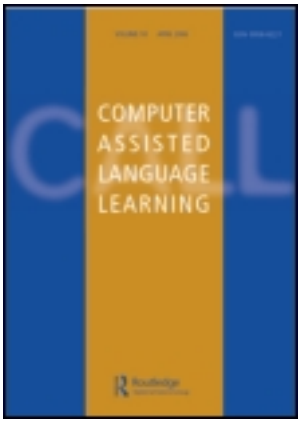

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It is more than knowledge seeking: examining the effects of OpenCourseWare lectures on vocabulary acquisition in English as a foreign language (EFL) context

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It is more than knowledge seeking: examining the effects of OpenCourseWare lectures on vocabulary acquisition in English as a foreign language (EFL) context

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OpenCourseWare (OCW) has received increasing attention over the past few years in higher education. These courses provide appealing opportunities to view classes taught in well-established universities worldwide. The current study aims to examine how OCW lectures can serve as authentic learning materials to facilitate vocabulary acquisition for learners learning English as a foreign language (EFL). It further investigates factors that influence the effectiveness of vocabulary acquisition via OCW lectures. Three open-course lectures from MIT and Yale University, on psychology, physics, and music, were selected. Sixty-five Taiwanese college students participated in the study. The results of pre- and post-testing indicate that learners were able to gain L2 vocabulary knowledge by simply viewing an OCW lecture once. Level of vocabulary (academic vocabulary, technical vocabulary and low-frequency vocabulary) was found to be the most influential factor affecting vocabulary acquisition through OCW lectures. In addition, learners improved more on technical words than on academic ones. Verbal elaboration was also an important factor affecting vocabulary acquisition; the more explicit the elaboration is the greater the vocabulary gain. Frequency of occurrence, on the other hand, had positive but relatively small effects on learners' vocabulary gain.

Keywords: OpenCourseWare; vocabulary acquisition; lecture comprehension

Introduction

Background of the study

Recently, increasing attention has been paid to OpenCourseWare (OCW) or Open Educational Resources (OER) that aim to remove the economic, geographic, and political boundaries in education (Smith, 2009; UNESCO, 2005; Wiley, 2006). Advocates of OCW or OER say that these programs have opened up high-quality educational resources to anyone with access to the Internet and other media technologies. To date, dozens of universities and educational institutions have shared their course lectures on the web for nonprofit use. These open courses have moved the platform of live classes to computer screens. They offer appealing

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opportunities for knowledge-seekers around the world to take high-quality classes taught in well-established universities, such as UC Berkeley, MIT, and Yale. The rapid growth of the open courses marks a revolution in education that has broken educational boundaries and opened up new opportunities for learning and teaching.

It has been agreed by researchers and instructors that lexical knowledge is essential to the achievement of second-language (L2) proficiency (e.g. Grabe & Stoller, 1997). In addition, acquiring English vocabulary for academic purposes is crucial, especially for non-native English-speaking students and professionals, to reach higher-level academic success. Studies have indicated that the key barrier for advanced L2 learners to comprehend academic speeches in international conferences is their insufficient vocabulary (Kelly, 1991), in particular, topic-specific or technical words within the lectures (Lessard-Clouston, 2009; Nation, 2001). Nation (1990, 2001) further points out that understanding technical words is essential to comprehending academic content since technical words carry the central meaning of a subject being discussed; yet, technical words are often difficult to learn through translation, repetition, or other context-independent vocabulary instruction. Chung and Nation (2003) further indicate two major problems in helping learners enhance technical vocabulary: teachers' lack of specialist knowledge of the learners' technical areas and the cognitive load of learning technical vocabulary and content knowledge of the field at the same time. Thus, Nation (2001) suggests that technical words should be learned through study of the field, instead of through isolated and context-independent approach.

Vidal's (2003) study finds that English as a foreign language (EFL) learners are able to acquire vocabulary, especially technical words, while obtaining knowledge through academic lectures. Although many studies have explored the acquisition of vocabulary from within an academic context, most of them focus on how learners acquire words via reading; few of them examine the effect of listening input on L2 vocabulary acquisition (Brown, Sagers, & LaPorte, 1999; Ellis, 1995). In addition, even fewer studies have investigated how learners can develop vocabulary knowledge via academic lectures (Vidal, 2003, 2011).

Noticing the value of academic lectures and the lack of relevant studies, Vidal (2003) designed an experiment to investigate whether academic lectures could be a source of vocabulary acquisition among 122 first-year university students in Spain. The lectures she used were three 15-min reading-style lectures in which a native English speaker gave a talk about tourism. The vocabulary knowledge scale (VKS) was used to measure students' knowledge of 36 target words chosen from the three lectures. The findings of the study suggest that students were able to gain vocabulary knowledge, especially technical words, through watching academic lectures. In a more recent study done by Vidal (2011), she compares the effect of academic reading and academic lectures on L2 vocabulary acquisition. The findings, again, show that L2 vocabulary can be acquired through watching academic lectures, though academic reading was found to be more effective. However, it should be noted that in Vidal's (2003, 2011) studies the "lectures" involved the lecturer reading from notes. This differs significantly from dialogic-style lectures, which are more interactive, spontaneous, and relatively common in classroom settings (Flowerdew, 1994; Glass, Hazen, Hetherington, & Wang, 2004; MacDonald, Badger, & White, 2000).

