Enhancing Science and Engineering Undergraduate Students' Writing in the Disciplines at Chinese Universities

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Following a research-intensive short visit to Nankai University in Tianjin, northern China in the early summer of 1999, Marty Townsend (2002) concluded: "writing instruction—as we understand it in the US—does not exist at Nankai University." (p. 139). Dan Wu (2013), in her doctoral dissertation (completed at Clemson University, the US), perhaps the most serious engagement with the American notions of WAC/WID in relation to the Chinese context to date, echoed Townsend's finding on a larger scale of Chinese tertiary education. Given the traditional fervor of Chinese higher education for learning from U.S. writing pedagogies (You, 2010), it may be somewhat surprising that the American WAC/WID has not taken root in the Chinese soil insofar as tertiary-level writing education is concerned. Yet despite the absence of WAC/WID in the Chinese context, as to be shown in this chapter through a survey of Chinese literature, discipline-oriented academic writing has been taught to science and engineering undergraduate students at Chinese universities by both content teachers and English teachers. Townsend (2002) pointed out that "American teacher/researchers must understand much more than just WAC principles to engage in cross-cultural discussion about teaching and learning" (p. 148). With the present chapter, together with an earlier mapping of the landscape of teaching English academic writing to graduate students at Chinese universities (Li & Ma, 2018), I aim to provide a Chinese perspective, to facilitate "cross-cultural discussion about teaching and learning" in the long run.

Although the pedagogical practices to be surveyed in the present chapter are "local" practices reported of various classroom contexts at Chinese universities at specific points of time, we are reminded that "remote literate practices shape and constrain local literacy practices" (Baynham & Prinsloo, 2010, p. 4). That is, the local practices are potentially "translocal and transnational" (Baynham & Prinsloo, 2010, p. 5), in light of the New Literacy Studies scholarship (e.g., Street, 2004). This perspective echoes writing studies scholars' championship for translingual and transnational writing education, whereby WAC/WID professionals are challenged to both move beyond a monolingual mindset in working with international students, and to look beyond national borders to understand how pedagogical traditions of other nationalities may inform new practices

(Donahue, 2018; Hall, 2016; Horner & Hall, 2018; You, 2018). In this vein, a perspective from the Chinese context can be a useful contribution to this collective endeavor in writing studies.

The Chinese Context

In the existing Chinese literature on English language teaching, sporadic references to the notion of "writing across the curriculum (WAC)" started to be found in the 2000s, usually in introductory pieces on the American WAC, either as part of book-length introductions of composition research in the West (e.g., Qi, 2000) or individual introductory texts on WAC (Luo, 2009). Notably, although the theme of the 5th International Conference on Teaching & Researching EFL writing in China (held in Guiyang, China in September 2007) was on "Teaching and Researching EFL Writing Across the Curriculum in China," apparently the phrase "Writing Across the Curriculum" was borrowed only to imply a broad coverage of the theme of the conference (Li, 2009).

More recently, there have been proposals among English language specialists for introducing WAC into Chinese higher education (Liu, 2016; Wu, 2013). In addition, calls for learning from the American WAC/WID have also been raised in the context of the traditional College Chinese (*daxue yuwen*) and College Writing (*daxue xiezuo*) (writing in Chinese) courses. These courses tend to be taught by Chinese language/writing specialists in the tradition of Chinese rhetoric studies and have a liberal arts education orientation, but they have been on decline or have been dropped off the course list at many universities (Zhang, 2008). Some calls to revive the courses have suggested that the College Chinese course be re-oriented to "writing in the disciplines," in light of Cornell University's freshman writing seminars (FWS) (Zhuang, 2014), and that the College Writing course should also be both re-positioned to "write to learn" (or *yi xie cu xue* in Chinese) in line with the American tradition (Li, 2007), and should be consolidated with establishment of degree programs on writing studies, after the American model (Ke, 2007).[1]

There seems to be no strong evidence that such calls for incorporating the American-style WAC/WID into Chinese higher education have come to fruition.

