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Investigating the Needs of Technical Communication for TVET Students: A Case Study of Manufacturing Students in the Central Part of China

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Abstract: The most significant challenge in the 21st century is to prepare professionals to communicate technical information well through writing and speaking in the professional context. Research and studies on TC started to emerge in various aspects, but there is still scarcity in studies on curriculum design of TC. This paper explored the needs of curriculum design for TC at vocational colleges. The study was conducted in two steps: online questionnaires (n = 580) for students and semi-structured interviews (n=8) for English instructors at vocational colleges in the Central Part of China. The results showed that the manufacturing students had been taught less related TC skills in English subject, especially oral TC skills; however, the skills they most want to improve are team communication skills and oral TC skills. The findings also indicated that the current existing English courses in TVET institutions are irrelevant to TC skills on the one hand, but both the students and English instructors highly valued the importance of the TC module on the other hand. The findings from the current study serve as a basis for the curriculum design for TVET students. Further, this study may also contribute to the under-researched issue of English language learning in TVET institutions.

Keywords: Technical Communication (TC), needs analysis, TVET, manufacturing students, vocational colleges

1. Introduction

Technical communication (TC) is an emerging topic that has received attention in both language studies and technical professions in the last few decades. As one of the most significant research areas, pedagogy has been addressed (Rude, 2009). It is insufficient that engineering students only possess technical skills; they must also communicate well and understand how to perform in the global workplace (Boiarsky, 2004; Williams, 2001). The research group in China's National Institute of Education Science (CNIES (2016) found that, compared with other countries, there is a much more significant gap between the technician and the engineer in the manufacturing industry in China. For instance, in India, the manufacturing industry is supported by many English-speaking technicians, engineers, and researchers, but we do lack such kind of talents, which has impeded the manufacturing industry from serving the international market.

Considerable evidence, however, showed that there exists a huge gap between market demand and supply of TVET curriculum (Chen, 2018; Guo, 2019; Han, Liu, & Gao, 2016; Li & Liu, 2016; Li, 2019; Xu & Wang, 2006). Murgor (2013) found that the provision of communication skills by TVET institutions was important in the current demand for a highly competitive labour market, and poor communication skills would result in poor performance for business organisations. In addition, the findings showed that employers were dissatisfied with the vocational college graduates' communication skills in the workplace (Bai, Zhao, & Zheng, 2009; Xu, Xiang, & Chen, 2009). In fact, vocational college graduates also expressed they lacked adequate TC skills training before they were employed (Han, 2010; Li, 2014).

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On the one hand, a study found that implementation of the work-related curriculum in the central regions of China suffers significantly from the relatively low status because it is not examination-oriented, and schools are unwilling to spend limited educational resources on such curriculum (Canning, Li, Mcglynn, & Pilz, 2012). On the other hand, there is still a shortage of technical communicators. Even though the TC practitioners are needed in the job market, only the CTCA (China Technical Communication Alliance) provides specialised TC training programs in collaboration with some reputable companies such as Huawei, ZTE, Lenovo, Haier, Hisense, Dongfeng Motor, General Electric, Siemens, Nokia, Schneider, Thinkcom, Canon, Nikon, Costa, and Yamagata (Xu & Wang, 2006). However, considering the small number of technical communicators in these companies' training, TC programs were suggested to be conducted in colleges and universities collaborating with the practitioners in TC career (Guo, 2019). Thus, there is a need to focus on developing a pedagogical module for more vocational college students with the support of both TC academic experts and practitioners in TC career as the current practices of TC between TVET institutions and industry are still inadequate. Minimal research attention, however, has been directed toward developing a work-related TC module in vocational colleges to bridge this gap.

By reviewing the literature, in this study, the definition of TC is mainly adapted according to D. Ding and Jablonski (2001), who regard TC as communicating technical information through writing and speaking in the professional context in English. On the other hand, manufacturing plays an essential role in the global market among all industry fields. Literature review also showed evidence that TC is urgently needed in manufacturing (L. Li, 2019).