In another study, a dialogic-style lecture with a Computer-Assisted Language Learning (CALL) activity was investigated by Smidt and Hegelheimer (2004). The

lecture was a 15-min digitized online video capturing a lecturer presenting a seminar on horticulture in an in-class situation. The CALL activity included transparency notes, picture slides, and an online dictionary alongside the video lecture. Twenty-four international students participated in the study. Twenty vocabulary items selected from the video lecture were tested through a partial dictation in pre- and post-testing. The researchers found a significant increase in participants' vocabulary in the post-test and suggested that an authentic academic lecture embedded in a CALL activity could result in incidental vocabulary acquisition. Nonetheless, since Smidt and Hegelheimer's (2004) study examined the effect of a lecture under a CALL setting, it is not clear whether the gain resulted from the lecture itself or whether other elements in the CALL activity (e.g. transparency notes, picture slides and dictionary use) can be attributed to the significant incidental vocabulary gains.

Purpose of the study

The potential of authentic academic lectures for L2 vocabulary acquisition has yet to be clarified. Therefore, the present study, which is part of a bigger project examining the effects of OCW on language learning, aims to examine vocabulary learning among learners learning EFL in Taiwan with the sole use of open-course lectures recorded from actual classes in order to investigate (1) whether open-course lectures can facilitate vocabulary acquisition and (2) what factors are influencing the effectiveness of this type of vocabulary acquisition. The specific research questions of the study are as follows:

(1) What is the effect of watching OCW lectures on vocabulary acquisition for EFL learners?
(2) What is the effect of (i) the type of vocabulary (technical, academic, and low-frequency word), (ii) verbal elaboration (explicit, implicit, and no verbal elaboration), (iii) nonverbal elaboration (with nonverbal elaboration and without nonverbal elaboration), and (iv) the frequency of occurrence (number of times a word appeared in the lecture) on vocabulary acquisition through watching open-course lectures?

Method

Participants

The participants of the study were recruited from two universities in northern Taiwan. A total of 65 college students (41 males and 24 females), coming from various disciplines, volunteered to participate in the study. Among them, 45 students were in natural science disciplines, and the other 20 were in social science disciplines. Forty-six students were undergraduates (12 freshmen, 12 sophomores, 11 juniors, and 11 seniors); 19 were graduates (16 master's degree students and three doctoral degree students). All of them were learners of EFL and their TOEFL scores ranged from 397 to 653 ($M = 535.74$, $SD = 57.26$).

Selection of OCW lectures

Three OCW lectures were chosen from MIT OCW and Open Yale Courses which cover three different subject areas, psychology, music, and physics. Table 1 shows

detailed descriptions of each lecture. To examine the participants' comprehension of the lectures, three 15-item true–false tests were constructed for each lecture (see an example in Appendix 1). All items in the tests were factual questions, which required participants to recall information they had learned from the given lectures. Ambiguous or inferential questions were avoided. To investigate whether the three lectures were equivalent in terms of difficulty, an ANOVA with repeated measures was performed. The results, as presented in Table 2, show that there is no significant difference between the three lectures, $F(2, 192) = 2.437$; $p = 0.091$, indicating that none of the lectures was especially difficult or easy for participants to comprehend.

Originally, the duration of each selected lecture was about the length of a class section, approximately 50 min. However, due to the amount of time required for the completion of the tasks for each session (pre- and post-test before and after viewing of the OCW lectures), the researchers edited each video lecture into a shorter version, ranging from 20 to 36 min.

Selection and categorization of target words

For the purposes of investigating the acquisition of vocabulary from watching authentic video lectures, a set of words with learning potential (i.e. words that are potentially unknown to participants) was selected from the transcripts of the three lectures. These words were further analyzed by their frequency of occurrence in lectures and the type of elaboration used upon them. A list of 33 target words was finalized. Following Nation's (1990, 2001) classification of vocabulary in academic reading texts, this study classified target words into academic words, technical words, and low-frequency words. The criteria for each word type and details of the classifying process are defined in Table 3. There were 11 of each type in the study (see Appendix 2).

Table 1. Duration and text analysis of selected OCW lectures.

Subject	Course title	Duration	Tokens	Types
Physics[1]	Electricity and magnetism	30 min	4203	669
Music[2]	Listening to music	20 min	2610	568
Psychology[3]	Introduction to psychology	36 min	5700	1189

Note: Tokens and types were analyzed by using VocabProfile (www.lextutor.ca). Tokens = total number of running words in the lecture transcript; types = total number of different word families in the lecture transcript. [1]Source: Paul Bloom, *Introduction to Psychology*, Spring 2007. Yale University: Open Yale Courses, Retrieved from http://oyc.yale.edu. License: Creative Commons BY-NC-SA; [2]Source: Craig Wright, *Listening to Music*, Fall 2008. Yale University: Open Yale Courses, Retrieved from http://oyc.yale.edu. License: Creative Commons BY-NC-SA; [3]Source: Walter Lewin, *Electricity and Magnetism*, Spring 2002. (MIT OpenCourseWare: Massachusetts Institute of Technology), Retrieved from http://ocw.mit.edu. License: Creative commons BY-NC-SA.

