Medical Word List Development through Corpus and Course Construction

Simon FRASER
Walter DAVIES
Keiso TATSUKAWA
Institute for Foreign Language Research and Education
Hiroshima University

This article reviews the year-on-year evolution of an intensive medical English course at Hiroshima University, and investigates the developing interaction between word lists, course construction, and corpus analysis emerging from our research in this field. In the first part of the article, we describe the development of course content and materials over a period of three years, examining the materials used and detailing the ways in which corpus software has helped us to produce both corpora and word lists for students.

In the discussion section of the paper, we consider three key issues arising from the research to date. With regard to specific aims and objectives, we examine the relationship between word lists designed for specific medical courses and general medical word lists, as well as the relative merits of book-based corpora and article-based corpora. Addressing broader issues, we discuss the ways in which English for general purposes and English for specific purposes are connected, arguing that treating the relationship as one that lies on a continuum offers possibilities for developing a more comprehensive medical English curriculum.

BACKGROUND

While a number of researchers (e.g., Cowan, 1974; Salager 1983, 1985; Baker, 1988; Chung & Nation 2003, 2004) have investigated the types of words contained in medical texts, and more recently Fraser (2007, 2009), Wang, Liang and Ge (2008), and Hsu (2013) have worked in constructing medical corpora and word lists, such studies have, for the most part, taken place independently of course creation. The course described here, however, has developed over a three-year period from an ongoing interaction between corpus analysis, word lists, and materials development.

The course was instigated in 2012 in response to a request from the university's medical faculty for help with the English language skills of third-year medical students, who have already received two years of general English language instruction (see Davies, Fraser, Lauer, & Howell, 2013). It was established as a four-day intensive course involving four teachers, each of whom is an experienced teacher-researcher, but without specialized knowledge of the medical field. Course participants (120 students) are divided into four classes, with all students receiving three 90-minute periods of instruction from each teacher. Since its establishment, the structure of the course and the members of the teaching team have remained the same. Two of the teachers (Fraser and Davies) are involved in research on developing medical corpora, word lists, syllabuses, and learning materials.

The initial request from the medical faculty was to focus on the productive skills of speaking and

writing, and the course proceeded on this basis. However, as an ongoing course with an emerging applied linguistics component involving background research on medicine as a practice, as well as consideration of the medical curriculum for students and their abilities and needs, it has evolved over the three years it has been taught. The first year of the course can be described as *exploratory*, the second as *research and piecemeal development*, and the third as *consolidation and syllabus development*. In this article we consider how, at the next stage, a broader curriculum could be established, particularly in relation to word lists and materials.

The exploratory period of the course has already been documented in detail (Davies et al., 2013). It involved obtaining material from a variety of sources — ranging from encyclopaedia articles to commercially produced teaching CDs and DVDs — and dividing the course into three main strands: doctor-patient medical conversations, discussions on medical ethics, and summary writing on medical topics. From the course materials, and with input from discussions amongst the teaching team, a word list was compiled and given to the students. The list was also used to produce a word test, which, along with a piece of summary writing and classroom performance, provided us with a means of evaluating the students. Student feedback from the course, and the word list in particular, was positive, and the medical faculty requested that the course continue.

In the research and piecemeal development phase of the course, additional information was gathered from the medical faculty. One of the interesting points of the student feedback was the high value placed on the word list that students had been given at the beginning of the course (see student assessment section below). A decision was made to undertake corpus research in the medical field, combined with materials development for the medical English course. Background research was undertaken in the form of interviews with senior medical professors (Davies, Fraser & Tatsukawa, 2014); in these discussions, anatomy and physiology were highlighted, with anatomy being stressed as a particularly important field. An anatomy corpus was constructed (Fraser, Davies, & Tatsukawa, 2014), and basic anatomy materials were produced and trialled (Davies et al., 2014) before being added to the material for the intensive medical course. The addition of these materials was a form of accommodation, in which they were an add-on to the materials used in the previous year.

In the consolidation and syllabus development phase, completely new materials were written for nine of the 12 classes taught in the medical intensive course. These integrated anatomy with areas of medical specialization, common diseases, and conditions, with a focus on speaking tasks and writing tasks (see Appendix 1 for an example). A new word list was created (see Appendix 2), with an accompanying word test (Appendix 3).

