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Exploring Students’ Perceptions in Sustainable Disciplinary Language Learning in an English-Medium Instruction University: A Case Study of Hong Kong Veterinary Medical Students

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Abstract: University students are expected to develop the skills required for their disciplines, especially those who have learnt English as a foreign language and study at English-medium instruction (EMI) universities. This study investigates the disciplinary literacy needs of students of veterinary medicine. The data were collected using a large-scale survey (n = 122) of students and interviews with five practitioners of veterinary medicine. The findings show that the student vets were trained to carry out highly demanding duties during their clinical placements, such as reading medical case histories, making diagnoses, elaborating on treatment plans for their clients, and composing referrals and medical reports. However, they were exposed to a challenging EMI environment where the requirement to speak and write in English significantly hindered the effectiveness of their learning. A discrepancy in disciplinary tasks between school and the workplace was also revealed. Therefore, it is crucial that researchers and educators at veterinary schools address students’ learning challenges to ensure they have the effective English language skills (including reading, writing, and speaking) they need to meet the language demands of their future clinical work and an understanding of the academic genres of veterinary medicine. This study also showcases the types of multi-literacies (i.e., academic genres and communication skills) needed to fulfil certain clinical duties, and the pedagogical implications are discussed.

Keywords: English-medium instruction; disciplinary language; veterinary; students; university

1. Introduction

Against the backdrop of internationalisation and the widespread use of English as the academic lingua franca in higher education globally [1], English has become an important medium in which university students construct and communicate complex disciplinary understanding [2,3]. However, when learners of English as a second/foreign language (ESL/EFL) acquire content knowledge through English, it raises the threshold for gaining access to and being successful in their academic careers [4].

English-medium instruction (EMI), widely understood as ‘the use of English to teach academic subjects (other than English itself) in countries or jurisdictions where the first language of the majority of the population is not English’ [1], has developed rapidly worldwide at the tertiary level [4,5], and Hong Kong is no exception [1]. Hong Kong adults’ English proficiency was relatively moderate compared to other regions of the world. According to the EF EPI 2022 (for detailed data description, see https://www.ef.com/wwen/epi/regions/asia/hong-kong/ accessed on 30 December 2022), a global English test-based data set, Hong Kong adults’ English proficiency score is 561, which is much lower than the Netherlands (661) and Singapore (642). EMI students in Hong Kong are expected to learn academic content and skills through English [6]. To this end, they need to acquire
the language used within their disciplines to learn the necessary content [7]. However, within and beyond Hong Kong, EMI students’ English proficiency [8–10] and academic literacy skills [11] have hindered their comprehension of complex academic content, limited their ability to express ideas about their subjects, and obstructed higher-order interactions with their teachers. In Hong Kong universities, the lack of familiarity with academic vocabulary and discourses and with genres that vary between subjects [12,13] also makes it challenging for students to communicate with and beyond their disciplines.

Out of the many effective tertiary level language learning and teaching programmes, academic literacy has received considerable attention. It is a cardinal necessity for perform academic tasks (e.g., reading, writing, presenting, evaluating, reasoning, and investigating), and mastery offers the crucial ability to communicate successfully in various academic fields [14,15]. Adding to general academic literacy, the recent attention of academic work has shifted to the practical aspects of the various disciplines [16]. Teaching through this lens of disciplinary literacy [17] is essential for students’ understanding of subject-specific texts, engagement in disciplinary practice, and the development of specific strategies for instructors to communicate their disciplinary understanding [16]. In the EMI context, disciplinary literacy supports ‘successful participation in EMI lessons, including understanding and using discipline-specific vocabulary, genres, and registers, and developing skills needed to complete subject-specific academic tasks in English’ [6].

In EMI in tertiary education, the various subjects’ different knowledge-making and communication needs are associated with variations in English use [18]. Researchers have suggested that enhancing disciplinary literacy is crucial for learning in EMI and that EMI teaching at the tertiary level should enhance disciplinary literacy [19,20]. This indicates an urgent need to explore real-life disciplinary practices and needs with students from different subjects to further guide their instruction in language skills and content learning [21]. However, the understanding of the various disciplinary differences in EMI that could highlight the potential effects of those differences on language use is largely absent. The mastery of disciplinary literacy and language ability is paramount to academic learning and conducting effective communication, especially in the case of veterinary science, in which communication has been identified as a crucial ability to succeed in the field given that veterinarians need to interact with animals’ owners and medical staff (e.g., addressing their questions and hand over) [22]. Hence, training future veterinary practitioners with the knowledge of their current classroom experiences, challenges, and needs regarding their disciplinary literacy is vital, especially for EMI students who have already been facing foreign language challenges, which is insufficient [23]. To date, studies of disciplinary language learning in EMI have only examined a few subjects, such as accounting [7], computer science [24], biotechnical sciences [25], engineering [13], and medicine [26,27]. Shaped by their learning experiences, students’ perceptions have a strong bearing on their learning, and such experiences differ across disciplines [28]. Therefore, this study aims to further the understanding of disciplinary language practices and the needs of different subjects in EMI from the perceptions of students who have majored in veterinary medical science.

2. Literature Review

2.1. Disciplinary Literacy

Disciplinary literacy arrived in the early 1990s, and its understanding developed partly in concert with research into academic language and literacy [29,30]. Advanced by Cognitive Academic Language Proficiency [31] and Systemic Functional Linguistics [32], scholars’ understanding of and focus on academic English have shifted over the past two decades. Scarcella [33] defined it as ‘a variety or register of English used in professional books and characterized by the linguistic features associated with academic disciplines’ (p. 9). This definition emphasises the context-specific usage of English. Snow [34], on the other hand, challenged the boundary between so-called academia and conversational
language. This transition recognises the complex and dynamic nature of actual language-in-use, empowering and being empowered by its various functions in different contexts.

