Ietsugu, T., Sukigara, M., & Furukawa, T. A. (2007). Evaluation of diagnostic criteria for panic attack using item response theory: Findings from the National Comorbidity Survey in USA. *Journal of Affective Disorders*, 104, 197-201. Jenkins, J. R., Stein, M. L., & Wyoski, K. (1984). Learning vocabulary through reading. *American Educational Research Journal*, 21, 767-787. Jian, N. (2004). Semantic transfer and development in adult L2 vocabulary acquisition. In P. Bogaards & B. Laufer (Eds.), *Vocabulary in a second language: selection, acquisition, and testing* (107-126). Philadelphia PA: John Benjamins Publishing Co.. Jongejan, W., Verhoeven, L., & Siegel, L. S. (2007). Predictors of reading and spelling abilities in first- and second-language learners. *Journal of Educational Psychology*, 99(4), 835-851. Kirisci, L., Tarter, R. E., Vanyukov, M., Martin, C., Mezzich, A., & Brown, S. (2006). Application of item response theory to quantify substance use disorder severity. *Addictive Behaviors*, 31, 1035-1049. Klare, G. R. (1963). The role of word frequency in readability. *Elementary English*, 45, 12-22. Kroll, J. F., & Merves, J. S. (1986). Lexical access for concrete and abstract words. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 12, 92-107. Lai, J. S., Dineen, K., Reeve, B. B., Roenn, V. J., Shervin, D., McGuire, M., Bode, R. K., Paice, J., & Cella, D. (2005). An item response theory-based pain item bank can enhance measurement precision. *Journal of Pain and Symptom Management*, 30(3), 278-288. Laufer, B. (1997a). The lexical plight in second language reading: Words you don't know, words you think you know, and words you can't guess. In J. Coady, & T. Huckin (Eds.), *Second language vocabulary acquisition* (20-34). New York: Cambridge University Press. Laufer, B. (1997b). What's in a word that makes it hard or easy: Some intralexical factors that affect the learning of words. In N. Schmitt & M. McCathy (Eds.), *Vocabulary: Description, acquisition, and pedagogy* (140-155). New York: Cambridge University Press. Laufer, B. (1998). The development of passive and active vocabulary in a second language: Same or different? *Applied Linguistics*, 19, 255-271. Lawson, D. M. (2006). Applying the item response theory to classroom examinations. *Journal of Manipulative and Physiological Therapeutics*, 2(5), 393-397. Li, S. L., & Pemberton, R. (1994). A genre-based investigation of the discussion sections in articles and dissertations. *English for Specific Purposes*, 7(2), 113-121. Lin, Y. H. (1999). *The Integrated Model of Fuzzy Latent Knowledge Space and Its Application*. Unpublished doctoral thesis. National Chengchi University. Lord, F. M. (1968).

Novick ' s statistical theories of mental test scores. Hillsdale, NJ: Lawrence Erlbawn Associates. Markson, L., & Bloom, P. (1997). Evidence against a dedicated system for word learning in children. *Nature*, 385(6619), 813-815. Martin, A. V. (1976). Teaching academic vocabulary to foreign graduate students. *TESOL Quarterly*, 10(1), 91-97. McLaughlin, M. W. (2002). Sites and sources of teachers ' learning. In C. Sugru & C. Day (Eds.), *Developing teachers and teaching practices: International research perspectives* (95-115). New York: Routledge. Meara, P. (1999). The vocabulary knowledge framework. Retrieved March 3, 2008 from <http://www.swan.ac.uk/cals/calsres/vlibrary/vlib.htm>. Meara, P., & Jones, G. (1990). The Eurocentres vocabulary size tests. Zurich: Eurocentres. Melka, F. (1997). Receptive vs. productive aspects of vocabulary. In N. Schmitt, & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (84-102). Cambridge: Cambridge University Press. Merves, J. S. (1986). Lexical access for concrete and abstract words. