Teaching and Evaluating a Medical English Flipped Learning Course

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

In this article, we document the process of creating a medical English flipped learning course for third-year students at Hiroshima University, evaluate the student feedback from the course, and also give a perspective from two of the course instructors (Fraser and Davies). In previous years, the course was taught intensively over a period of four days, and was almost entirely classroom based. The flipped learning course has involved the use of the university's Learning Management System (LMS), Blackboard Learn 9 (Bb9), to create self-study units of classroom teaching materials, with previous years' material being separated and edited to create a self-study component and a classroom component.

The medical English courses described here are strongly linked to central-government-funded research. In the first project, a research team of three (Fraser, Davies, Tatsukawa), from the Institute for Foreign Language Research and Education (FLaRE), worked on developing a word list integrated with teaching materials for third-year medical students (Fraser, Davies, & Tatsukawa, 2015). As an extension to this, a second project was started in 2016 that focuses on the creation of online medical English materials (see Fraser, Davies, Enokida, & Tatsukawa, 2017, for an account of the origins of the project). The team now includes an ICT (information and communication technology) specialist (Enokida). Initially starting with a focus on second-year students, the project has expanded to include materials for third-year students.

FLIPPED LEARNING

Flipped learning is an instruction model developed by Jonathan Bergmann and Aaron Sams in 2007 (Bergmann & Sams, 2012). It is a form of blended learning, which involves the combination of delivery media or methods (Graham, 2005). Flipped learning has been described as "a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter" (Network, 2014). It typically involves out-of-class learning utilizing ICT and the Internet, where learners are asked to access the online materials for instruction before the class, using their own personal devices such as PCs, smartphones, or tablets. These materials, including video clips, texts, images, interactive quizzes, and essay questions, enable learners to work on them repeatedly, regardless of time and place, until they can understand their content. As Staker and Horn (2012) point out, flipped learning is a variation of blended learning in that e-learning is

integrated into traditional face-to-face settings. In flipped learning, however, a classroom is no longer a place for face-to-face instruction; it is, rather, a place where learners should actually *use* the knowledge that has been acquired beforehand, through group activities that will encourage them to use their productive and creative skills. Flipping the classroom, typically with the aid of technology, allows learners and instructors to use their limited class time more efficiently (Milman, 2012).

DEVELOPING A FLIPPED LEARNING MEDICAL ENGLISH COURSE

In the present article, we describe the process of creating a flipped learning medical English course, analyze the student feedback from the course itself, and discuss the course from the perspective of instructors (two of the authors of this article were key members of the teaching team involved in the classroom-based part of the course). Consequently, the article addresses the following questions:

1. Why was the flipped learning course created?
2. How was the flipped learning course created and implemented?
3. How did students respond to the new course?
4. How did instructors perceive the new course?

Motivation for Changing to a Flipped Learning Course

Part of the momentum for creating a flipped learning course for third-year students came from an inquiry from the university's medical faculty about reducing the cost of the course. As it is an additional responsibility for FLaRE, involving extra teaching hours, there is a transfer of budget from the medical faculty to the institute based on teacher class time. With a completely classroom-oriented course, this comprised 48 contact hours. With a flipped learning course, it seemed feasible that this number of hours could be greatly reduced.

A further reason for trying a flipped learning course related to previous experiences in teaching the classroom-based course. During the course, students had to produce a piece of summary writing as a part of their evaluation. Due to the complexity of scheduling, involving four instructors, the writing had to be done in class. With classes of around 30 students, this seemed an inefficient use of the limited class time, and could better be undertaken during a separate evaluation period. Flipped learning would be a way of creating enough time to do this. Another factor was that most students were efficient in doing homework. One instructor, worried that his materials could not be covered in class, gave students reading and vocabulary exercises as homework, which most students completed before class, and the instructor consequently managed to cover all the teaching materials early. With classroom materials that involved both input and output activities, it was clear that students were quite capable of dealing with a large amount of the input, in the form of readings and vocabulary development, by themselves.

Planning the Flipped Learning Course

<u>The initial plan: PDFs and paper</u>

The original plan for a flipped learning course was technologically unambitious. The course itself had a 75 percent focus (three instructors) on medical English in the form of anatomy, physiology, medical

problems and doctor-patient interaction, and a 25 percent focus (one instructor) on medical ethics. The flipped learning was oriented towards the former portion of the course. The course materials would be roughly divided into input activities for self-study, and output activities in class. The self-study materials would be created as PDF files, which students could print out and complete. One day prior to the course, there would be a taught session in which the input sections would be checked, and key words covered with pronunciation drills. The main course would then be taught over a period of two days, and there would be a final day of evaluation tasks, involving a multiple-choice vocabulary test and summary writing.

Bridging projects

While the planning for the third-year flipped learning course was taking place, research and planning was simultaneously being undertaken with the aim of developing online materials for second-year medical students. Our plan was to produce medical English content parallel to students' medical studies in Japanese; students should study English language for materials they had recently covered in their medical studies. By doing this, there should be very little problem with conceptual understanding of the content, so that students could focus on English discourse related to their medical studies. In their second year, medical students study mainly gross anatomy, histology and physiology (hereafter, GAHP). During a meeting with senior medical professors, it was agreed that the research and materials development would be oriented towards these areas. As professors teaching these subjects often produced glossaries of key terms in English, these were to be used as guides in creating online materials. There was also a request that audio files be created for students to aid with aural/oral skills.