Using the word ‘literacy’ instead of ‘language,’ academic literacy shifts its focus from language to all of the language’s practices and discourses in communication, as well as other multimodalities, such as pictures, graphs, and home languages [29,35]. In this sense, academic literacy is multidimensional, displaying linguistic, cognitive, and social aspects [36].

From the linguistic perspective, academic literacy is the ability to use language in academic discourse adaptively, and it consists of reading, writing, and speaking, as well as evaluating information, critiquing viewpoints, and creating knowledge [15]. Cognitively, academic literacy requires an individual’s higher-order thinking and language skills [37]. The social features of academic literacy include the ability to read or write academic texts and adapt to the social environment and specific academic culture, such as that of a department at school [38]. Students’ afterschool literacy life (i.e., language skills they need at their future workplace) and their personal and cultural experiences also affect what academic literacy means to them [39]. More recently, Dalton-Puffer et al. [40] called for a more collaborative and multidisciplinary approach to teaching that highlights academic literacy. Overall, academic literacy implies facing the challenges of acquiring and teaching this language skill. This, in turn, requires the support of numerous experts from the discourse community and beyond, who impart variously integrated and intersectional content knowledge while considering the contexts to which the students belong [15].

This need for nuanced consideration of context has encouraged researchers to look into disciplinary practice in academic work or disciplinary literacy [16]. To some extent, this corresponds to the linguistic, cognitive, and social dimensions of academic literacy working simultaneously in disciplinary practices [41]. In terms of language use, disciplinary literacy consists of the idea that different academic discourse communities use language differently, such as in text structures, vocabulary usage, and grammar choices [16,42]. Cognitively, the higher-order thinking process of academic literacy is closely associated with disciplinary epistemologies, which refer to modes of knowing, doing, and thinking in subject-specific ways [36,43]. In this sense, language use and cognitive activity in disciplines are interrelated. Linguistic knowledge (e.g., how texts and sentences are structured differently), discourse knowledge (e.g., whether the evidence in an argument is well supported in a text), and content knowledge (e.g., how an argument furthers the understanding of this field) allow students to put their knowledge to use in solving disciplinary problems and forming a discipline-specific way of thinking [30].

Researchers have argued that the disciplinary variation of language is rooted in the inherent features of the subject itself and the methods adopted, which further influence the employment of learning strategies [25,42]. The disciplinary distinction between doing and thinking is manifested primarily when an individual is engaged in academic tasks, such as reading and writing. For instance, unlike historians, mathematicians think less about an author’s perspective when reading [42]. In higher education, Bojović [25] found that university students and instructors of biotechnology reported the frequent use of background knowledge as a comprehension strategy. This may be the result of the main sections of biotechnological texts—purpose, background knowledge, and sourcing. Airey and Larsson [29] interviewed several university teachers of physics and reported the wide use of semiotic resources, such as graphs, tables, and diagrams, to construct and communicate knowledge of physics to undergraduate students. These studies imply that in tertiary-level disciplinary practices, a broad view of language is an inherent and indispensable feature of cognitive activity in terms of learning strategies, knowledge building, and communication in both general and specific academic tasks.

The social aspect of academic literacy is reflected in the attention paid to the many in-depth disciplinary subcultures that conduct research into disciplinary literacy [43]. As well as the abovementioned linguistic and cognitive dimensions, disciplinary literacy practices are based on communicative purposes, traditional community norms and conventions [44],
the context of the course, personal intentions, and cultural backgrounds [45]. Underlining that disciplinary literacy develops through social interaction, Airey [46] proposed the disciplinary literacy triangle to visualise the understanding that developing communicative competence in each type of disciplinary literacy depends on the emphasis on three contexts: society, academia, and the workplace. For instance, mathematical lectures tend to develop students’ communication ability in the context of the academy, while nursing experts might focus more on communicative ability in society and the workplace, such as in a hospital [29]. Despite the interdisciplinary differences in communicative competence, Airey and Larson [29] also called for more attention to intradisciplinary variations. For example, at a South African university, Linder et al. [47] examined representational competence in physics from a teacher’s perspective—in other words, the ability to effectively communicate both knowledge of physics and to do so in the related physical workplace. However, they found that the teachers viewed these skills as irrelevant to their jobs.

Disciplinary literacy is also a pedagogical approach. It suggests the explicit connection that teachers operate between disciplinary teaching and language, as well as their support in making the disciplinary text accessible and in imparting the strategies needed for students to engage in disciplinary activities [48]. It also highlights a variation with English academic education, which pays the most attention to general academic vocabulary [49].

Taken together, the complexity and specificity of the linguistic, cognitive, and social aspects increase by the same amount of complexity and specificity when teachers seek to enhance students’ disciplinary literacy. From the perspective of the increasing specialisation of literacy development, disciplinary literacy is at the top of the pyramid, representing literacy skills that are peculiar to the subject matter (for detailed specialisation, see [37]). This definition highlights that the more specialised literacy skills are, the more abstract, ambiguous, decontextualised, and even contradictory the knowledge contained is. Therefore, to succeed at the tertiary level, students, especially EFL learners, require disciplinary literacy of a considerable complexity in another language. However, studies at the university level are scarce and pay limited attention to writing tasks [38] compared with research into primary and secondary school levels.

2.2. Disciplinary Literacy Challenges in Tertiary EMI

Given the significant and synergic linguistic, cognitive, and social challenges, and the importance of acquiring disciplinary literacy skills for university students internationally, EMI courses have been called into question. If these are not effectively and appropriately implemented, some students’ limited English ability would hinder engagement in disciplinary inquiry [50,51]. In Hong Kong, Lo and Lo [52] showed that in subjects including science, history, and geography, EMI students received lower scores than those who were taught using their home language. This could be related both to the students’ second language (L2) proficiency and to teachers’ pedagogical skills.