2. Literature Review

In the last decade, scholars have investigated definitions of technical communication (TC) and their related terms (Carradini, 2020) as well as the main issues in this area (Rude, 2009). Some of these researchers have also reviewed the research methods used in TC (Boettger & Lam, 2013; McNely, Spinuzzi, & Teston, 2015).

Some of the studies have focused on careers that require TC. For instance, Lanier (2009) found that employers required technical communicators with technical or domain-specific knowledge, while Brumberger and Lauer (2015) analysed core competencies required for TC in the job market. Hence, the continued interest in TC has shown a critical need to review and update the current research base for academics and practitioners. In addition, the current professional translation industry is concerned with the issues of sundry professional translation-related services and practices (Martín, 2020). To some extent, translation training is a value-added service for both industry and graduates' employability, and we can infer those professionals need to be equipped with TC skills for solid career support.

Boettger and Lam (2013) conducted a quantitative and qualitative analysis of papers published within five leading journals on TC from 1992 to 2011. The results showed that solid correlation variables, such as pedagogy, virtual collaboration, and intercultural communication were found. Another quantitative analysis of TC found that topics related to communication strategy and collaboration might foster future academic-industry connections (Friess & Boettger, 2021).

Besides that, some studies addressed the issue from the education perspective. The studies showed that the TC curriculum is highly valued in higher education, such as in the U.S., the U.K, Germany, Russia, Australia, Japan, and South Korea (Davis, 2010; H. Ding, 2018; Reave, 2004; Rus, 2015). English oral communication skills and technical writing skills were taught to engineering students in these countries. For instance, to achieve success in the career of engineering students, there is an additional qualification for them who pass TC courses as an elective course and will attain a TC skill certification in the top-ranked universities in the U.S. and Canada (Reave, 2004).

Research in China found that TVET students' TC skills were too low to support frequent communications in import-export businesses and transnational corporations. The recent studies showed that TC is increasingly needed in manufacturing because of the more frequent economic and technological exchange with foreigners (Chen, 2018; T. Han et al., 2016; L. Li, 2019; Yang et al., 2018). Chen (2018) conducted needs analysis of TC in key domains of the Belt and Road Initiative. The findings showed a large gap between the needs of technical communicators who can use English effectively at work and foreign language education provision. TC and local service can back up strongly China's popular industries in reaching a global audience (T. Han et al., 2016). In the process of China's manufacturing industry opening to the outside world, language has become a stumbling block to in-depth communication (Yang et al., 2018).

However, past studies did not adequately address developing manufacturing graduates' TC skills through courses in China's vocational colleges (S.-Y. Li & Chen, 2013). There were few Career English courses for manufacturing students in vocational colleges, and most were offered with College English courses. Feng (2015) elaborated that the current English teaching still focused on language grammar acquisition but neglected developing students' English application abilities (such as technical reports, seminars, product instruction, interpretation of production process, charts, and data). Besides, Feng (2015) addressed that manufacturing students in vocational colleges have difficulties in TC, especially oral English skills, and cannot solve work-related problems.

Yang et al. (2018) also found the same result. In response to this gap in the literature, this article addresses the following research questions:

1. What are the current teaching practices of TC skills?
2. What is the importance of the TC module?

3. Methodology

The study was conducted in two steps: online questionnaires (n =580) for students and semi-structured interviews (n = 8) for English instructors at eight vocational colleges in the central part of China.

3.1 Online Questionnaire

This questionnaire was used to identify what degree TC skills included in current English courses from the students' views. The questionnaire for the current study was adopted from Jamaludin, Alias, DeWitt and Mohd Ibrahim (2020) TC Model for TVET students with their permission. Table 1 shows the summary of the needs analysis questionnaire dimensions and items.

Table 1 - Dimensions and items

Dimension	Items	No of Items
Basic information	1-4	4
A. Oral Technical Communication Skills	A1-A9	9
B. Written Technical Communication skills	B1-B11	11
C. Team Communication skills	C1-C8	8
D. Skills You Would Like to Improve	D1-D4	4
E. Additional Comments		
Total		36

Two experts viewed the first version for content validation. The instrument translation process was achieved with the assistance of two linguistics experts who are certified translators, followed by a pre-test and pilot study to ensure instrument validity. The questionnaire was piloted with 50 manufacturing students in the central part of China, who were members of the target population but excluded in the final sample.