INTERPLAY BETWEEN MATERIALS DEVELOPMENT AND TEACHING

Given that the students placed a high value on the vocabulary list they received in the first intensive medical course, consideration was given to the development of pedagogical word lists from a medical corpus:

> An important result of the feedback was the value that the students attached to the final word-list, and this suggests possibilities for future course development: The organization of a syllabus on the basis of the creation of a medical corpus and the development of materials on the basis of an analysis of that corpus. (Davies et al., 2013: 57)

Early ideas had focused on materials development following corpus construction and analysis. However, once the research was underway, this seemed impractical from at least two perspectives. The first was the sheer length of time it would take to complete the corpus research, compile word lists, and then create materials. The second issue concerned the complexity of materials creation: Given the number of factors that had to be taken into account in producing materials, it was not clear how a word list alone could be used in their development. In consequence, the decision was made to work on corpora construction in parallel with the development of teaching materials. Insights and findings in both areas interacted with each other, primarily through discussion within the research team.

CORPUS CONSTRUCTION

Selection of Texts

The original plan was to build a corpus from 100 medical articles, with a methodological approach similar to that used for Fraser's Pharmacology Corpus and word lists (see Fraser, 2007; 2009; 2013). To achieve a representative corpus, it was necessary to divide the medical field into a manageable number of broad areas. This was done by a member of the medical faculty, who suggested the following ten divisions: Cardiovascular medicine; Digestive medicine; Respiratory medicine; Neuromusculoskeletal medicine; Infectious diseases and immunology; Oncology; Developmental medicine; Nephrology and endocrinology; Critical care and anesthesiology; and Sensory organology. However, given the emphasis placed on anatomy in the background research interviews, we decided to begin by creating a corpus from an anatomy textbook: *Gray's Anatomy for Students*. This would be used to identify the most commonly used anatomy terms, and also as a resource for creating and checking teaching materials (see Fraser et al., 2014). As the medical faculty interviewees had also suggested a focus on some common diseases and symptoms, another well-established medical reference book was chosen for subsequent analysis: *Harrison's Principles of Internal Medicine*. An article-based corpus would be developed in the final stages of the project (see below).

Corpus Size

The switch in approach to corpus creation led us to reflect on how corpus analysis was being affected by the set-up of the project. Most corpora and word lists have, to our knowledge, been created independently of consideration of pedagogical materials, often being used to examine the nature of the words under study. In contrast to this approach, our medical project has a corpus component that has emerged from course creation, and the key question is: *What are the best words for these particular students to learn?* An issue arising from this is corpus size, especially in relation to how document input may skew word frequency counts: A major challenge in the creation of a pedagogical medical word list for undergraduates is the sheer number of medical English terms, and an important way of choosing the best terms to learn is through an examination of word frequencies. However, this presents a difficult task in terms of corpus creation. If a large corpus is created using a variety of sources such as textbooks and articles, and if we are to use word frequency as a way of evaluating key words, then the texts comprising the corpus must be representative of the field as a whole and of generally the same length. For example, if a corpus researcher inputs five 300-page texts, covering four major fields, and then a 2,000-page text on another field, then the frequency count is going to be skewed towards that fifth field. In such cases, if a corpus analysis is oriented towards an

examination of medical words, this may not matter. However, where word frequency is important, minimizing the risk of skewing is very important. For this reason, a decision was made to use small rather than large corpora, initially by analysing general reference books, with two separate corpora being made using the two books described above. This would be followed by a third corpus that was based on medical articles. A presentation to senior medical staff on this approach to corpus building indicated that, with regard to third-year students, they valued the corpus creation from the two resource books over the creation of an article-based corpus, on the basis that the language of these books was more relevant to students at this stage, and that article reading in English would generally come later in their studies. This issue is addressed in the discussion section of the article.

Word Lists

A further very important concern, which will be discussed later in this article, is the difference between course-specific and general medical word lists. The word lists used for the intensive medical courses were created with the application of corpus software on the materials that had been chosen for the course. *AntConc* (Anthony 2011) was used to provide lists of the most frequent words and in producing concordances to provide contextual information. In relation to the first word list (377 words), the terms mainly came from materials prepared for the writing classes, which focused on infectious diseases: two edited encyclopaedia articles, used for summarization tasks, plus some related online material. It was the popularity of this word list that acted as one of the drivers for the current project, adding a research dimension to course construction. The second word list was produced in a similar way to the first from the current materials used for the course. It focuses on anatomy, diseases, and symptoms (567 words, see Appendix 2). Both of these word lists may be regarded as course-specific. The relationship between such word lists and a general pedagogical medical word list is considered in the discussion section of the article.

