

Supplementary Materials

Table S1. Top 80 High-frequency CET4 Words of the Corpus as Target Words.

1.treat	21.illegal	41.casual	61.launch
2.abundant	22.economical	42.staff	62.reluctant
3.transfer	23.alter	43.prohibit	63.chill
4.chew	24.register	44.appeal	64.boast
5.objective	25.ensure	45.tackle	65.chase
6.intend	26.emit	46.reputation	66.switch
7.optional	27.distribute	47.slip	67.contrast
8.despite	28.strategy	48.contact	68.pitch
9.intense	29.influence	49.assignment	69.negotiation
10.expand	30.dim	50.entitle	70.drift
11.local	31.individual	51.illustrate	71.kit
12.acknowledge	32.insert	52.discipline	72.drain
13.behalf	33.discharge	53.characteristic	73.squeeze
14.generous	34.hint	54.criticise	74.collect
15.resolve	35.remark	55.exhaust	75.install
16.automatic	36.efficient	56.assist	76.response
17.species	37.adequate	57.deceive	77.convey
18.involve	38.appropriate	58.overtake	78.commercial
19.estate	39.brand	59.consume	79.imitate
20.conduct	40.overall	60.legal	80.crack

Table S2. Sample of the First Wordlist for the Control Group. Week 2 (10 words).

1. involve /ɪn'vɒlv / v. 包含; 使参与, 牵涉; 围绕, 缠绕; 使专心于	2. discharge /dɪs'tʃɑ:dʒ / n. 发射; 释放; 解雇; 放电 v. 卸掉负担; 发射; 放电 vt. 卸(货); 使爆炸; 履行; 解雇
3. abundant /ə'bʌndənt/ adj. 丰富的; 大量的	4. collect /kə'lekt / v. 收集; 领取; 聚集; 募捐 adj. 由对方付费的 n. (宗) 短祷文
5. expand /ɪk'spænd/ v. 膨胀; 扩大 vt. 详细展开	6. influence /'ɪnfluəns / n. 影响; 势力; 有影响的人(或事物) v. 影响
7. insert /ɪn'sɜ:t/ vt. 插入; 嵌入 n. 插入物; 插页	8. prohibit /prə'hɪbɪt/ v. 禁止
9. squeeze /skwi:z / v. 挤进, 塞进; 用力挤 压榨取; 减少, 压缩 n. 榨; 压榨; 挤, 塞	10. commercial /kə'mɜ:ʃl/ adj. 商业性的, 贸易的 n. 商业广告

Supplementary Materials Section S1. An Excerpt from Vocabulary Size Test (Nation & Beglar, 2007)

Choose the letter a-d with the closest meaning to the bold word in the statement.

- see: They **saw** it. () a. cut b. waited for c. looked at d. started
- time: They have a lot of **time**. () a. money b. food c. hours d. friends
- period: It was a difficult **period**. () a. question b. time c. thing to do d. book
- figure: Is this the right **figure**? () a. answer b. place c. time d. number
- poor: We are **poor**. () a. have no money b. feel happy c. are very interested
d. do not like to work hard
- drive: He **drives** fast. () a. swims b. learns c. throws balls d. uses a car

7. jump: She tried to **jump**. () a. lie on top of the water b. get off the ground suddenly c. stop the car at the edge of the road d. move very fast
8. shoe: Where is your **shoe**? () a. the person who looks after you b. the thing you keep your money in c. the thing you use for writing d. the thing you wear on your foot
9. standard: Her **standards** are very high. () a. the bits at the back under her shoes b. the marks she gets in school c. the money she asks for d. the levels she reaches in everything
10. basis: This was used as the **basis**. () a. answer b. place to take a rest c. next step d. main part

Supplementary Materials Section S2. Knowledge Scale Test of 80 Words

Choose the most suitable one (I–V) for you to fill in the bracket, and do as told in the bracket if you choose one from III to V. One example is shown how to do it.

- I. I don't remember having seen the word before.
 - II. I have seen this word before, but I don't know what it means.
 - III. I have seen this word before, and I think it means _____. (synonym or translation)
 - IV. I know this word. It means _____. (synonym or translation)
 - V. I can use this word in a sentence: _____. (Make a sentence.) (If you do this section, please also do Section 4
- For example, drive (V) I can drive the car. 驾驶.