Table 2. ANOVA with repeated measures for three lectures.

Lecture	Mean	SD	df	*F*	Sig.
Physics	11.29	1.598	2	2.437	.091
Music	11.55	2.158			
Psychology	10.95	2.211			

Table 3. Descriptions of different types of words.

Type of words	Descriptions
Academic words	Academic words appear commonly across different academic texts. These words have been carefully distinguished and organized in Coxhead's (1998) Academic Word List (AWL), as well as in Xue and Nation's (1984) University Word List (UWL). Potential words in this study were classified as academic words if they appear either in AWL or UWL.
Technical words	Technical words are specific to a particular field, topic or discipline.
Low-frequency words	Low-frequency words are defined, in this study, as words that are rarely used by everyday users of English. In order to distinguish them, the researcher checked frequency count of every potential word in the lectures against the British National Corpus (BNC) and the Corpus of Contemporary American English (COCA). Those words with a frequency count lower than 1.5 occurrences per million words in the BNC and a frequency count lower than 1.4 occurrences per million words in the COCA were classified as low-frequency in this study.

Measurement of vocabulary gain

Vocabulary acquisition through watching authentic video lectures was gauged by comparing the pre-test and post-test scores measured by the VKS, with an audio recording by a female native speaker of English speaking the words. The VKS included 44 words (33 target words and 11 non-words). Non-words were included in the test so that a one-point score could be given for words that learners said they were familiar with but that they could not give the meaning. The non-words enabled the researchers to verify the measure to which a participant's indication of familiarity was true or not. The participants took the pre-test two weeks before watching the lectures and then the post-test immediately after each OCW lecture. The non-words, formed by following English spelling and phonological rules, served as distracters to control the over-estimation of participants' word knowledge.

The scoring scale of the VKS was modified from Vidal's (2003) and Paribakht and Wesche's (1997) studies in which (1) one point was deducted for familiarity with a ''non-word''; (2) zero point was awarded for not being familiar with a word and having no idea about its meaning; (3) one point was awarded for being familiar with a word but having no idea about its meaning; (4) two points were awarded for demonstrating a vague idea of the meaning of a word; (5) three points were awarded for demonstrating a vague idea of the meaning of a word and being able to produce a clear example of it (e.g. drawings of the concept taught in the lecture); (6) four points were awarded for giving a correct synonym or Chinese translation of a word; and (7) five points were awarded for giving a correct synonym or Chinese translation of a word and being able to use it with semantic appropriateness and grammatical accuracy in a sentence. The reliability for each pre-test and post-test were 0.77 and 0.86, respectively, which indicates that the vocabulary measures used in this study reached satisfactory reliability.

Verbal elaboration

With the purpose of examining whether and how the elaborations of words in authentic lectures would influence vocabulary acquisition, elaborations of target words were classified as explicit, implicit, or no elaboration. Chaudron (1982) classified verbal

elaborations from authentic lectures as explicit or implicit based on their clarity to L2 learners. Following Chaudron's (1982) classification, the current study analyzed verbal elaborations of target words with the guidelines presented in Table 4.

However, it should be noted that since most of the target words appeared more than once in the lectures it is impossible to assign the level of elaboration accompanying each word as purely explicit or implicit in authentic contexts; sometimes there were both explicit and implicit elaborations for one single target word. To clarify the boundary between explicit and implicit elaboration, once there was an explicit elaboration of a target word, the word would be classified under explicit elaboration. For example, the word "polarization" appeared three times in the physics lecture and was accompanied by one implicit elaboration, one explicit elaboration, and once with no elaboration. As such, "polarization" was classified as having an explicit elaboration.

Nonverbal elaboration

Since the selected lectures in this study were in an audiovisual format with the capacity for visual nonverbal demonstration, the researchers also classified target words with nonverbal elaboration and without nonverbal elaboration. If an action, symbol, or object was used to elaborate a target word, the word was classified as having nonverbal elaboration for further analysis. For example, the word "electroscope" was written once on a blackboard by the lecturer; thus, the researchers classified this act of spelling as with nonverbal elaboration. It should be noted that words with or without nonverbal elaboration can be accompanied with three possible types of verbal elaboration (explicit, implicit, or no verbal elaboration) (see Appendix 2).

Procedure

When recruiting participants, the researchers inform the potential participants that the study would be related to OCW lectures. Anyone interested in OCW was welcome to join the experiment.

Table 4. Classification of verbal elaboration.

Type	Definition	Sentence pattern	Example
Explicit	Elaboration: either through syntactic or semantic elaboration by providing definition, questioning, or naming structures.	Definition: (e.g. X is a type Y which…)	An electroscope is a type of device which detects the presence and determines the sign of electric charges,
		Naming: (e.g. X is called Y.)	The instrument we use to measure charges is called an electroscope.
Implicit	Elaboration with structure of apposition, parallelism, and paraphrase	Apposition	An electroscope, a device measuring charges, is used here.
		Parallelism	This task can be done with electroscopes, voltmeters, or other electrical measuring instruments.

At the onset of the experiment, participants were given a TOEFL equivalent test to measure their English proficiency, and a pre-test on their knowledge of the 33 target words. To ensure that these pre-tested target words would not be readily recalled by the participants and therefore became the focus while viewing the lectures, there was a two-week interval between the pre-test and the video-viewing experiment.