Materials Development

Over the three years of the courses, the materials have evolved on the basis of an increasing understanding of students' needs. In the exploratory stage of the course, the teaching team was asked to focus on students' productive skills in oral communication and writing. Because of the inexperience of the teaching team in medical English, only very broad areas were defined, and teachers used a variety of resources to achieve these aims. However, with the continuation of the course, and the opportunity to conduct more in-depth research (Davies et al., 2014), some key issues began to emerge concerning content and context.

In relation to content, the emphasis on anatomy resulted in the creation of anatomy materials (Davies et al. 2013), which were trialled and then used in the research and piecemeal development phase of the intensive course. However, as noted above, these were stand-alone materials that did not connect with the other course materials. Regarding context, through informal conversations with medical students, it was clear that they were exposed to and sometimes taught medical anatomy terms in English, but these terms did not appear in an English context. Either they were tagged to key words in Japanese discourse, or they were presented in lists. Similarly, the stand-alone anatomy materials for the intensive course provided learners with minimal exposure to the anatomy words in English discourse.

It was also necessary to consider the content of the students' conversations in English. In the first two

years of the course, students were asked to undertake some discussion work on medical ethics. For other oral communication skills classes, they were asked to perform doctor-patient conversations by practising example dialogues and then carrying out role-plays. However, one concern was that this was conversation without background content; although students could perform the role-plays, they were not being asked to explain a medical condition or how a particular part of the body was being affected, for example. Given that medical professors had highlighted the importance of anatomy, common diseases, and symptoms, there was a need to give students exposure to discourse in these areas and more opportunity to talk about them.

Based on the background research and emerging issues described above, a new set of materials was designed for the third year of the course, connecting anatomy and physiology to diseases. A general medical field was chosen and matched to an anatomy area, as shown in Table 1:

TABLE 1. Matching Anatomy to Medical Field

General Medical Area	Anatomy Area	Medical Problem
1. cardiovascular medicine	1. heart	1. stenosis, infarction, endocarditis, etc.
2. musculoskeletal medicine	2. skeletal system	2. knee problems (arthritis, spinal injury)
3. digestive medicine	3. digestive tract	3. ulcers, tumours, GERD, appendicitis
4. neurosurgery	4. brain	4. strokes and tumours
5. respiratory medicine	5. lungs	5. pulmonary tuberculosis
6. endocrinology	6. pancreas	6. diabetes mellitus

The materials were designed to build from anatomy and physiology to diseases and symptoms, with the anatomy corpus being used as a tool for editing along with advice and feedback from doctors where possible. The assumption was made that students would be familiar with the contents of the units in Japanese; their schematic knowledge in their L1 would be good, which would help them greatly when they encountered difficult words or sentences.

In the first part of each unit of materials, students are asked to match key anatomy words to basic anatomy diagrams. This task is followed by a short reading of approximately 300 words, focusing on anatomy and/or physiology to contextualize the words, along with some comprehension questions. After this, students are required to talk about the anatomy/physiology in pairs (Appendix 1).

In the second part of each unit, another set of words is introduced by matching words to definitions. These words are then seen in the context of a longer essay of around 600 words, which contains some historical and background information, and descriptions of diseases/medical problems, along with comprehension questions. After this, students practise a doctor-patient conversation and useful questions for such dialogues, followed by role-plays in pairs involving the medical conditions addressed in the essay (Table 2).

While the structure of the units was originally designed to incorporate speaking activities, it was easily adapted to writing activities, the difference being that, with an orientation towards summarization, the second essay was lengthened to about 1,000 words with accompanying tasks.

TABLE 2. Structure of Unit of Material

Anatomy
1. Matching anatomy words to anatomy diagrams
2. Reading a short text on anatomy/physiology with comprehension questions
3. Talking practice on anatomy/physiology
Medical problems and symptoms
4. Discussion of medical field
5. Reading a longer text on diseases with comprehension questions
6. Practising a short doctor-patient medical dialogue
7. Performing doctor-patient role-plays

STUDENT EVALUATION AND TEACHER IMPRESSION OF THE COURSE

Each year of the course, students have been asked to give feedback via a questionnaire. With four of the questions, they have been required to make an evaluation based on a four-point scale (4=very positive, 3=positive, 2=negative, 1=very negative):

1. How motivated were you to develop your English skills?
2. How useful was the course?
3. How clear were the classes and teaching materials?
5. How useful was the medical word list?

