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Taiwanese English Majors' Acquisition of Technical Vocabulary in TESOL Profession

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This study explored the effects of the instructional strategies on technical vocabulary among 36 English majors in a TESOL course in a teacher education program in a university in northern Taiwan. The analysis of document, questionnaire, and participants' final writing projects revealed that participants regarded "the instructor's explanations and use of technical vocabulary" as the most useful instructional strategies. The instruction on technical vocabulary influenced the participants' vocabulary use, particularly in memory recall and their final writing projects. The most frequent technical vocabulary used in the final writing projects was related to participants' research topic interest. Suggestions on effective instruction in technical vocabulary are provided.

Key words: English majors, instructional strategies, memory recall, technical vocabulary

Introduction

Reading academic texts in English is crucial for English as a foreign language (EFL) undergraduates at tertiary level. They may encounter technical vocabulary and feel challenged in their disciplinary reading (Coxhead, 2000; Hyland, 1997, 2009; Mirzaei, Shakibaei, & Jafarpour, 2017; Wray, 2000). In addition to high frequency words and academic vocabulary of words, EFL learners should be trained to be equipped with technical vocabulary, referring to the domain-specific corpus, the terminology, and usage of the specific academic discipline (Nation, 2001; Smith, 2011; Veenstra & Sato, 2018). Braun (2005) argues that corpus should be pedagogically relevant, referring to corpus as "relevant for the needs of the target group" (p. 53). Hyland and Tse (2009) suggest that teachers should assist students to develop the disciplinary-based lexical repertoire. So learners can acquire and have the sense of ownership of the technical vocabulary in their disciplines.

In the field of TESOL (Teachers of English to Speakers of Other Languages), there is a great amount of jargon or technical vocabulary for language teachers to understand and use (Copland, 2008). As a language teacher trainer in Taiwan, the researcher teaches undergraduates whose major is English instruction. These undergraduates are expected to be English teachers in the future and have been taking courses related to English learning and teaching. They should be able to capture the language used in the TESOL academy in order to understand and clearly describe the disciplinary knowledge. However, they still lack technical vocabulary in the TESOL field. Not all of them have competence in using the correct terminology during their class presentations.

What is worse, during the simulation practice for the oral interview for the elementary school English teacher's screening test, they cannot produce the TESOL technical vocabulary, such as Total Physical Response (TPR) or information gap. When asked questions such as "What have you learned from your

pre-service language teacher education program?" or "How will you teach picture books?" they answered, "I learned something" instead of "I learned TPR," or "I learned different instructional strategies and activities, such as information gap for oral practice," or "I will use different reading instruction strategies, such as picture walk, prediction, or making connections."

Writers require support for their academic writing, particularly vocabulary (e.g., technical terms, hard words, academic clusters) and systematic trainings and instruction are recommended (Hsieh & Liou, 2008; Lo, Liu, & Wang, 2014). In the present study, technical vocabulary was introduced to English majors in a university course in northern Taiwan. The aim of this study was to explore the effects of instructional strategies on technical vocabulary on Taiwanese English majors' learning strategies and acquisition of technical vocabulary related to TESOL profession. This article seeks to address the following questions. First, what techniques or strategies did English majors employ for learning technical vocabulary? Second, what was participants' attitude toward the instructional strategies on technical vocabulary? Third, how did the participants' acquisition of the technical vocabulary influence their academic writing and performance?

Literature Review

Definitions and Importance of Technical Vocabulary

Scholars categorize words in different ways. While vocabulary is categorized into three levels: general service learning, academic vocabulary (non-specialized), and technical vocabulary (specialized) (Escudero, 2012), vocabulary is divided into three groups: high frequency words, academic words, and technical vocabulary (Nation, 2001). While Nation (2001) defines specialized vocabulary as "recognizably specific to a particular topic, field or discipline" (p. 198), technical vocabulary refers to vocabulary that is "subject related, occurs in a specialist domain, and is part of a system of subject knowledge" (Chung & Nation, 2004, p. 252). Scholars use different terms for technical vocabulary, such as terminological words, specialized lexis, technical terms, specialist vocabulary, or technical words (Chung & Nation, 2004). The term "technical vocabulary" is used in this study.

Technical vocabulary refers to word collocation or a grammatical form that differs from its other use (Chung & Nation, 2003). Technical vocabulary is usually presented with clues in the text. These clues include (1) the word being defined in the text, (2) the word being written in bold or italics, (3) the word appearing as a label in a diagram (Chung & Nation, 2003).

Technical vocabulary and academic discourse are extremely difficult for EFL learners no matter whether they are freshmen university students or advanced doctoral students. Chi (2010) compared and contrasted two drafts of a process writing task written by six Hong Kong engineering major freshmen in an English course. In the course, five major features were suggested as best avoided in academic writing, including phrasal verbs, general verbs, conversational English, idioms and abbreviations and contractions. Analysis revealed that these undergraduates failed to employ pertinent vocabulary or phrases used in academic writing. Therefore, Chi (2010) suggested that an academic word list should be included in English courses. With strong vocabulary knowledge, a foundation with reference skills can assist EFL learners' learning in academic English writing.