Studies into the linguistic challenges in disciplinary literacy have centred around Hong Kong EMI students’ challenges in comprehending content, partly due to a lack of academic and technical vocabulary [53]. EMI experience has also affected Hong Kong university students’ receptive academic vocabulary [54] and their vocabulary in subject areas [55]. Those with less EMI experience or exposure to English were disadvantaged compared with those with more.

Regarding the cognitive load of disciplinary literacy in EMI, researchers have examined the challenges students face when performing academic tasks, including listening, speaking, writing, and reading. Despite the cognitive load from content learning, language-related challenges have been found to intensify EFL students’ difficulties and to cause their poorer academic performance [56]. For instance, Chan [57] found that the frequent use of specialised vocabulary influenced students’ comprehension of content lectures. As for the main issues in the discussion and presentation of disciplinary subjects in EMI classes, researchers have noted the lack of training for students in the appropriate discipline-specific discourse knowledge [11]. For Hong Kong EMI students, those who have low English expo-
sure face more problems with oral English, an issue to which the lack of academic speaking skills and the breadth and depth of vocabulary have contributed [51]. A limited exposure to disciplinary-specific academic discourse, genres, and referencing conventions has been found to be a major challenge for students’ writing in EMI contexts [12,13]. In the context of Hong Kong EMI, Evan and Morrison [8] found the lack of an appropriate disciplinary writing style to be one of the biggest obstacles for university students. Students’ previous EMI exposure had been previously found to affect their writing and their performance in content-subject tests [54]. As for reading, the widespread use of specialist vocabulary in discipline-specific books and reading tasks [58,59], as well as limited experience in interpreting writers’ attitudes, purposes, and writing styles [55], were found to impede EMI students’ reading comprehension and success in completing tasks. In Hong Kong, Pun [51] suggested that the reading comprehension challenges faced by many students who had had fewer EMI experiences before attending college were attributable to the absence of Chinese definitions of both general and discipline-specific vocabulary in textbooks.

In terms of the social dimension of disciplinary literacy, Kırkgoz [60] adopted a discourse community perspective to identify Turkish EMI university students’ academic needs and challenges in writing. A discourse community groups together people who possess the same goals and norms and share knowledge of a discipline. Unveiling the gap between social and academic needs and the instructions received, Kırkgoz [60] called for the provision of genuine materials, tasks, and tests in tune with their disciplinary requirements. Furthermore, what is equally crucial is to provide the socialisation opportunities needed to experience the disciplinary discourse community, such as practising the communication strategies used when attending conferences on their discipline.

The challenges reviewed here, together with the use of EMI in an era in which students’ social and academic success is judged internationally [1,61], show the need to investigate the pedagogical approaches that support the disciplinary literacy requirements of tertiary-level EMI students in each subject [61]. As Snow [34] noted, students cannot understand science without being equipped with the academic language for writing and talking about science.

Jakobek et al. [62] investigated the needs of the veterinary teaching hospital referral centres associated with regional veterinary colleges regarding students’ continuing education, collaborative research, and referrals for specialty consultation and care. The findings showed multiple unmet needs in continuing education, of which dermatology and behaviour were most common. Many veterinary colleges reported an interest in collaborative research participation. Communication was frequently selected by the respondents when asked what could be improved in the veterinary teaching hospital referral centre process. These findings were affected by disciplinary literacy accentuating social practices in different communities in its development [46]. However, the needs of university students of veterinary medicine for sustainable, effective education in disciplinary literacy remain under-researched.

2.3. Disciplinary Literacy Support in Tertiary EMI

To address the abovementioned challenges and enhance disciplinary literacy and content learning, scholars have investigated the perceived roles and practices that are germane to disciplinary literacy in tertiary-level EMI lecturers. Although Aguilar [63] pointed out that many tertiary EMI lecturers attach little importance to language interaction, this issue may vary in different contexts or even across classrooms. For example, Basturkmen [7] found that EMI lecturers in New Zealand played an important role in supporting students’ learning of the accounting register and the development of disciplinary literacy, although this was largely understood as learning specialised vocabulary. Examination of their incidental language-related episodes also revealed that some EMI lecturers paid attention to language issues in content learning and proactively mentioned the use of language [7,24]. On the contrary, in other EMI classrooms, students’ discipline-specific language competence, such as technical language and sentence structures [21,26], disciplinary genres and texts, and communication issues [64] were overlooked. Additionally, a widespread pre-
sumption exists in many EMI courses that university students enter the classroom with adequate English proficiency and academic literacy skills [11]. Macaro et al. [65] observed a university EMI course in China and noticed that when encountering disciplinary concepts, whether simple or complex, teachers tended to use students’ mother tongue (L1) to explain. However, the careless use of L1 needs to be cautioned against as it may not help students improve their academic English, but rather reduce the quality of EMI education [66].

Drawing on the social aspect of disciplinary literacy, Airey et al. [50] advocated a detailed EMI programme and syllabus with specific disciplinary literacy objectives alongside general academic goals, as well as a university-level language policy flexible enough to accommodate disciplinary differences. In this way, more EMI content teachers would gain a more explicit recognition of the importance and needs of disciplinary language learning and be willing to take on the role of language teachers [50].

Students’ perceptions of their EMI experiences also show the need for better disciplinary language support. In the context of tertiary education in Hong Kong, Xiao and Cheung [21] conducted a small-scale intervention on EMI students’ discipline-specific writing ability. From the student perspective, the findings suggested that variations among subjects and grades influenced students’ perceived needs for disciplinary writing. For instance, students who majored in mathematics had less need to write a summary than English majors. Undergraduate students might also have less desire to attend academic writing classes because they are rarely required to write research articles. Similarly, Eriksson [13] designed an intervention to support the disciplinary writing ability of engineering students at a Swedish university and suggested that one way of addressing students’ writing challenges was to explicitly identify what was expected in each discipline and course. Interviews with students showed that they were clear about the purposes and value of disciplinary writing and recognised the importance of teachers’ feedback on writing tasks. This further informed a collaborative approach between content and language teachers to highlight the important genres and content during writing. Furthermore, Moncada-Comas’ [67] qualitative study explored Spanish students’ perceptions and experiences of EMI and noted their criticism that EMI undermined in-depth disciplinary content learning and was ineffective in language development. On the other hand, some positive experiences with EMI occurred when the disciplinary knowledge delivered in English was interesting, relevant, and authentic. Students’ perceptions, shaped by their learning experiences, are influential in their learning effects and such experiences differ across disciplines [28]. These studies suggest that students’ perceptions of discipline-specific language experience and needs in EMI classrooms should play a significant role as an entry point to facilitate content learning in EMI by designing more suitable language support.