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1   In the realm of undergraduate English language education at Chinese universities, "writing to learn" (*yi xie cu xue*) has long been championed, concerning the teaching of both English majors (e.g., Wang, et al., 2000) and non-English majors (Zhang, 2011). The emphasis conveyed by the slogan of *yi xie cu xue* falls on a "length approach" (*xie chang fa*), which encourages students to write at length, and thus improve their ability of expression through writing. Recently, the call for *yi xie cu xue* has picked on a writing-in-the-disciplines orientation, in the context of enhancing doctoral science students' ability to write English research papers (Yu, 2015).

However, several factors would suggest that an exploration of how instruction on discipline-oriented writing has taken place in tertiary education in China is a worthwhile undertaking. Firstly, there has been no shortage of books on scientific paper writing (SPW) (*keji lunwen xiezuo*) in China (one example being Zhu, 2004). Secondly, specialist English (*zhuanye yingyu*) courses, which typically focus on reading, vocabulary and translation, are often taught by content teachers within their schools/departments (in particular in science disciplines) at Chinese universities (Cai & Liao, 2010). Such courses, together with the trend of policy-prompted bilingual/English-medium instruction of subject courses implemented to various degrees at some universities, as well as the pressure for academics and research students to write for international publication, would provide a context for content teachers to facilitate students' English writing ability. Thirdly, a paradigm shift from general English to academic English or English for Academic Purposes (EAP), initiated in the 2000s, is becoming a major trend at Chinese universities (Cai, 2019; Cheng, 2016; Li & Ma, 2018). The EAP-turn would increasingly justify the installation of English academic writing instruction for students across disciplines at all levels. Finally, at the national policy level there has been a growing emphasis upon enhancing education in academic norms and academic ethics (*xueshu guifan/xueshu daode*) in recent years. Universities have been responding with new courses designed accordingly. Such courses are offered by content teachers or language teachers to undergraduates or postgraduates.

It is against this backdrop that in the study to be reported below I aimed to deduce from a survey of the existing Chinese academic literature what discipline-oriented academic writing instruction targeting science and engineering undergraduate students has been like at Chinese universities.

Methods

Compared with a questionnaire survey or interviews, the method of surveying relevant existing Chinese-language publications (journal papers) brings two benefits. Firstly, the fact that the authors of the papers have chosen to publish on their pedagogical interventions indicates that they took those interventions seriously and considered them worth sharing with a large audience. The practices reported in the papers thus form a kind of purposeful sample as a result. Secondly, the surveyed papers, by reporting from different parts of the country (rather than from a few elite institutions, for example), imply greater representativeness of the wider practices.

To identify a target sample of Chinese publications, the China Academic Journals Full-text Database (CJFD), a sub-section of CNKI (China National Knowledge Infrastructure) (http://www.cnki.net/), was searched, using a variety

of search terms and their combinations, in order to find (Chinese-language) articles that report on discipline-oriented writing pedagogy to undergraduate students. Searching based on the Chinese equivalents of "writing in the disciplines," or combinations of "writing" with "college chemistry," "college physics," etc., was not fruitful. Searching on the Chinese equivalents of "English-medium instruction," "bilingual teaching," "scientific paper writing," "specialist English," "course paper," "academic writing," "English for academic purposes," "education on academic norms" in varied combinations with "teaching," "undergraduate students," etc. led to large sets of hits.

I then went through the full texts of the numerous hits, looking for papers that reported on teaching discipline-oriented academic writing (in Chinese or English) to undergraduate science and engineering students, with at least a moderate amount of detail on the pedagogy provided. Discussion papers, which typically consisted of commentary on a problematic situation followed by recommendations, and indeed accounted for the vast majority, were excluded. A total of 34 papers, comprised of 20 papers on content teachers teaching scientific paper writing in Chinese (see Appendix 1), six on content teachers facilitating their science and engineering students' English writing ability (see Appendix 2), and eight on English teachers teaching English academic writing to science and engineering students (see Appendix 3), were selected as a result. Altogether 29 universities' cases are featured in these 34 papers. The papers are mostly reports of teaching practices, rather than empirical research papers. They range from two to nine pages (with a weight on the shorter side) and commonly include the following sections: introduction, current problems, pedagogical innovation implemented, and reflection and conclusion. The level of detail provided of the pedagogical practices varies and is often quite limited. In examining the short reports, I focused on culling from each report such information as the disciplinary areas of the students, the timing, duration, and content of the pedagogical intervention, and the instructors involved.