Technical vocabulary and specialist language of a discipline is crucial to learners' learning of disciplinary knowledge and academic studies (Coxhead, 2000; Coxhead & Nation, 2001). Learners need to understand the concepts of technical vocabulary and the relationship between technical vocabulary and the phenomena so they will be able to accurately use technical vocabulary in writing and make meaning of the disciplinary knowledge (Coxhead, 2000; Ma, 2015; Woodward-Kron, 2008).

Learners can then attain academic literacy and become part of the academic discourse communities (Hou, 2014; Hyland & Tse, 2007) and will be able to acquire the specialized discourse competencies to help them succeed in their field and participate as group members (Adel & Erman, 2012).

Instructional Strategies on Technical Vocabulary

Many studies recommend different instructional strategies in technical vocabulary (e.g., Chen, 2004, Nation, 2001). First, in order to develop learners' retainable lexical knowledge, language teachers can provide better quality of language samples for learners to be exposed to adequate sentence examples or contexts (Chen, 2004). Arno-Macia and Mancho-Bares (2015) analyzed the role of language learning in different content areas at a university in Spain. The observation data revealed that different levels of language support were included in different context. In the Law and Accounting courses, language-learning outcomes came from the exposure to content lectures. Explicit language-learning objectives and outcomes were emphasized in the Agronomy course. Hence, learners can acquire and master technical vocabulary when they have multiple exposures to it (Brun-Mercer & Zimmerman, 2015; Nation, 2001; Schmidt, 2000).

Second, technical vocabulary can be taught in target language and learners' L1. Gablasova (2015) compared the L1 and L2 instruction in technical vocabulary among 72 students recruited from two high schools in Slovakia with a Slovak-English Content and Language Integrated Learning (CLIL) bilingual program. The study concluded that the technical word knowledge of the L2-instructed participants was less precise and less elaborate than that of the L1-learning group. The L2-instructed students relied on the strategy of resorting to their existing knowledge and known concepts, which can negatively affect their learning progress.

Third, teachers should arouse leaners' awareness of technical vocabulary. Woodward-Kron (2008) discovered that there is little literature on the teaching and learning of discipline-specific vocabulary to gain disciplinary knowledge. Woodward-Kron (2008) focused on education context. Woodward-Kron (2008) used systemic-functional linguistics to analyze specialist language and its role in six students' disciplinary learning through writing in a Faculty of Education at one regional Australian university in terms of the concreteness, abstraction, and metaphors of being specific (i.e., Vygotsky, scaffolding, maturation), generic (i.e., learner, teachers), or semiotic (i.e., principles, theories). Analysis of the writing revealed that these six students used definitions for clarification and explanations, such as "Observational learning refers to the learning of behaviors through observation and imitation." Moreover, the concreteness was revealed in their writing, because the participants included specific theorists and researchers in early children development, such as Vygotsky or Piaget. Woodward-Kron (2008) identified the importance of raising awareness of the role of the specialist language of academic disciplines for learners' learning of disciplinary knowledge.

Next, a variety of strategies such as modeling, word games, or glossaries were identified in Bruce, Nolan, and Rees (2013) to be employed to assist learners develop their understanding of key chemistry terms. Word cards are employed to teach technical vocabulary (Coxhead, 2000). Visual aids were regarded as the most useful by the 35 participants in Durham University's Foundation Centre (Bruce et al, 2013). Teachers can raise learners' awareness of technical vocabulary (Coxhead, 2000). Learners need to be involved in the process of vocabulary construction so they have a sense of ownership and it can lead to the acquisition of transferable vocabulary knowledge (Smith, 2015a, 2015b). Six finance and accounting majors in an EAP program in the United Kingdom used the instructor's lectures to create their own vocabulary portfolio in learning technical vocabulary (Smith, 2015a, 2015b).

Furthermore, learners should be provided with the opportunity to use technical vocabulary productively and receive feedback on its use (Brun-Mercer & Zimmerman, 2015; Perrone, 2015). Zhu and Flaitz (2005) used focus group methodology to understand eleven international students' needs in academic language in English as Academic Purpose (EAP) in the United States. These international students had difficulties in understanding special terminology. Zhu and Flaitz suggested that language teachers should provide international students with authentic academic language experience, such as participating in group discussions, giving class presentations, or writing longer academic paper. Charles (2012) investigated 50 advanced EFL learners' attitude toward the do-it-yourself approach on discipline-specific corpus building for their academic writing. The analysis of initial and final questionnaires revealed that 90% of the

participants agreed a corpus was a useful resource for writing discipline-specific texts. In order to make sure that learners continue to use the corpus as a useful resource for their academic writing, instructors' just-in-time support and refresher sessions on using corpus and technical vocabulary should be provided (Charles, 2014).

Finally, effectively assessing learners' technical vocabulary is crucial. Kose and Yuksel (2013) used three instruments (Vocabulary Level Test, lexical frequency profile analysis of argument writing, and Test of Academic Vocabulary) to investigate 371 Turkish English language teaching (ELT) majors' lexical competence and performance. The result revealed that there was a salient effect of proficiency for ELT majors' academic vocabulary development.