Three authentic video lectures were presented to participants one by one on different days so that their attention was more focused than if they viewed all three video lectures at once. Before each lecture viewing, the participants were told only that there would be a lecture comprehension test, but were not specifically told about the inclusion of vocabulary measurement in the lecture comprehension test. Participants were encouraged to take notes while viewing the OCW lectures. Immediately after each lecture, these notes were collected and a comprehension test and a vocabulary post-test were conducted on the target words that appeared in the given lecture in order to investigate whether watching authentic video lectures could result in vocabulary gain.

Results

Preliminary analysis

Table 5 illustrates the descriptive analysis of vocabulary gain observed by different participant groups. The results show that no significant difference was found between gender groups, undergraduates and graduates, or natural science and social science majors on performance in vocabulary acquisition through viewing OCW lectures.

The raw data of the pre- and post-tests and gain scores of the 65 participants are presented in Table 6. The results showed that only two participants did not increase their vocabulary knowledge after viewing the OpenCourse lectures.

Research question 1: What is the effect of watching OCW lectures on the acquisition of vocabulary for EFL learners?

Differences were found in the mean test scores of pre- and post-tests, revealing that watching open-course lectures did result in L2 vocabulary gain, with the mean score of the post-test being 16.69 points higher than that of the pre-test (pre-test M = 38.74, SD = 15.93; post-test M = 55.43, SD = 21.84). Table 7 illustrates the descriptive statistics for vocabulary measures. Take the target word ''electroscope,''

Table 5. Vocabulary gain observed by different participant groups.

Participant group	*N*	Mean	SD	Sig.
Gender				
Male	41	15.34	9.91	0.205
Female	24	19.00	12.97	
Seniority				
Undergraduate	46	17.74	11.87	0.243
Graduate	19	14.16	9.09	
Discipline				
Natural science	45	16.76	10.42	0.946
Social science	20	16.55	13.02	

Table 6. Individual participants' pre-test, post-test, and gain on vocabulary test.

ID	Pre-test	Post-test	Gain	ID	Pre-test	Post-test	Gain
1	29	37	8	34	43	72	29
2	46	58	12	35	41	65	24
3	55	70	15	36	47	56	9
4	36	44	8	37	28	46	18
5	37	50	13	38	41	78	37
6	19	25	6	39	36	43	7
7	56	84	28	40	41	59	18
8	15	19	4	41	36	45	9
9	42	64	22	42	24	17	−7
10	44	55	11	43	48	64	16
11	32	37	5	44	23	37	14
12	28	31	3	45	26	43	17
13	20	45	25	46	49	68	19
14	19	42	23	47	41	75	34
15	30	47	17	48	75	123	48
16	30	47	17	49	15	24	9
17	41	38	−3	50	24	36	12
18	65	66	1	51	41	72	31
19	36	62	26	52	27	30	3
20	15	27	12	53	32	52	20
21	33	65	32	54	26	30	4
22	84	100	16	55	39	66	27
23	14	19	5	56	33	43	10
24	33	48	15	57	40	55	15
25	80	92	12	58	34	65	31
26	49	79	30	59	50	66	16
27	26	30	4	60	42	84	42
28	18	24	6	61	37	75	38
29	66	84	18	62	71	89	18
30	54	71	17	63	38	50	12
31	21	31	10	64	67	83	16
32	49	61	12	65	49	71	22
33	32	69	37				

for example. Only one person (1.5%) knew its meaning and 31 learners (48%) misinterpreted it as "microscope" or "telescope" in the pre-test. After viewing the lecture, 22 learners (34%) successfully demonstrated the correct meaning in the post-test. A paired-sample *t*-test further indicates a significant difference between pre- and post-test ($p = 0.000$), with a large effect size ($d = 0.88$). Thus, the results suggest that viewing OCW lectures significantly facilitates vocabulary acquisition for learners learning EFL. Detailed information on the number of words scoring 0 to 5 on the pre- and post-test by all participants and the score change from pre-test to post-test are presented in Appendices 3 and 4.

Research question 2: What is the effect of (i) the type of vocabulary, (ii) verbal elaboration, (iii) nonverbal elaboration, and (iv) the frequency of occurrence on vocabulary acquisition through watching OCW *lectures?*

Table 8 illustrates the computation of rank order through item analysis. The results show that 8 of the 10 best-learned words are technical vocabulary. Among them, seven use explicit elaboration and seven use nonverbal elaboration. These results

indicate that word type, the degree of explicitness of elaboration, and the usage of nonverbal elaboration have certain influences on learners' vocabulary acquisition through viewing OCW lectures.

Since frequency, vocabulary type, verbal elaboration, as well as nonverbal elaboration can all be confounded with each other to a certain extent, instead of

Table 7. Descriptive analysis of 65 participants' scores on each vocabulary measure.

Vocabulary measures	Mean	SD	*N*	Number of test items	
				Target-w	Non-w
Pre-test	38.74	15.93	65	33	11
Post-test	55.43	21.84	65	33	11
Physics	18.08	7.99	65	10	3
Music	15.68	7.65	65	10	3
Psychology	21.68	10.36	65	13	5

Table 8. Computation of rank order of vocabulary gains through item analysis.