Next, the online questionnaires were distributed to target manufacturing students by teachers who were interviewed later at eight vocational colleges in Hubei, Hunan, and Henan Province. The collected data were analysed using the Statistical Packages for the Social Sciences (SPSS) version 23 for instrument internal consistency. The results showed that the Cronbach's alpha coefficient was high (.97), indicating very high reliability.

3.2 Semi-Structured Interviews

The semi-structured interviews aimed at understanding in more detailed the experience of the current TC skill teaching practice. The list of possible open-ended questions was grounded in prior studies and was compiled before the interviews. The interviews with eight English instructors were conducted in April 2021 and took about 30 minutes each.

The most appropriate sampling strategy of qualitative research is purposeful sampling (Merriam, 2009, p. 77). Thus, in this study, some criteria were used during sample selection. First, the vocational colleges in central part of China must include automobile manufacturing majors. Second, the vocational college must be public full-time institute, which meant that the instructors must have qualification certificates. Third, the English instructors would volunteer to participate in this research. In addition, the snowball technique was applied through recommendation from professional colleagues.

The interview aim was explained to all interviewees. They signed the consent form to participate in the study and agreed to have their interviews audio recorded. Six interviews were conducted face-to-face, while two interviews were via voice call.

The data were analysed using thematic analysis method. Specifically, the interview voice recordings were transcribed. The transcribed data were coded systematically through the entire data set, and identified interesting aspects in the data items that later were used to create themes. Next, organizing codes into potential themes and collecting all required data for each theme with the help of qualitative analysis software QDA Miner Lite. Finally, the interpretation with codes was taken back to one participant to get feedback to ensure internal validity of the findings.

4. Results

4.1 Questionnaire

The six questions of Survey 1 (N = 580) provided a sketch of the participants' backgrounds and demographics shown in Table 2. There were more males (92.4%) than females (7.6%), which reflects a much greater interest of automobile manufacturing among male students. The study included all grade of automobiles. Most respondents were freshmen.

Table 2 - Participants' background information

Category	Subcategory	Frequency	Percentage (%)
Gender	Male	536	92.4
	Female	44	7.6
Grade	1	359	61.9
	2	202	34.8
	3	19	3.3
	Total	580	100.0

	N	Min	Max	M	SD
Age	580	17	23	19.35	1.25

As for the current practice of TC skills, Table 3 presents the respondents' mean scores and standard deviations on the three categories of TC skills.

Table 3 - Results of the current teaching practice on TC skills from students' views

(Extremely high/High /Moderate/Low /Not at all: 5 4 3 2 1)

Oral Technical Communication Skills	**Min**	**Max**	**M**	**SD**
Q8 The ability to communicate effectively with co-workers and administrators.	1	5	2.59	1.135
Q9 The ability to deliver a speech to the audience.	1	5	2.27	1.015
Q10 The ability to give presentations to customers	1	5	2.49	1.041
Q11 The ability to plan and prepare visual aids.	1	5	2.70	1.044
Q12 The ability to define communication purpose.	1	5	2.71	1.059
Q13 The ability to define audience	1	5	2.73	1.069
Q14 The ability to chair a meeting	1	5	2.38	1.010
Q15 The ability to discuss in the meeting.	1	5	2.55	1.031
Written Technical Communication skills				
Q17 The ability to retrieve relevant information.	1	5	2.70	.964
Q18 The ability to gather and organize the relevant information	1	5	2.71	.953
Q19 The ability to plan and develop the content.	1	5	2.63	.932
Q20 The ability to produce technical descriptions and instructions	1	5	2.56	.991
Q21 The ability to produce technical reports and articles.	1	5	2.51	.983
Q22 The ability to produce correspondence.	1	5	2.48	.957
Q23 The ability to comprehend job-related journal and technical materials	1	5	2.61	.976
Q24 The ability to distinguish main ideas from supporting details.	1	5	2.57	.989
Q25 The knowledge on how to operate technological tools to improve communication	1	5	2.67	.993
Q26 An awareness of how technological tools help to promote social interactions and collaboration at work.	1	5	2.66	.985
Team Communication skills				
Q28 The ability to establish professional relationships with customers.	1	5	2.70	.979
Q29 The ability to establish professional relationships with co-workers.	1	5	2.76	1.011
Q30 The ability to share information in small group settings.	1	5	2.80	.993
Q31 The ability to positively handle conflicts within groups.	1	5	2.78	1.011
Q32 The leadership skills.	1	5	2.68	.996
Q33 The ability to effectively give instructions.	1	5	2.77	1.003
Q34 The ability to give feedback.	1	5	2.77	1.010
Q35 The multicultural awareness.	1	5	2.80	1.023