Research Gap

The empirical studies investigated technical vocabulary instruction in English as Specific Purposes (ESP) in different content areas, including chemistry (i.e., Bruce et al, 2013), hospitality (i.e., Hou, 2014); accounting and finance (i.e., Smith, 2015a), agronomy (i.e., Arno-Macia & Mancho-Bares, 2015); law (i.e., Arno-Macia & Mancho-Bares, 2015) or academic writing (i.e., Brun-Mercer & Zimmerman, 2015; Charles, 2012; Chi, 2010; Zhu & Flaitz, 2005). The empirical studies (e.g., Arno-Macia & Mancho-Bares, 2015) concluded that it is important for learners to acquire technical vocabulary for gaining disciplinary writing improving academic writing. Limited studies explored English majors' acquisition of technical vocabulary in their TESOL field through the specific data, such as interviews, questionnaire, or course evaluation (e.g., Blakemore, 2012; Cheung, 2010; Schenck & Cho, 2012; Zareva, 2013). Different sources of data collected in this study were used to explore English majors' acquisition of technical vocabulary in the TESOL course and influence of the acquisition on their academic performance and writing.

Method

Participants and Setting

A total of 36 English majors participated in this study during the 2015 fall academic year from September 2015 to January 2016. The participants were seniors and simultaneously enrolled in the TESOL course, which was part of a language teacher education program in a city in northern Taiwan. This two-credit required English-delivered course was designed to provide a basic overview of research studies and current issues in English language teaching, so participants could complete a research proposal with accurate technical vocabulary.

The participants included 29 females and 7 males. With regard to their English proficiency levels, 55.6% (n = 20) of the participants had reached the B2 (vantage) of the Common European Framework of Reference for Languages (CEFR). However, 30.6% (n = 11) were at B1 (threshold), below the requirement for graduation as a major in English instruction. Of the participants, 11.1% (n = 4) and 2.8% (n = 1) were at C1 (effective operational proficiency) and C2 (mastery).

Materials

A total of 139 technical vocabulary was selected based on the issues covered and introduced in the TESOL course. While the word list for the topic "pronunciation" included 30 technical vocabulary items, only nine technical vocabulary items were introduced for the topic "writing." During the 2015 fall academic year, a variety of instructional strategies were employed in order to develop these undergraduates' understanding of TESOL-specific vocabulary. The range of activities included: (1) the instructor's explanations, (2) visual aids (i.e., word cards, flashcards), (3) reading academic journal

articles and conference abstracts, (4) word wall (relevant words on certain topics, i.e. curriculum development, listening, reading), and (5) word tasks (i.e., True or False, Spotlight Vocabulary, Matching, Information Gap, Runner and Brainer, A-Z terms, Jeopardy).

Class photos, handouts, projects, and PowerPoint files were collected as documents during the course. The instructor used PowerPoint slides to show the theories on technical vocabulary and the instructor used the flashcard to describe the definitions. Figure 1 was the example of "metacognition" and its definition "a person's awareness of how they think and learn."
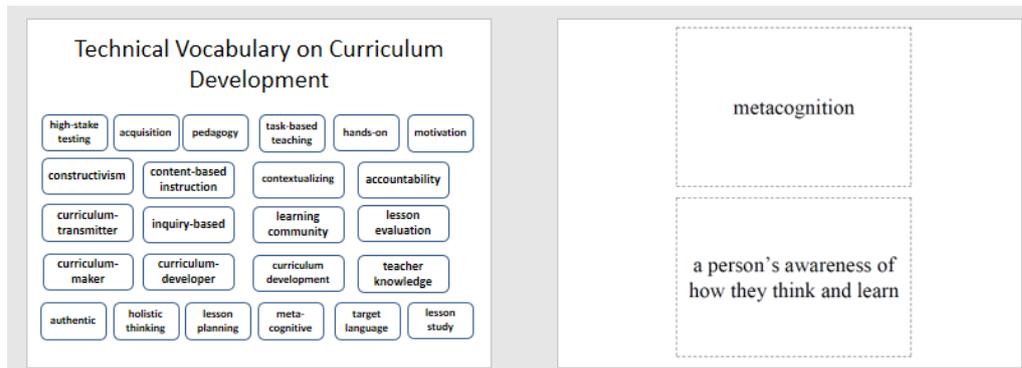

Figure 1. PowerPoint slide and flashcards on word explanations.

The participants were asked to read the assigned abstract and write down technical vocabulary related to curriculum development. Participants wrote some items of technical vocabulary on curriculum development, such as content-based, authentic text, or attribution as in Figure 2.
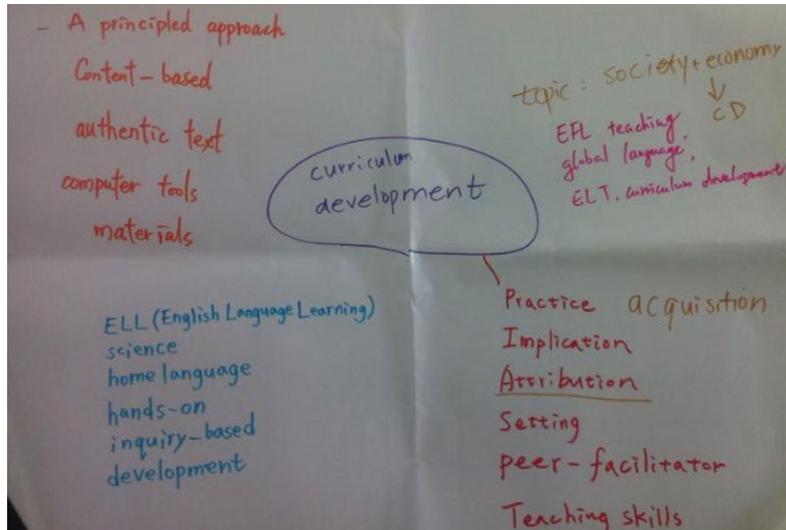

Figure 2. Participants' discussions on curriculum development.

