Creating Online English Materials for Medical Students

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In recent years, educators at the tertiary level in Japan have become increasingly concerned with the need to provide students with a more globally-oriented education, and the field of medicine is no exception. In 2015, the Japan Society for Medical English Education (JASMEE) published a set of guidelines developed with the aim of raising the medical English proficiency of Japanese medical students to levels necessary for "meeting the global standards of medical English education". Against this backdrop, we have been asked by the medical faculty at Hiroshima University for help with the development of their students' English-language skills that goes beyond a basic command of English. The project we describe here has been motivated by our success in developing and teaching an intensive English course for third-year medical students at the university, with corpus analyses and frequency-based word lists playing an integral role in materials development.

In this new project, our intention is to exploit the use of information technology at our university and create e-learning opportunities for students of medicine and other medically-related fields. In order to expand upon what can be accomplished in the classroom, we plan to build a set of online medical English materials. Targeting second-year students, the main focus of the materials will be on anatomy, supported by elements of physiology and biochemistry. In this article, we describe the initial planning for the creation of the materials, and consider how to determine the content, the type of tasks to be used, and the selection of a suitable web-based platform to deliver the materials.

BACKGROUND

A Corpus-based Approach

Although corpus analysis in English for Specific Purposes (ESP) has previously been applied to syllabus and materials design (Flowerdew, 1993, for example, created a corpus from transcriptions of biology lectures), it is more usual for these studies to take place independently of course creation. In our previous project, the development of a medical English course for third-year students, we attempted to address this shortcoming. In the project, we employed methodology which involved an ongoing interaction between corpus analysis, word lists, and materials development (see Fraser, Davies & Tatsukawa, 2015, for an overview). In the initial phase of the course development, commercially produced materials were used, a small pedagogic corpus was built, and a glossary of terms was compiled. The next stage involved conducting interviews with senior medical professors (Davies, Fraser, & Tatsukawa, 2014). In these discussions, anatomy, physiology, and common diseases and symptoms were highlighted, with anatomy and physiology singled out as being especially important.

An anatomy corpus was constructed (Fraser, Davies, & Tatsukawa, 2014), based on *Gray's Anatomy for Students*. Basic anatomy materials were produced and trialled before being added to the existing course materials. A new set of materials has since been designed, linking anatomy and physiology to medical conditions, and informed by a subsequent corpus analysis of *Harrison's Principles of Internal Medicine* (Fraser, Davies, & Tatsukawa, 2016). A revised word list draws from these materials and focuses on anatomy, common diseases, and symptoms.

Such a corpus-based approach enriched the course by improving the materials themselves and creating specialized word lists, helping students with their learning of the most salient medical terms. Close contact with the medical faculty ensured that we were able to provide students with English in situations and contexts with which they were already familiar from their own medical studies, and feedback from students regarding the materials, and word lists in particular, was very positive (Fraser et al., 2015).

From interviews with the medical faculty, ten broad medical areas have been identified that should comprise the discipline as a whole: 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. Awareness of these categories is helping us to organize integrated sets of materials; existing materials include units covering the digestive, cardiovascular, neurological, pulmonary, endocrine, and skeletal systems. The categories are also enabling us to begin work on the systematic construction of a corpus of medical research articles with a view to helping students with their reading and writing of such articles. The importance of this is recognized by the JASMEE (2015) guidelines, which state that the ability to read, write, and present medical papers is an essential component of the medical English proficiency required by doctors.

Using Online Instruction to Expand Learning Opportunities

The application of information communication technology (ICT) is becoming increasingly common in educational institutions around the world. ICT involves the use of electronic media for educational purposes; such media include Moodle and other similar learning management systems (LMS), computers, smartphones, and cloud sharing. Nowadays, many departments of higher education institutions, including the Institute for Foreign Language Research and Education at Hiroshima University, are using LMS for the administration of online courses, with the aim of providing greater flexibility in addressing students' needs. Online digital media are often combined with traditional classroom methods, a methodology known as 'blended' learning. 'Flipped' or 'inverted' learning (see Bergman & Sams, 2012) is a form of blended learning that delivers instructional content online, allowing learners to use classroom time to work through problems, collaborate with their peers, and gain a deeper understanding.