On examination of the glossaries and materials that our research group received from the gross anatomy and histology professors, it became clear that there was going to be considerable overlap between the third-year materials and the second-year materials. Because students start their medical English studies in the third year, the teaching materials produced by the research team integrated gross anatomy, histology, and physiology with medical problems related to the topic of each unit. For example, in the digestive system unit, the gross anatomy of the digestive system was combined with the process of digestion. Medical problems associated with the digestive system were then introduced: peptic ulcers, reflux esophagitis, appendicitis, and colon cancer. Given that the first parts of each unit focus on GAHP, it was clearly going to be impossible to make a strict separation between second-year and third-year materials.

Bridging the digital divide

The solution to the problem of overlap came with the use of the LMS, and highlighted the importance of having technical expertise within the team. Although all the members of FLaRE involved in the project are highly experienced teachers and researchers, the use of the available technology to best effect presented a considerable challenge. Only one member of the team (Enokida) had used the university's LMS, but on receiving two PDF files of self-study material for posting on the Internet, he experimented with adapting them for placement on Bb9. It was immediately clear that this was a much better approach than the use of PDFs, and the research team agreed to set up the self-study part of the course on Bb9. The foremost benefits of the LMS were that students could self-check their answers, and that instructors could monitor students' use of the materials and the results of the self-study exercises.

Converting and extending the materials

There were seven out of 14 planned units of material that required conversion (Table 1). The numbers of the seven units were allocated on the basis of this 14-unit plan (see Appendix 1). Four of the units (2, 3, 8, and 11) were designed to build towards developing speaking skills in the form of doctor-patient role plays. Two of the units (4 and 6) were oriented towards developing writing skills in the form of summarization. The selection of the online materials was on the basis of technical medical English relating to GAHP and medical problems.

TABLE 1. Units of Teaching Material for Conversion

Units of Pedagogic Material
01 Anatomy planes, terms of location, and views
02 The Brain (speaking skills)
03 The Heart (speaking skills)
04 The Pulmonary System (writing skills)
06 The Endocrine System (writing skills)
08 The Digestive System (speaking skills)
11 The Skeletal System (speaking skills)

The course materials were designed to move between input and output activities, and the online materials were oriented towards the technical medical English used by doctors rather than the more colloquial English of doctor-patient interactions. On Bb9, a course file, *Third-year Medical*, was created. The speaking skills units could be divided into seven sections, and are illustrated in the screenshot of Unit 11 (The Skeletal System) in Figure 1 below. They were built around two essays (Reading 1, Reading 2).

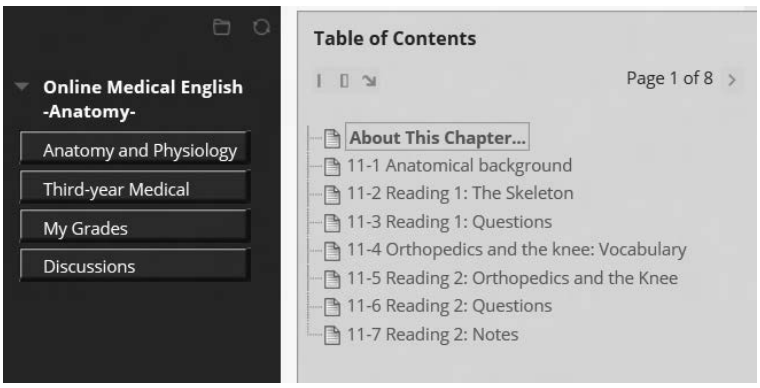


FIGURE 1. Skeleton Unit Table of Contents (Third-year Medical)

Anatomical terms were introduced through matching activities (Figure 2). Previous years' materials contained images found through Internet searches. This had been acceptable in terms of copyright for in-house educational materials in the form of free handouts. However, new pictures were purchased from the Shutterstock website, which contains extensive materials on anatomy, as it was possible that printed materials

might be published in the form of a book. These pictures were then edited to create vocabulary-diagram matching activities.

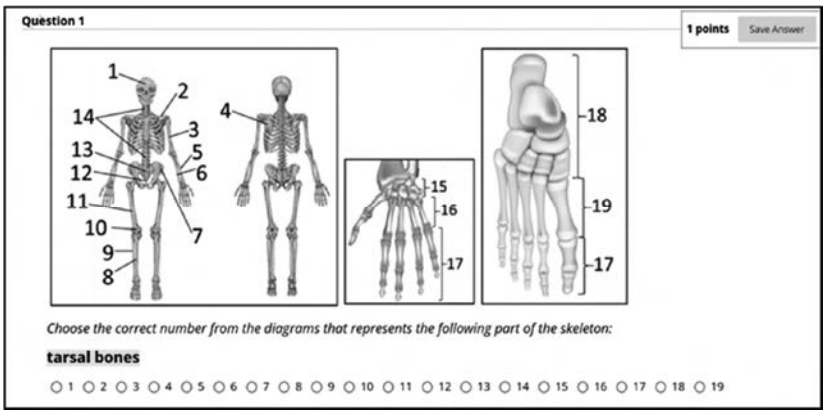


FIGURE 2. Anatomical Terms Matching Exercise Using Shutterstock Images

A second word exercise related to Reading 2 in the medical problem section and involved matching medical terms to their definitions in English (Figure 3).