The role of language and literacy are part and parcel of disciplinary learning [16]. However, EMI professional training focusing on teaching disciplinary language and literacy to support content learning is scarce at the tertiary level [68]. There is a disparity between what is needed in teaching tertiary EMI disciplinary literacy and (1) the understanding of students’ specific disciplinary needs as well as (2) the appropriate pedagogical approaches to supporting students’ academic and career success with the help of language. To bridge that gap, this study investigates the disciplinary literacy needs of university students in a specific discipline, namely veterinary medical science. One of the highlights of this study is the needs analysis of sustainable effective education, given that needs are the central component of course design [69,70]. This seems to be taken for granted in discussions of sustainable effective education given that needs may change over time and according to context. As discussed in the literature, to identify learners’ needs, a needs analysis involving collecting and analysing data is conducted [71].

3. Methodology

This study followed a convergent parallel design [72], a mixed-method approach with independently conducted quantitative and qualitative strands, to explore the academic literacy needs of veterinary medical students in an EMI university. The quantitative
phase used the survey method to explore students’ academic literacy experiences and their perceived importance, challenges, and coping strategies relevant to language use. The research team used multiple approaches, including distributing a questionnaire and sending direct emails. The research team then developed a survey to elicit the students’ views of learning and teaching disciplinary English in the context of veterinary science. Semi-structured interviews took place with a small group of participants seeking to understand their experiences of acquiring disciplinary English to meet the demands of their daily academic tasks (including reading, writing, and speaking skills in veterinary medical science). The interviews were conducted as a subordinate data source to supplement the results of the survey.

In the qualitative phase, semi-structured interviews were conducted with veterinary clinicians to understand their real-world disciplinary literacy needs and in response to the sociocultural facets of disciplinary literacy, which are developed through interactions in society, academia, and the workplace [46]. Both quantitative and qualitative data were then combined for interpretation.

4. Participants

One hundred and twenty-two students were recruited from an EMI university veterinary medicine programme for this study. The students, who had completed three years of studies at most, completed a questionnaire about their perceptions of communication in their veterinary training. Of the 122 respondents, 45.1% were female and 54.9% were male, making for a relatively balanced gender ratio. Most were aged between 18 and 20 (82.7%), with the youngest being 17 years old and the eldest being 24 years old. Seventy per cent had received their secondary education in Hong Kong; 30% had taken the Hong Kong Diploma of Secondary Education (a public examination for university admission), 10% had completed the General Certificate of Education, and another 10% had completed the International Baccalaureate. In addition to the standardised examinations, half of the respondents had taken the International English Language Testing System, and 5% had taken the Test of English as a Foreign Language to gauge their proficiency in English.

Five veterinary clinicians participated in one-to-one semi-structured interviews. The female (n = 4) and male (n = 1) practitioners had obtained a degree or diploma in the veterinary field as both doctors and nurses.

5. Data Collection

5.1. Developing Surveys

The survey aimed to elicit the students’ perspectives on the use of language in their overall veterinary education. It consisted of five sections: (1) their background information (i.e., age, gender, previous educational background, English exposure, and experience studying in English-speaking countries); (2) their language choice(s) in their previous educational and scientific activities and their self-reported academic achievements; (3) their self-concepts and beliefs about learning science in English; (4) their language challenges and the strategies adopted; and (5) their perceptions of science writing and their understanding of scientific reports. Specifically, the participants were also asked to comment on their use of English in their discipline to reveal their views about using English to study veterinary medicine. They rated their current English levels and their views about the English skills needed for studying veterinary medicine on a 5-point Likert scale.

5.2. Semi-Structured Interviews

The semi-structured interview, with well-designed follow-up interview questions and probes, allows researchers to delve deeper into a phenomenon relating to their research aims [73]. Hence, this method of data collection was adopted to increase our understanding of the disciplinary language experiences from the five practitioners’ viewpoints (represented as V1–V5), using a convenience sampling technique [73]. Despite the limitations of using less controlled participants, this study involved a relatively balanced number of
interviewees (45.1% female and 54.9% male), gathered high-quality interview data (i.e., topic-relevant and undisclosed information from each interviewee from their experience-based perspectives), and carefully described the shared characteristics of the sample with enough details in the findings to ensure its validity and credibility.

Each of the participants attended a 30-minute interview in English with a researcher in which they were asked to share their veterinary practices, particularly regarding communication. The guided questions included the following: (1) ‘In your discipline, what do you think is the role of communication?’, (2) ‘How do you define effective communication?’, (3) ‘What strategies do you use to ensure that your clients understand your explanations?’, (4) ‘How do you communicate with your colleagues in your workplace?’, and (5) ‘What expectations do you have for the communication skills of veterinary graduate students?’.

6. Data Analysis

Quantitatively, the survey data were analysed using SPSS 22.0 (Statistical Package for Social Sciences, IBM SPSS Inc, Chicago, IL, USA). Kristina Simunović all of the respondents were calculated and compared.