In the field of medical English education, researchers are beginning to realize the potential of ICT, and blended learning in particular, to enrich the learning environment. One example of this is a recent study investigating the effects of increasing ICT use in a medical English oral communication course (Jego, Udagawa, Taniguchi, & Nemoto, 2016), in which the positive effects of ICT in improving speaking skills are clearly demonstrated. However, the experience was not a positive one for all students, particularly for reasons of access and technical support, and the authors stress the need for careful consideration of the way in which e-learning is implemented.

THE ONLINE PROJECT

Obviously, a major difference between our previous project and the new one is that the latter involves the creation of online materials. However, an additional, and equally important, aim is to create a coherent and interlinked set of English language learning materials that contains medical language which is relevant to students' actual studies. At this early stage of the project, the research is exploratory, building towards the main work that will take place in the following years. In the present article, we address the following key research questions:

1. What should the content of the online materials be?
2. How will the online materials fit with the existing materials?
3. How should the online materials be constructed?
4. How will the materials be delivered online?

Determining the Content of the Online Materials

As discussed in previous articles (see, e.g., Davies, et al., 2014; Fraser, et al., 2015), the content of our medical materials is driven by the studies of the students in the medical faculty. We have argued that a distinction needs to be made between learning medicine through the medium of English and the learning of medical English. The concern of our present research is with the latter, which means that units of medical English content should either slightly lag, or run in parallel, with the students' medical studies. In this way, students can link the language and discourse in the medical English materials to their existing understanding of medicine. This necessarily leads to the question of which students the project is targeting.

Our previous project was oriented towards third-year students in the medical faculty, and involved a synthesis of several components: Anatomy and physiology were linked to medical conditions, and technical medical English was incorporated into essays as well as the language of doctor-patient consultations. In the new project, the applied linguistics team is going to focus on materials aimed at second-year students. The reasons for this relate to clarity and organization of content, and are stated below.

Targeting Second-year Students

In relation to clarity, we have noted that while it is clear that students are exposed to medical English terms in their classes, it is difficult to establish exactly which words these are and how they are taught. Medical English learning is not only taking place in specialized English courses, but also in medical courses where the medium of communication is Japanese. In part, both the earlier project and the present project have the aim of bringing this English language learning to the surface, and this can be done partially through collating key terms and forming word lists. Metaphorically, we see word lists as the skeleton which supports the more diverse activities used in language learning. Having course-specific and unit-specific word lists will allow medical teachers to know what content students can be expected to learn if they study the online materials.

Another reason for focusing on the second grade is that it gives students the opportunity to start learning medical English content at an earlier stage. Medical English contains a huge number of technical terms, and this presents a considerable challenge for medical students. As stated in the "WFME Global

Standards for Quality Improvement, Basic Medical Education: Japanese Specifications" guidelines, published by the Japan Society for Medical English Education in 2013, part of a doctor's duty is to "contribute to the national and international developments of medicine", and the ability to use medical English offers the opportunity for such research to reach a much wider audience. To be able to present and publish internationally requires a firm grasp of medical terminology and the ability to use it appropriately; given the size of this challenge, starting early is important.

A third reason relates to medicine as a profession, in which there is a general consensus on what needs to be studied in the early years of medical studies. All students wishing to become doctors in Japan are evaluated through two sets of national exams: Computer-based testing (CBT), and the Objective Structured Clinical Examination (OSCE). This national testing means that all students need to cover a similar curriculum leading up to these tests, with the result that syllabus content for all medical students is broadly the same. Consequently, this offers the opportunity to organize medical English syllabuses and content for students that parallel or connect to their studies in Japanese.