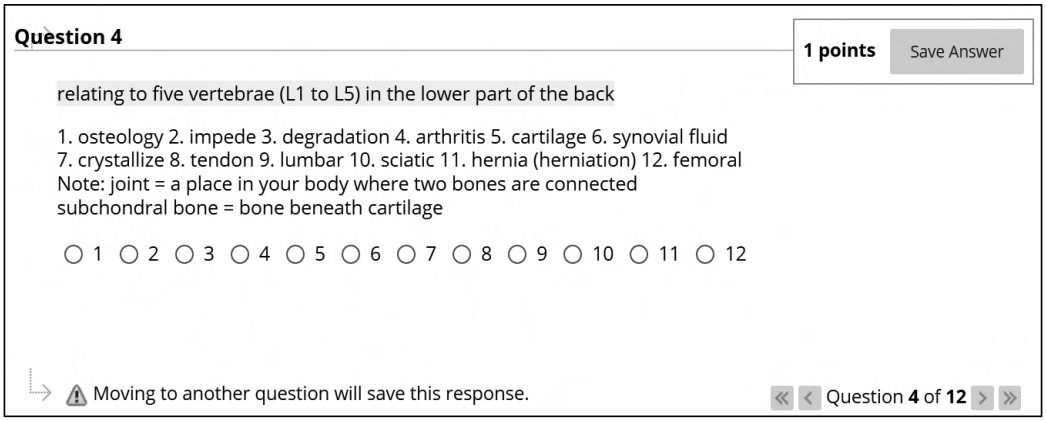


FIGURE 3. Matching Exercise Using Definitions

The online materials were extended by adding audio files for listening and pronunciation activities and exercises. As noted above, inclusion of audio components had already been requested by senior medical staff during discussions regarding online materials for second-year students. Our access to FLaRE's recording studio made creating high-quality audio files possible. Over three weeks, two members of the team (Davies and Fraser) made 28 recordings of the essays and of the key words for the vocabulary exercises. One issue that emerged during this process concerned pronunciation. It became clear, from discussion and sources on the Internet, that even within standard British and American English there is by no means a consensus on what might be considered the "correct" pronunciation of medical terms; deciding which

pronunciations to adopt was a time-consuming process. In creating the audio, the narrators primarily used British English, but accommodated some American pronunciations, which from teaching experience would be more familiar to students. A further issue involved editing of the files. While some recordings were relatively easy to make, the long essays (Reading 2) often contained complex words embedded in long paragraphs. This made mistakes common. With long complex essays, a paragraph-based approach was often taken, and the paragraphs were later spliced together using *Audacity* software, which was also used for other editing purposes, such as reducing long pauses.

While the recording component was straightforward, the audio files then had to be integrated into the online materials. Video clips were created by adding images to the audio files. These were then uploaded to YouTube with transcript files so that the files could be heard, and the audio could be followed with the caption option. As part of the purpose of the audio files was to give the students the opportunity to improve pronunciation, the captions could act as an aid to shadowing the essay.

Implementing the Course

The self-study component of the 2017 course took place in August, with a deadline for completion set the week before the commencement of the taught component in September. The taught component involved all the third-year students of the Hiroshima University medical English course (121 participants). The students were divided into four groups of about 30. Due to the self-study component, the number of classroom contact hours for the same amount of material was dramatically reduced from 18 hours in 2016 to 11.5 hours. The same team of four instructors taught both the 2016 and 2017 courses.

In the previous year's course, an instructor taught three 90-minute classes per day over four days to groups of around 30 students. Each instructor taught the same content four times, and student groups rotated around the instructors. In the 2017 course, each instructor was required to teach four classes of 70 minutes each day for two days, with student groups again rotating around instructors.

The medical faculty had allocated a week of time to the taught component of the course, which was utilized in the following way: Day 1 (Monday) for classes covering material with no online component; Day 2 (Tuesday) for students who had not completed the self-study component to catch up; Day 3 and Day 4 (Wednesday/Thursday) for flipped learning classes; and Day 5 (Friday) for testing. The classes on Day 1 gave the teaching team an opportunity to experiment with some new teaching material on dermatology, and 180 minutes of class time were allocated to this. The material was taught in a conventional way, with no connection to the online materials. However, it offered an opportunity to roughly compare student reactions to a classroom-based approach (Day1) with reactions to a flipped learning approach (Day 3 and Day 4). On Day 5 (Friday), as part of their course assessment, students took a 60-item multiple-choice vocabulary test and were asked to summarize in writing a reading on diabetes mellitus. The first 50 items in the test were almost identical to those of the 2016 test, allowing comparisons to be made between the flipped learning course and the previous year's classroom-based course.