NVivo, a computer-assisted qualitative data analysis software suite, was used in the qualitative section during data transcription and coding. Both inductive and deductive coding methods were used. The deductive approach can help researchers identify some already-known communication functions in the medical field and serves as a structural and theoretical underpinning to inductively explore other codes derived from this study which particularly examines the veterinary medical context [74]. The researchers first coded the data deductively according to the communication skills in the medical field categorised by Glendinning and Holmström [75]. This includes finding overarching themes, such as history-taking (H) (i.e., learning the basic information and symptoms); diagnosis (D) (i.e., identifying the problems); treatment (TR) (i.e., medical and/or surgical treatment); and special examination (SE) (e.g., instructing, reassuring, rephrasing, encouraging, and prompting).

Inductive coding was then adopted to check whether there were any novel themes given both the Hong Kong context and the veterinary discipline. For example, collaborating (C), translating (TL), and reporting (R) were added. C refers to veterinarians interacting with clients or other veterinary staff to reach information exchanging and mutual understanding. TL means that veterinarians translate verbally or in writing the information from English to Chinese or from Chinese to English. R means veterinarians verbally or in writing talk about the vet’s condition, diagnosis, and treatment to the vet’s owner.

After an iterative process, the coding schemes for real-world veterinary tasks and real-world communication skills were developed covering speaking and writing communications with different interlocutors (i.e., a vet’s clients and co-workers) and examples.

The coded interview transcripts were carefully read and repeatedly compared, sorted, recorded, and explored for connections between the coded segments. To check the reliability of the coding framework, about 10% of each type of interview data was independently coded by two researchers following the coding sheet that was developed.

7. Results

7.1. Survey Findings

This study was designed to help students identify the communication skills required in bilingual veterinary contexts. It is important to note that the survey was carried out at a time of social unrest and at the height of the COVID-19 pandemic, which may explain the lower-than-expected response rate, especially for a large-scale survey of students.

7.2. Educational and Language Background

The majority (Figure 1) of the participants were in their first year (63.9%) of university, with the remainder (33.6%) largely in their second year, and a few in their third year (2.5%). Their major was in veterinary medicine. Most had been educated primarily in Hong Kong,
(82.8%), and 11.5% had received most of their education in mainland China. The remaining participants had been educated in Canada, Kyrgyzstan, India, the Philippines, the UK, and Malaysia.

Most (Figure 1) spoke Cantonese as their L1 (80.3%), and 13% had Putonghua (Standard Mandarin) as their L1. The rest had English, Russian, Hindi, Korean, and Tagalog as their mother tongues.

Language Choice(s) in Previous Education, Scientific Activities, and Self-Reported Academic Achievements

As can be seen in Figure 2, before university, the participants had gradually moved from ‘always’ learning science in Cantonese/Putonghua in kindergarten to mostly ‘code-switching between English and Cantonese’ (27%) or even ‘usually’ in English (24.6%) or ‘always’ in English (26.2%) in their senior secondary education. Overall, the science students admitted to university had mostly been educated in English throughout their secondary school years.
Although most of the participants had been educated in English, their performance on the English test of the Hong Kong university entrance examination—an exam that tests students on their level of English for basic reading, writing, listening, and speaking skills—was similar. Most (29.5%) of their grades fell between Level 4 and Level 3 (27%). Their grades in Chinese also fell between these two grades but were slightly worse, with 34.4% achieving Level 3 and 23.8% achieving Level 4.

In their university classes, most of the respondents (49.2%) always answered their teachers’ questions in English and always asked their teachers questions in English (45.9%). However, when they participated in whole-class discussions, they preferred code-switching between English and Cantonese (32%). In general, the students chose to communicate with their teachers in English (36.9%) and code-switch between English and Cantonese when interacting with their peers (34.4%).

In science-related discussions at university, such as defining an item of scientific vocabulary, discussing a scientific phenomenon, or talking about a lab experiment, the students tended to switch between English and Cantonese (30–40%). However, most (61.5%) of their textbooks and examinations in science subjects were in English and most (54.9%) of their science teachers always spoke in English in class. Therefore, there was a difference in language choices between student–student interactions and student–teacher interactions. The explanation for this discrepancy may be that the students were ‘neutrally’ confident in studying science in English (45.1%), with only 8.2% being extremely confident. Moreover, only about 10% of the participants always understood their science teachers’ spoken instructions and explanations.

That said, most of the students still actively listened to their teachers’ explanations of science content (more than 62% reported ‘always’ and ‘often’) and asked their teachers questions in science classes, with over 46% always or often doing so. The students were relatively less likely to have group discussions with their peers, as only 44.3% reported that they would sometimes do so.

The students always or often (more than 69%) spoke English when asking questions in class, obtaining feedback from course instructors (more than 74%), working on a lab experiment (~60%), communicating with lab demonstrators or technicians (over 65%), reporting findings to specialists (over 61%), and talking to clients/scientists/professionals in their fields (over 57%).

7.3. Self-Concepts and Beliefs in Learning Science through English

Most of the participants viewed English as extremely important in studying science, with over 64% of them reporting speaking skills as most important or very important when interacting with their teachers or presenting. Moreover, more than 54% perceived writing as an extremely important skill when writing up scientific reports and daily assignments.
Over half of the respondents found comprehension skills to be extremely important for understanding scientific vocabulary, English vocabulary, and the style and organisation of scientific texts. Over 76% also noted the importance of accurate language in scientific writing in English.

7.4. Perceptions of the Importance of English in the Science Classroom

More than 78% of the students said they were eager to learn how to write science research effectively in English and were keen to improve their English writing skills. This could be because only about 25% felt confident in their English writing skills. Over 62% of science students said that workshops specifically designed for the course to address concerns about their English writing skills would help their science learning.

7.5. Perceived English Language Challenges

When reflecting on their level of English, fewer than 35% of the participants said they found it easy or very easy to communicate in English during classes or to write in English. The major challenges these students had encountered when studying science in English included understanding technical terminology in English (over 27%), comprehending and applying the acquired knowledge (over 28%), explaining an abstract and challenging scientific concept in English (over 28%), and using the correct English vocabulary and technical terms in their writing (32%).