Different tasks were designed, including True or False, Spotlight Vocabulary, Matching, Information Gap, Runner and Brainer, A-Z terms, and Jeopardy. Figure 3 was the Jeopardy on the pronunciation instruction. Participants were divided into different groups. Each group took turns to choose one category (i.e., manner of articulation, place of articulation) starting with the easiest one. If the group got the correct answer, the group got the point.
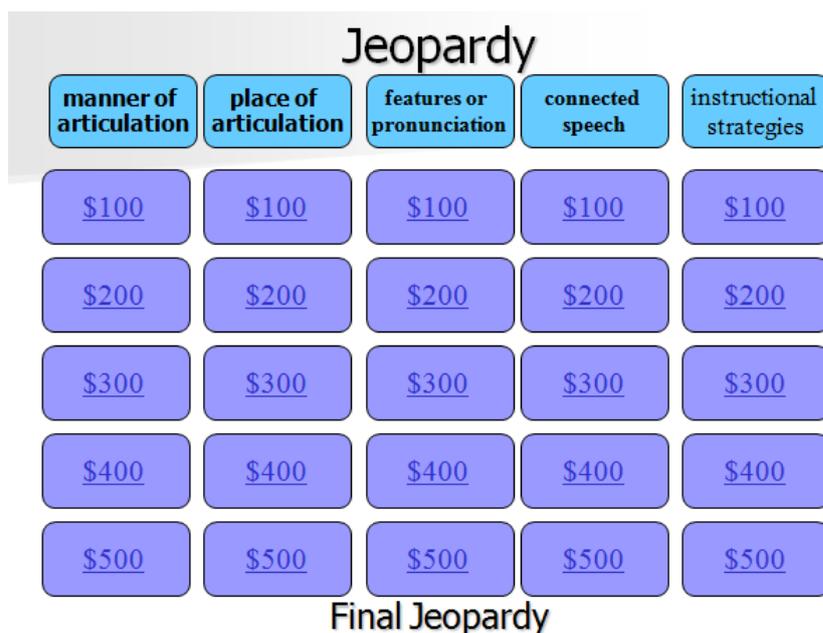
Figure 3. Jeopardy on pronunciation instruction.

For the final writing project, participants were required to write a research proposal. This proposal included: (1) title, (2) research background, (3) research questions, (4) a very brief overview of the related literature, (5) the rationale for the study, (6) research questions, (7) a brief description of the participants and setting, (8) a description of data collection procedure, and (9) references.

These 36 participants worked individually or in groups to complete their final writing projects. A total of twelve projects were completed; however, four of them were written in Chinese and focused on linguistics and literature. Only eight writing projects were included for the data analysis. Four writing projects focused on reading; three projects on curriculum development, and only one project on writing.

Instrument

The questionnaire was designed based on Bruce et al. (2013) and Brun-Mercer and Zimmerman (2015). The questionnaire included four parts. The first part was the personal background information, including name, age, gender, language test scores, and English learning experience. While the second part was related to the learning strategies participants used for learning technical vocabulary, the third part of the questionnaire was used for participants' evaluation of the instructor's instructional strategies. The 6-point Likert scale was used in the second and third part of the questionnaire and participants chose from 1 "strongly disagree" to 6 "strongly agree." The last part of the questionnaire was ten open questions on learners' reflections on learning and using technical vocabulary, such as "Do you remember using any technical vocabulary from this class in your final project? Could you give some examples?" Participants completed the questionnaire on the last day of the course.

The questionnaire was given to two experts to assure the content validity. For the trial test, the questionnaire was given to four juniors of the same department. Cronbach's alpha was 0.83 and 0.75 for the second and third part of the questionnaire with good internal consistency.

Data Analysis

The qualitative data, including documents and writing projects, were used to answer the third research question, "How did the instructional strategies influence English majors' use of technical vocabulary?"

The quantitative data from the questionnaire were used to answer all three research questions, mainly the first and second research questions: "What techniques do English majors employ for learning technical vocabulary? and "What instructional strategies can assist these English majors to learn and use technical vocabulary effectively?

Data were analyzed by the following steps. First, the Likert responses were coded on a scale of 1 to 5. The numerical description was employed for the mean and standard deviation. Second, the researcher first used the class PowerPoint slides on the technical vocabulary in seven topics to identify the technical vocabulary written in eight final writing projects. Finally, the researcher read through the document and the open-ended parts of the questionnaire and labeled each data with codes (i.e., definitions, tasks, word wall). Categories and themes were generated based on the research questions.

Results

Learning Strategies on Technical Vocabulary

As shown in Table 1, of all the learning strategies, the most popular learning strategies employed by the participants were "I searched websites" (n = 33, 91.7%), followed by "I recalled the technical vocabulary taught by other instructors" (n = 24, 66.7%) and "I recalled the technical vocabulary from texts from other classes" (n = 23, 63.9%). The least popular learning strategy used by the participants was "I made word lists of technical vocabulary" (n = 6, 1.67).