Tables 2 and 3 below show at a glance the differences between the 2016 and 2017 courses regarding schedule and classroom contact hours:

TABLE 2. Classroom Contact Hours, 2016

Day 1	Day 2	Day 3	Day 4	Day 5
270 minutes	270 minutes	270 minutes	Break	270 minutes

TABLE 3. Classroom Contact Hours, 2017

Day 1	Day 2	Day 3	Day 4	Day 5
180 minutes		280 minutes	280 minutes	140 minutes

Obtaining Student Feedback on the Course

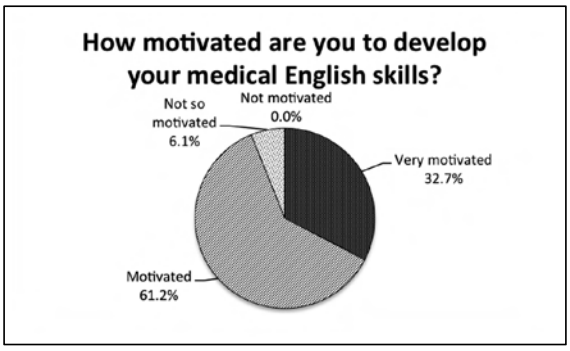
For the 2017 course, an online questionnaire was used for the first time to obtain feedback from the students (see Appendix 2). It was created on *Google Forms*, and administered using the course LMS. With *Google Forms*, both multiple-choice and open-ended answers were collected digitally, so they could be quickly tabulated and made ready for analysis. Students were asked to evaluate their motivation for studying English, and the clarity and usefulness of both the online and taught components of the course, as well as the number of hours they spent on their online study. The questionnaire used a four-point Likert scale to avoid a neutral response. The survey also included open-ended comment sections, and students' comments will be analyzed in a future paper. In this article, however, we focus primarily on the quantitative findings. Of the 121 students who took the course, 98 (81%) completed the questionnaire. Since all the question items were written in English, most of the students answered the open-ended questions in English, while some did so in Japanese.

EVALUATION OF THE FLIPPED LEARNING COURSE

Student Response to the Course

Among the 98 students who responded to the questionnaire, motivation to improve medical English skills was high. Students could choose from *Very motivated, Motivated, Not so motivated*, and *Not motivated*. As Table 4 shows, 93.9% of the students gave positive responses (either *Very motivated* or *Motivated*), and of those, 32.7% stated they were very motivated.

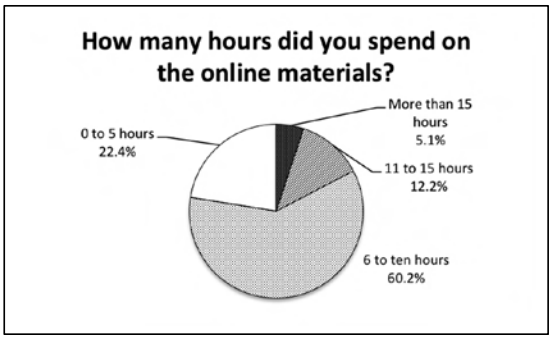
TABLE 4. Student Motivation (N=98)



The online component

A question regarding the online materials concerned the number of hours that students spent on studying them (see Table 5). The largest block, about 60% of the students, studied the materials for between six to ten hours. As a rough calculation, if these students studied for eight hours (480 minutes), then study hours including tests totalled 1,180 minutes, which is comparable to the previous year's taught course. It is also important to note that 22.4% of students spent fewer hours (0 to 5 hours), 12.2% took 11 to 15 hours, and 5.1% took more than 15 hours. Considering this variation, the advantage of the online materials is that students can work at their own speed. In a classroom, the work tends to be tailored towards the median student, which can be frustrating both for fast students, who must wait, and for slower students, who do not have time to process the English they are studying.

TABLE 5. Hours of Self-study



In terms of the clarity of the online part of the course (see Table 6), 90.8% of respondents gave positive feedback, with 33.7% finding the materials very clear. This positivity was reflected in many of the comments from the open-ended items, such as the following:

- *My medical vocabulary improved dramatically by using it.*
- *The essays on the online [course] are important and they will be useful in the future.*
- *Online part was a good review of anatomy I learned last year.*
- *I felt it made me easier to learn English by myself before starting the English lectures.*

A small proportion of students, 9.2%, felt that the materials were not so clear. Possible reasons for this were revealed in the open-ended comment section. There are two types of problem: technical issues, and the difficulties with language. On the technical side, a number of students pointed out that the online materials needed to be studied on a big screen:

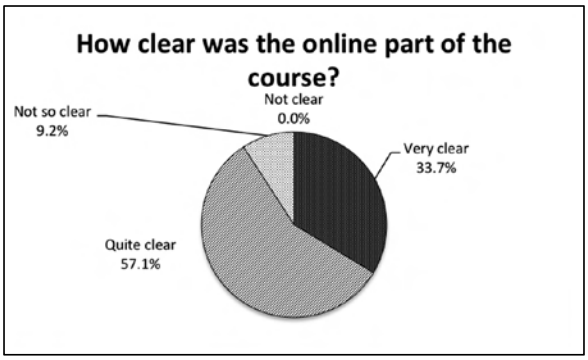
- *These online contents are not suitable for use with a laptop or a tablet. A big monitor is necessary to clear the problem.*
- *It was very good and a little bit difficult. It may become better if we can see all of the texts with our cellphone.*

A senior member of the medical faculty, who checked the online materials for any content problems, had also mentioned that some of the diagrams were too small. However, under pressure to have the materials ready for students, it had not been possible for us to make changes for 2017.