Selecting Topics for the Materials

With a focus on the second year of students' medical studies, for the reasons stated above, the question then arises as to the content of the course. Meetings with senior members of the medical faculty have led to an agreement that anatomy should be given the highest priority, as there are two major courses on it in the second year: gross anatomy and microscopic anatomy. However, these meetings have also indicated that, as with many subjects, the lines between gross anatomy, microscopic anatomy, and physiology are blurred, or at least shade into each other. In rather the same way that an English writing course does not exclude the other three skills of reading, listening, and speaking, a gross anatomy course will include aspects of microscopic anatomy and physiology. Questions such as "*Where is it located?*", "*What does it look like?*" and "*What is it attached to?*" are concerned with anatomy, but "*What does it do?*" or "*How does it work?*" relate to physiology. Accordingly, while the main focus of the online materials will be anatomy, elements of physiology and biochemistry are also going to be incorporated.

The approach to content of the online materials differs to that in the previous project due to the detailed input on vocabulary we are now receiving from medical experts. In the previous project, as applied linguists, our research method was to build the materials on the basis of the division of medicine into the categories mentioned earlier; working top-down, terms were extracted from the materials through corpus software, with corpus analysis of *Gray's Anatomy for Students* and *Harrison's Principles of Internal Medicine* then enabling us to enrich and improve the materials, and so add to our course word list. In the current project, medical professors are supplying us with the topics of their classes and glossaries of words that they introduce to students. Our role is to organize these words into groups, and build texts and learning tasks that can be undertaken online. This will mean that a substantial part of the word list for online materials will emerge from decisions made by medical specialists. Because the English glossaries are linked to medical content in Japanese, they naturally form related groups of words, which can be built up into coherent and cohesive texts. In essence, topic and content are primarily chosen by the medical expert, while the construction of texts in English and learning tasks is undertaken by language specialists. Corpus analysis is then used to support the process, bringing the language of the English texts as close as possible to that of established

medical texts, and seeking potential high-value words that might be added to the list.

Fitting the Online Materials within the Existing English Curriculum

One important consideration in the project is how the new materials will affect existing materials, and how they will fit within the existing English curriculum. In the current system of the university, students begin by taking general English classes, with a university-wide set of courses provided in the first and second year of their studies. In their first year, they undertake four mandatory courses, each with a focus on a language skill: speaking, reading, writing, listening. In the second year of classes, students have to take a further general English course, choosing one course from a range of options (Table 1):

TABLE 1. General English Courses for Medical Students

Communication IA	Speaking
Communication IB	Reading
Communication IIA	Writing
Communication IIB	Listening
Communication IIIA	Speaking and Writing
Communication IIIB	Reading and Listening
Communication IIIC	English Language-related Subjects

All the general English courses are given to first- and second-year students. Within the medical faculty, there are also courses which are taken by third-year students. Our previous research has been focused on one such course: an intensive medical English course, taught annually by four teachers over a four-day period in September. The project has moved forward by linking with the medical faculty's English specialist to create a more integrated set of English for Medical Purposes (EMP) classes covering the following areas (Table 2):

TABLE 2. EMP Integrated Classes

Intensive Medical Course Topics

1	Planes and positions	Views of the body, X-rays, CT-scans
2	The brain	Neurosurgery
3	The circulatory system	Cardiovascular medicine
4	The lungs	Pulmonary tuberculosis
5	The digestive tract	Digestive medicine
6	The endocrine system and the pancreas	Diabetes mellitus
7	The skeleton	Orthopedics and the knee

Linked Classes Taught by Medical Faculty English Specialist

8	The lymphatic system	Viral infections
9	The liver	Hepatology

Another consideration is how the anatomy/physiology sections of the third-year course will be affected by the creation of second-year materials. Should these components be removed from the third-year course as the new course develops? An important issue here is related to teaching rather than materials. Anatomy and physiology were made integral to the materials for two reasons: The first of these was the uncertainty of the extent of the students' knowledge by the time they took the course; the second was that, in most cases, a substantial number of the anatomy terms were necessary for describing the medical conditions in the second part of each unit.