TABLE 1
Learning Strategies on Technical Vocabulary

	Agree		*M*	*SD*
	n	%		
1. I looked up the technical vocabulary in a dictionary.	16	44.4	4.19	1.09
2. I used L1 an assistance.	19	52.8	4.39	0.99
3. I kept a notebook.	19	52.8	4.56	0.97
4. I made word lists on technical vocabulary.	6	1.67	3.47	1.16
5. I recalled the technical vocabulary from texts from other classes.	23	63.9	4.56	1.00
6. I recalled the technical vocabulary taught by other instructors.	24	66.7	4.69	0.82
7. I searched websites.	33	91.7	4.44	0.73
8. I read academic journals.	17	47.2	4.36	1.16
9. I used memorization skills.	14	38.9	4.36	0.64

In this study, participants tried to learn unfamiliar technical vocabulary in the academic texts, websites, or mother tongue. They also tried to establish their word knowledge of the technical vocabulary through the instructor, memorization skills, word lists, or notebooks. Learners should be directed to identify their vocabulary strategies (Chung & Nation, 2003) and the vocabulary learning strategies these participants tried were "sources" and "process" (Nation, 2001).

Attitude Toward the Instructional Strategies on Technical Vocabulary

As shown in Table 2, the participants felt "The instructor's definitions and explanations of technical vocabulary were useful" (n = 32, 88.9%), such as the example provided in Figure 1 to be the most useful instructional strategy, followed by "The instructor used the technical vocabulary in class" (n = 28, 77.8%) and "The instructor used mind-mapping on technical vocabulary" (n = 28, 77.8%) as in Figure 2.

TABLE 2
Instructional Strategies on Technical Vocabulary

	Agree		*M*	*SD*
	n	%		
1. Reading copies of academic journal articles provided in class was helpful.	27	75	5	0.72
2. Reading conference abstracts provided in class was useful.	27	75	4.97	0.77
3. Searched for technical vocabulary from academic journals and conference abstracts helped me become professional.	25	69.4	4.94	0.83
4. Visual aids on technical vocabulary were useful.	23	63.4	4.75	0.81
5. The instructor's definitions and explanations technical vocabulary were useful.	32	88.9	5.28	0.70
6. The instructor used the technical vocabulary in class.	28	77.8	5.08	0.73
7. The instructor used mind-mapping on technical vocabulary.	28	77.8	5.03	0.77
8. The lists of technical vocabulary as the word wall were helpful.	25	69.4	4.83	0.81
9. Different tasks on technical vocabulary in class were useful.	25	69.4	4.97	0.77

This finding was in accord with Brun-Mercer and Zimmerman (2015), that learners benefit from being explicitly taught the new term or technical vocabulary. Nation (2001) identifies aspects of word knowledge in terms of knowing related grammatical patterns, common lexical sets, associations, and using the word receptively and productively. When teaching technical vocabulary, teachers should provide definitions, translations, part of speech, sentences, or expressions. In addition to teaching complete word knowledge of technical vocabulary, teachers can help learners by being good models of using the technical vocabulary (Chamot, 2009). When presenting and explaining TESOL issues, instructors are encouraged to use appropriate technical vocabulary and sentence structures with paraphrases, definitions, and examples.

Participants regarded "reading the technical vocabulary in context, such as journal articles and conference abstracts" as useful (n = 27, 75%) as in Figure 4. Brun-Mercer and Zimmerman (2015) recommend that learners should be provided with opportunities to explore the technical vocabulary in different types of texts and genres. By doing so, learners will become familiar with authentic linguistic patterns and ensure the technical vocabulary is used accurately.

Figure 4. Samples of a conference abstract.

Participants regarded the instructional strategies, such as searching for technical vocabulary, word wall, or class tasks, as beneficial to their learning of technical vocabulary (n = 25, 69.4%). Word walls are "bulletin boards that contain a collection of high-frequency or theme-related words and their activities include games that focus on using the word wall to learn sight words" (Jasmine & Schiesl, 2009, p. 301). In this study, the word wall, or word list was used to help 36 participants review technical vocabulary on the topic "listening" as in Figure 5. Word walls can be used as one type of effective instructional

strategies and teaching aids, because they help learners remember connections between words, retain knowledge of the word, and ultimately read them with automaticity (Callella, 2001; Ehri, 2005; Jasmine & Schiesl, 2009).
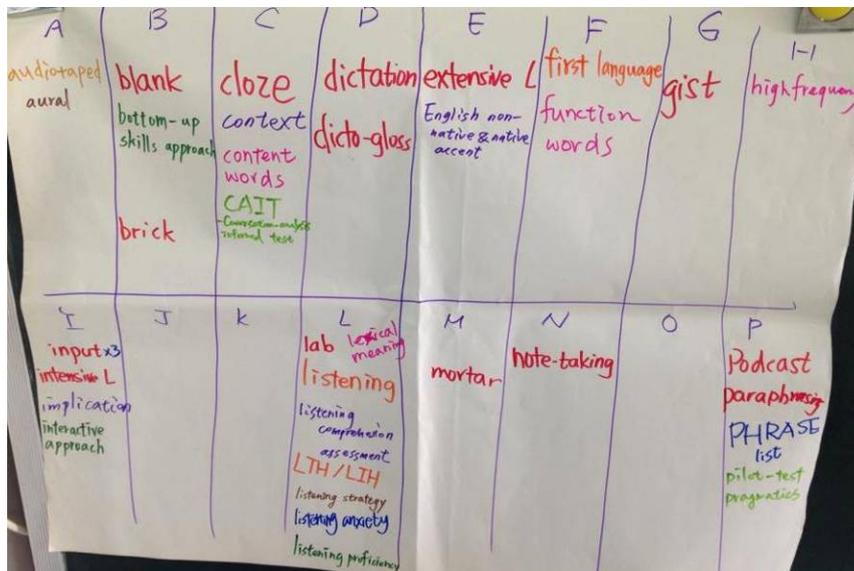

Figure 5. A-Z word wall.