Another problem was that some students found the content too challenging:

- *The online course is so difficult and it wastes a lot of time.*
- *They are useful, but the amount of online part is big.*
- *There were some too difficult parts.*

TABLE 6. Clarity of the Online Component

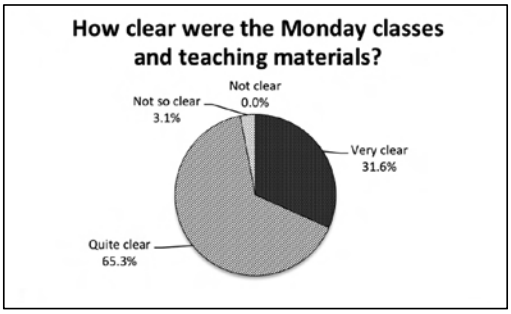


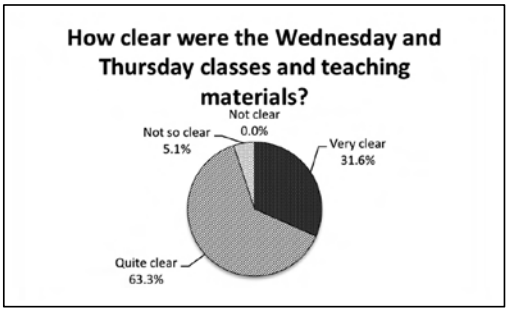
The taught component

As part of the taught component of the course, the Day 1 (Monday) dermatology-focused classes were an addition to the provisional 2017 plan for the course. They were taught primarily in the style of the previous year, integrating input activities with output activities. Students studied vocabulary and read essays in class. The students formed pairs and described the skin to each other, and prepared for an activity in which they wrote a doctor-patient dialogue. Class sizes were double those of the Day 3/Day 4 (Wednesday/Thursday) classes at around 60 students per class. The Day 3 and Day 4 classes had a strong focus on output activities, with the expectation that students had covered the necessary input materials in the self-study component. In relation to the clarity of the teaching and materials, the results between the Day 1 (Monday) classes and the Day 3/Day 4 (Wednesday/Thursday) classes were similar (Table 7).

Another comparison can be made between the Day 1 classes and the online component of the course. In the Day 1 classes, students did vocabulary exercises and read essays in class under instructor supervision. Only 3.1% of respondents felt that the Day 1 classes and teaching materials were not so clear compared to the 9.2% of students who felt that the online materials were not so clear. In the classroom, a student had access to an experienced instructor and other students. Both these sources are important in aiding clarity; in contrast, the solitary activity of self-study does not provide the opportunity for interpersonal support. Including input activities in class doubled the length of time needed to cover a unit of material.

TABLE 7. Clarity of the Taught Component

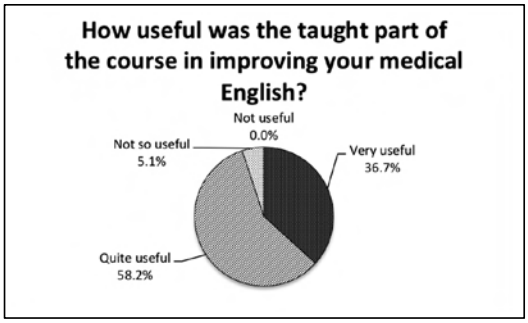


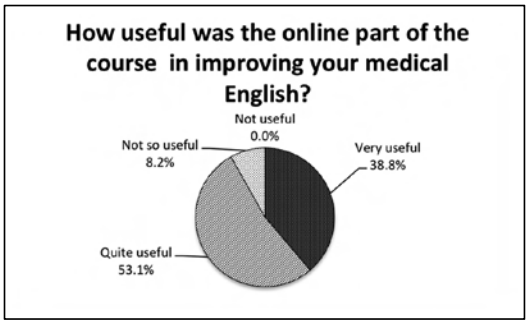


Perceived usefulness and overall impression of the course

Table 8 depicts the perceived usefulness of both parts of the course. In relation to the taught part of the course, 94.9% of the respondents gave positive responses, and 36.7% found it very useful. The feedback on the online component showed similar results, with 91.9% responding positively and 38.8% finding it very useful.

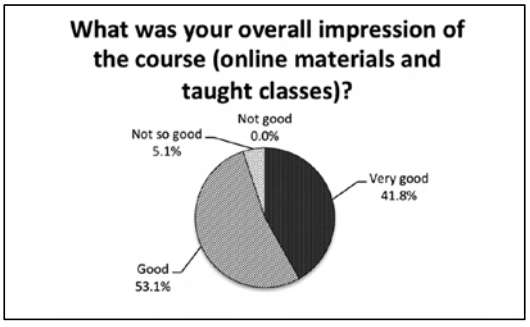
TABLE 8. Usefulness of the Online Materials and Taught Component of the Course





A final question on overall impression of the course showed that 94.9% of respondents were positive (i.e., answering either *Very good* or *Good*) about the course, with 41.8% having a very good impression of it (Table 9).