Based on Table 3, it was found that the mean value ranges from 2.27 to 2.80 on a 5-point Likert scale. This indicates that, on average, the manufacturing students have been taught less related TC skills in English subject, especially oral TC skills. Specifically, "the ability to deliver a speech to the audience" (2.27) and "the ability to chair a meeting" (2.38). In terms of written TC skills, "the ability to produce correspondence" (2.48), "the ability to produce technical reports and articles" (2.51), "ability to produce technical description and instructions" (2.56), and "the ability to distinguish main ideas from supporting details" (2.57) were less involved. Regarding team communication skills, the current teaching practice has less content on "the leadership skills" (2.68) and "the ability to establish professional relationships with customers" (2.70).

Table 4 - The skills students want to improve

(Extremely/Very/Moderately/Slightly/Not at all: 5 4 3 2 1)

Items	Min	Max	M	SD
Q37 Oral TC skills that are relevant to the industry.	1	5	3.71	1.047
Q38 Written TC skills that are relevant to the industry.	1	5	3.62	1.045
Q39 Team communication skills.	1	5	3.81	1.057

Table 4 presents which sub-skills are essential in training for manufacturing students. The skills they most want to improve are team communication skills and oral TC skills, followed by written TC skills. The findings identify the gap between what they have learned and what they want to learn.

4.2 Semi-Structured Interviews

Table 5 - Interviewees' profile

NO.	Gender	Age	Degree	Graduation university	Institution	Teaching Major	Location	Working years
A1	Female	40	Master	China Three Gorges University	Hubei Three Gorges Polytechnic	Mechanical and electrical engineering		19 years
A2	Male	26	Master	The University of Edinburgh	Hubei Three Gorges Polytechnic	Mechanical and electrical engineering	Yichang	2 years
B	Female	40	Master	Central China Normal University	Wuhan Railway Bridge Vocational College	Mechanical and electrical engineering	Wuhan	16 years
C	Female	40	Master	South China Normal University	Hubei Polytechnic Institute	Mechanical and electrical engineering	Xiaogan	17 years
D1	Female	36	Master	Hainan University	Hubei Industrial Polytechnic	Automotive engineering		11 years
D2	Male	31	Master	Politecnico di Torino, Italy	Hubei Industrial Polytechnic	Automotive engineering		5 years
D3	Female	37	Master	Xi'an University of Architecture and Technology	Hubei Industrial Polytechnic	Automotive engineering	Shiyan	9 years
D4	Female	34	Master	Wuhan University of Science and Technology	Hubei Industrial Polytechnic	Automotive engineering		9 years

The interviews generated richer data confirming and adding depth to the questionnaire results. Interviewees' profile presents in Table 5. The following themes emerged in the eight interviews during open coding:

College English is more about daily life than about future work

All vocational colleges offer College English for manufacturing students. Only one of the four provides an additional Career English course, named Automotive Engineering English. Four of them are college English instructors (A1, A2, B, C). Three are Career English instructors (D1, D2, D3), and one teacher (D4) has experience in teaching both College English and Career English.

Participant A1, A2, B, C, and D4 all addressed that the College English course is irrelevant to TC skills, such as participant C:

Now, College English is not closely linked to their majors, and students may not use it in their future work.

