Digital Note-Taking Strategies in EFL Vocabulary Learning

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Abstract. Most college students take lecture notes. Studies have shown that effective note-taking practices can improve study practices, course outcomes, and retention of content. While L2 vocabulary learning is one of the most popular topics in mobile-assisted language learning, little attention has been paid to the effect of digital lecture notes on vocabulary learning. This study responds to the call for further research on mobile-assisted vocabulary learning through digital note-taking with a tablet. Both quantitative data from a 5-point Likert scale and qualitative data from interviews were analyzed to extract themes representing different strategies. It was revealed in the study that this group of EFL students mainly employed four categories of learning strategies in digital note-taking: organization, encoding, processing, and reviewing. Additionally, participants encountered two major challenges: distraction and over-dependence. These findings will help with the development of the framework for learning strategies. Guidelines are suggested to help instructors improve students' performance in vocabulary learning.

Keywords: Note-taking · Learning strategies · Mobile-assisted vocabulary learning

1 Introduction

1.1 Note-Taking

Taking notes is an essential component of academic life that has been practiced in higher education for centuries [1]. Note-taking can be non-generative, i.e., writing verbatim what is heard, and generative, a way of recording notes in one's own words. More cognitive efforts are required for generative note-taking, which benefits knowledge processing, retention, and learning [2]. The effects of note-taking on learning have been previously studied in the encoding function (i.e., improving learning and retention by the process of taking notes) and the external storage function, manifested by the availability of information to boost content recall [3, 4].

1.2 Vocabulary Learning and Note-Taking Strategy

The hypothesis of input enhancement reveals how the input of vocabulary knowledge is made salient to learners [5]. Salience can be enhanced mainly through implicit strategies

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(e.g., bolding, underlining) and explicit strategies (e.g., retelling, practice). Norris and Ortega have argued that the explicit instruction benefits learning more significantly than the implicit instruction [6].

The effect of strategy instruction on the improvement of the second language learning and usage represents a growing field. There have been several attempts to establish a vocabulary learning strategy taxonomy. Gu and Johnson have compiled a substantial list of vocabulary learning strategies encompassing a basic scheme of beliefs about vocabulary learning, metacognitive regulation, and several cognitive strategies including note-taking [7].

Previous studies have substantiated that many students take ineffective notes, which may not exert a profound influence on learning. Therefore, more emphasis should be placed on the use of note-taking strategies [8]. As technological devices are increasingly adopted in vocabulary learning, it's essential to examine strategies students used when implementing digital note-taking. The term digital note-taking in this study refers to a method of writing, storing, sharing, and reviewing notes on a tablet through utensils or Apple Pencils.

Although studies have begun to examine the tablet-enhanced note-taking [9], they mainly concentrated on the merits and demerits of note-taking applications. Detailed investigations of students' behaviors when taking digital notes have not been conducted.

The current study is driven by the following three research questions: What type of learning strategies do Chinese EFL learners use in digital note-taking to learn the vocabulary from the Advanced English class? What are the students' attitudes towards adopting digital note-taking and what are the manifested major challenges for students to take advantage of digital notes?

2 Method

The study began with the observations of a class comprised of twenty junior students majoring in English at a university in China, more than half of them used a tablet to take notes in the Advanced English course, a compulsory course designed for English majors in China.

After observing participants' behaviors and having five pilot interviews with the purpose of investigating their after-class strategies, a 5-point Likert scale was developed with 18 questions related to the frequency of strategy use as well as 11 questions regarding participants' perception of digital note-taking. Forty-two questionnaires were randomly distributed to students who were taught by the same teacher in the Advanced English course. A total of 40 questionnaires were analyzed with two excluded due to incompletion and invalidity.

Then, a follow-up semi-structured interview was conducted among 30 students who had finished the questionnaire. The questionnaire items and interview questions were based on observations and previous research into technology-assisted learning strategies [8, 10]. As participants were interviewed in their first language, the transcripts were then transcribed into English to analyze and refine themes.