TABLE 9. Overall Impression of the Medical English Course



Instructor Perception of the Flipped Learning Course

Two of the authors (Davies and Fraser) were instructors on the course and taught the Monday classes, the Wednesday/Thursday classes, and supervised the Friday evaluation periods. A post-course discussion regarding implementation of the course raised a number of key points concerning the following: coordination, staging, and monitoring of the course; the size, content, and pace of classes; the separation of evaluation tasks from classroom teaching; dealing with student feedback.

Coordination, staging, and monitoring of the course

Changing to a flipped learning course involved a lot of work initially, with considerable planning needed to implement the changes. While previous courses had been fairly self-contained, the inclusion of a self-study component meant that the materials had to be re-written and organized on the LMS; students had to be made aware of the self-study requirements and how these related to the course overall. This required coordination between FLaRE and the medical faculty. A crucial factor was the very strong support provided by senior medical faculty members and administrators. Senior faculty members checked drafts of teaching material for accuracy, and made suggestions on the content of the online materials. In addition, they ensured that a senior member attended the orientation meetings, mainly to stress the importance of medical English and encourage the students to make the most of the course. An administrative staff member in the medical faculty worked closely with FLaRE on the new scheduling, keeping students informed and providing key data for registering students on the LMS for access to the online materials. Compared to previous years, there were two distinct components to the course: the online component, and the taught component. The online component started with an orientation. During this, students received a handout in which the course was clearly outlined and the student evaluation clearly specified. Students were expected to work on the online materials until a mark of 80 percent was achieved.

Size, content, and pace of classes

There was an interesting contrast between Day 1 (Monday) and Day 3/Day 4 (Wednesday/Thursday) classes. The two Monday classes involved the use of conventional classroom-based materials with groups of 60 students. Such materials had never been tried with large classes, but it was surprising how well they worked with the groups. Word exercises, essay readings, comprehension work, and doctor-patient dialogue practice were all completed with relative ease. The final task of the unit would usually be a role play activity, but for the large class, students worked in pairs and wrote a doctor-patient dialogue. Because of the limited class time, the students were assigned the writing task to complete as homework. The advantage of the Monday classes was that the periods of interactional activity were interspersed with quieter periods. During quieter periods, in which students studied vocabulary or worked on reading comprehension activities, instructors had time to monitor the students. In contrast, the 70-minute Wednesday/Thursday classes with groups of 30 students ran at a continuously high pace, making the classes more tiring for the instructors and students alike.

The separation of evaluation tasks from classroom teaching

A major advantage of the flipped learning course was that it created space for a day that was primarily

oriented towards evaluation. With the evaluation tasks scheduled in the afternoon, students had the morning to review the online materials and course word list as well as prepare to summarize the diabetes mellitus reading. From the instructors' point of view, previous problems due to time pressure were greatly reduced. There was time to give students a short orientation on filling out mark cards for the word test, and students could also be given a full 90-minute period to work on their summary writing task, enabling them to produce more polished summaries than in previous years. Despite the substantial reduction in number of classroom contact hours, the mean student score on the word test was almost identical to that of the previous year; a *t*-test showed no significant difference.

Student feedback

Regarding student feedback, an online questionnaire was used for two reasons. First, the use of the online questionnaire meant that, unlike in the past, when the responses were handwritten, there was no need to transcribe the responses, and they could be analyzed immediately. Also, it had been agreed that the project member dealing with feedback (Enokida) should not be one of the instructors involved in evaluating the students (Davies and Fraser). This was made clear to students before they filled out the questionnaires. The advantage of the online approach was that it was very easy to collect and tabulate the data, which was used in post-course discussions with senior members of the medical faculty. A disadvantage was that the coverage was only 80 percent of course participants. The feedback responses were nearly identical to last year's, but with 20 percent of students not completing the questionnaire, the result is more uncertain than in previous years, in which coverage was almost 100 percent.

DISCUSSION

In an era of increasing globalization, greater emphasis is being placed on English, particularly in areas such as medicine where it is the language of international publications. The flipped learning course described in this article was designed as an innovation to improve efficiency, both in terms of teaching and learning, with the momentum developing from a mixture of research and pedagogic interests. Five key considerations emerged from the flipped learning course: the effective delivery of materials to students; changes of rhythm and pace in the flipped learning classroom; the importance of medical faculty support; the ease in developing the online materials; options for adaptation within a changing university system.

The use of flipped learning did not have an impact on the overall results of the word test. While the word test does not comprehensively represent English learning that took place on the course, learning the technical language of medicine is important, given that, in their future working lives, students will be communicating through this specialized language. In addition, the new course allowed students more time to practice their summarization skills than in previous classroom-based courses. This was seen in the higher quality of the evaluated summaries.