Participants in this study practiced and reviewed the technical vocabulary by participating in different tasks, such as Jeopardy in Figure 3. Learners can be more confident in using the new technical vocabulary when they have learned the word in a meaningful way and have multiple exposures to it and in different contexts (Brun-Mercer & Zimmerman, 2015).

Participants regarded visual aids as the least useful instructional strategies (n = 23, 63.4). Nation (2001) defines "learning from word cards" as "the formation of associations between a foreign language word form (written or spoken) and its meaning (often in the form of a first language translation, although it could be a second language definition or a picture or a real object)" (p. 296). Flashcards are used to encourage learners to retrieve the meaning of the target word from memory and eventually leads to a more permanent learning (Barcroft, 2007; Nation, 2001). In this study, the instructor used the flashcard as shown in Figure 1 to help participants build the relationship between the word and its meaning.

Use of Technical Vocabulary in Academic Writing

Of a total of 139 technical vocabulary items introduced in the handouts in the TESOL course, as shown in Figure 1, 59% (n = 49) was written in the participants' final writing projects. Some of the technical vocabulary was frequently written and used in the final writing projects, as shown in Table 3. The most frequent technical vocabulary used in the final projects was "motivation" and "task" (n = 6), followed by "picture book" and "story book" (n = 4). The technical vocabulary above was repeated in these eight writing projects because these research writing projects focused on integration of tasks and picture books to motivate learners' English learning.

TABLE 3
Words Written in the Final Writing Projects

Frequencies	Words
6	motivation, task
4	picture book, storybook
3	awareness, grammar-translation method
2	CLT (communicative language teaching), cultural teaching, curriculum, during the task, e-book, extensive reading, pre-task, post-task, TBLT (task-based language teaching), technology
1	acquisition, APP, argumentative writing, audio-lingual method, CALL (computer-assisted language learning), CBI (content-based instruction), co-teaching, cultural awareness, fluency, identity, instruction, jigsaw puzzle, literacy, literature circle, macro-goal, MALL (mobile assisted language learning), meta-cognitive, pedagogy, prior knowledge, reading comprehension, reading strategies, remedial instruction, scaffolding, socio-culture, station teaching, story sequence, target culture, target language, text, transfer, vocabulary knowledge, word meaning

The short paragraph below was written by one participant. Her research project aimed to explore the integration of extensive reading into remedial education. Three technical vocabulary were written: "remedial instruction," "extensive reading," and "motivation."

> However, in Taiwan, remedial instruction is designed to assist students who fall behind academically to achieve their desired levels in different subjects. Thus, this study aims to explain that extensive reading is an effective method for students with low proficiency and poor motivation to learn English reading. (Project 5)

Wray (2006) claims "when we speak, we select particular turns of phrase that we perceive to be associated with certain values, styles and groups" (p. 593). Compared to native speakers of English, non-native speakers tend to use less than formal language or technical vocabulary in their writing (Adel & Erman, 2012). For any language learners, writing academically is naturally difficult. In the above-mentioned example, the participant included the technical vocabulary such as "remedial instruction," "extensive reading," or "motivation." In addition, she used academic language such as "This study aims to explain."

The example below was written by a group of five participants. This group wrote this introductory paragraph under their literature review section. They included a quote by Prabhu to define the task and included two technical vocabulary items: "task-based language teaching" and "task."

> Task-based language teaching is introduced by Prabhu (1987),(.) a (A) task is "an activity which required learners to arrive at an outcome from given information through some process of thought, and which allowed teacher(s) to control and regulate that process." (p. 10) (Project 2)

In the example above, this group used only a very limited amount of the technical vocabulary in the introductory paragraph. EFL writers might lack structural knowledge or technical vocabulary for academic writing because they are new researchers within academic communities (Al-Khasawneh, 2017; Hyland, 2007). It is difficult for language learners to put receptive word knowledge into productive use (Brun-Mercer & Zimmerman, 2015).