In teaching the intensive course, it became apparent that while some students had a good knowledge of the medical English terms, and many had some knowledge of the terms, there were a few students who struggled with them. To avoid potential problems, it was deemed necessary to cover the terms in class. It was also unclear how well students could pronounce such terms, or whether they could use them in oral interaction. Even if the terms were known, it was useful to review them and start to sensitize the students to the area they were going to study. Consequently, with regard to the content, most of the existing units of material will be unaffected; a teacher, though, will probably find that such areas will be covered much more rapidly if the online materials become an integral part of medical students' study. However, it may be possible to tailor some anatomy and physiology sections to fit more closely with the medical problems described in a particular unit. One example is the unit oriented towards 'orthopedics and the knee'. In the current unit, the anatomy/physiology section covers both the axial and appendicular skeleton (See appendix). This could be replaced by a section that specifically focuses on the knee joint, including important terms such as *anterior cruciate ligament* and *posterior cruciate ligament*, as well as an adjustment to the medical essay to include tears to tendons, while the key bones of the body can be moved to sections in the online materials.

The topics for the online materials will be drawn from the subject matter of the anatomy courses. For example, the microscopic anatomy course has the following main class topics:

TABLE 3. Topics for Microscopic Anatomy

1. Cardiovascular system
2. Digestive system 1
3. Digestive system 2
4. Endocrine system
5. Female reproductive system
6. Lymphatic system/bone marrow/spleen
7. Male reproductive system
8. Respiratory system
9. Sensory systems: olfaction/audition
10. Sensory systems: visual
11. Skin
12. Urinary system

The topics are based on body systems, From the point of view of topic organization, microscopic anatomy has the advantage that students study pre-prepared slides and these can be matched to body systems. We have taken the urinary system as an example, and considered the microscopic anatomy (histology) glossary for it (Figure 1). This contains words on the kidney, ureter, and urinary bladder.

Kidney

cortex, medulla, cortical labyrinth, medullary rays, renal pyramid, renal papilla

renal corpuscle (Malpighian corpuscle), glomerulus, Bowman's capsule, Bowman's space, capillary, endothelial cell, podocyte, basement membrane, mesangial cell, vascular pole, urinary pole, afferent glomerular arteriole, efferent glomerular arteriole, proximal tubule, brush border, basal striation, distal tubule, juxtaglomerular apparatus, macula densa, extraglomerular mesangium, granular cell, juxtaglomerular cell, epithelioid cell, collecting duct, loop of Henle, collecting duct

Ureter

Urinary bladder

mucosa, transitional epithelium, dome-shaped cell, lamina propria mucosa, lamina muscularis, lamina adventitia

FIGURE 1. Words from the Urinary System Glossary (Microscopic Anatomy Course)

In contrast to microscopic anatomy, gross anatomy involves a combination of dissection and lectures. At Hiroshima University, for practical reasons, a regional approach to anatomy is necessary for dissection, allowing students to get visual and tactile understanding of the body in three dimensions. However, in order to gain an understanding of the physiological function of organs, lectures may include aspects of microscopic anatomy, as can be seen from the terms used for the urinary system in the gross anatomy course (Figure 2). Consequently, while it is in possible to make a separation between gross anatomy and microscopic anatomy in terms of dissection and examining slides, in relation to gaining an understanding of how the body functions, terms from both gross anatomy and microscopic anatomy are often used in conjunction.