Item	Gain	Type	Frequency	Verbal elaboration	Non-verbal elaboration
Polarization	109	Technical	3	Explicit	Yes
Pizzicato	104	Technical	6	No	Yes
Electroscope	101	Technical	5	Explicit	Yes
Dualism	100	Low frequency	8	Explicit	No
Vibrato	88	Technical	6	Explicit	Yes
Tremolo	85	Technical	3	No	Yes
Proton	80	Technical	6	Implicit	Yes
Amphetamine	61	Low frequency	2	Explicit	No
Axon	59	Technical	7	Explicit	No
Induction	55	Technical	6	Explicit	Yes
Neutral	44	Academic	4	Explicit	Yes
Woodwind	44	Low frequency	2	No	No
Complementary	42	Academic	1	Implicit	No
Dendrite	41	Technical	6	Explicit	No
Serotonin	31	Technical	3	Implicit	No
Agonist	26	Technical	2	Explicit	No
Tinsel	24	Low frequency	5	Implicit	Yes
Amorphous	22	Academic	1	No	No
Intensity	19	Academic	4	Implicit	No
Spherical	18	Academic	3	No	Yes
Reincarnation	16	Low frequency	1	Implicit	No
Parlance	12	Low frequency	1	No	No
Cellophane	10	Low frequency	1	No	No
Saran	3	Low frequency	1	No	No
Iteration	1	Low frequency	1	No	No
Doctrine	0	Academic	3	No	No
Paralyze	0	Low frequency	1	Implicit	No
Depression	−2	Academic	4	Implicit	No
Gambit	−3	Low frequency	1	No	No
Subtle	−5	Academic	2	No	No
Accompaniment	−7	Academic	2	No	Yes
Parallel	−20	Academic	2	No	No
Operate	−29	Academic	2	No	No

examining the effect of each factor independently, categorical regression with optimal scaling (CATREG), which deals with the combination of nominal, ordinal, and interval independent variables, was performed. By using CATREG, it is possible to examine the four factors together and analyze the relative importance of each explanatory variable.

Overall, the results show that the four factors, i.e. (1) type of vocabulary, (2) verbal elaboration, (3) nonverbal elaboration, and (4) frequency of occurrence together can explain almost 67% of the variance in the vocabulary gain from watching OCW lectures. From the standardized regression coefficients (Table 9), it can be seen that the largest coefficient occurs for word type, followed by verbal elaboration, frequency of occurrence, and nonverbal elaboration. Removing the effects of the other variables, word type alone explains 23% of the variation in vocabulary gain. The other three variables explain relatively smaller portions of the variance in vocabulary gain, with verbal elaboration accounting for 14%, nonverbal elaboration 13%, and frequency of occurrence 5%. It should be noted that in the analysis of research question 2, the 11 non-words were excluded since they could not be classified by any of the four variables.

Type of vocabulary

Descriptive statistics in Table 10 indicate that learners gained much more knowledge on technical words and far less on academic ones. On average, each student gained 1.09 points on a technical word, 0.37 points on a low-frequency word, and only 0.11 points on an academic word. Table 11 shows learners' progress on technical, academic, and low-frequency vocabulary from pre- to post-test. It shows that over half (54%) of the scores on technical words improved. The scores of a large number of academic words (54%) and low-frequency words (64%) stayed constant between pre- and post-tests. As for the scores that declined from pre- to post-test, relatively few technical words (6%) or low-frequency words (9%) deteriorated. Yet, the scores of nearly one-fifth (19%) of academic words declined after watching the lectures. Detailed data of the learning progress on each vocabulary item are presented in Appendix 5.

Table 9. Categorical regression coefficients.

	Standardized coefficients				Correlations	
Variables	Beta	Standard error	F	R^2	Partial	Part
Type of word	0.370	0.132	7.833	0.667	0.481	0.317
Verbal elaboration	0.300	0.148	4.131		0.370	0.230
Frequency of occurrence	0.178	0.154	1.337		0.221	0.131
Nonverbal elaboration	0.250	0.127	3.864		0.360	0.222

Notes: (1) Since the most common approach for describing how well a categorical regression fits the data is R square (R^2), this table presents only the R^2 value and leaves out the R, and adjusted R^2 value. (2) Part correlation is the correlation between the response and the residuals from regressing a predictor on the other predictors. On the other hand, partial correlation measures the degree of association between two variables, when removing the linear effects of a set of controlling variables.

Verbal elaboration

Table 12 illustrates the vocabulary gains on different degrees of verbal elaboration. On average, learners improved 1.05 points on an explicitly elaborated word, 0.40 points on an implicitly elaborated word, and only 0.24 points on a word receiving no elaboration.

Nonverbal elaboration

The results show that words with nonverbal elaboration resulted in much higher gains than words without nonverbal elaboration. Table 13 shows a higher vocabulary gain for words with nonverbal elaboration (M = 0.98) and a relatively lower gain for those without nonverbal elaboration (M = 0.30).

Frequency of occurrence

Table 14 shows the mean and standard deviation of participants' gains of the target words that were used ranging from 1 to 8 times. The results show that the vocabulary gain rises as the frequency of word occurrence increases. However, some of the means presented in Table 14 do not confirm this trend, including the mean of words that occurred two, four, and seven times. This could result in the high intercorrelation between word frequency and type of vocabulary, the factor that correlates highest with vocabulary gain. From the target word list in Appendix 2, we

Table 10. Vocabulary gain observed by type of word.