Use of Technical Vocabulary on Academic Performance

With regard to the influence of the technical vocabulary on participants' academic performance, the majority of the participants said that they could recall the technical vocabulary (n = 31, 86.1%), as in Figure 6.
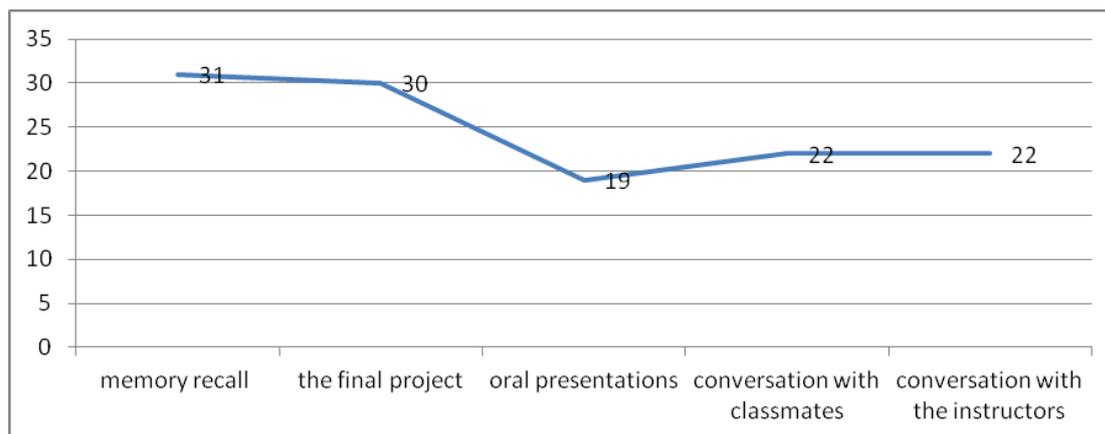
Figure 6. Use of technical vocaublary on disciplinary knowledge development.

As revealed in Table 4, a total of fifteen technical vocabulary items was recalled, such as CALL, extensive reading, pedagogy, or top-down reading.

Table 4
Technical Vocabulary Mentioned in Participants' Reflections

Areas	technical vocabulary
memory recall	CALL, content, extensive reading (2), high-stake, MALL, IT, pedagogy (2), proficiency test, station teaching, teaching method, top-down reading (2), washback
the final project	APP, CALL, gate-keeper, intrinsic motivation (2), MALL, reading comprehension, self-regulated learning, SSR, SSS, standardized test, the technology instructional strategy, transfer
oral presentations	extensive reading, literacy, self-efficacy, self-regulated learning, technology-nested
conversation with classmates	acquire, CALL (2), gate-keeper, high-stake, intrinsic motivation, MALL (2), vocabulary instruction
conversation with professors	APP, CALL (2), IT, MALL, pedagogy, test anxiety,

Note. Numbers in parenthesis indicated the times participants recalled.

Moreover, 83.3% of the participants (n = 30) wrote that they included the technical vocabulary in their final projects, such as in Project 2 and 5. A total of 13 technical vocabulary items was listed in the questionnaire, such as CALL, intrinsic motivation, MALL, or reading comprehension, as shown in Table 3.

More than 61.1% of the participants wrote they used the technical vocabulary when they had conversations with their instructors (n = 22) and classmates (n = 22). One participant wrote, "But actually, I always feel nervous when talking to professors, so I seldom talk to them. However, as to this question, I think yes, (an) example would be limitation of the research etc." Only 52.8% (n = 19) of the participants used the technical vocabulary when they gave oral presentations in other TESOL-related courses.

Participants in this study should be encouraged to develop autonomous learning skills and apply the technical vocabulary and its related concepts that they obtain in other courses or contexts (i.e., discussions with other professors and classmates, presentations in other TESOL-related courses) so they can be facilitated to move from the surface to a deeper approach to learning and use of the technical vocabulary (Bruce et al., 2013). In this way learners can develop independent thought and take more responsibility for their own learning, something that is commonly associated with higher levels of TESOL-disciplinary knowledge.

Discussion

The document, questionnaire, and final writing projects were used to analyze 36 Taiwanese English majors' learning strategies, attitude toward the technical vocabulary, and their academic performance. This study has the following major findings. First, the majority of the participants resorted to online resources for learning technical vocabulary as their learning strategies. Second, participants regarded "the instructor's explanations and use of technical vocabulary" as the most useful instructional strategies as in Figure 1. Third, the instruction on technical vocabulary influenced their use of technical vocabulary, particularly in memory recall and their final writing project as shown in Project 2 and 5. Fourth, of all the technical vocabulary covered in in the TESOL course, they used 59% from the word list, mostly in the topics of curriculum development and reading. Fifth, the most frequent technical vocabulary used by the participants in their final projects was "motivation" and "task," because their projects mainly focused on reading instruction, curriculum development, or activity designs in tasks.

In order to effectively teach English majors technical vocabulary for their disciplinary knowledge development, four major issues should be taken into consideration. These are provisions of online glossaries of technical vocabulary, the instructors' explanations and modeling the use of technical vocabulary, the selection of the technical vocabulary for instruction, and using technical vocabulary for TESOL knowledge development.

Online Glossaries of Technical Vocabulary

In this study, participants resorted to online resources as their learning strategy on technical vocabulary. It is recommended that online glossaries (or e-glossaries) with learning activities are constructed collaboratively by the instructor and learners (Bruce et al., 2013). Such online glossaries can provide the learners with the learning experience to enable them to gain a clear understanding of the meaning of the technical vocabulary in the TESOL field, develop effective learning strategies to undertake TESOL disciplinary discourse, and foster them to progress in the TESOL profession.