Urinary System: renal artery, renal vein, kidney, ureter, urinary bladder, urethra, urethral sphincter

Kidney: cortex, medulla, capsule, papillae, renal column, ureter bladder

Nephron: afferent glomerular arteriole, efferent glomerular arteriole, proximal convoluted tubule, loop of Henle, distal convoluted tubule, collecting duct

Renal Corpuscle: Bowman's capsule, glomerulus, podocyte, endothelial cells, mesangial cells, basement membrane, Bowman's space, capillary, vascular pole, urinary pole

Juxtaglomerular Apparatus: macula densa, juxtaglomerular cell (granular cell), extraglomerular mesangium (extraglomerular mesangial cell)

Urinary Bladder: mucosa, transitional epithelium, dome-shaped cell, lamina propria mucosa, lamina muscularis lamina adventitia

FIGURE 2. Terms from the Glossary (Gross Anatomy Course)

From the perspective of materials creation at the university, it seems practical to start with a holistic approach that incorporates both gross anatomy and microscopic anatomy within topics organised around body systems.

Factors Affecting the Construction of the Online Materials

A major consideration is the actual construction of materials. In the previous project, the approach has been to build conventional paper-based classroom materials. To what extent will online materials resemble these, and in what ways will they differ? In this section, we continue with the urinary system as an example. The initial construction of classroom materials followed a particular structure (Figure 3):

Anatomy/Physiology
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. Reading and practising a short doctor-patient medical dialogue
7. Performing doctor-patient role-plays

FIGURE 3. Structure of a Teaching Unit Focused on Speaking Skills

Text structuring

The online materials will look similar to the first parts (1 and 2) of the third-year units of material, involving diagrams and a short essay that forms a simple account of the anatomy/physiology. For example, the materials could start at the gross anatomy level, with a transition to the microanatomy level. A standard way of introducing vocabulary is through anatomy diagrams (Figure 4).

Due to the nature of online materials, it is possible to divide an anatomy/physiology essay into component parts (Figure 5). In the example of the urinary system, it is possible to create links within the materials to connect diagrams with paragraphs of text, so that students can link words to diagrams, read texts directly related to diagrams, and check understanding.