Type of vocabulary	Mean	SD	*N*	Sig.
Technical	1.09	1.665	11	0.000
Low frequency	0.37	1.227	11	
Academic	0.11	1.573	11	
Total	0.53	1.555	33	

Table 11. Learning progress on technical, academic, and low-frequency vocabulary.

Types of vocabulary/ Learning progress	Total (65 × 11 = 715)	Improved (%)	Stayed constant (%)	Declined (%)
Technical	715	387 (54)	284 (40)	44 (6)
Academic	715	194 (27)	387 (54)	134 (19)
Low-frequency	715	193 (27)	457 (64)	65 (9)

Table 12. Vocabulary gain observed by verbal elaboration by type of word.

Verbal elaboration	Mean	SD	*N*	Sig.
Explicit elaboration	1.05	1.650	10	0.000
Implicit elaboration	0.40	1.494	8	
No elaboration	0.24	1.430	15	
Total	0.53	1.555	33	

Table 13. Vocabulary gain observed by nonverbal elaboration by type of word.

Nonverbal elaboration	Mean	SD	*N*	Sig.
With nonverbal elaboration	0.98	1.867	11	0.000
Without nonverbal elaboration	0.30	1.316	22	
Total	0.53	1.555	33	

Table 14. Vocabulary gain observed by frequency of occurrence by type of word.

Frequency of occurrence	Mean	SD	*N*	Sig.
1	0.18	0.973	9	0.000
2	0.15	1.667	7	
3	0.75	1.621	5	
4	0.31	1.650	3	
5	0.96	1.547	2	
6	1.13	1.784	5	
7	0.91	1.284	1	
8	1.54	1.611	1	
Total	0.53	1.555	33	

can see that the words that occurred two and four times are mostly academic words, which, according to the results, are less likely to be acquired by learners. As a result, words that occurred two and four times received relatively low vocabulary gains. One word occurred seven times, and as such it can be considered to be an outlier. Despite the inconsistency between the trend and means, in general, the frequency of word occurrence is positively related to vocabulary gain.

Discussion

Effect of OCW lectures on the acquisition of vocabulary

The results of the study corroborate Vidal's (2003, 2011) studies that language learners can acquire vocabulary through academic lectures. According to Schmidt's (1993) Noticing Hypothesis, "noticing" is necessary and sufficient for the conversion of input to intake. A more specific interpretation of NH provided by Truscott and Sharwood Smith (in press) states that if learners are to acquire an aspect of language form, they must notice a particular form of the input, and the form must have reached an activation level sufficient for awareness. The OCW lectures used in the study contain considerable repetition, emphasis, and elaboration on vocabulary that can allow the activation of noting particular words and raising learners' awareness, and leading to increased opportunity for deeper processing and vocabulary acquisition. In other words, OCW lectures provide stimuli that can facilitate the noticing required for the conversion of input to intake.

The type of vocabulary was found to be the best predictor of vocabulary acquisition through OCW lectures. Learners reported to improve much more on technical vocabulary and far less on academic one. A similar finding was observed in Vidal's (2003, 2011) studies. One probable explanation is that technical vocabulary is, by nature, more perceptibly salient in academic content.

As noted by Nation (1990, 2001), technical words are closely related to and carry the central meaning of disciplinary content. The activation levels of technical words should be higher in comparison with other types of words because the knowledge of disciplinary content is often bound with its technical words. Thus, understanding the discipline itself can, in some degree, lead to the understanding of and learning of technical words, and vice versa. Therefore, as Nation (1990, 2001) indicated, topic-specific or technical words can be learned and are better learned through the study of the field.

As for the poor levels of improvement on academic words, there are two possible explanations. First, academic vocabulary tends to be less likely to be noticed. According to Nation (2001), academic words are often not directly related to the topics written about in academic texts. They work in a supportive function for delivering messages. Thus, they are less likely to be specifically noticed by the lecturer or the listeners. Second, academic words tend to be more abstract and polysemous (e.g. neutral, operate, accompaniment), which could hinder learners from making form–meaning connections. For example, some learners stated the meaning of "operate" as "to work or use a machine" in the pre-test, but after hearing the sentence "the music operates in that fashion" in Music lecture, they became confused and could not clearly state the meaning of the target word in the post-test. As shown in Table 11, the scores of nearly one-fifth (19%) of the academic words decreased from pre-test to post-test.

As low-frequency words had the same improvement rate as academic words, but had less loss, it appears that low-frequency words received overall higher gain scores than academic words in this study. One probable explanation is that low-frequency vocabulary tends to be more meaning-specific (e.g. tinsel, saran, cellophane) than academic vocabulary. Thus, the confusion caused by polysemy is less likely to occur when processing low-frequency vocabulary.