3 Results and Discussion

Table 1 displays the quantitative results of the 5-point Likert scale questionnaire in percentages related to strategy use, followed by qualitative findings of sub-strategies with examples derived from the interview in Table 2. The questionnaire also illustrated that this group of EFL students generally adopted a positive attitude towards digital note-taking.

From the table, it can be seen that "zoom in or out on the interface" (Item 1, M = 4.43) is the most frequently used strategy, followed by "look up the Chinese meaning of the word" (Item 2, M = 4.18). In the study, the operational strategy refers to the generic strategies used in both in-class and after-class scenarios, i.e., "zoom in or out on the interface" and "Use a split-screen mode" (Item3, M = 3.93). Accordingly, other strategies related to vocabulary learning are represented by the term "learning strategy". Based on the content of the questionnaire, there emerged four clusters of items. In-class learning strategies were labeled as organization and encoding while after-class learning strategies included processing and reviewing strategies.

3.1 Organization

The term organization is used to describe a series of strategies that advance the arrangement of written notes, mainly involving meta-cognitive strategy as students organize their notes to monitor vocabulary learning when they adopted the organization strategies. As shown in Table 1, highlighting was found to be a frequently used strategy with a mean rating (3.68) between *often* (3) and *usually* (4). In the interview, almost all of the participants commented that they often use the highlight tool and some illustrated that it

Table 1. Strategies used by students (N = 40) when learning words in digital notetaking

Items	M	Std	1	2	3	4	5
1. Zoom in or out on the interface	4.43	0.95	2.50%	5.00%	2.50%	27.50%	62.50%
2. Look up the Chinese meaning of words	4.18	0.86	0.00%	5.00%	15.00%	37.50%	42.50%
3. Use a split-screen mode	3.93	1.03	2.50%	5.00%	27.50%	27.50%	37.50%
4. Add slides images to notes	3.88	1.12	7.50%	2.50%	17.50%	40.00%	32.50%
5. Highlight the text with color	3.68	0.96	2.50%	10.00%	22.50%	47.50%	17.50%
6. Retrieve words in digital notes	3.28	1.05	5.00%	17.50%	35.00%	30.00%	12.50%
7. Supplement notes with pictures	3.25	1.20	12.50%	7.50%	40.00%	22.50%	17.50%
8. Supplement notes through copy and paste	3.23	1.17	5.00%	27.5%	25.00%	25.00%	17.50%
9. Seek help from classmates or teachers	3.20	1.05	5.00%	22.50%	30.00%	32.50%	10.00%

Choose 1 (Never), 2 (Sometimes), 3 (Often), 4 (Usually), and 5 (Always)

Table 2. Learning strategies students (N = 30) adopted in digital note-taking and frequencies in the interview

Category		Items	Frequency
Operational strategies		Zoom in and zoom out	30
		Use split-screen mode	21
Learning strategies	Organization	Highlight texts with different colors	27
		Use a template	6
	Encoding	Add slides images to notes	28
		Recording	4
	Processing	Further searching	20
		Help-seeking	5
	Reviewing	Retrieval of content	23
		Word usage	6

is a strategy they did not utilize with traditional pen and paper as they considered switching stationeries as inconvenient and time-consuming in a fast-paced class. In Smith's input enhancement theory [5, 11], highlighting performs the same role as underlining, which is regarded as an implicit strategy to enhance word learning. With easier access to the highlight tools in a digital note-taking application, students may benefit from highlighting the words as it stimulates input processing and thus vocabulary learning.

Additionally, it can be seen from the data in Table 2 that taking notes on a tablet inspired participants with new methods (Cornell note-taking method in the study) to take notes, improving the organization of notes.

3.2 Encoding

As the encoding function of note-taking occurs when notes are being taken, encoding in the study refers to the kind of strategies employed to facilitate learning when taking digital notes in class. Table 1 showed that 92.5% of the participants would add images of lecture slides to notes in class. Most of the students in the interview found taking photos on their tablet computer, especially combined with further annotation in them, to be a helpful strategy to learn vocabulary. This is in accordance with the study of Gao and Shen [10], who investigated learning strategies employed by EFL learners in China and found that taking pictures of lecture slides was a strategy frequently used by the participants.