Such online glossaries can be constructed based on the following principles (Bruce et al., 2013). First, explanations, meanings, and examples of the technical vocabulary should be included, to ensure that learners can review and study the fundamental technical vocabulary and its related theoretical concepts relevant to TESOL. The explanations, meanings, and examples of the technical vocabulary can be presented in videos, animations, podcasts, and via English and the mother tongue. Second, the content can be uploaded by learners with moderation by the course instructor. Third, activities or tasks on technical vocabulary can be included, such as Bingo, Pictionary, or Directed Activities Related to Text (DART) (i.e., completing a table, or chart, labeling a diagram, gap-filling) (Wellington & Osborne, 2001).

Instructors' Explanations and Modeling the Use of Technical Vocabulary

Vocabulary should be taught systematically and explicitly. Instructors can teach the technical vocabulary through a scaffold series of descriptions and examples. Instructors can first ascertain learners' understanding of the technical vocabulary by discussing the context for their prior exposure in other courses. Instructors could pronounce the technical vocabulary several times in order to foster an auditory imprint. Next, instructors can contextualize the technical vocabulary in an academic reading text (i.e., journal article, abstract). Instructors could explain the meaning of the technical vocabulary and write a brief definition on the board or word wall as in Figure 1 or Figure 5 (Brun-Mercer & Zimmerman, 2015; Nation, 2001; Perrone, 2015; Schmidt, 2000).

In addition to explaining the meaning of the technical vocabulary, Ma (2015) recommends that teachers should foster "academic apprenticeship" (p. 8). Teachers should become the academic researchers and productive writers. Teachers should model for their learners the process of selecting the right technical vocabulary item when writing their academic paper. Learners can become the "writing apprentices" of

their teachers as academic writers and learn how to learn, expand, and use the technical vocabulary.

Selection of the Technical Vocabulary for Instruction

In this study, technical vocabulary in different TESOL issues was introduced including listening, speaking, reading, writing, pronunciation, curriculum development, and vocabulary. However, participants' final writing projects were related mostly to reading and curriculum development. Participants are encouraged to choose their topics for research in the first class. More technical vocabulary and academic vocabulary in academic writing relevant to these topics could be selected and introduced in class.

The technical vocabulary can be large (Chung & Nation, 2003). Once the topics are chosen, the instructor can select the technical vocabulary based on the TESOL-related technical dictionary, TESOL-related academic texts with technical vocabulary, computer-based approach (i.e., automatic term extraction, automatic term recognition) and the rating scale (Chung & Nation, 2004). The technical vocabulary that has been annotated in the academic texts signals its importance and the difficulties in learning or understanding the word while reading the academic texts (Coxhead, 2000).

Using Technical Vocabulary for TESOL Knowledge Development

Technical vocabulary is part of the system of subject knowledge (Chung & Nation, 2004). In order to accurately incorporate the technical vocabulary into their writing and oral presentations within the field of TESOL, participants in this study needed to acquire understanding of the concepts and phenomena of the technical vocabulary. Accordingly, learners such as the 36 participants in this study should be provided with ample controlled and guided writing and oral practice with the same technical vocabulary in different contexts. In doing so, learners will become aware of the technical vocabulary and feel more comfortable incorporating it into their own writing, oral presentations, and discussions with their classmates and instructors (Brun-Mercer & Zimmerman, 2015). With an adequate amount of technical vocabulary, learners can demonstrate their good knowledge of a specific subject area, such as TESOL (Chung & Nation, 2004; Woodward-Kron, 2008).

Conclusion

This study explored 36 Taiwanese undergraduates' technical vocabulary learning strategies, preferences as to the instructional strategies of the technical vocabulary related to TESOL, and their use of the technical vocabulary. This study revealed the need for the effective instruction on the technical vocabulary in TESOL programs. Systematic selection of the technical vocabulary, the university instructor's explicit instruction and language modeling of the technical vocabulary, online resources, and ample opportunities for language use could foster learners' learning of the technical vocabulary and developing of the disciplinary knowledge in TESOL issues. Such findings highlighted the key elements of teaching the technical vocabulary in TESOL programs.

Three limitations of this study must be acknowledged. First, there are different learning strategies and vocabulary learning strategies used by language learners. This study did not make a distinction between categories of these strategies, but only focused on the strategies that 36 participants employed. Second, this study addressed a limited set of issues among 36 Taiwanese EFL learners' learning and use of the technical vocabulary. These participants majored in English Instruction. The findings could provide limited insight into other EFL learners with different majors. The third limitation was the instrument design. No pre-test was designed to assess participants' knowledge of TESOL technical vocabulary. To enhance the trustworthiness of this study, triangulation was achieved through comparing participants' writing projects, responses from the questionnaire, and the document on class handouts and PowerPoint

slides. Moreover, peer review performed by the researcher's colleagues was employed during the coding and analysis.

This study explored teaching technical vocabulary 36 undergraduates in a university course and discussed the influence on the undergraduates' use of the technical vocabulary. The instructional strategies for the technical vocabulary included the instructor's explanations, modeling the use of the technical vocabulary, reading academic texts, or different types of tasks (True or False, Spotlight Vocabulary, Matching, Information Gap, Runner and Brainer, A-Z terms, Jeopardy). Online glossaries, flashcards, and other online tasks could be developed for learning and teaching the technical vocabulary. A further study could explore the influence of online resources on language learners' learning on technical vocabulary, using the technical vocabulary, and acquisition of TESOL-based disciplinary knowledge.

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