Findings

Content Teachers Teaching Chinese Scientific Paper Writing (SPW) to Science and Engineering Students

Twenty papers (shown in Appendix 1) authored by content teachers report on their teaching of Chinese scientific paper writing (SPW) to undergraduate science and engineering students at 19 universities located in 17 Chinese cities, with engineering, agriculture and chemistry being in the majority of the disciplines covered. Two-thirds of the papers were published from the year 2015 onwards, indicating a growing and ongoing interest amongst content teachers in enhancing SPW

training for their students. The aim of such training was captured by this statement in one of the papers: "developing students' knowledge in the structure and composition of various types of scientific writing and raising their ability to write research articles and the degree thesis" (Xu & Yang, 2012, p. 93).

In terms of the timing, other than a few unspecified cases, SPW training typically occurred in Years 3 and 4. In one special case, the training was offered to 78 undergraduates preparing to participate in mathematical modeling contests in the years from 2019 to 2020 (Sun & Jing, 2021). The featured SPW training was either in a separate course (14 papers) or integrated into a specialist content course (six papers). When SPW was a separate course, the emphasis was placed upon preparing students to write up their research project, which was either a university-funded project or their graduation thesis project (Bian, et al., 2016; Han & Yang, 2016; Liang, et al., 2016; Liu, et al., 2014; Zhang, et al., 2016), and there was sometimes joint teaching with a content course (Guo, et al., 2017; Lei & Chen, 1998; Zhang & Ge, 2016). When SPW was integrated into a specialist content course, the course involved tended to be compulsory and foundational courses (Chen & Huang, 2012; Liu, et al., 2016; Yan & Sun, 2012; Zhang, et al., 2000), located earlier in time in the curriculum. In one case (materials science), the writing requirement spanned across three modules in Years 3–4 (Li, et al., 2015). There thus in this case seems to be a stress upon sustained SPW training as part of the content learning.

Published journal articles in Chinese or in English, and sometimes previous degree theses too, were incorporated into class teaching, and analyzed by the teacher and the students (Bian, et al., 2016; Li, 2017; Liu, et al., 2014; Xu & Yang, 2012). The teaching could be organized around the different sections of a research report (Gao & Zhang, 2016; Xu & Yang, 2012) and when the timing of the course paralleled students' graduation thesis research, students could be expected to draft their graduation thesis over the duration of the course (Gao & Zhang, 2016). A range of benefits of such "application-oriented" teaching (Bian, et al., 2016; Liu, et al., 2014) were cited: that it would motivate students and enhance their confidence, hone their independent thinking, strengthen their research ability through first-hand experience of the research process, and raise the quality of their degree theses (Guo, et al., 2017; Jia & Zhuo, 2016; Lei & Chen, 1998; Zhang & Ge, 2016; Zhang, et al., 2000).

Content teachers single- or co-authored all 20 papers (as can be seen in the affiliations of the authors), except for the earliest paper in the collection, Zongming Lei and Jie Chen (1998), which had a content teacher (in oil drilling) as the first author and a Chinese language specialist colleague as the second author. Lei and Chen (1998) did not specify the roles of the authors in the teaching, except mentioning that at the end of the featured SPW course, students should submit two copies of their papers—one to the "specialist teacher" who would assess the

scientific soundness of the work, and the other to the "writing teacher" who would assess to what extent the presentation of the work conformed to the conventions of academic paper writing (p. 94).

Finally, only one comment on the qualification of the instructors was found in the collection of papers. Xihui Bian, et al. (2016) pointed out that the course teacher should be "familiar with literature searching systems, the conventions of SPW, excellent grasp of English in the relevant specialist area, having conducted in-depth research in an area, and having published high-level research papers" (p. 151). Overall, it seems language teachers were almost entirely out of the consideration of the content teachers who reported on their Chinese SPW instruction.