Participant D4 also states:

The content of the College English course is related to college life, and mainly about daily life, not work-related. For example, topics are renting and shopping. Topics on future careers are not involved.

All eight participants stated that English course in vocational college, both College English and Career English, is marginalized. Especially, the Career English course.

Participant D 4 explains:

The school paid less attention to it (Career English course). For instance, the core professional courses account for 6 credits. And College English accounts for 3 credits, while the Career English course only occupies 1.5 credits.

Participant D 1 also mentions:

The Career English course is not taken seriously. Whether it is for the students themselves or the administrative leaders, I do not think they pay enough attention. Because they also feel that the extension course is not a professional course, nor is it a compulsory course. They think 30 hours can make a difference. What can you teach students in 30h learning time? How much can students obtain? At most, students remember some or a few English words. Even worse, he may still not be able to learn a single word when they finish the course.

Students also do not pay enough attention to it. Many said it was unnecessary because they thought they would not do any English-related jobs when they graduate, so they do not want to spend time on it.

The same goes for D2 and D3, and they mentioned that the Career English course had not been paid enough attention as it should have.

Limited effectiveness of the existing teaching resources

All English teachers addressed those existing resources failed to support the course implementation effectively. According to their statements, the effectiveness of teaching resources is limited to two aspects: teaching facilities and instructors

All teachers mentioned that the existing module is not supportive. For instance, participant B explains:

The objectives of the module are too high to reach for vocational students. Based on the course objectives, we developed students' English language skills and prepared them to become compound talents. However, they can still not express themselves freely.

Participants D1 and D3 also note:

We cannot reach the present objectives. We have been lowering our teaching goals….

Next, the participant D1explains:

There are limited teaching resources. The textbook is boring and inflexible, not attractive or interesting….

Participant A2 also mentions:

The teaching goal is ideal, and there is still a big gap between the actual and ideal situations.

Participant D2 even explains:

We are facing the challenge of finding a suitable textbook. Some textbooks do not yet have the so-called objectives. In fact, our teaching goal is to follow the Chinese version of "Car Structure". Then take its knowledge goal as the Career English course, just to reduce some knowledge points…. This course lacks a suitable carrier. There must be a connection between professional knowledge and the English language…. This textbook we are using even has some mistakes in it. It may be edited by some language teachers without a professional background.

Apart from that, they also mentioned some issues with the current course contents. On the one hand, as mentioned before, the College English course is irrelevant to TC skills. On the other hand, the Career English course is a kind of English-medium instruction (EMI) more than content-based instruction (CBI). The data from interviews support this claim.

Participant D1, D2, D3 and D4 note:

This course is an English version of the core professional course named "car structure". Its content is on pure professional knowledge.

Participant D2 also explains,

It is hard for students to expand to the Career English area from their weak professional knowledge foundation…. This course did not emphasize the four basic skills (listening, speaking, reading, and writing skills). The focus is not on these basic language skills.

Besides that, participant A addresses,

Students lack a practical training environment. As I know, Shenzhen Polytechnic has a course called Applied English, which is conducted in a simultaneous interpretation classroom. They have that kind of training room. In our school, we do not have such hardware.

Participant D2 also mentions,

Students lack a real language practice environment, for example, sitting in a car and looking at the interiors of those English abbreviations…we do not have, and students need an environment for learning while using.

Participant C also mentions,

Professional knowledge is a big challenge for English language teachers. If only teaching some vocabulary, simple working principles, and processes, English teachers can shoulder this duty.

Furthermore, preparing lessons is a very tough task for English language teachers. Participant D4 explains,

It is challenging to choose a suitable teacher to teach the Career English course. You will find that Career English is either taught by professional subject teachers or English language teachers. A professional subject teacher has good knowledge of the professional area, but his English language is not so good as an English teacher. Although the English teachers have strong language skills and are better at language instructions, their professional knowledge is far behind. I understand how difficult the situation is because I taught both college English and Career English. To be honest, there are very few suitable teachers in this area.