Two of the questions require yes/no answers: (4) *Do you think your English has improved during this course?* and (6) *Was the intensive course a good way to study?* The results (Table 3) show a great deal of consistency year-on-year. Each year, about 80% of the students have found the course beneficial. Interestingly, the major change in materials from 2013 to 2014 did not lead to much change in the responses. One interpretation of this might be that given that the teachers involved in the course and the structure of the intensive course have remained the same over the three years, the students' perceptions are more affected by these factors than the content of the course itself.

The one item where there was some variation was the word list, with the result dipping in 2013 to 3.0 (still a positive evaluation, nonetheless). Several factors may account for this. In all three years, word lists were connected with evaluation in the form of a word test. However, in 2012, two lists were produced. A list of 100 items was given to the students, who were informed that they would be tested on these words; a longer list (377 words) was provided as a general reference. In the second year, the students were only given the 377-word list and told that they would be tested on it. When we consider that that most of the words were not overtly taught, and that the list was strongly oriented towards the writing classes, we might expect students to have been less favourably inclined towards the list. In 2013, the students were given a much longer list (567 words), but the words were spread across nine classes and embedded in the materials, which also included vocabulary-building tasks. Consequently, it seems that although the students in 2014 faced a greater learning task, they recognized the relevance of the list and had a highly positive view of it.

TABLE 3. Student Feedback Averages

Question	2012	2013	2014
1. motivation	2.9	2.8	2.9
2. usefulness	3.0	2.9	3.0
3. clarity	3.0	2.9	3.0
5. word list	3.3	3.0	3.3
4. improvement	83%	80%	80%
6. intensive course	78%	76%	80%

From the teacher perspective, three of the teaching team were involved in using the new materials. In general, the materials were considered more demanding in 2014 than in 2012 and 2013. This had a motivating effect on the teaching side, with considerably more time being dedicated to course preparation. Also, due to the greater focus on content through essays, the vocabulary test (Appendix 3) was much more challenging; the average score was 70%, considered by all the teachers to be an ideal level of difficulty, with the two best students obtaining 96%. This contrasted with previous years, when large numbers of students scored close to 100%.

DISCUSSION

In the process of the ongoing research, a number of important issues have come to light in relation to specific goals and objectives. Later in this section, we discuss broader opportunities for curriculum development.

The specific goals of this research are to produce corpora, word lists, and materials for third-year undergraduate students at a medical faculty in a Japanese university. This has led us to consider the following areas: 1) the relative merits of general word lists and course-oriented word lists; and 2) research article-based corpora versus book-based corpora. In relation to broader curriculum issues, these emerge in an examination of English for General Purposes and English for Specific Purposes.

General Word Lists Versus Course-oriented Word Lists

In this research, with its strong orientation towards pedagogy, the question of how to construct pedagogic word lists has become increasingly important. As noted earlier in the article, a key driver for research into medical English was the popularity among our students of a word list made using corpus analysis tools. What has become apparent is that there is a complex relationship between corpus software, corpora, pedagogic word lists, and teaching materials. A simplistic and unrealistic approach to the process would be linear, with corpus creation leading to word list formation, from which materials are then created. While this approach might work from the perspective of creating reference materials such as dictionaries and glossaries, in our research, a more complex approach has been taken with corpus data from resource books linking with materials development: Background research from a corpus perspective led to the identification of key medical fields; this informed materials development with the creation of cohesive sets of materials topically organized on the basis of those fields; corpus analysis of the materials themselves acted as an

editing check leading to small improvements; and the course word list emerged from materials themselves through the use of corpus software.

As one aim of the research is to create a general medical word list for students, the question remains as to the relationship between a specific medical word list and a general medical word list. There is no easy answer to this, except to observe that a specific list, drawn from materials that have been taught and tested in the classroom, provides a good basis for a more general word list. For the creation of a general word list, the specific list requires editing to focus on the most useful words because its function is slightly different; it is provided to aid understanding of the materials being taught on a course. Consequently, there will be certain words that should be removed, and others that should be added. This will become apparent through an analysis of data from the corpora, and consideration of what might be added to units of teaching material to ensure contextualization.