In the current study, note-taking applications made it possible to take a photo or make a sound recording and directly insert it into the digital notes, avoiding the process of writing down words verbatim and consequently refocusing students' attention back on what the teacher said to improve their understanding. Moreover, substituting transcription with pictures or recordings leaves more time for students to organize and take generative notes, which requires more cognitive efforts [2], and thus is beneficial to the retention of words.

3.3 Processing

Learning strategies of processing are mainly divided into interaction with objects (further researching) as well as with other people (help-seeking). These results are consistent with the findings of Chen [8], who found after-class note-taking strategies used by students included elaboration to supplement information and seek help.

While 72.5% of participants agreed that they would seek help from classmates or the teacher, the percentage of participants who remarked that they discussed leftover questions in notes after class was less than 20% in the interview. A possible explanation for the inconsistency might be that a considerable number of participants usually asked for lecture slides instead of specific questions about a certain word.

3.4 Reviewing

Concerning retrieval of words in digital notes, 95% of participants opted that they *sometimes* or more often used the strategy. In the interview, participants acknowledged the benefits brought by retrieving a word to refresh their memory and enhance the form-meaning link, "*Goodnotes can recognize my handwriting and help me locate the word I want to review when I forget its meaning*" (Participant 3).

Although few, there emerged some students in the study who practiced using the word through speaking or writing. Participant 31 explained:

I would copy the example sentences to one page and use these expressions when practicing speaking. I usually assume that I was talking to others and responding to them with language points on the page.

Students with higher digital literacy may make full use of various functions in note-taking applications, which equip students with ways to organize their academic materials and test themselves on the content of notes. Previous studies have testified that active processing, such as self-explanation or self-testing, is much more productive than passive reading [12]. With the help of digital devices, it will be significant to raise students' awareness to practice instead of merely rereading their notes.

3.5 Perceptions Towards Digital Note-Taking

The questionnaire results also revealed students' attitudes towards applying digital note-taking. Sixty percent of the participants were aware of its benefit in making vocabulary learning more efficient. However, 35% of the participants did not realize the difference between digital and traditional note-taking, and 5% disagreed with the benefits brought by digital note-taking. In the interview, over-dependence and distraction were found to be the major constraints of digital note-taking, which were well captured below:

Although it is convenient to insert photos in class, this strategy can be adopted without thinking, which may affect my learning efficiency in class. (Participant 13)

In the past, we always used electronic devices for recreation. When I began to use a tablet to study, I found it hard to focus on what I'm learning. (Participant 12)

Both the qualitative and quantitative data implied the existence of over-dependence on technology in that students may completely regard the notes as a corpus to retrieve information, insert pictures without thinking and rely on lecture slides to get a better

understanding without raising questions, which hinders the actual learning of vocabulary. Therefore, measures like student-teacher interaction and testing are suggested to ensure the internalization of word knowledge.

4 Conclusion

The present study contributes to the understanding of vocabulary learning by exploring students' strategies adopted when taking digital notes and the challenges of learning words with a tablet.

In this study, participants' use of two operational strategies and four types of learning strategies was identified in a tablet-assisted learning environment. The study revealed that though participants took advantage of digital notes applications when taking and processing notes, few students resorted to productive methods when reviewing digital notes.

As demonstrated in the research, students with instructions in certain aspects, i.e., raising awareness of explicit learning and avoiding over-dependence on digital devices, may benefit more from implementing digital note-taking. Additionally, when it comes to the teacher, apart from guiding students towards a better mastery of mobile-assisted learning, monitoring their performance is necessary to prevent over-reliance. However, the current study did not make a deeper exploration of the effects of applying digital note-taking through indicators such as tests. Future research can continue to investigate the impact brought by digital note-taking through detailed experiments.

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