7.6. Ability and Strategies for the Comprehension of Scientific Reports in English

It is crucial that science students have the ability to comprehend English effectively as they have to read scientific reports in English during their tertiary education. The survey thus assessed their reading skills as well as their perceptions of how English is used in scientific learning.

Fewer than a third of the participants (31.6%) strongly agreed or agreed that they understood what an Introduction, Methods, Results, and Discussion (IMRD) article was. Even fewer were confident in their understanding of the sections in an IMRD article (30.4%). Although more were self-reported active readers who looked for certain information in each section (about 40% strongly agreed or agreed they were active readers), fewer than half (45.6%) were confident that they understood the communicative purposes of the IMRD structure.

7.7. Ability and Strategies in Writing Scientific Articles

As science students at university are required to write their own scientific reports in English, it is equally important for researchers to assess their writing skills. Over 35% of the participants strongly agreed or agreed that they understood how to compose good introductions. In general, over half of them understood the purpose of an introduction, but fewer (31.6%) understood the strategies for writing an introduction, such as the organisation and the relevant writing strategies.

Whereas more than 40% said they were very clear about the purpose of such sections, fewer than 30% of the participants understood how to write good method sections. They were more confident in writing results sections (more than 35% strongly agreed or agreed that they understood how to compose effective result sections). Half of the participants also said they understood the effectiveness of figures, tables, and illustrations when presenting data, but fewer were confident in their use of English in these sections. For example, only 35.5% said they were very sure of what phrases to use, and 41.8% said they were clear about the use of the past tense in results sections. Fewer than 27% strongly agreed or agreed that they understood how to write the discussion section of a scientific report effectively, the part the participants were the least confident about.

Table 1 summarises the students’ disciplinary tasks in and out of the classroom, the language-related challenges they reported, and the English language skills they perceived as important in speaking, comprehension, and writing.
Table 1. Veterinary medical students’ views on disciplinary tasks, language-related challenges, and English skills perceived as important.

<table>
<thead>
<tr>
<th>English Use in and out of Classroom Context(s)</th>
<th>Language-Related Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speaking</strong></td>
<td><strong>challenging to communicate in English during classes</strong></td>
</tr>
<tr>
<td>English</td>
<td><strong>challenging to explain abstract and challenging scientific concepts in English (over 28%)</strong></td>
</tr>
<tr>
<td>Code-switch between English and Cantonese</td>
<td><strong>lack of confidence in studying science in English (fewer than 50%)</strong></td>
</tr>
<tr>
<td>Comprehension</td>
<td><strong>challenging to understand the meaning of technical terminology in English (over 27%)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>challenging to comprehend and apply acquired knowledge (over 28%)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>the challenge in understanding IMRD articles (68.4%)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>lack of confidence in their understanding of the sections in an IMRD article (30.4%)</strong></td>
</tr>
</tbody>
</table>

- communicating with teachers (36.9%)
- asking questions in class (more than 69%)
- obtaining feedback from teachers (more than 74%)
- working on a lab experiment (about 60%)
- communicating with lab demonstrators or technicians (over 65%)
- reporting findings to specialists (over 61%)
- talking to clients/scientists/professionals in their fields (over 57%)
- challenging to understand the meaning of technical terminology in English (over 27%)
- challenging to comprehend and apply acquired knowledge (over 28%)
- the challenge in understanding IMRD articles (68.4%)
- lack of confidence in their understanding of the sections in an IMRD article (30.4%)
Table 1. Cont.

<table>
<thead>
<tr>
<th>English Use in and out of Classroom Context(s)</th>
<th>Language-Related Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing • Writing assessments (e.g., written examinations, dissertations, assignments)</td>
<td>• lack of confidence in English writing skills (about 75%)</td>
</tr>
<tr>
<td></td>
<td>• strong desire to learn about writing research articles (more than 78%)</td>
</tr>
<tr>
<td></td>
<td>• challenging to write in English in class</td>
</tr>
<tr>
<td></td>
<td>• challenging to use the correct English vocabulary and technical terms in their writing (32%)</td>
</tr>
<tr>
<td></td>
<td>• less clear about strategies for writing an introduction, such as the move structure and relevant strategies (31.6%)</td>
</tr>
<tr>
<td></td>
<td>• not clear about how to write a good method section (fewer than 30%)</td>
</tr>
<tr>
<td></td>
<td>• least confident in writing a good discussion section (about 73%)</td>
</tr>
<tr>
<td></td>
<td>• not clear about phrase use (64.5%)</td>
</tr>
<tr>
<td></td>
<td>• not clear about the use of the past tense in results sections (58.2%)</td>
</tr>
</tbody>
</table>

7.8. Findings from the Interview Data

Table 2 summarises the real-world communication tasks revealed in the interviews with the five veterinary clinicians. As seen from the table, the communication tasks for veterinarians are not only verbal, but also nonverbal; not only with clients, but also with colleagues and other medical staff. Many tasks require a combination of skills that need to be mastered to reach successful communication (e.g., they need to know and simultaneously conduct the skills of taking notes of vet’s history, collaborating with staff, providing treatment, and diagnosing when engaging in the discipline-specific task of writing to staff).

This study, situated in Hong Kong veterinary medicine field, added three more codes (collaborating, translating, and reporting) to the original code book by Glendinning and Holmström [75] (1998). R was found during writing and speaking tasks with clients when reporting their vet’s conditions, treatment, or diagnosis. TL happened when talking with clients. Veterinarians needed to translate English academic jargon into plain Cantonese to have their clients understand. C often occurred during the oral and written communication with staff through various ways of information exchange, handovers, and confusion clear-up (e.g., stating and explaining the intended treatment of the animals).