Content Teachers Facilitating Science and Engineering Students' Ability in English Writing

Six papers reported how content teachers (also authors of the papers) facilitated their students' ability in writing in English. Four of the papers featured the context of a compulsory specialist English (*zhuanye yingyu*) course (Chen, 2003; Liu, 2015; Wang, et al., 2009; Zhang & Jiang, 2010). In Guifang Wang, et al.'s (2009) course, apart from a focus on vocabulary, reading, and translation, students were expected to write paper abstracts. The other three papers all mentioned the use of English journal articles during teaching. In addition, Chen's (2003) students of geosciences were required to draft a short research paper in English based on their own graduation thesis topic, targeting a specialist journal; they were given 10 minutes to present it at the end of the course (with Q & A). Yuanfu Zhang and Zaixing Jiang's (2010) students were required to write short segments on discipline knowledge, paragraphs, and different sections of a research paper; a three-level scale of achievement was designated for each item: basic, intermediate, and advanced. Debao Liu's (2015) students were expected to read native-English-speaking authors' papers in high-impact journals and note down useful expressions for different sections of a paper and for describing figures, categorization, and hypotheses.

In addition to the four papers featuring specialist English courses, two papers concerned a context of a bilingual SPW course (Li, 2011) or a bilingual specialist course (Liu, 2012). Of the two, Xiangli Liu (2012) emphasized writing short pieces in Chinese or in English to facilitate learning and cultivate students' analytic ability: outlining key issues during lesson preview, recalling key points covered at the end of a lecture session, and summarizing the highlights of each unit. This, and to some extent the writing tasks given by Yuanfu Zhang and Zaixing Jiang (2010) (cited above), seem to constitute rare examples in the focal Chinese literature that echo the American notion of "write to learn," with content teachers advocating the use of more informal writing to facilitate students' learning in the disciplines (Townsend, 2018).

Like the literature on content teachers teaching Chinese SPW, this modest collection of papers on content teachers facilitating students' English writing ability does not mention any involvement from language teachers. However, there is one reference to content teachers "observing the writing classes taught to English majors [by English language teachers]" for the sake of "absorbing teaching experience" to inform their own teaching of SPW in English (Zhang & Jiang, 2010, p. 112).

English Language Teachers Teaching English Academic Writing (EAW) to Science and Engineering Students

Eight papers, authored by English teachers, reported on the authors teaching English Academic Writing (EAW) to science and engineering students. In contrast to the Chinese or English writing instruction provided by content teachers which often took place in Year 3 or Year 4, the EAW instruction offered by English teachers tended to occur in Year 1 or Year 2.

Two papers (Liu, 2010; Yang, 2013) specifically indicated target students as those who have passed CET 4 (College English Test, Band 4) (see Zheng & Cheng, 2008). The EAW course described by Bin Liu (2010) focused on information gathering, problem-solving and the writing process. The EAW component in the academic English course described by Feng Yang (2013) introduced skills on note-taking, the writing of the different sections of an AIMRaD paper (Abstract, Introduction, Methods, Results, and Discussion), and avoiding plagiarism. The remaining six papers demonstrated a stronger connection with students' disciplines, with a variety of approaches implemented to make EAW instruction discipline-oriented. For example, Yanjiang Teng (2016) subscribed to an instructional mode of "language plus disciplinary content" (p. 45). Thus, a teaching plan of a writing course for engineering students shows a list of topics, each mapping onto a set of writing skills. Under the topic of "Data," the writing skills focused on the use of academic vocabulary, graphs, writing of descriptive paragraphs, tenses, and sentence patterns (Teng, 2016). As another example, Jin Yan and Yafei Ge (2011) reported that geosciences students, in fulfilling a project-based assessment task in their English for Professional Purposes experimental class, should complete a 2,000-word research paper in a specialist field that they would expect to pursue in the future.

Compared with content teachers, the English teacher authors were able to draw upon various theoretical/pedagogical notions from the applied linguistics literature, such as content-based (Teng, 2016; Yao & Han, 2016), collaborative learning (Yan & Ge, 2011), project-based (Yan & Ge, 2011; Yang & Han, 2012), task-driven (Yan & Ge, 2011; Yao & Han, 2016), the prototypical IMRD structure of research articles (Wang, 2013; Yang, 2013), and academic literacies and learning autonomy (Teng, 2016). In addition, while content teachers hardly considered engagement with English teachers, there was evidence that the latter aspired to work

with their counterparts in disciplines (Teng, 2016; Yan & Ge, 2011; Yi, 2015). Yet overall, despite the aspiration, evidence of such partnership in practice is not seen in any of the eight papers, in contrast to such collaboration sporadically occurring in graduate-level EAW instruction (see Li & Ma, 2018).