With the flipped learning course, there was a radical reduction in classroom contact hours. This change was made possible due to the experience of the teaching team members. However, as noted above, the pace and flow of the flipped learning classes were notably altered. Although, from the perspective of time, the new course is efficient, there is the question of whether students benefit from quieter periods in the classroom when they have time to reflect and interact with their instructor in a more relaxed way.

Converting to a flipped learning course was a major undertaking, and would not have been possible without the extensive support of senior medical faculty members. One of the risks for English language instructors is that students may not consider language courses to be a priority, especially when the instructors come from a group that is outside the medical faculty. Given the medical professors' influence both as role models and authority figures, their presence and encouragement at orientations sent a clear signal to the students that the course should be a serious undertaking. In addition, accuracy of content is very important, and the time and effort put into checking materials, both in their development stage and their final implementation on the LMS, contributed greatly to the success of the course. In addition, the professionalism of senior medical teaching staff and medical administrative staff ensured the smooth running of the course.

This is an ongoing project in which new materials are being developed both for second-year and third-year students. The use of an LMS makes it possible for new materials to be placed online as they become available, and for medical faculty members to check them easily; materials can be amended rapidly, in contrast to the slower process of change with published books. As we have noted in this article, the seven online units form part of a larger 14-unit pedagogical scheme. Our aim is to create a comprehensive set of units for undergraduates. Four more units are in development and can be added relatively quickly, creating a substantial block of material that could constitute a full credit-based course.

In relation to credit-based courses, the university is undergoing a period of dramatic change, in which a two-semester system is being replaced by a four-term system. The advantage of a flipped learning course is that it can be fitted into eight weeks, with a great deal of the input side of a course being covered through self-study online and monitored by the course instructor, and the class hours being used to focus on practicing and on developing interactive communication skills.

CONCLUSION

In this article, we have documented the creation and evaluation of a flipped learning course for medical students. This research has demonstrated that flipped learning using an LMS can be as effective as a more traditional taught course. Even with the constraints of university budgets, personnel, and curricula, the quantity and quality of course content can be maintained, while classroom time can be reduced. Furthermore, online learning can be repeated to reinforce language, and it also allows students to work at their own pace.

Part of the project described here involves word list development which is integrated with pedagogic tasks. Consequently, the *what* of learning is closely connected with the *how*. A comprehensive word list for undergraduates must cover a greater range of medical situations than is currently the case in the existing materials. The flexibility of using an LMS allows extra tasks and activities to be added to remedy this as gaps are identified. For example, essays and exercises on testing and treatment can be added to the existing units. This contextualizes important terms in the word list, anchoring vocabulary learning in a communicative approach.

ICT is in a constant process of change, generating one new instructional model after another with the latest technology. Among these models is flipped learning: The development of ICT has brought about a change in our perception of time and space, enabling instructors and learners to stay connected outside the classroom via an LMS, and at the same time helping to enrich their in-class activities. This paper has shown the potential of flipped learning to provide solutions to the challenges we have faced in our previous medical English courses.

REFERENCES

Audacityteam.org.<http://www.audacityteam.org/>

Bergmann J., & Sams, A. (2012). *Flip Your Classroom. Reach Every Student in Every Class Every Day*. Washington, DC: International Society for Technology in Education.

Fraser, S., Davies, W., & Tatsukawa, K. (2015). Creating a corpus-informed ESP course for medical English graduates. *Professional and Academic English, 45*, 16-20.

Fraser, S., Davies, W., Enokida, K., &Tatsukawa, K. (2017). Using ICT to create a medical English flipped learning course. *Journal of Medical English Education, 16*(3), 62-67.

Graham, C. R. (2005). Blended learning systems: Definitions, current trends, and future directions. In: *Handbook of Blended Learning: Global Perspectives, Local Designs* (Bonk, C. J. & Graham, C. R., eds). San Francisco, CA: Pfeiffer Publishing.

Milman, N. B. (2012). The flipped classroom strategy: What is it and how can it best be used? *Distance Learning*, *9*(3), 85.

Network, F. L. (2014). The four pillars of FLIP. <http://classes.mst.edu/edtech/TLT2014/BCH120/Abkemeier--FLIP_handout_FNL_Web.pdf>

Staker, H., & Horn, M. B. (2012). Classifying K-12 blended learning. *Innosight Institute*.

Shutterstock.com<https://www.shutterstock.com/home/home>

APPENDIX 1. Planned Units of Pedagogic Material

Unit	Field	Anatomy/Physiology
1	anatomical position	planes, terms of location, views
2	neurology	brain
3	cardiology	heart
4	pulmonology	pulmonary system
5	immunology	lymphatic system
6	endocrinology	endocrine system
7	review unit 1	units 1 to 6
8	gastroenterology	digestive system
9	hepatology	liver
10	nephrology/urology	urinary system
11	orthopedics	knee
12	gynecology/urology	female and male reproductive system
13	dermatology	integumentary system
14	Review unit 2	Units 7 to 13

APPENDIX 2. IMEC Feedback Questionnaire 2017

Please answer all the feedback questions.
* Required
How motivated are you to develop your medical English skills? *
- Very motivated
- Motivated
- Not so motivated
- Not motivated

How clear was the online part of the course? *
- Very clear
- Quite clear
- Not so clear
- Not clear

How useful was the online part of the course in improving your medical English? *
- Very useful
- Quite useful
- Not so useful
- Not useful

Please write your comments on the online part of the course: *

Your answer

How many hours did you spend on the online materials?