Delivering a clear, comprehensible message to communicate effectively with clients is crucial when diagnosing and treating an animal patient or interrogating, relationship-building with and instructing the owner, or translating the label on a medicine bottle. Veterinarians also need to put themselves in clients’ shoes to understand their distress when they hear bad news and to be aware of the potential misunderstandings of a layperson. For instance, in diagnosis and treatment, delivering bad news about an animal was one of the most frequently mentioned scenarios. As V1 said, ‘It’s bad news, and we need to be sympathetic towards the client and understand, uh, give time for them to understand and absorb the information’. That is, not only should a vet use simple language in a client’s L1 to ensure their understanding (e.g., ‘Rather than throwing in a lot of scientific terminology,
it is easier to say “upset tummy” [V2] and ‘Translate the English label into Filipino’ [V4]), but they should also show compassion for their loss, such as by changing tone (e.g., ‘I need to use a lower tone in conversation with them. And then try to comfort them’ [V3]) and using appropriate body language (e.g., ‘I will give the client a hug’ [V3]).

Table 2. The summary of authentic communicative tasks and suggested disciplinary language skills from the interviewees.

<table>
<thead>
<tr>
<th>Interlocutors</th>
<th>Communicative Tasks</th>
<th>Examples</th>
<th>Suggested Language Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients</td>
<td>Speaking</td>
<td>D + TR</td>
<td>- Deliver bad news about animals&lt;br&gt;- Explain medical jargon in Cantonese/Putonghua&lt;br&gt;- Ask for agreement for diagnosis and treatment&lt;br&gt;- Ask precise questions to learn about their animals&lt;br&gt;- Ask questions to check their comprehension</td>
</tr>
<tr>
<td></td>
<td>SE-reassuring</td>
<td></td>
<td>- Introduce the clinic and veterinarians’ credibility and professional ethics&lt;br&gt;- Deliver bad news about animals</td>
</tr>
<tr>
<td></td>
<td>SE-encouraging</td>
<td></td>
<td>- Talk to the client heart-to-heart</td>
</tr>
<tr>
<td></td>
<td>SE-instructing</td>
<td></td>
<td>- Give advice on how to take care of their animals</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td></td>
<td>- Deliver messages over the phone</td>
</tr>
<tr>
<td></td>
<td>TL</td>
<td></td>
<td>- Translate professional English for the layperson in the client’s L1 (Cantonese/Putonghua)</td>
</tr>
<tr>
<td>Writing</td>
<td>H + R</td>
<td></td>
<td>- Write about the animals’ condition and send an email or short message to the owners</td>
</tr>
<tr>
<td>Staff</td>
<td>Speaking</td>
<td>C + D</td>
<td>- State and explain the intended treatment of the animals&lt;br&gt;- Explain cases</td>
</tr>
<tr>
<td></td>
<td>Writing</td>
<td>H + C + D + TR</td>
<td>- Email the animals’ history&lt;br&gt;- Write the treatment&lt;br&gt;- Write a follow-up email, or a memo to ask for a reply after the acknowledgement of receipt&lt;br&gt;- Use specific medical terms correctly&lt;br&gt;- Write instructions for treatment</td>
</tr>
<tr>
<td></td>
<td>D + TR</td>
<td></td>
<td>- Fill in hospital-formulated forms</td>
</tr>
</tbody>
</table>

From a functional point of view, activities involving clients, such as speaking and writing to get their agreement to a diagnosis or giving advice on taking care of their animals, cannot simply be categorised as the language of everyday speech or scientific language. As V2 suggested, ‘When you talk to clients, avoid medical jargon. Talk at their level so that they understand you’. However, a certain degree of formulaic language is needed to build a sense of credibility and trust between clients and veterinarians. As V5 said, ‘A newly graduated vet should be able to present himself or herself to the client professionally in terms of knowledge and manners because the client’s impression can help build trust.’
In addition to communicating with clients, communicating in the workplace—interacting with clinical or hospital staff—was one of the main topics mentioned in the interviews. As V5 stated, she did not need to communicate only with clients but also with co-workers, including ‘veterinary nurses, veterinary technicians, customer service personnel, [and] dispensary and other ancillary personnel like IT staff.’ Writing accounted for a major portion of her interactions with staff, compared with the large number of oral tasks when communicating with clients. For example, collaborating with colleagues in treating animals, writing emails or reports about animals’ histories and their previous and planned treatments, and writing instructions for treatment were considered crucial for effective communication and proper medical treatment. Notably, although the majority of veterinary staff use this specific register, mutual comprehension is still necessary. As V1 said, ‘We (the veterinary doctors) follow up, in many cases depending on the situation, we email or print and fax the history to make sure [that] they understand and the communication has been successful.’

8. Discussion

This study offers empirical evidence regarding the level of English that EMI tertiary veterinary students are expected to reach and their linguistic challenges. Taken together with the interview findings about their future workplace’s expectations, recommendations can be made for the development of discipline-focused English courses.

From the linguistic perspective of disciplinary literacy, the reported tasks showed the significant influence that students’ knowledge of English vocabulary has over their success in speaking and writing tasks and comprehension of EMI content. For instance, students are required to communicate with lab demonstrators or technicians. However, effective communication cannot be achieved if students lack the academic and technical vocabulary, an issue found in both this study and in other EMI research [53–55]. However, from the social dimension of disciplinary literacy, the study found with the five veterinarians that translating English academic vocabulary to plain Cantonese language for clients was crucial for their understanding and improved clinical outcomes. Therefore, EMI veterinary teachers should pay attention to authentic communicative needs by providing opportunities to practice explaining professional vocabulary in plain language. Moreover, although English is prescribed to be the language of instruction, teachers can also encourage students to familiarize themselves with the translation of English terms in their clients’ languages, especially in bi/multilingual contexts, such as Hong Kong, where about 90% of clients were found to only speak Cantonese [23].

The language barriers added to the cognitive load faced by EMI student vets when carrying out academic speaking and writing tasks. One of the most central English language challenges perceived by the participating students was writing academic papers. This finding is in line with Xiao and Cheung [21], who developed an intervention for EMI students’ summary writing skills. Another issue was the sharp contrast between students’ eagerness to learn about writing and their lack of confidence in doing so, which suggests that instructors should pay attention to students’ self-confidence in academic writing while teaching the necessary skills [76].