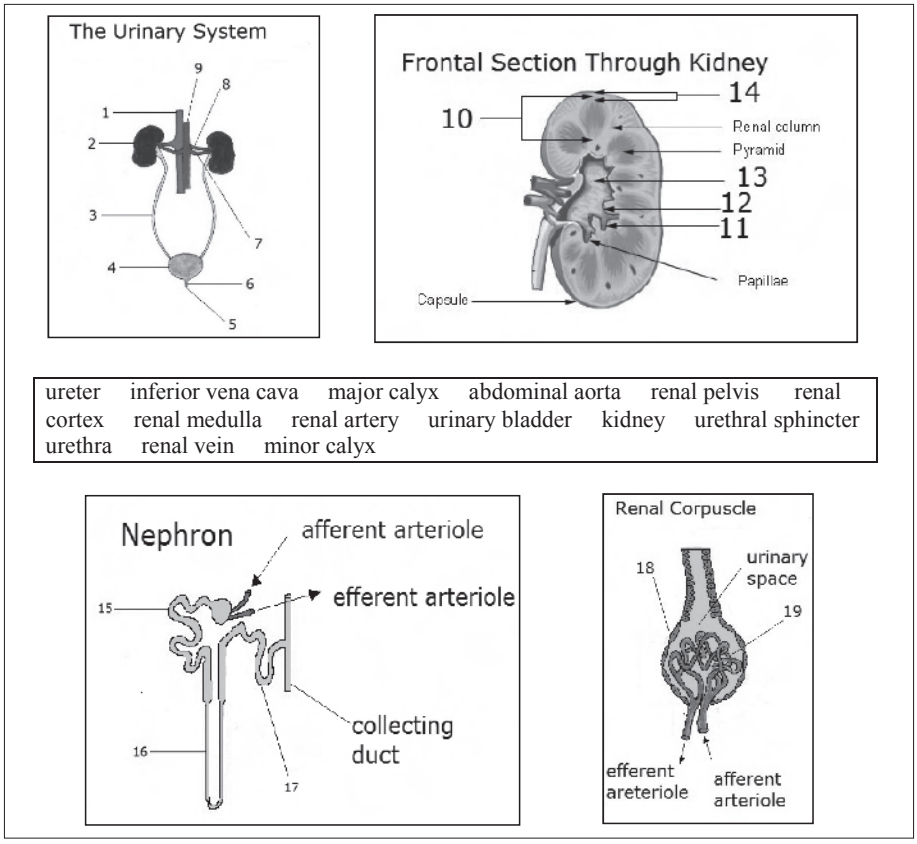

FIGURE 4. Gross Anatomy for the Urinary System: Matching Terms to Numbers

The Nephron

The main function of the kidneys is waste excretion. Each kidney contains about one million filtering units, which are called nephrons. Each nephron filters a small amount of blood. The nephron includes the renal corpuscle, the proximal convoluted tubule, the loop of Henle, and the distal convoluted tubule.

The Renal Corpuscle

The renal corpuscle consists of the Bowman's capsule and the glomerulus. The glomerulus is a network of capillaries, and it is surrounded by the Bowman's capsule. Water and small molecules from the blood pass through the glomerulus into the Bowman's capsule. Blood cells and large molecules remain in the capillaries.

FIGURE 5. Microscopic Anatomy for the Urinary System with Descriptive Paragraph

Task creation

Within the online materials, tasks can take a variety of forms for each key paragraph. All tasks require clear answers that can be checked online. There are two types (1 and 2) that have been used from the previous project, while others (3, 4, 5) are also valuable.

1. Matching terms to diagrams. As can be seen in the diagrams above, they can be labelled with numbers and matched to the English medical terms.
2. Matching terms to definitions. In this case a list of terms can be numbered and matched to a set of definitions in English.
3. Multiple choice questions. These are a staple of the CBT, and therefore something that medical students have to get used to in Japanese.
4. Matching medical English to medical Japanese. Medical terms can be matched in both directions.
5. Gap-filling texts. Here existing texts can be adapted with gaps in them, and students have to choose items from a word box.

Selecting an Appropriate Web-based Platform for Delivering the Materials

The first step in building an online course involving the five above-mentioned activities is to choose a web-based platform that is accessible and easy to use for both learners and instructors. One option would be to build our own custom e-learning site; however, there are a number of commercial or open source learning management systems available that cover all the functions we need, and using one of these would save us the time and cost of building an online system from scratch. The most popular commercial LMS is Blackboard Learn, first released in 1997 by Blackboard LLC. One of the best-known open source systems is Moodle, which first became available in 1999, and has since attracted a huge users' community worldwide.

After comparing the relative advantages and disadvantages of several systems, we have concluded that Blackboard Learn (also known as "Bb9", in reference to its current version) would be the most suitable for our project. In addition to covering all the functions necessary for our planned activities, this LMS, being an in-house service provided by Hiroshima University's Information Media Center, is expected to alleviate the technical hurdles that will be encountered by students, instructors, and course designers. A web server needs to be set up, and its data, containing users' personal information, protected from cyber-attacks, for example. With Bb9, however, the time and effort necessary to manage the system itself will not be a concern, and, using this platform, we will be able to focus on developing the content of the materials.

DISCUSSION

In this article, we have sketched out a plan for the creation of online medical English materials for second-year students. The main focus will be on anatomy, supported by elements of physiology, and possibly also biochemistry and molecular biology. The following aspects of the project require discussion: the advantages of online materials over written materials, the limitations of online materials, and the development of a core medical English word list.

The Advantages of Online Materials over Textbooks

In this project there is strong cooperation between medical specialists and applied linguists, which has resulted in the decision to create a set of English language materials that connects directly to the anatomy classes of second-year students. While it would be possible to do this through the production of a traditional textbook, online materials provide greater flexibility. One consideration is the difference in approach that arises out of the two different anatomy courses. The gross anatomy course requires students to carry out

dissection to study anatomical structure, and out of necessity a regional approach to anatomy is taken. In contrast, microscopic anatomy involves the study of the minute structure and function of cells and tissues of the body, allowing a systems approach to be adopted. Consequently, medical specialists may wish to refer their students to particular terms at different times during a semester. With an online system of study, links can be created that allow students to connect their understanding of English terms across the main body systems. Students will also, under their own initiative, be able to explore particular areas or links in the materials which represent the human body as an interacting set of systems. A learner investigating the circulatory system, for instance, may become interested in the filtering of the blood and look at the connection to the urinary system, or may consider the actions of white blood cells and their relationship to the lymphatic system; similarly, consideration of the processes of digestion may lead to the liver via the portal system.