Discussion

In the foregoing section, three strands of Chinese literature were reviewed: on content teachers teaching Chinese scientific paper writing (SPW) to science and engineering students, content teachers facilitating such students' ability in English writing, and English language teachers teaching English academic writing (EAW) to such students. Due to the traditional separation of language and content subjects, as well as the separate publication venues of content teachers and language teachers in China, it may be safe to suggest that within the country, content teachers' work, reported in the first two strands of literature, has been largely unknown to English teachers; likewise, the latter's work reported in the third strand of literature may have also been hidden from content teachers. Together, all three strands of literature may have been largely unknown to the outside world.

It can be suggested that all three strands of literature reviewed in this chapter, by focusing on the teaching of discipline-oriented writing to undergraduate science and engineering students, illustrate forms of writing-in-the-disciplines pedagogies. It can also be suggested that the content and English language teachers who engaged in their reported pedagogical practices subscribed to the notion that "writing and disciplinary knowledge are embedded in each other" (Donahue, 2011, p. 25). These Chinese forms of writing-in-the-disciplines pedagogies will continue to evolve in the coming years, in light of the paradigm shift from general English to EAP at the tertiary level, local institutional contexts, and their policy-led drive toward creating courses to teach academic norms and academic ethics. Yet it seems hard to foresee an interbraiding of the Chinese writing education and English writing education in the curriculum. Separate bodies of scholarship, connected to separate disciplines, exist; cross-disciplinary fertilization, while desirable, will not be easily achievable. Nevertheless, under the banner of EAP, interdisciplinary collaboration between English language teachers and content teachers can be cultivated, despite potential challenges that come from institutional structures and the traditional separation of their lifeworlds (Li, 2021; Li & Cargill, 2019). Language-content partnership is growing in the context of teaching EAW (or more specifically, English for research publication purposes) to graduate students at Chinese universities (Li & Ma, 2018). Systemic establishment of such partnership, which is likely to be a long-term process, will lead to the growth of "writing to learn" at both undergraduate and graduate levels.

The study reported in this chapter relied on relevant Chinese literature found in the China Academic Journals Full-text Database (CJFD). Needless to say, the numbers of papers in the three strands found to meet the selection criteria do not necessarily correspond proportionately to the amount of relevant work actually going on along these lines in the country. The third strand in particular, on English teachers teaching EAW to science and engineering students, although only represented by eight papers in the study, is taking on a variety of forms as the EAP enterprise continues to boom in China. Two examples are prominent, both concerning events hosted by the China EAP Association (CEAPA) (whose members are mainly EAP teachers) for university students. The first is the 5-Minute Research Presentation (5MRP) contest. The inaugural contest was held in 2018, attracting 871 student contestants from 64 universities. In the competition, student contestants were expected to present on their research in English within 5 minutes.[2] The second example is the International Conference for Students (ICS). The 5th ICS, addressing the theme of "Sustainability and Innovation: Human, Environment, Economy and Development of Technology," was held concurrently (on May 25, 2019) at 16 conference sites, involving over 200 Chinese universities.[3] Informal interviews (conducted by myself and several research students) at one site of the 5th ICS indicated that the university students were keen to enhance their academic communication abilities and receive training from the early years of their study programs. Students' needs seem to point in particular to the value of discipline-oriented research project-based EAW pedagogy, exemplified in the third strand of literature reviewed in the present chapter (Yan & Ge, 2011), and advocated both in the wider Chinese literature (e.g., Zhou, 2011) and sometimes in the English literature on academic writing instruction (Levis & Levis, 2003). The participation of content teachers or supervisors, working in collaboration with language teachers, would obviously be immensely valuable.

Conclusion

Focusing on three strands of published Chinese-language literature, this paper offers only a glimpse of a range of cases of discipline-oriented writing instruction to science and engineering undergraduate students at Chinese universities. I was not

2   The 5-Minute Research Presentation (5MRP) competition is modeled after the 3-Minute Thesis Competition. The latter was developed in 2008 by The University of Queensland, Australia and has become popular in many universities around the world.