From a social disciplinary literacy point of view, the writing challenges encountered at school fall short when tackling the writing tasks needed in the workplace. As shown in Table 3, veterinary writing in the workplace focuses more on communicating with clients and colleagues about everyday treatments, whereas in school greater weight is placed on doing lab research, writing academic articles, and taking examinations. Similarly, the widespread use of English in speaking tasks at school may fail to equip students with the ability to deliver comprehensible and clear information to future clients whose first language is Cantonese, notwithstanding needing to carry out other real-world tasks that have been revealed (e.g., delivering bad news about animals). This resonates with Jakobek et al. [62] in that communication ability was one of the most critical needs during the veterinary teaching hospital referral centre process.
Table 3. Disciplinary writing tasks and language use in school compared with the workplace.

<table>
<thead>
<tr>
<th>Context(s)</th>
<th>School</th>
<th>Workplace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing tasks</td>
<td>Write assessments (e.g., written examinations, dissertations, assignments)</td>
<td>Write about animals’ condition; send the owners an email or short message</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email an animal’s history</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write out the treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write a follow-up email or a memo to ask for a reply to a received email</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use specific medical terms correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write treatment instructions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fill in hospital-formulated forms</td>
</tr>
<tr>
<td>Choice of Language(s)</td>
<td>English</td>
<td>Clients’ L1 (mostly Cantonese)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>English with colleagues</td>
</tr>
</tbody>
</table>

Therefore, by referring to the disciplinary literacy triangle [46], veterinary educators should, of necessity, take care to strike a balance between the communication tasks in society, academia, and the workplace when designing their curricula. In this specific discipline, the communication needs when writing and speaking in school and the workplace and with clients and clinical staff should be taken into consideration. For example, students need opportunities to practice writing and speaking abilities when writing emails, delivering bad news about animals, and giving advice on animal care to clients. These tasks have not been found in the target students’ reported classroom activities. If students concentrated on practicing writing and speaking skills to write an academic paper or conduct lab experiments, they would not get ready for real-world communication. As Kunze and Rutherford [28] suggested, EMI students preferred relevant and authentic disciplinary knowledge, and this preference could influence their learning outcomes.

Furthermore, in EMI classrooms, writing and speaking should be English. In contrast, in Hong Kong veterinary clinics, most of the clients speak Cantonese [77]. One potential issue resulting from this inconsistency in language use is students’ inability to communicate effectively with clients, such as translating English terms into Cantonese and using an informal tone rather than the formal one used in academia. Therefore, it is suggested that when necessary, activities such as roleplay [75], where students can practise real-life writing tasks using Cantonese, should be accepted in all English EMI classrooms. Regarding curriculum design, calibrating disciplinary-specific EMI teaching objectives apart from general EMI goals while considering disciplinary literacy needs can support EMI teachers’ teaching practice [50].

Given the impossibility of meeting the social needs of disciplinary literacy by completing every task in both English and the local language in EMI classrooms, Airey [19] proposed another mode (Figure 3), which sheds light on the teaching of veterinary tasks in Hong Kong’s EMI classrooms. As can be seen in Figure 3, each language occupies one disciplinary literacy triangle. The expectation that students should be able to perform different functions varies between the different languages. In the context of this study, students should therefore be encouraged to use both Cantonese and English when communicating with clients for activities such as reassuring, encouraging, and diagnosing.

Most undergraduate students in Hong Kong in English-medium programmes are L2 users of English. These students need to equip themselves with discipline-specific skills in English to succeed at school. In veterinarian–client and interdisciplinary settings within a clinic, however, there is an emphasis on effective communication skills [77]. Therefore, it is essential for these students to develop skills in multidisciplinary literacy and to acquire effective English language skills to address their learning challenges both at the tertiary level and in their future professional lives. Students who are competent in English in their disciplines tend to achieve better academic results. To be specific, veterinary medicine places tough disciplinary demands on students’ communication. They are required to fulfil highly demanding tasks, such as reading medical cases, making diagnoses, elaborating on
treatment plans, and composing referrals and medical reports. Therefore, these students must not only meet the university’s general demands regarding the skills of academic literacy (e.g., reading textbooks, understanding lectures, and writing assessments) but they must also perform the tasks noted above.

Figure 3. Disciplinary literacy triangles in the EMI context (adapted from Airey [30]).

9. Conclusions

This study provides a deeper understanding of the disciplinary literacy needs and challenges of EMI veterinary students by exploring their perceptions through surveys and comparing their school tasks with real-world veterinary tasks, as set out in interviews with practitioners. Two major themes were uncovered. First, the linguistic and cognitive demands on EMI students lie in speaking (e.g., talking to clients/scientists/professionals in their fields) and writing (e.g., filling in hospital-formulated forms) in school and their future workplaces. Second, there is a discrepancy between school and the workplace in the disciplinary needs of veterinary medicine. Educators need to pay attention to the specialised demands of disciplines to support students in developing advanced skills [78]. To this end, this study explored specific tasks in schools and students’ future workplaces. Building on this understanding, future research could design tools and guidelines for teachers to meet students’ specific literacy demands [78].

However, one limitation of this study is that the participating students were not interviewed for the study, which might have provided a more comprehensive picture of students’ perceptions of the disciplinary tasks in schools. Further studies could use ethnographic methods, such as interviewing EMI veterinary students, observing their in-and out-of-school disciplinary activities, and collecting relevant multimodal artifacts, to draw a more comprehensive picture of their disciplinary tasks and needs. It is also unfortunate that this study did not include the perspectives of EMI veterinary teachers, who could provide more information on their views on teaching disciplinary literacy, the use of L1 in EMI classes, and the perceived challenges. This added viewpoint could facilitate the development of EMI teacher training, which is a fruitful area for future work.
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