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 12(1), 92-107. Meyer, P. G.. (1990). Non-technical vocabulary in technical language. Paper delivered at AILA congress in Thessalonika. Nagy, W., & Anderson, R. C. (1984). How many words are there in printed school English? *Reading Research Quarterly*, 19, 304-330. Nagy, W. E., Diakidoy, I. A., & Anderson, R. C. (1993). The acquisition of morphology: learning the contribution of suffixes to the meanings of derivatives. *Journal of Reading Behaviour*, 25, 155-170. Nation, I. S. P. (1982). *Teaching and learning vocabulary*. Boston: Heinle & Heinle. Nation, I. S. P. (1990). *Teaching and learning vocabulary*. New York: Newbury House. Nation, I. S. P. (1993). Vocabulary size, growth, and use. In R. Schreude & B. Weltens (Eds.), *The bilingual lexicon* (115-134). PA: John Benjamins Publishing Co.. Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press. Nation, I. S. P. (2005). *Teaching and learning vocabulary*. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (581-595). NJ: Lawrence Erlbaum Associates. Nippold, M. A., Cuyler, J. S., & Braunbeck-Price, R. (1988). Explanation of ambiguous advertisements: a developmental study with children and adolescents. *Journal of Speech and Hearing Research*, 31, 466-474. Nuttall, C. (2000). *Teaching reading skills in a foreign language*. Oxford: Macmillan Heinemann. Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart, & Winston. Panter, A. T., & Reeve, B. B. (2002). Assessing tobacco beliefs among youth using item response theory models. *Drug and Alcohol Dependence*, 68, S21-S39. Paribakht, T. S., & Wesche, M. B. (1993). Reading comprehension and second language development in a comprehension-based ESL program. *TESL Canada Journal*, 11, 9-29. Parry, K. (1991). Building a vocabulary through academic reading. *TESOL Quarterly*, 25(4), 629-653. Patterson, K. E. (1981). Neuropsychological approaches to the study of reading. *British Journal of Psychology*, 72, 151-174. Perry, D., & MacDonald, P. (2001). Word knowledge and vocabulary instruction [Electronic version]. Proceedings from: International Conference on Engineering Education in Oslo, Norway. Poirier, M., & Sain-Aubin, J. (1996). Immediate serial recall, word frequency, item identity, and item position. *Canadian Journal of Experimental Psychology*, 50, 408-412. Qian, D. D. (1998). Depth of vocabulary knowledge: Assessing its role in adults ' reading comprehension in English as a second language. Unpublished doctoral thesis, University of Toronto, Canada. Qian, D. D. (1999). Assessing the roles of depth and breadth of vocabulary knowledge in reading comprehension. *The Canadian Modern Language Review*, 56, 282-307. Quinn, G. (1968). The English vocabulary of some Indonesian University entrants. Salatige: IKIP Kristen Satya Watjoru. Raimes, A. (1983). *Techniques in teaching writing*. New York: Oxford University Press. Read, J. (1989). Towards a deeper assessment of vocabulary knowledge. Washington, DC: Eric Clearinghouse on Languages and Linguistics. (ERIC Document Reproduction Service No. ED 301048). Read, J. (1993). The development of a new measure of L2 vocabulary knowledge. *Language testing*, 10(3), 355-371. Read, J. (1997). Vocabulary and testing. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition, and pedagogy* (303-320). Cambridge: Cambridge University Press. Read, J. (2000). *Assessing vocabulary*. Cambridge: Cambridge University Press. Richards, J. C. (1976). The role of vocabulary teaching. *TESOL Quarterly*, 10(1), 77-89. Ridgway, T. (1997). Thresholds of the background knowledge effect in foreign language reading. *Reading in a Foreign Language*, 11(1), 151-168. Rodgers, T. S. (1969). On measuring vocabulary difficulty: An analysis of item variables in learning Russian-English vocabulary pairs. *IRAL*, 7(4), 327-343. Santos, M. G. (2002). Examining the vocabulary skills of language minority students in community college. Retrieved March, 3, 2008, from [http://www.instruction.greenriver.edu/avery/Faculty/TESOL02\\_santos.htm](http://www.instruction.greenriver.edu/avery/Faculty/TESOL02_santos.htm) Scherbaum, C. A., Finlinson, S., Barden, K., & Tamanini, K. (2006). Applications of item response theory to measurement issues in leadership research. *The Leadership Quarterly*, 17, 366-386. Schmitt, N. (2000). *Vocabulary in language teaching*. Cambridge: Cambridge University Press. Schmitt, N., & McCathy, M. (1997). *Vocabulary: Description, acquisition, and pedagogy*. Cambridge: Cambridge University Press. Schweickert, R., Guentert, L., & Hersberger, L. (1990). Phonological similarity, pronunciation rate, and memory span. *Psychological Science*. 