Skills Limitations to Online Materials

The main limitation of online materials is that they are primarily designed for self-study. This means that students are not given the opportunity to experiment and explore medical language through the development of productive skills in the way that communicative approaches do in English language classrooms. While receptive skills are valuable, they need to be complemented with productive skills. One potential risk of a communicative approach, however, as we have noted in a previous article (Davies & Fraser, 2016), is that students may learn stock phrases without having the underlying resources to give explanations of body function and explain how a disease impacts such function. Developing the productive skills medical students really need, and as early as possible in their studies, should be a priority. One way of dealing with this requirement in the future could be through the provision of support classes that give students the opportunity to practice describing systems and processes in anatomy and physiology.

The Development of a Core Medical Word List

An aim of both the previous project, using traditional materials, and the online project is the compilation of a core word list of manageable size for students. As we have noted, a challenge for students is the magnitude of the medical English lexicon. However, some words clearly have a much higher pedagogic value than others. By synthesizing the lists of most salient medical terms from the two projects, we hope to substantially complete our aim of producing a core medical word list of 2,000 medical words that can be studied in context.

CONCLUSION

In this paper, we have outlined a basic plan for building an online course for second-year medical students, one that parallels their medical studies in Japanese and dovetails with existing materials for third-year students. Although this project presents many challenges, cooperation between medical specialists and applied linguists makes it feasible, particularly as the Institute for Foreign Language Research and Education has expertise in the use of language learning technology, and is currently undertaking various other online projects.

While the project is essentially oriented towards students in the medical faculty, the flexible nature of online materials may create opportunities for students studying other medically-related fields including

dentistry, physical therapy, and nursing. The advantage of the system is that it potentially offers the opportunity for students and teachers to pick and choose topics that may be relevant to a certain course of study. In contrast to a textbook, which offers a bundled set of materials, online materials allow different departments to identify and organize learning relevant to their purposes, and so the materials themselves may have a much wider relevance than medical studies alone. As with all educational institutions, resources are limited. Finding common ground in a specialist field that links across departments and faculties may help to make education more relevant. Online materials for anatomy have the potential to be one such field, and subsequent articles will explore this possibility.

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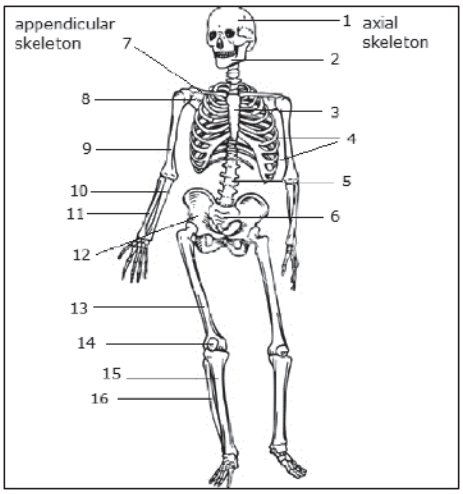
The Skeleton

Anatomy



radius vertebral column patella scapula ulna fibula sacrum humerus mandible coxa skull sternum clavicle ribs tibia femur

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

word	word
1.	9.
2.	10.
3.	11.
4.	12.
5.	13.
6.	14.
7.	15.
8.	16.

The Skeleton

The human skeleton is composed of 270 bones at birth. This number decreases to 206 bones by adulthood because some of the bones fuse together. The skeleton can be divided into the axial skeleton and the appendicular skeleton.