Next, participant D1 explains,

I may not have such good pronunciation and intonation as an English language teacher do…. When speaking, I did not follow the grammatical rules. Therefore, I do not have a high grammar requirement for my students.

Participant D2 mentions,

I remember that I had difficulty doing English grammar in the courseware, such as attributive clauses. The attributive clause is a difficult grammar point for most students…. Especially long sentences containing attributive clauses are hard to understand. If the sentence is long, there will be more grammatical explanations. Students feel more confused. Although grammar is not a critical point, it is necessary. So, teaching and learning English grammar is challenging work.

The English instructors also struggle with curriculum improvement. Participant A mentions,

The improvement of the curriculum is needed. However, it is only at this stage that we are affected by some factors, such as hardware, software, and instructors. We are not able to improve each aspect at the same time. So we can only make some minor improvements based on our current conditions.

Participant D1 notes,

Sometimes I want to improve my lessons, but I do not have time. After class, meetings, training are coming, very crowded schedule… The time and energy of teachers are very limited.

For the second research question, "What is the importance of TC module?", all eight English instructors addressed the need for TC module in the manufacturing department. Participant B explains,

I believe that we can make a bold trial. TC module is essential, and it is very feasible. Professional vocabulary, listening and speaking skills, and writing work-related documents are necessary…

Participant D2 also explains,

Engineering colleges like us, TC, are required in the industrial field. There is a need to offer this course for students.

Because the manufacturing industry may be processing, it is all in English and will not be expressed in Chinese. The requirements will get higher and higher. In the future, China will be a manufacturing powerhouse in this trend. This may all be given to artificial intelligence. If all are handed over to manual manufacturing, then the ability to operate the robots and understand the meaning of the fault code are required. Programmatic things have higher requirements for students' reading comprehension and problem-solving abilities.

And participant D2 also notes,

Even though students may just meet the industry's requirements, or they may not be able to use it now, as the current trend of the manufacturing industry, in fact, the automotive industry, as the large part of the manufacturing industry, will have higher and higher requirements for TC skills.

5. Discussion, limitation, and direction of future research

This section offers responses to the research questions and suggestions for future studies. Concerning RQ1, the current teaching practices of TC skills, the questionnaire responses showed that in English teaching practice, TC is less involved from students' views, which was supported by the results from instructors' interviews. The interview analysis supported this finding. The findings also supported that of previous studies such as Li (2014) and Han (2010), which found that the existing English courses failed to develop students' TC skills. Moreover, it was found that the current English instructors were facing many challenges. The findings correlated closely with the existing literature (Gao, 2015; Shi, 2015; Yang, 2017). This again indicated that English courses should be improved to be more effective and work-related to meet job market needs.

In considering RQ2, both students and English instructors highly value the importance of the TC module. This finding was consistent with Ding and Jablonski (2001) and Ding (2010). English course designers and instructors should emphasise TC skills training, with further modularised TC education and training in particular areas. Besides that, the study supported the findings that manufacturing is one of the most critical industries in China. TC will be more and more needed due to the frequent communication with outsiders (CNIES, 2016; Han et al., 2016). As such, ESP researchers and English instructors should endeavour to incorporate TC pedagogy within a syllabus or course content to help the TVET students bridge the gap between the classroom and the workplace and better equip working technicians with the English language skills needed career advancement and becoming global high skilled talents.

The following were identified as limitations to this study. First, the scope of TC skills is vast, and the definition of TC is also changing dynamically. This study limits the TC in pedagogy and more specifically, immersion in English subjects. Based on previous literature, only three main TC skill clusters were selected, namely technical writing skills, oral presentation skills, and team communication skills, but the subskills of TC might be various according to the different conceptual frameworks. Second, the data were collected from only six vocational colleges in the central part of China. Thus, the results could not be generalized to all the vocational colleges in China due to contextual constraints.

Despite these limitations, the findings of the study imply that the developmental research of the TC module for manufacturing students has also given valuable inputs in terms of career English courses in vocational colleges. Additionally, this study may help ESP researchers. On the one hand, based on the findings researchers can further explore the connection between ESP and TC. Also, researchers can test whether the English subject in vocational colleges can shoulder the responsibility of developing students' TC skills, which remain questionable and controversial in academia. To this end, it can also identify whether the TC program can break through the current dilemma of ESP.