3   Nearly 7,000 students (including occasional participants from overseas) submitted presentation proposals to the conference. Three forms of presentation (in English) were featured: research paper presentation (20 minutes, including Q & A), research proposal presentation (10 minutes, including Q & A), and poster presentation (via electronic boards at the conference sites).

able to, for example, examine closely textbooks or teaching materials used in the instruction (such information is often lacking in the literature surveyed). Ethnographic research of pedagogies—beyond Townsend's (2002) short research visit at one Chinese university—would be a promising line of investigation to undertake in the future, given that such research in relation to writing in the disciplines seems surprisingly lacking in the Chinese context. At a theoretical level, ethnographies of literacy in local contexts would both shed light on the relationship between the local and the global (Baynham & Prinsloo, 2010; Street, 2004), and feed into the reimagination and practice of writing education from translingual and transnational perspectives (Donahue, 2018; Hall, 2016; Horner & Hall, 2018; You, 2018).

Overall, with this chapter, it is shown that in the Chinese enterprise of teaching writing at the undergraduate level in science and engineering disciplines, both content and language specialists are found to be the bearers of responsibilities; yet there has been little evidence of joint endeavor between the two parties. Nevertheless, such interdisciplinary collaboration is urgently needed and is likely to develop, against the backdrop of the EAP-turn in China. Earlier in the chapter, calls of Chinese authors to introduce the American-style WAC/WID and the American tradition of "write to learn" into China were mentioned (e.g., Li, 2007; Wu, 2013). Yet while "writing to learn" should be enhanced at Chinese universities, it is perhaps EAP, rather than the American-style WAC/WID, that will continue to be the driving force of the process in the years to come. Against this backdrop, it is the right time for the language and content teachers in China to exchange with their international counterparts, to "engage in cross-cultural discussion about teaching and learning" (Townsend, 2002, p. 148).

Acknowledgment

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Appendix 1. Content Teachers Teaching Chinese Scientific Paper Writing (20 papers)

Bian, Xihui, Tan, Xiaoyao, Liu, Peng, & Chu, Yuanyuan. (2016). "Keji lunwen xiezuo" kecheng jiaoxue chutan [Explorations in teaching a course on "scientific paper writing"]. *Jiaoyu Jiaoxue Luntan* [Education Teaching Forum]*, 34*, 151-152.

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Lei, Zongming, & Chen, Jie. (1998). *"Keji lunwen xiezuo" yu "zuanjing xingongyi xin- jishu" shixing lianhe jiaoxue gaige de changshi* [Integrating "scientific paper writing" with "introduction to new developments in drilling technologies"]. *Heilongjiang Shiyou Gaodeng Zhuanke Xuexiao Xuebao [Journal of the Heilongjiang Petroleum Insti- tute], 1*(5), 93-94.

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Liang, Yonghou, Liang, Chunxia, Xu, Min, & Wang, Gui. (2016). Benke yuanxiao keji lunwen xiezuo kecheng de mokuaihua jiaoxue fangfa tantao [Designing modules in teaching a scientific paper writing course for undergraduate students]. *Heilongjiang Xumu Shouyi* [Heilongjiang Animal Science and Veterinary Medicine], *12*, 259-261.

Liu, Changjian, Ma, Gaofeng, & Zhang, Xiguang. (2016). Cehui gongcheng zhuanye benkesheng keji lunwen xiezuo nengli peiyang de shijian yu sikao [Cultivating undergraduate students' ability in scientific paper writing in Surveying and Engineering]. *Gaojiao Luntan* [Higher Education Forum], *7*, 46-50.

Liu, Youqin, Yan, Yun, & Xu, Yuehua. (2014). *Yingyong wei daoxiang de "Huaxue wenxian jiansuo ji lunwen xiezuo" jiaogai tansuo* [Pedagogical reforms in an application-oriented course on "Literature Searching and Paper Writing in Chemistry"]. *Neimenggu Shiyou Huagong* [Inner Mongolia Petrochemical Engineering], *8*, 89-91.

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Xing, Hucheng, & Jie, Yucheng. (2014). Caoye kexue zhuanye keji lunwen xiezuo kecheng de jianshe ji jiaoxue gaige tansuo [Designing a course on scientific paper writing in pratacultural science]. *Shidai Jiaoyu* [Time Education], *21*, 202-204.