1 treat ()	21 illegal ()	41 casual ()	61 launch ()
2 abundant ()	22 economical ()	42 staff ()	62 reluctant ()
3 transfer ()	23 alter ()	43 prohibit ()	63 chill ()
4 chew ()	24 register ()	44 appeal ()	64 boast ()
5 objective ()	25 ensure ()	45 tackle ()	65 chase ()
6 intend ()	26 emit ()	46 reputation ()	66 switch ()
7 optional ()	27 distribute ()	47 slip ()	67 contrast ()
8 despite ()	28 strategy ()	48 contact ()	68 pitch ()
9 intense ()	29 influence ()	49 assignment ()	69 negotiation ()
10 expand ()	30 dim ()	50 entitle ()	70 drift ()
11 local ()	31 individual ()	51 illustrate ()	71 kit ()
12 acknowledge ()	32 insert ()	52 discipline ()	72 drain ()
13 behalf ()	33 discharge ()	53 characteristic ()	73 squeeze ()
14 generous ()	34 hint ()	54 criticise ()	74 collect ()
15 resolve ()	35 remark ()	55 exhaust ()	75 install ()
16 automatic ()	36 efficient ()	56 assist ()	76 response ()
17 species ()	37 adequate ()	57 deceive ()	77 convey ()
18 involve ()	38 appropriate ()	58 overtake ()	78 commercial ()
19 estate ()	39 brand ()	59 consume ()	79 imitate ()
20 conduct ()	40 overall ()	60 legal ()	80 crack ()

Supplementary Materials Section S3. Questionnaire of Students' Perceptions of the App

This questionnaire is to collect information about your perceptions on using the app. This is not a test, so there is no 'right' or 'wrong' response. Your responses will be used for academic research only and will be treated with the utmost confidentiality. Your co-operation and contribution will be very much appreciated.

Part 1 Personal Information

Instructions: Please read each of the following items carefully and fill in the blanks or mark (✓) the responses which best describe your situation.

1. Gender: ☐ male ☐ female
2. Age: ____ Length of learning English: ____ English scores in NCEE: ____

3. Have you ever used any mobile application to learn English? Yes or no? If yes, what is it? And for what English skills (listening, speaking, reading, writing and translation) _____
4. Have you ever used any mobile application to learn English vocabulary? Yes or no? If yes, what is it? _____

Part 2 Perceptions on using the app

Instructions: Please read each statement carefully and choose (√) the responses which best describe your perceptions on using the app.

1 = Strongly Disagree; 2 = Disagree; 3 = Not sure; 4 = Agree; 5 = Strongly Agree

Items	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1. The vocabulary learning app is easy to use.	1	2	3	4	5
2. Learning vocabulary via the app is convenient, for I can choose place and time to learn new words.	1	2	3	4	5
3. The app makes vocabulary learning easier for me compared with wordlist.	1	2	3	4	5
4. It is a good method to learn vocabulary via the app.	1	2	3	4	5
5. I prefer the app to traditional wordlist for learning vocabulary.	1	2	3	4	5
6. The vocabulary learning app motivates me to learn new words.	1	2	3	4	5
7. The app is useful for me to learn vocabulary.	1	2	3	4	5
8. The Learning Sections in the app help me learn vocabulary more effectively.	1	2	3	4	5
9. The immediate feedback in the app can push me to monitor and adjust my vocabulary learning.	1	2	3	4	5
10. The Retrieval sections in the app enable me to review and remember the vocabulary well.	1	2	3	4	5
11. The app makes vocabulary learning more convenient outside classroom.	1	2	3	4	5
12. I can learn the words easier based on the pictures and example sentences in the app.	1	2	3	4	5
13. The example sentences can consolidate words in my mind.	1	2	3	4	5
14. The vocabulary learned via the app is not easily forgotten.	1	2	3	4	5
15. The example sentences help me learn how to use the words appropriately.	1	2	3	4	5
16. In the future, I will continue to use the app to learn vocabulary.	1	2	3	4	5

Supplementary Materials Section S4. The Interview Questions on Perceptions of the App

1. Do you enjoy learning vocabulary via the App? Yes, or no? And why?
2. Is the app helpful for your vocabulary learning? If yes, in what ways? If no, why not?
3. Is the app interesting? If yes, in what ways?
4. Comparing the traditional word list-based learning approach with the App-assisted vocabulary learning, which one do you prefer? And why?

5. Please describe your opinions of the App?
6. Is it convenient for you to learn vocabulary via the App? If yes, in what ways?
7. What do you think of the pictures or example sentences in the App?
8. What do you think of the vocabulary exercises in the App?
9. What do you think of the prompt feedback in the App?
10. What else would you like to say about the App-assisted vocabulary learning in the present study?
11. What do/don't you like about the mobile App? Please describe it.

Supplementary Materials Section S5. The Informed Consent Form for the Experimental Group

You will participate in a research project to explore the effects of using a mobile application on CET4 vocabulary learning and retention. It will be conducted for a period of 8 weeks in the first semester of academic year 2021–2022. Your role in this study is to learn 80 CET 4 words via a mobile app independently by the five times per week schedule, and keep diaries. Besides, the relevant pretest, posttest, delayed-posttest will be conducted. Also, diaries will be collected weekly and the semi-structured interview will be performed at last. All information that you provide will be kept strictly confidential. I promise not to use your real name during my whole thesis. Once this study is completed, I will summarize my findings, which hopefully are helpful for your vocabulary learning, especially CET4 vocabulary learning. If you have any questions about this research project, please feel free to contact me at maxxjxnu@qq.com. If you agree to participate in this project, please sign below. Thank you for your cooperation.