6. Conclusion

This paper identified the need to develop a TC module for TVET students. First, the manufacturing students have been taught less related TC skills in English subject, especially oral TC skills; however, the skills they most want to improve are team communication skills and oral TC skills. Second, both English instructors and students value the importance of TC skills. Moreover, since the manufacturing industry is a typical area in China, it is believed that results could be generalised to other areas. Due to the lack of such studies in China, the results of this study may help bridge this gap and help China's TVET institutions better prepare students for future careers as professionals who can communicate technical information well through writing and speaking in the professional context. As such, English course designers and instructors are supposed to emphasise TC skills, with further modularised training in particular areas. By doing so, it might help to compensate for the cross-domain overlap between the technical domains and English language proficiency, which could also provide opportunities for career advancement.

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References

Bai, J., Zhao, X., & Zheng, Y.-C. (2009). 企业对高等职业教育学生英语应用能力要求的调查与分析[Investigation and analysis on the requirements of enterprises to the english application ability of higher vocational college students]. *China Adult EducationChina Adult Education, 6*(2), 80-82.

Boettger, R. K., & Lam, C. (2013). An Overview of Experimental and Quasi-Experimental Research in Technical Communication Journals (1992-2011). *IEEE Transactions on Professional Communication, 56*(4), 272-293. doi: 10.1109/tpc.2013.2287570

Boiarsky, C. (2004). Teaching engineering students to communicate effectively: A metacognitive approach. *International Journal of Engineering Education, 20*(2), 251-260.

Brumberger, E., & Lauer, C. (2015). The Evolution of Technical Communication: An Analysis of Industry Job Postings. *Technical Communication, 62*(4), 224-243.

Canning, R., Li, J., Mcglynn, C., & Pilz, M. (2012). A comparative study of work-related learning in the lower secondary school in Germany, China and Scotland: The implications for the continuing professional development of teachers. *International Journal of Continuing Education and Lifelong Learning, 5*.

Carradini, S. (2020). A Comparison of Research Topics Associated With Technical Communication, Business Communication, and Professional Communication, 1963–2017. *IEEE Transactions on Professional Communication, 63*(2), 118-138. doi: 10.1109/TPC.2020.2988757

Chen, Y. (2018). *技术传播视角下"一带一路"重点行业领域企业外语需求研究[A study of corporate foreign language needs of enterprises in key domains of the belt and road initiative : from the perspective of technical communication](Master's thesis).* (硕士), 东南大学. Available from Cnki

CNIES. (2016). China's National Institute of Education Science. 完善先进制造业重点领域人才培养体系研究[On advancing the system of talent cultivation in priority areas of manufacturing in china]. *Educational Research, 37*(01), 4-16.

Davis, M. T. (2010). Assessing Technical Communication within Engineering Contexts. *IEEE Transactions on Professional Communication, 53*(1), 33-45. doi: 10.1109/tpc.2009.2038736

Ding, D., & Jablonski, J. (2001). Challenges and opportunities: Two weeks of teaching technical communication at Suzhou University, China. *Technical Communication, 48*(4), 421-434.

Ding, H. (2018). Development of Technical Communication in China: Program Building and Field Convergence. *Technical Communication Quarterly*, 1-15.

Feng, X.-F. (2015). 高职院校非英语专业口语教学改革与实践——以电子制造业为例[reform and practice of oral english teaching for non-english majors in higher vocational colleges -- taking electronic manufacturing industry as an example]. *Contemporary education research and teaching practice*(10), 202+201.

Friess, E., & Boettger, R. K. (2021). Identifying Commonalities and Divergences Between Technical Communication Scholarly and Trade Publications (1996–2017). *Journal of Business and Technical Communication, 35*(4), 407-432. doi: 10.1177/10506519211021468

Guo, Z.-Y. (2019). *技术传播行业发展战略研究[Research on development strategy of techncial communication] (Master's thesis).* (硕士), 北京邮电大学. Available from Cnki

Han, T., Liu, L., & Gao, Z. (2016). 强化技术传播与本地化,助力中国品牌走出去[The strengthen of technical communication and localization for the purpose of helping Chinese brands going global]. *Science & technology review, 34*(17), 105-109.