The effect of verbal and nonverbal elaboration

Verbal elaboration was the second best predictor of vocabulary acquisition via OCW lectures. The results show that learners improved much more on words accompanied by explicit verbal elaborations than on words accompanied by implicit or no elaboration. The finding is in line with Vidal's (2003, 2011) and Kim's (2006) studies. One probable explanation is that the explicit elaboration of words helps clarify the meaning of vocabulary and facilitate form–meaning connections. The findings of the study further indicate that words with nonverbal elaboration received higher levels of gain than those without it. As mentioned by Chun and Plass (1996), "research on second language (L2) vocabulary acquisition has revealed that words associated with actual objects or imagery techniques are learned more easily than those without" (p. 183). Thus, nonverbal elaboration such as using body language, writing down spellings on blackboard, or using objects for illustration can all facilitate in vocabulary acquisition.

The effect of frequency of occurrence

The findings of the current study are also in line with previous studies (e.g. Chen & Truscott, 2010; Rott, 1999, 2007; Tekmen & Daloglu, 2006; Vidal, 2003, 2011; Webb, 2007; Zahar, Cobb, & Spada, 2001) that suggest there is a positive

relationship between word acquisition and the number of times a word occurs. As noted by Greene (1992), "all other things being equal, our memory for information will depend on the number of times that we have encountered or studied it" (p. 132). This makes sense since the increase of a word's occurrence in the input is also the increase of opportunities for the word to be noticed and activated. Nonetheless, frequency of occurrence was found to be the least influential factor for vocabulary acquisition, accounting only for 5% of variance. One possible explanation might be that unlike reading activities during which one can stop and process an unfamiliar word each time it occurs, when involved in a listening activity, learners have less control over the sequence and representation of input. During listening, unknown words can be easily left unnoticed while other information keeps adding to the listener's short-term memory simultaneously. Thus, during listening activities, the repetition of vocabulary did not lead to an increase of attention that learners pay to the words.

Conclusion

The results of the study show that EFL learners were able to acquire L2 vocabulary simply through viewing OCW lectures once. As for the factors influencing learners' vocabulary gains, the type of vocabulary was found to be the most influential. The results indicate that OCW lectures can be an effective source for learning technical words. Factors such as verbal elaboration on vocabulary and the degree of explicitness or clarity of elaboration are shown to affect learners' vocabulary acquisition. As for nonverbal elaboration, vocabulary associated with nonverbal elaboration was also learned more efficiently. Finally, it was found that the frequency of occurrence of a word was, relatively, a weaker predictor of vocabulary acquisition through listening input.

Limitations and recommendations for future study

First, due to the difficulties of recruiting participants, the current study only examined the short-term effect of viewing lectures on vocabulary acquisition by implementing an immediate post-test after each lecture viewing. Future studies should include delayed post-tests to examine the retention of learners' vocabulary gains. Second, although efforts were made to eliminate the possibility that learners would remember target words from the pre-tests, it is recommended that future studies should include a control group to investigate whether taking the pre-test two weeks prior to viewing the lectures has any lasting effects on learners' performances on the post-test. Third, Nation and Webb (2011) state that the VKS mixes different aspects of knowledge, from receptive familiarity of form to receptive knowledge of meaning, and then to productive use at a sentence level. In addition, it involves differences in the nature of the evidence, from no evidence for categories I and II to a sentence context in categories IV and V. Moreover, the VKS does not represent a continuum of growth in vocabulary knowledge. Thus, as Waring and Takaki (2003) point out, using only one test allows us to look at only one dimension of word knowledge gains. Future research employing other measures of the same word will offer new insights into other aspects of vocabulary gains. Fourth, due to the non-experimental nature of the study, the results of the statistical analyses in the study should only be taken as suggestive rather than decisive. Future research employing

experimental research design should be conducted to shed new light on the effects of OpenCourse lectures on vocabulary acquisition. Finally, although the study intended to investigate whether OCW lectures could facilitate L2 vocabulary learning, what has been discussed so far is still restricted to the effect of video-recorded, not face-to-face in-class lectures. Thus, it is worth investigating whether vocabulary acquisition through attending in-class lectures would generate different learning outcomes.

Pedagogical implications

The findings of the study yield important pedagogical implications for the use of OCW lectures in foreign language instruction. First, the findings suggest that OCW lectures carry educational values beyond simply knowledge transmission; they also carry language learning benefits, especially for learning English for academic purposes. Second, as technical words were more effectively acquired through OCW lectures than academic words, the findings suggest that academic words should be explicitly learned instead of being left for incidental learning via context, as suggested by Nation (1990, 2001). It must be noted, however, that the findings further suggest instructors could provide content-rich materials for teaching technical words, such as OCW lectures, for learners to learn through exposure to discipline-specific knowledge, instead of teaching them through a decontextualized approach.

The results of the study also show that explicit elaboration is an effective approach for enhancing vocabulary acquisition while implicit elaboration tends to be overlooked by L2 learners. Thus, to maximize the effect of lectures on L2 vocabulary acquisition, lecturers should explain the meaning of a set of vocabulary with the use of explicit structures such as definition, naming, or exemplification to make input more achievable for learners. Furthermore, as the frequency of occurrence of a word had little influence on the acquisition of vocabulary through listening input, it is suggested that is it the quality of input (e.g. degree of elaborations) rather than the quantity of input (e.g. number of repetition) which facilitates vocabulary acquisition from listening context more effectively. Efforts to make vocabulary input more achievable for learners should be the focus of instruction.