Sincerely,

Researcher: a Ph.D. and an English lecturer in YuZhang Normal University

Signed Participant:

Date:

Signed Researcher:

Date:

Supplementary Materials Section S6. The Informed Consent Form for the Control Group

You will participate in a research project to explore the effects of using a paper-based wordlist on CET4 vocabulary learning and retention. It will be conducted for a period of 8 weeks in the first semester of academic year 2021–2022. Your role in this study is to learn 80 CET 4 words with the paper-based wordlist independently by the five times per week schedule, and keep diaries. Besides, the relevant pretest, posttest, delayed-posttest will be conducted. Also, diaries will be collected weekly. All information that you provide will be kept strictly confidential. I promise not to use your real name during my whole thesis. Once this study is completed, I will summarize my findings, which hopefully are helpful for your vocabulary learning, especially CET4 vocabulary learning. If you have any questions about this research project, please feel free to contact me at maxxjxnu@qq.com. If you agree to participate in this project, please sign below. Thank you for your cooperation.

Sincerely,

Researcher: a Ph.D. and an English lecturer in YuZhang Normal University

Signed Participant:

Date:

Signed Researcher:

Date:

Supplementary Materials Section S7. Results concerning the Diaries of Experimental Group

Table S3. Time length, studying time for 10 words/week, and feelings from EG.

Times/Week	The 1st Time	The 2nd Time	The 3rd Time	The 4th Time	The 5th Time	Total Time/Week
Average time length (min)	20	18	17	10	10	75
Studying time (number, percentage)	Students' writings					
-in early morning (38, 76%)	D6W2EG: ...when I woke up at 6:00 a.m. before getting up, I would switch on smartphone and use the app to learn words...					
-between two classes (30, 60%)	D28W5EG: ...usually I use the app to review words during the 20 minutes' break time between two classes...					
-during the meals (31, 62%)	D31W4EG: ...I often learn the words through the app while I am queuing or eating in the canteen...					
-during going-out period (40, 80%)	D18W9EG: ...when I go outside and take a bus, I like using the app to learn words for killing time...					
-late at night (45, 90%)	D42W7EG: ...After 11:00 P.M., I got on the bed and could not fall asleep easily. Then I turned on the smartphone to learn words via the app...					
Feelings by category (number, percentage)	Students' writings					
1 Preferable (41, 82%)						
-in memorizing words	D32W9EG wrote: "After using the app to learn vocabulary, I can retain them solidly without tiredness, so I like it."					
2 Convenient (45, 90%)						
-in time and place	D37W4EG wrote: "Whenever and wherever I want to learn or review vocabulary, I can use the app."					
3 Effective (41, 82%)						
-in memory of words	D16W4EG wrote: "The learning section and retrieval section of the app could consolidate my memory of the words."					
4 Reasonable (44, 88%)						
-in learning 10 words at a time	D31W2EG: ...using the app to learn 10 words per time outside the class is reasonable and easy...					
-in 5 times' schedule per week	D38W5EG: ...The teacher gave us the five-time schedule of the app so that we didn't have any pressure to learn words...					
5 Satisfied (37, 74%)						
-with an increase in vocabulary size	D4W5EG wrote: "I know more words than before week after week, so I am very content with the app."					
6 Fun (38, 76%)						
-in the process of learning words	D14W8EG: ...in the process of learning words, this app will alleviate the boring of learning words and add more fun...					
-in the process of remembering words	D8W7EG wrote: "To learn and remember target words through the app bring me much fun."					
7 Easy (34, 68%)						
-in memorizing words	D25W8EG wrote: "it is not difficult for me to retain them after using the app to learn target words."					
8 Useful (42, 84%)						
-in the pronunciation of words	D31W3EG: ...using the app to review words could correct my pronunciation...					
-in increasing interest in English	D43W4EG: ...after using the app for three weeks, my interest in English learning is much improved...					
-in memorizing words	D39W6EG wrote: "it is useful for me to learn and remember vocabulary fast with the app."					
-in increasing confidence in Eng-	D25W2EG: ...After using the app, my heart has lighted a raging fire, and my confidence in English comes					

lish

back...

9 Willing to persist

(40, 80%)

-in learning words via the app

D34W3EG wrote: "If possible, I will continue to utilize the app for learning vocabulary in the future.."

10 Difficult (10, 20%)

-in sticking to the schedule during military training

D43W4EG: ...Because of military training, the arrangement each day was full. It was very difficult to stick to the five-time schedule to learn words...

-in remembering the pronunciations and meanings of all words

D24W6EG: ...but it was difficult to remember the pronunciation and meanings of every word completely...

-in recalling the words

D48W7EG: ...I felt I could not recognize the words after seeing them if I switched off the smartphone...