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[Applying a case study approach to teaching scientific paper writing]. *Anhui Nongye Kexue* [Journal of Anhui Agricultural Science], *44*, 233-234.

Zhang, Yuanxin, & Ge, Yakun. (2016). Shengwu jishu zhuanye keji lunwen xiezuo kecheng jiaoxue gaige tansuo [Pedagogical reforms in a course on scientific paper writing in biotechnology]. *Keji Zhanwang* [Technology Outlook], *33*, 178.

Appendix 2. Content Teachers Facilitating Their Students' English Writing Ability (six papers)

Chen, Yuelong. (2003). Diqiu huaxue benkesheng zhuanye yingyu jiaoxue de ji dian tihui [Reflections on teaching specialist English to undergraduates in geochemistry]. *Zhongguo Dizhi Jiaoyu* [Chinese Geological Education], *2*, 31-33.

Li, Hualan. (2011*).* Huaxue zhuanye keji lunwen xiezuo shuangyu jiaoxue de shijian yu tansuo [Teaching a bilingual course of scientific paper writing in chemistry]. *Xin Kecheng Yanjiu* [New Curriculum Studies], *6*, 23-25.

Liu, Debao. (2015). Yejin zhuanye yingyu jiaoxue zhong de keji lunwen xiezuo nengli peiyang [Cultivating scientific paper writing ability in teaching English for metallurgy]. *Tianjin Yejin* [Tianjin Metallurgy], *5*, 63-66.

Liu, Xiangli. (2012). "Duoyangxing xiezuo" zai xinjian benke yuanxiao shuangyu jiaoxue zhong de yingyong [Using "diverse forms of writing" in bilingual instruction at newly founded teaching institutions]. *Henan Huagong [Henan Chemical Engineering]*, *29*, 62-64.

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Zhang, Yuanfu, & Jiang, Zaixing. (2010). Yi keji lunwen xiezuo wei daoxiang de zhuanye waiyu jiaoxue moshi jiangou [Specialist English instruction with an orientation to teaching scientific paper writing]. *Zhongguo Dizhi Jiaoyu* [Chinese Geological Education], *2*, 112-114.

Appendix 3. English Teachers Teaching English Academic Writing to Science/Engineering Students (eight papers)

Liu, Bin. (2010). Xueshu yongtu yingyu xiezuo kecheng sheji [Course design for college EAP writing]. *Zhongguo ESP Yanjiu* [Chinese Journal of ESP], *1*, 136-143.

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Yan, Jin, & Ge, Yafei. (2011). Dixue benkesheng xueshu yingyu xiezuo kecheng tansuoxing yanjiu [Teaching academic English writing to undergraduates in geology]. *Hubei Di'er Shifan Xueyuan Xuebao* [Journal of Hubei University of Education], *28*(11), 105-107.

Yang, Feng. (2013). Yixiang jiyu xueshu yingyu xiezuo jiaoxue de xingdong yanjiu [An action research study teaching academic English writing]. *Zhongguo Waiyu Jiaoyu [*Foreign Language Education in China*)*, *6*(4), 32-41.

Yang, Liping, & Han, Guang. (2012). Jiyu xiangmushi xuexi moshi de daxue yingyu xueshu xiezuo jiaoxue shizheng yanjiu [A project-based approach to teaching English academic writing]. *Waiyujie [*Foreign Language World*)*, *5*, 8-16.

Yao, Jing, & Han, Guang. (2016). Feiyingyu zhuanye benkesheng xueshu yingyu xiezuo jiaoxue shijian yu sikao [Teaching academic English writing to non-English major undergraduates]. *Kaoshi yu Pingjia (Daxue Yingyu Jiaoyan Ban)* [Examination and Evaluation (College English Teaching and Research)], *2*, 70-73.

Yi, Lan. (2015*). "*Tongyong yingyu" zhuanxiang "xueshu yingyu"—Jiaoyu guojihua beijing xia de daxue yingyu jiaoxue gaige yu shijian [From EGP to EAP: College English teaching reform and practice in the context of internationalization of higher education]. *Chongqing Shifan Daxue Xuebao* [Journal of Chongqing Normal University] (Philosophy and Social Sciences Edition), *6*, 74-81.