Article-based Corpora and Book-based Corpora

In terms of word list creation, another important issue that has surfaced is the question of what corpora to build. In meetings with medical staff, preference was expressed for an analysis of resource books over corpora based on medical journal articles. The practical reason for this is that the reading of research articles tends to come later in students' studies, and the language of resource books will be more appropriate for third-year students. The approach we have taken in this research has been based on recommendations in interviews that we start from anatomy and then consider some common medical conditions and symptoms. The building of corpora has followed this advice: A corpus has been constructed using *Gray's Anatomy for Students*, and a second corpus is being built on the basis of *Harrison's Principles of Internal Medicine*. However, we have to ask whether such corpora will be sufficient for our learners' needs.

In our view, an article-based corpus is valuable for a number of reasons. One is that background research (Davies, 2013; Davies et al., 2014) has indicated the importance of article reading in the professional work of qualified doctors; some of this has to be done in English. A smaller proportion of doctors may also wish to present or publish their own research internationally in English rather than domestically in Japanese. Consequently, one of the ultimate goals of students should be to attain proficiency in reading and discussing research published in English. A corpus built from medical articles will be indispensable in addressing this challenge. By analyzing the English of medical case studies, clinical studies and review articles, it should be possible to identify the most frequent terms, and to introduce them in simple contexts relatively early in students' studies. In this sense, the aim is to familiarize students with useful terms that they will experience in the future in the more complex language of authentic medical research. It can be seen, therefore, as a process of 'investment' (Widdowson, 1990) for future experiences. In the creation of short essays in the units of material, the pedagogic aim has been to create simple 'accounts', described by Widdowson (1978: 89) as "forms of discourse that are a recasting of information abstracted from some source or other to suit a particular kind of reader".

A further key issue that goes beyond the specific research aims, and one that has not yet been explored, is the value of access to the corpora themselves (a 'Data-Driven Learning' approach). For practising doctors and students undertaking research, the opportunity to use the corpus itself to explore the ways in which particular terms are used, including their collocational patterns, may be very useful.

English for General Purposes and English for Specific Purposes

Another area of importance concerns the ways in which the research could be extended into a broader medical English curriculum. As noted earlier, with a pedagogic word list, there is the need not only to consider the words comprising the list, but also when and how they should be introduced into structured courses. The word lists that have proved popular with our students have been compiled through an analysis of classroom materials using corpus software. From the perspective of a broader curriculum, there is the question of the overlap between English for General Purposes (EGP) and English for Specific Purposes (ESP). In the context of the medical project described here, students undertake two years of general English classes before focusing on English for medical purposes. As Hutchison and Waters (1987) have noted, EGP and ESP share much in common, including grammar and teaching methodologies. Carefully constructed general English courses could incorporate a selection of basic medical words and research terms; similarly, a further course on reading and writing research articles could build on the medical terms covered in the intensive medical course. In this way, the curriculum could be oriented towards a steady progression into the medical field rather than an abrupt switch into specialized medical English studies.

CONCLUSION

The current research has shown that it is possible for applied linguists, without specialized knowledge of medicine, to develop and successfully teach a set of ESP materials for medical English learners — in this case, third-year medical students in Japan. Our corpus-based approach adds richness to the materials taught, by improving the materials themselves and creating specific word lists that help students with their learning of useful medical terms. A key point to note is that in teaching such material, the aim is not to teach medicine through the medium of English; it is, rather, to provide students with English in contexts they are already familiar with from their own medical studies. This may be why such high value is given to the medical word lists themselves by the students — of primary importance are terms and how they are used; the lists act as key reference documents that the students take with them after a course has finished.

In the final stage of the research, the resource-book based and article-based corpora will be completed, allowing for an extensive evaluation of the pedagogic units of material for the intensive medical course, and for the development of a specific word list, covering between 500 and 600 items. A review and editing of the specific word list, in conjunction with analysis from the three corpora, will then be used to compile a general medical word list for medical undergraduates.

REFERENCES

Anthony, L. (2011). *AntConc* (Version 3.2.4) [Computer Software]. Tokyo, Japan: Waseda University. Available from http://www.antlab.sci.waseda.ac.jp/

Baker, M. (1989). Sub-technical vocabulary and the ESP teacher: An analysis of some rhetorical items in medical journals. *Reading in a Foreign Language, 4*(2), 91-105.