- 0 to 5 hours
- 6 to 10 hours
- 11 to 15 hours
- More than 15 hours

How clear were the Monday classes and teaching materials? *

- Very clear
- Quite clear
- Not so clear
- Not clear

How clear were the Wednesday and Thursday classes and teaching materials? *

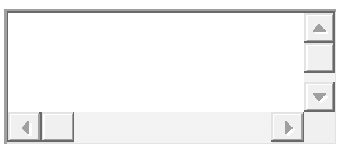
- Very clear
- Quite clear
- Not so clear
- Not clear

How useful was the taught part of the course in improving your medical English? *

- Very useful
- Quite useful
- Not so useful
- Not useful

Please write your comments on the taught part of the course. *

Your answer



What was your overall impression of the course (online materials and taught classes)? *

- Very good
- Good
- Not so good
- Not good

Please write a comment on your improvement or lack of improvement. *

Your answer

ABSTRACT

Teaching and Evaluating a Medical English Flipped Learning Course

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

In this article, we document the process of creating a medical English flipped learning course for third-year students at Hiroshima University and discuss both student and teacher feedback on the course. In doing this, we (1) explain why the flipped learning course was created; (2) describe how it was created and implemented; (3) evaluate how students responded to the course; and (4) consider instructor perceptions of the course.

The primary reasons for changing to a flipped learning course were to increase efficiency regarding classroom contact hours, and to allow students to self study content relating to receptive skills, such as essays and vocabulary. In previous years, the course had been taught to the third-year students with a team of four instructors over four days. With a flipped learning approach, involving pre-course study on the university's learning management system (LMS), content relating to receptive skills was placed online. This included essays and audio as well as a variety of pedagogic matching and multiple-choice tasks. The taught component was initially reduced to two days, with testing taking place on a third day. In addition, further content was added and taught on an extra day in a non-flipped way.

Of the 121 students who took the course, 98 (81%) completed a feedback questionnaire. The results showed that almost all the students found the course useful and had high levels of motivation. A vocabulary test, administered at the end of the course and used in the previous year, showed no significant difference in a *t*-test, indicating that, for a variety of tasks, it was just as effective for students to study online as in class. The results of an evaluated task on summary writing showed that students produced better summaries than in previous years. This was probably because the flipped learning course created more out-of-class time to prepare for the task and more time to write the summaries. Teacher perceptions indicated several key points: While the flipped learning course was more complex regarding planning, very strong support from medical faculty senior staff and administrators made it possible; overall, flipped learning lightened the load of teaching contact hours, although the taught component was much more intense; the complete separation of evaluation tasks from teaching was beneficial; the use of the LMS made it easier to monitor students and get feedback from them.

要　約

医学英語講座における反転授業の実践と評価

榎　田　一　路
サイモン・フレイザー
ウォルター・デイビス
達　川　奎　三
広島大学外国語教育研究センター

本稿では，広島大学 3 年生対象の医学英語講座における反転授業の導入について，その過程を記すとともに，同授業に対する学生と教員の評価について考察する。具体的には，反転授業が導入された背景，その導入および実施の過程，同講座に対する学生の反応，および教員の受け止め方，以上の 4 点について報告する。

反転授業が導入された最大の理由は，対面授業の効率性を高め，読み物や語彙といった受容技能に関わる教材について，学生が自学自習を行えるようにするためである。前年まで 4 名の教員が 4 日間，3 年生に授業を行っていたが，反転授業により，大学の学習支援システム（LMS）を用いた事前学習が導入され，受容技能関連の教材がオンライン化された。その中には，読み物や音声教材に加えて，組み合わせ問題や多肢選択問題などのタスクが含まれている。この結果，対面授業は 2 日に減り，3 日目は試験にあてられた。その後対面授業が 1 日増え，そこでは反転授業を伴わない別の内容が取り扱われた。

講座を受講した学生 121 名のうち，81% にあたる 98 名が同講座に関するアンケートに回答した。この結果，ほぼ全ての学生が，同講座が役に立ったと考えており，英語学習への意欲も高いことが判明した。講座終了時に実施された語彙テストのデータを前年のデータと比較したところ，有意差が見られなかったことから，テストで扱われたタスクに関しては，オンライン学習が教室での学習と同程度に有効であることが示されたと言える。要約課題の評価は前年よりも高い結果となった。これは反転授業の導入により，授業外での準備および課題の作成にあてる時間が増えたためと考えられる。教員の受け止め方に関しては，いくつか重要な点が示された。まず，反転授業を伴う講座の企画・立案は複雑な作業を要したが，それを可能としたのは，医学部による強力な支援であった。次に，反転授業により，対面授業の部分が短期集中型になった反面，授業の実施にかかる時間的負担が軽減された。また，評価のための時間を授業時間と完全に切り離したことは有益だった。さらに，LMS の使用は，学生の進捗状況を把握し，彼らからのフィードバックを得ることを容易にした。