Effects of Flipped Classroom Methodologies on Performance Outcomes of an English Oral Communication Course for Basic Medical History Taking Skills in 1st year students at Nihon University School of Medicine

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Background: Flipped classroom methodologies have gained popularity and undergone much research scrutiny in recent years. However, there have been no studies examining the effects of flipping an English, first-year, basic medical history taking course in Japan.

Methods: A 1-year prospective cohort of students (n = 135) enrolled in an English, basic medical history taking course (30 hours) was taught using a flipped approach. A historical cohort of students (n = 128) was taught using a more conventional task-based communicative approach (45 hours) for comparison. Baseline metrics indicated that there was adequate similarity for comparison between the two groups. Performance examination scores were analyzed to assess effectiveness in 4 categories: Spoken English Proficiency (SEP); Communication and Interpersonal Skills (CIS); Integrated Clinical Encounter (ICE); Comprehension (Comp.).

Results: The overall average examination score increased from 67.5 ± 1.5% (mean ± SE) in 2014 to 77.5 ± 1.5% in 2015 (mean difference between the groups, 9.6%; [95 percent CI, 5.5% to 13.7%], P < .001) indicating a significant improvement in student performance. Largest gains were observed in SEP and CIS and there were no significant changes in the ICE and Comp. categories.

Conclusion: It appears that students performed significantly better in a basic history taking examination with a simulated patient in English after having been taught using the “Flipped Classroom” method, despite having had 15 fewer classroom hours. Therefore, it is worth considering this innovative methodology as a means to improve educational effectiveness.

Key words: flipped classroom, basic history taking, medical English education, first-year students, Japanese medical school

Classroom active learning methodologies in medical schools all over the world. Also, flipped methodologies have been shown to be effective in English language education. Despite this expanding trend, very little empirical evidence exists regarding the use of these methods in English classes for basic medical history taking at Japanese medical schools. This study sought to measure the effect of using flipped classroom methods by comparing the performance results of a group of first-year students (2014) in a non-flipped English course versus another group of first-year students (2015) in a flipped version of the same course.

1.1 Objective

The objective of this study was to determine the extent to which flipping the class in 2015 affected performance outcomes of first-year students in an English oral communication course for basic history taking skills by comparing and analyzing 2014 (non-flipped course) and 2015 (flipped course) performance examination results. The hypothesis being that given the same basic content of the two versions of the course, the potentially deleterious effects of less class time on performance outcomes could be mitigated by implementing more effective educational methods, namely, the flipped classroom.

2. Materials and Methods

Non-flipped English course lessons (90 minutes) in 2014 consisted of activities based on a short video of a real history taking session between a doctor and a patient. The videos were approximately 1 minute in length and activities were designed to develop specific listening skills, broad listening skills, paraphrasing skills, pronunciation ability and conversational skills while fostering imaginative and creative spontaneous thought through self-directed role-plays at the end of each lesson. This had basically been the methodology used up to and including 2014 but because of the implementation of the new curriculum and the associated reasons above, a new methodology started in 2015. This study sought to examine the effects of this new methodology on student performance outcomes. To do so in a meaningful way, it was first necessary to establish that the two groups were sufficiently similar to warrant comparison.

Upon initial examination of the student characteristics considering a variety of metrics, it was determined that the two groups of students were sufficiently similar at their respective starting points to justify comparing them. Table 1 shows some of the characteristics of each group.

As shown in Table 1, the main differences between the 2 groups were a decrease of 15 hours of class time and implementation of the flipped classroom in the new curriculum.

A “Flipped Classroom” methodology began in 2015 to address the challenge of maintaining performance outcomes despite fewer class hours and to fulfill the need to continuously attempt to improve education for our students. An English OSCE-style examination was used to measure performance outcomes using the same evaluation criteria and the same instructor and evaluator for both the 2014 and the 2015 students. Examination scores for both groups were compared to determine the extent to which the flipped methodology affected performance outcomes.

What follows is a brief explanation of how exactly this course was “flipped”. Before each lesson in 2015, students watched doctor-patient history taking videos and completed associated tasks which are packaged together in an online learning module referred to as “learning objects”. These “learning objects” were to be completed for homework before each lesson and short quizzes were administered at the beginning of each class to ensure completion prior to the lesson. These “learning objects” and the quizzes were accessible through the learning management system (Moodle) used by the university.

Flipped methodology involves providing pre-lesson activities for students to do on their own before a class. When they come to class, they are prepared with basic knowledge and understanding of concepts so that they can...
engage in higher order communicative activities involving spontaneous decision making, reacting to unforeseen circumstances and application of their basic knowledge in a novel situation while they are in class working together. During class time, instructors are not deliverers of content, but rather facilitators or coaches who guide students and offer advice and direction. Each lesson and pre-lesson “learning object” is based on a short video of approximately 1 minute of a doctor-patient encounter.

This flipped version of the course in 2015 contrasted with the non-flipped version held in 2014 in the following ways. The 2015 course required students to watch the videos and do the associated activities before the class and then while in class, they engaged in cooperative higher level reasoning, problem solving, and more spontaneous active communication during the 55 minute sessions. For the 2014 course, all the activities associated with the videos were the same as those in the pre-lesson learning packages in 2015 but they were done during class time which left much less time for the higher level activities and communicative engagement despite the longer lesson time of 90 minutes.