Chung, T. M. & Nation, I. S. P. (2003). Technical vocabulary in specialized texts. *Reading in a Foreign Language, 15*(2), 102-116.

Chung, T. M. & Nation, I. S. P. (2004). Identifying technical vocabulary. *System, 32*, 251-263.

Cowan, J. R. (1974). Lexical and syntactic research for the design of reading material. *TESOL Quarterly,*

8(4), 389-399.

Davies, W. (2013). Linking a medical practitioner's use of English for medical purposes in Japan to skills and abilities development at university. *Hiroshima Studies in Language and Language Education, 16,* 89-102.

Davies W., Fraser, S., Lauer, J., & Howell, P. (2013). English for Medical Purposes: Teaching an intensive English course to third-year medical students. *Hiroshima Studies in Language and Language Education, 16,* 65-88.

Davies, W., Fraser, S., & Tatsukawa, K. (2014). A background study for the development of medical English corpora, word lists and university course materials in Japan. *Hiroshima Studies in Language and Language Education, 17,* 105-117.

Drake, R., Vogl, A. W., & Mitchell, W. M. (2004). *Gray's Anatomy for Students*. London: Churchill Livingstone.

Fraser, S. (2007). Providing ESP learners with the vocabulary they need: Corpora and the creation of specialized word lists. *Hiroshima Studies in Language and Language Education, 10,* 127-143.

Fraser, S. (2009). Breaking down the divisions between general, academic, and technical vocabulary: The establishment of a single, discipline-based word list for ESP learners. *Hiroshima Studies in Language and Language Education, 16,* 49-59.

Fraser, S. (2013). Building corpora and compiling pedagogical lists for university medical students. *Hiroshima Studies in Language and Language Education, 16,* 49-59.

Fraser, S., Davies, W., & Tatsukawa, K. (2014). A corpus analysis of an anatomy textbook: Preliminary findings and implications for medical English development. *Hiroshima Studies in Language and Language Education, 17,* 119-140.

Hsu, W. (2013). Bridging the vocabulary gap for EFL medical undergraduates: The establishment of a medical word list. *Language Teaching Research, 17*(4), 454-484.

Hutchison, T. & Waters, A. (1987). *English for Specific Purposes*. Cambridge: Cambridge University Press.

Longo, D. et al. (2012). *Harrison's Principles of Internal Medicine* (18th Edition). McGraw Hill.

Salager, F. (1983). The lexis of fundamental English: Classification framework and rhetorical function — a statistical approach. *Reading in a Foreign Language, 1*, 54-66.

Salager, F. (1985). Specialist medical English lexis: Classificatory framework and rhetorical function — a statistical approach. *EMP Newsletter, 2*(2), 5-17.

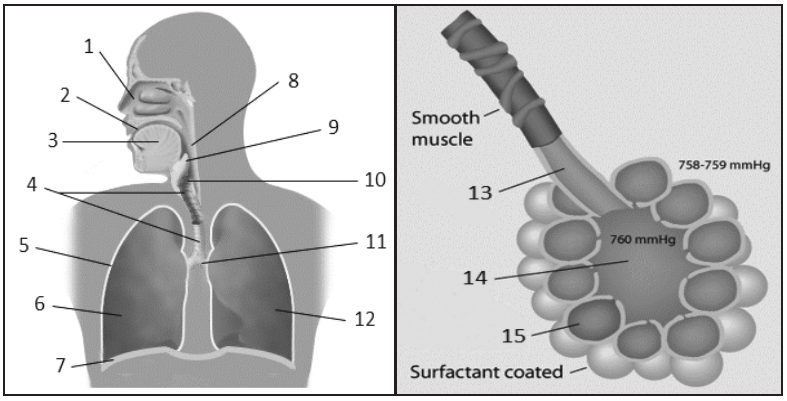
Wang, J., Liang, S-l, & Ge, G-c. Establishment of a medical academic word list. *English for Specific Purposes, 27*(4), 442-458.

Widdowson, H. G. (1978). *Teaching Language as Communication*. Oxford: OUP.

Widdowson, H. G. (1990). *Aspects of Language Teaching*. Oxford: OUP.