Han, Y. (2010). Developing technical communication education for Chinese industry professionals: Preliminary findings and suggestions. *IEEE Transactions on Professional Communication, 53*(2), 102-115.

Lanier, C. R. (2009). Analysis of the Skills Called for by Technical Communication Employers in Recruitment Postings. *Technical Communication, 56*(1), 51-61.

Li, L. (2019). 制造业转型升级下高职学生职业能力培养研究[Research on vocational ability of higher vocational students from the perspective of transformation and upgrading of manufacturing industry]. *Education and teaching forum*(19), 238-239.

Li, L., & Liu, W. (2016). 从 EGP 到 ESP 看高职院校英语教学的定位与转型[The orientation and transformation of English teaching in higher vocational colleges from EGP to ESP]. *Vocational & Technical Education Forum*(02), 72-75.

Li, S.-Y., & Chen, Y. (2013). 试论高职院校专门用途英语人才培养模式[On the cultivation mode of specialized English talents in higher vocational colleges]. *Heilongjiang researches on higher education, 31*(08), 102-104.

Li, X. (2019). 职业教育产教融合实施的关键问题及制度环境创设[The key problems and the establishment of institutional environment for the integration of industry and education in vocational education]. *Vocational & Technical Education Forum*(08), 32-36.

Li, Y.-L. (2014). 基于学习者交际需要的高职 esp 教材开发策略探析[Development strategies of esp english teaching textbook based on learners' communicative needs]. *Vocational and Technical Education, 35*(23), 82-86.

Martín, M. M. (2020). Transcreation as a Way to Promote Employability in Translation Training: Adding Value to Translation Training. *Journal of Language and Communication in Business, 60*, 125-139.

McNely, B., Spinuzzi, C., & Teston, C. (2015). Contemporary research methodologies in technical communication. *Technical Communication Quarterly, 24*(1), 1-13. doi: 10.1080/10572252.2015.975958

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*: John Wiley & Sons.

Murgor, T. K. (2013). Relationship between Technical and Vocational Acquired Skills and Skills Required in Job Market; Evidence from TVET Institutions, Uasin Gishu County, Kenya. *Journal of Education and Practice, 4*.

Reave, L. (2004). Technical communication instruction in engineering schools a survey of top-ranked US and Canadian programs. *Journal of Business and Technical Communication, 18*(4), 452-490. doi: 10.1177/1050651904267068

Rude, C. D. (2009). Mapping the Research Questions in Technical Communication. *Journal of Business and Technical Communication, 23*(2), 174-215. doi: 10.1177/1050651908329562

Rus, D. (2015). Developing technical writing skills to engineering students. *Procedia Technology, 19*, 1109-1114.

Williams, J. M. (2001). Transformations in Technical Communicat ion Pedagogy: Engineering, Writing, and the ABET Engineering Criteria 2000. *Technical Communication Quarterly, 10*(2), 149-167. doi: 10.1207/s15427625tcq1002_3

Xu, Q., & Wang, X. (2006). *技术传播学：美国的发展对我们的启示[Technical communciation: Enlightenment from the development of the united states]*. Paper presented at the Conference on the 5th Asia-Pacific Media, Technology and Social Development, 中国北京.

Xu, W.-C., Xiang, Q.-J., & Chen, X.-Z. (2009). 用人单位对高职高专毕业生英语能力岗位要求的调查报告[Investigation report of employers on the requirements of higher vocational college graduates' English proficiency]. *Education and Vocation*(14), 183-185.

Yang, S., Duan, Q., Ji, T., Li, X., Hu, P., & Yang, Y. (2018). 面向制造业企业的英语专业教学模式研究[Research on the teaching mode of English majors for manufacturing enterprises]. *Guangxi journal of light industry, 34*(01), 149+151.