27, 74 – 77. Shaw, P. (1991). Science research students ' composing processes. *English for Specific Purposes*, 10, 189-206. Smiley, P., & Huttenlocher, J. (1995). Conceptual development and the child ' s early words for events, objects, and persons. In M. Tomasello, & W. Merriman (Eds.), *Beyond names for things: Young children ' s acquisition of verbs* (21-62). New York: Lawrence Erlbaum Associates. Snow, C. E., & Locke, J. (2001). Quality of phonological representations of lexical items. *Applied Linguistics*, 22, 283-477. Spencer, K. (2002). English spelling and its contribution to illiteracy: word difficulty for common English words. *Reading*, 36(1), 16-25. Sperling, G., & Speelman, R. G. (1970). Acoustic similarity and auditory short-term memory: experiments and a model. In D. A. Norman (Ed.), *Models of human memory* (151-202). New York: Academic Press. Tamayo, J. M. (1987). Frequency of use as a measure of word difficulty in bilingual vocabulary test construction and translation. *Educational and Psychological Measurement*, 47(4), 893-902. Thorndike, E. L. (1921). *The teacher ' s word book*. New York: Columbia University, USA. Thurstun, J., & Candlin, C. N. (1998). Concordancing and the teaching of the vocabulary of academic English. *English for Specific Purposes*, 17(3), 267-280. Tyler, A., & Nagy, W. (1990). Use of derivational morphology during reading. *Cognition*, 36, 17-34. Unnderwood, B. J. (1957). Interference and forgetting. *Psychological Review*, 64, 49-60. Wang, M. Y. (1994). An analysis of errors on an English vocabulary test by junior high school students. Unpublished master ' s thesis, National Kaohsiung Normal

University, Taiwan. Waring, R. (1997). A study of receptive and productive vocabulary learning from word cards. *Studies in Foreign Languages and Literature*, 21(1), 94-114. Waring, R. (2002). Scales of vocabulary knowledge in second language vocabulary assessment. Retrieved May 21, 2008, from <http://www1.harenet.ne.jp/~waring/papers/papers.html>. Waring, R., & Takaki, M. (2003). At what rate do learners learn and retain new vocabulary from reading a graded reader? *Reading in a Foreign Language*, 15 (2), 130-163. Washburn, J. W. (1992). Teaching difficult vocabulary in reading. Biola University. (ERIC Document Production Service ERIC Document Reproduction Service No. ED 347 836). Watkins, M. J., Watkins, O. C., & Crowder, R. G. (1974). The modality effect in free and serial recall as a function of phonological similarity. *Journal of Verbal Learning and Verbal Behaviour*, 13, 430-447. Weiss, D. J., & Yoes, M. E. (1991). Item response theory. In R. K. Hambleton & J. N. Zaal (Eds.), *Advances in education and psychological testing* (69-96). Boston: Kluwer Academic Publish. Wesche, M., & Paribakht, T. (1996). Assessing L2 vocabulary knowledge: depth versus breadth. *The Canadian Modern Language Review*, 53(1), 13-40. West, M. (1953). A general service list of English words. London: Longman, Green & Co.. Wright, B. D., & Masters, G. N. (1982). *Rating scale analysis*. Chicago: MESA Press. Wright, B. D., & Stone, M. H. (1979). *Best test design*. Chicago: MESA. Yang, H. (1986). A new technique for identifying scientific/technical terms and describing scientific texts. *Literary and Linguistic Computing*, 1(2), 93-103. Yule, G.. (2001). *The study of language*. Cambridge: Cambridge University Press.