APPENDIX 1

Example of Anatomy material for Pulmonary Tuberculosis Unit



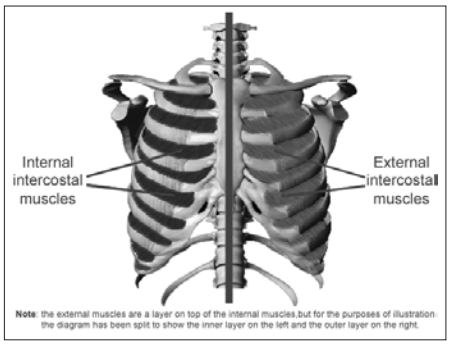
epiglottis	bronchus/bronchi	alveolar sac	nasal cavity
alveolus/alveoli	tongue	trachea	alveolar duct
diaphragm	left lung	oral cavity	larynx
pharynx	right lung	pleura/pleurae	

Write the terms in the box next to the correct number for the diagrams.

word	word
1.	9.
2.	10.
3.	11.
4.	12.
5.	13.
6.	14.
7.	15.
8.	

The Lungs

The lungs are located in the thoracic cavity, which is separated from the abdominal cavity by the diaphragm. Within the lungs of an adult, there are about 300 million alveoli. These create a surface area of 160 square metres, roughly the size of a singles tennis court. There are two pleurae (pleural membranes), one which lines the thoracic cavity and one which covers the outside of the lungs, and these stick to each other.



The diaphragm and intercostal muscles are important for

breathing. During inspiration (inhalation), the external intercostal muscles contract, lifting the ribs up and out. The diaphragm also contracts drawing it down. These actions cause the lungs to expand, drawing air into them.

During normal (gentle) expiration, the external intercostal muscles and diaphragm relax. Because of their natural elasticity, the lungs contract, pushing air out of them. During forced (vigorous) expiration the internal intercostal muscles contract, pulling the ribs in and down, and the wall of the abdomen contracts, pushing the stomach and liver upwards. With vigorous breathing in a normal adult, three to five litres of air can be exchanged with each breath. This is known as *vital capacity*. However, 1.2 litres of *residual air* remain in the lungs.

Questions

1. What is the name of the cavity in which the lungs are located?

2. What does the diaphragm do during inspiration?

3. What happens during normal expiration?

4. What happens during forced expiration?

5. What is the *vital capacity* of a normal adult?

Speaking

Work with a partner and do the following activities. Use the words from the boxes to help you.

Breathing

Verbs:	contract lift draw relax expand push
Other words:	inspiration external/internal intercostal muscles ribs diaphragm expiration walls abdomen stomach liver

Student A

Talk to student B. Describe the process of breathing if you are sitting at a desk.

Student B

Talk to student A. Describe the process of breathing if you are running 800m.

Passage of Air

larynx nasal cavity alveolar sac bronchi pharynx alveoli oral cavity trachea bronchioles alveolar duct

Student A

Talk to student B. Describe the route that air takes during inspiration, starting at the nasal cavity.

Student B

Talk to student A. Describe the route that air takes during expiration, starting at the alveoli.