The axial skeleton is composed of 80 bones and consists of the skull, the vertebral column and the rib cage. It supports the head and trunk of the body, so that a human can maintain an upright position. The bones of the spine are supported by many ligaments and muscles. It is possible to survive with only the axial portion of the skeleton.

The appendicular skeleton consists of the pectoral girdles, the upper limbs (arms), the pelvic girdle, and the lower limbs (legs). The functions of the appendicular skeleton are to make locomotion possible and to protect the major organs of digestion, excretion, and reproduction.

In addition to support, protection and movement, the bones of the skeleton have three other functions: the production of red blood cells, the storage of minerals and elements, and endocrine regulation. The skeleton is the site of hematopoiesis — the development of blood cells. In children this occurs primarily in the femur and tibia. In adults, it occurs mainly in the pelvis, cranium, vertebrae and sternum. The bones are also used as storage for important elements and minerals such as calcium, phosphorous and magnesium. In addition, bone cells release a hormone called osteocalcin, which contributes to the regulation of blood sugar and fat deposition.

Questions

1. What does the axial skeleton consist of?

_____

2. What does the appendicular skeleton consist of?

_____

3. Where are red blood cells produced in a child?

_____

4. Where are red blood cells produced in an adult?

_____

5. What does osteocalcin do?

_____

ABSTRACT

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Recent years have seen educators at the tertiary level in Japan become increasingly concerned with the need to provide students with a more globally-oriented education, and the field of medicine is no exception. In 2015, the Japan Society for Medical English Education (JASMEE) published guidelines developed with the aim of raising the medical English proficiency of Japanese medical students to levels necessary for "meeting the global standards of medical English education". Against this backdrop, the medical faculty at Hiroshima University has requested help with the development of their students' English-language skills that goes beyond a basic command of English. The project described here has been driven by our success in developing and teaching an intensive English course for third-year medical students at the university, with corpus analyses and frequency-based word lists playing an integral role in materials development.

In this new project, our intention is to exploit the use of information technology at our university and create e-learning opportunities for students of medicine and other medically-related fields. In order to expand upon what can be accomplished in the classroom, we plan to build a set of online medical English materials. Targeting second-year students, the main focus of the materials will be on anatomy, supported by elements of physiology and biochemistry. In this article, we describe the initial planning for the creation of the materials, and consider how to determine the content, the type of tasks to be used, and the selection of a suitable web-based platform to deliver the materials.

要　約

医学部生のためのオンライン英語教材の開発

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近年，日本の高等教育に従事している教員は，よりグローバルな課題や場面に対応できる教育内容を学生に提供する必要性をより認識しつつある。これは医学教育においても例外ではない。例えば，日本医学英語教育学会（the Japan Society for Medical English Education: JASMEE）は，日本の医学生の英語運用能力を国際的な医学英語教育基準に見合うレベルに引き上げるための指針を，2015 年に発表した。このような背景もあり，広島大学医学部からは，医学生のいわゆる基本的な英語運用力を滋養するのではなく，より高度な（専門的な）英語力を養成するための支援を要請された。本プロジェクトは，医学部 3 年生を対象とした「医学英語集中講座」を企画・実践することによって得られた成果に基づいている。具体的には，医学生に対してより専門的な医学英語を提供するために「コーパス分析」を行い，それをもとに「使用頻度の高い語彙リスト」を作成し，それらをオリジナル教材の中核に据えた。

今回紹介する新たなプロジェクトは，本学でこれまでに実践されてきた，ICT 活用を含む教材開発の知見を生かし，医学部生はもとより医療関係専攻学生に e-learning による学習機会を提供することを目指している。つまり，教室内で学習したことをより定着させるために，オンラインによる医学英語教材の開発を行いたい。主として扱うのは「解剖学」の領域で，「生理学」「生化学」の要素も含むものである。本稿では，新プロジェクトにおける教材開発の企画経過の概要をまずは紹介し，その後，教材で扱う「内容」，取り組ませる「タスク・タイプ」，そしてウェブ配信により適したシステムのあり方について，どのように決定したかを詳述する。