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Appendix 1. Comprehension test for Introduction to Psychology lecture

True/False

(T = True; F = False)

(1) ( )Rene Descartes, a defender of dualism, claimed that for humans, there are two separate things: material bodies and immaterial minds.
(2) ( )According to the lecturer, most people believe that their immaterial self can survive after the destructions of their bodies.
(3) ( )The scientific consensus now is that dualism is reasonable and scientific.
(4) ( )The basic unit of the brain is the neuron.
(5) ( )Neurons do not grow back once you lose them.
(6) ( )Neurons are connected and tied together to one another.
(7) ( )Alcohol is inhibitory; it could relax and shut down some parts of the brain.
(8) ( )Agonists increase the effect of neurotransmitters; antagonists slow down the amount of neurotransmitters.
(9) ( )Depression is the result of too much of a neurotransmitter known as serotonin.
(10) ( )One can take a lot of brain damage and still preserve some mental functioning.
(11) ( )People have created a machine that can recognize faces or understand sentences at the level of a two-year-old human.
(12) ( )About eighty percent of the volume of human's brain is cortex, which fish do not have.
(13) ( )The brain is symmetrical; the right hemisphere and the left hemisphere of the brain is the same.
(14) ( )The size of the body part represented in the brain correspond to the size of the body part in the real world.
(15) ( )For right-handed people, the part that is in charge of language is in their right hemisphere of the brain.

Appendix 2. Classification of target words

Target word	Type of word	Frequency	Type of elaboration	
			Verbal	Nonverbal
Polarization	Technical	3	Explicit	Yes
Induction	Technical	6	Explicit	Yes
Electroscope	Technical	5	Explicit	Yes
Proton	Technical	6	Implicit	Yes
Axon	Technical	7	Explicit	No
Dendrite	Technical	6	Explicit	No
Agonist	Technical	2	Explicit	No
Serotonin	Technical	3	Implicit	No
Pizzicato	Technical	6	No	Yes
Vibrato	Technical	6	Explicit	Yes
Tremolo	Technical	3	No	Yes
Spherical	Academic	3	No	Yes
Neutral	Academic	4	Explicit	Yes
Doctrine	Academic	3	No	No
Amorphous	Academic	1	No	No
Subtle	Academic	2	No	No
Parallel	Academic	2	No	No
Depression	Academic	4	Implicit	No
Complementary	Academic	1	Implicit	No
Operate	Academic	2	No	No
Accompaniment	Academic	2	No	Yes
Intensity	Academic	4	Implicit	No
Cellophane	Low frequency	1	No	No
Saran	Low frequency	1	No	No
Dualism	Low frequency	8	Explicit	No
Tinsel	Low frequency	5	Implicit	Yes
Reincarnation	Low frequency	1	Implicit	No
Paralyze	Low frequency	1	Implicit	No
Amphetamine	Low frequency	2	Explicit	No
Parlance	Low frequency	1	No	No
Gambit	Low frequency	1	No	No
Iteration	Low frequency	1	No	No
Woodwind	Low frequency	2	No	No

Appendix 3. Number and percentage of words scored 0, 1, 2, 3, 4, and 5 on the pre- and post-test by 65 participants

Score	Pre-test	Percentage	Post-test	Percentage
0	1222	56.97	786	36.64
1	410	19.11	573	26.71
2	69	3.22	150	6.99
3	17	0.79	60	2.80
4	124	5.78	194	9.04
5	303	14.13	382	17.81
Total	2145	100.00	2145	100.00

Appendix 4. Changes of scores from pre-test to post-test

Score	N	Score	N	Score	N	Score	N	Score	N	Score	N
0 to 0	671	1 to 0	83	2 to 0	14	3 to 0	0	4 to 0	6	5 to 0	12
0 to 1	335	1 to 1	190	2 to 1	13	3 to 1	2	4 to 1	17	5 to 1	16
0 to 2	73	1 to 2	50	2 to 2	11	3 to 2	4	4 to 2	2	5 to 2	11
0 to 3	30	1 to 3	14	2 to 3	4	3 to 3	3	4 to 3	5	5 to 3	4
0 to 4	48	1 to 4	29	2 to 4	12	3 to 4	3	4 to 4	47	5 to 4	54
0 to 5	65	1 to 5	44	2 to 5	15	3 to 5	5	4 to 5	47	5 to 5	206

Appendix 5. Number of students whose score improved, stayed constant, or declined on each vocabulary item

Item	Improved	Constant	Declined
Polarization	39	21	5
Induction	34	22	9
Electroscope	41	23	1
Proton	28	31	6
Axon	33	28	4
Dendrite	26	36	3
Agonist	25	33	7
Serotonin	26	35	4
Pizzicato	53	10	2
Vibrato	41	23	1
Tremolo	41	22	2
Spherical	11	46	8
Neutral	29	29	7
Doctrine	19	34	12
Amorphous	19	44	2
Subtle	16	36	13
Parallel	14	32	19
Depression	15	34	16
Complementary	30	27	8
Operate	7	41	17
Accompaniment	18	28	19
Intensity	16	36	13
Cellophane	10	55	0
Saran	11	46	8
Dualism	46	18	1
Tinsel	21	36	8
Reincarnation	16	43	6
Paralyze	11	42	12
Amphetamine	29	33	3
Parlance	10	53	2
Gambit	4	54	7
Iteration	10	43	12
Woodwind	25	34	6