APPENDIX 2

Extract from the 2014 Medical Word List

A	
abdomen	腹部
abdominal cavity	腹腔
abnormal	異常な
absorb	吸収する
absorption	吸収
acid	酸
acid-fast	抗酸性の
acidic	酸性の
acidosis	アシドーシス　酸性血症
active	活動性の
acute	急性の
adipose tissue	脂肪組織
adrenal glands	アドリナ腺
adverse effects	副作用
agony	激痛
alimentary canal	消化管
alkali	アルカリ性の
alpha cell	アルファ細胞
alveolar duct	肺胞管
alveoli (sg. alveolus)	肺胞　腺胞
anemia/anaemia	貧血
aneurysm	動脈瘤
angina	狭心症
angiotensin	アンジオテンシン（アンギオテンシン）
antibiotic	抗生物質
antibody	抗体
antigen	抗原　アンチゲン
anus	肛門
anxiety	不安　心配
aorta	大動脈
aortic valve	大動脈弁
aphasia	失語症
appetite	食欲
appendicitis	虫垂炎
appendicular skeleton	体肢骨格　四肢骨
appendix	虫垂
arachnoid membrane	くも膜
arterial blood	動脈血
arteriole	細動脈
artery	動脈
arthritis	関節炎
asepsis	無菌状態
atrial	心房の
atrium	心房
axial skeleton	中軸骨格
B	
bacilli (sg. bacillus)	バチルス　桿菌
bacteria (sg. bacterium)	細菌
belly	腹
beta cell	ベータ細胞
bile	胆汁
bile duct	胆管
blackout	意識喪失
blocker (of receptor)	遮断剤（受容体の）
bloodstream	血流
blood cell	血球
blood vessel	血管
blurry	ぼんやりした
bone(s)	骨
bowel(s)	腸
brain stem	脳幹
brain tumor/tumour	脳腫瘍
breastbone	胸骨
bronchi (sg. bronchus)	気管支
bronchiole	細気管支
bruise	打撲
C	
calcium	カルシウム
cancer	癌
cancerous	癌の　癌性の
capillary	毛細血管
carbon dioxide	二酸化炭素
carcinogenic	発癌性の
cardiac tamponade	心（臓）タンポナーデ
cardiovascular system	心臓血管系
carrier (e.g. of a virus)	キャリア　保菌者
cartilage	軟骨
caseous necrosis	乾酪壊死
cavity	腔
cecum/caecum	盲腸
cell	細胞
cell division	細胞分裂
cellular	細胞の、細胞性
cell wall	細胞壁
cerebellum	小脳
cerebral cortex	大脳皮質
cerebral infarction	脳梗塞
cerebrospinal fluid	脳脊髄液
cerebrum	大脳
chills	悪寒
cholesterol	コレステロール
chronic	慢性の
chyme	糜粥（びじゅく）
circuit	回路
circulation	循環
circulatory system	循環系
cisterna magna	大槽
clavicle	鎖骨
clinical	臨床上の
colon	結腸　大腸
commit suicide	自殺する
complaint	病訴　不調
complication(s)	合併症

APPENDIX 3

Extract from the Word Test

Vocabulary Test

Answer all the questions. Choose the best answer for each question.

1) What are the grooves in the cerebral cortex called?
   A. gyri
   B. bronchi
   C. sulci
   D. pleurae

2) What is the term for a balloon-like bulge in the wall of a blood vessel due to a weakness?
   A. tumor
   B. fistula
   C. ulcer
   D. aneurysm

3) What is the term for bleeding that takes place between the arachnoid membrane and the dura mater?
   A. cerebral edema
   B. cerebral infarction
   C. subdural hematoma
   D. subarachnoid haemorrhage

4) Which lobe of the brain is at the back of the head?
   A. parietal lobe
   B. occipital lobe
   C. temporal lobe
   D. frontal lobe

5) Which of the following is closest to the cerebral cortex?
   A. pia mater
   B. arachnoid membrane
   C. dura mater
   D. cranium

6) What is the name of the layer of connective tissue that covers the cranium?
   A. perineum
   B. pericardium
   C. peritoneum
   D. periosteum

7) What is the process of stopping bleeding called?
   A. hemostasis
   B. hemoptysis
   C. hematoma
   D. hematopoiesis

要　約

コーパス構築と授業コース設計を通しての大学生用医学英語語彙リストの開発

フレイザー・サイモン
デービス・ウォルター
達　川　奎　三
広島大学外国語教育研究センター

本論文の目的は，広島大学における医学英語講座の経年的前進をまとめ，本プロジェクトの一連の研究から得られた「語彙リスト」「授業コース設計」「コーパス分析」における関連性を議論することである。まず初めに，過去 3 年間にわたる本講座の授業内容と教材開発について報告する。とりわけ，使用した教材を吟味し，そしてコーパスと学生用語彙リスト作成にコーパス・ソフトウェアがどのように役立ったかを詳細に説明する。

次に，考察の部分では，今日までの本研究で判明した 3 つの事柄について考えてみる。特定の目的に関わっては，特定分野を意識した医学英語語彙リストと包括的な医学的語彙リストの関係性を調査した。また，医学書籍（教科書）に基づくコーパスと医学論文に基づくコーパスの相対的関係性についても調査してみた。さらに，もっと広い視野から考察するために，「一般的な目的のための英語学習」と「ある特定分野の英語学習」の関係を議論し，より包括的な医学英語カリキュラムを構築するためには，どちらか一方に偏るのではなく，これら 2 つを連続体として捉えるべきであることが分かった。