After approximately 30 sessions over the course of the academic year, each students’ English skills were evaluated individually in 2014 and 2015 using the evaluation criteria shown in Table 2.

This evaluation form shown in Table 2, was specially designed for first and second-year Japanese medical students. It was adapted from the USMLE Step 2 Clinical Skills Scoring guidelines and has appeared in a different form in a previous research study.

### 2.1 Statistical Analysis and Data Collection

The differences between the two study groups for performance scores were assessed with Welch’s *t*-test. All *P* values were two-tailed and not adjusted for multiple testing; *P* < .05 was considered to be statistically significant. Plus-minus values are means ± SE. For SEP, CIS, ICE and Comp. categories (secondary outcomes), each was scored out of 3 points and then scaled to 100%. The primary outcome was the sum of SEP + CIS + ICE + Comp. divided by four and denoted by TOTAL. Data were analyzed with SAS statistical software (version 9.4, SAS Institute).

Data were collected from students in accordance with the Nihon University School of Medicine ethical committee recommendations.

### 3. Results

The mean score of the TOTAL increased from 67.5 ± 1.5% in 2014 to 77.1 ± 1.5% in 2015 (mean difference between groups, 9.6%; [95% CI: 5.5% to 13.7%], *P* < .001) despite 15 hours less class time in 2015. Flipping the class increased speaking time which positively affected the SEP and CIS categories. The mean score of SEP increased from 58.0 ± 2.4% in 2014 to 81.8 ± 1.9% in 2015 (mean difference between groups, 23.7%; [95% CI: 17.7% to 29.8%], *P* < .001). The mean score of CIS increased from 49.1 ± 2.6% in 2014 to 66.1 ± 2.6% in 2015 (mean difference between groups, 17.0%; [95% CI: 9.7% to 24.5%]).

### Table 2 Evaluation criteria used in 2014 and 2015

<table>
<thead>
<tr>
<th>Interview Skills Evaluation (Basic Medical History Taking)</th>
<th>SEP</th>
<th>CIS</th>
<th>ICE</th>
<th>Comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spoken English Proficiency</strong></td>
<td>(i) listening (clearly showed understanding using appropriate cues)</td>
<td>(i) demonstrated a professional attitude which made the patient feel comfortable</td>
<td>3 pts = all questions were clearly thoughtful, reasoned and appropriate</td>
<td>3 pts = all comprehension questions were answered correctly</td>
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<td></td>
<td>(ii) speaking (used comprehensible pronunciation, appropriate speed, pace and volume)</td>
<td>(ii) demonstrated at least one specific and appropriate empathetic behaviour</td>
<td>2 pts = questions seemed to perhaps be appropriate but somehow deficient</td>
<td>2 pts = 1 comprehension question was answered incorrectly</td>
</tr>
<tr>
<td></td>
<td>(iii) English usage (used understandable vocabulary; pronunciation and grammar)</td>
<td>(iii) demonstrated appropriate body language and engagement with the patient</td>
<td>1 pt = improvement needed in 1 SEP item</td>
<td>1 pt = 2 comprehension questions were answered incorrectly</td>
</tr>
<tr>
<td></td>
<td>3 pts = excellent in all 3 SEP items</td>
<td>3 pts = excellent in all 3 CIS items</td>
<td>1 pt = improvement needed in 2 SEP items</td>
<td>0 pts = the chief concern could not be identified adequately and/or over 2 incorrect answers to comprehension questions</td>
</tr>
<tr>
<td></td>
<td>2 pts = improvement needed in 1 SEP item</td>
<td>2 pts = improvement needed in 1 CIS item</td>
<td>0 pts = improvement needed in 2 SEP items</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 pts = improvement needed in all 3 SEP items</td>
<td>1 pt = improvement needed in 2 CIS items</td>
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<tr>
<td></td>
<td></td>
<td>0 pts = improvement needed in all 3 CIS items</td>
<td></td>
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<tr>
<td><strong>Communication &amp; Interpersonal Skills</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Integrated Clinical Encounter</strong></td>
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<tr>
<td><strong>ICE</strong></td>
<td>3 pts = all questions were clearly thoughtful, reasoned and appropriate</td>
<td>3 pts = all comprehension questions were answered correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 pts = questions seemed to perhaps be appropriate but somehow deficient</td>
<td>2 pts = 1 comprehension question was answered incorrectly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 pt = asked 1 clearly inappropriate question</td>
<td>1 pt = 2 comprehension questions were answered incorrectly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 pts = asked 2 or more clearly inappropriate questions</td>
<td>0 pts = the chief concern could not be identified adequately and/or over 2 incorrect answers to comprehension questions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
to 24.3%], \( P < .001 \). Results for each evaluation category are shown in Figure 1.

No significant differences between the 2014 and 2015 groups were observed in the ICE or the Comp. categories. For the ICE category, the mean was 82.2 (± 2.5%) in 2014 and 79.7 (± 2.0%) in 2015 which represents a 2.5% difference (95% CI: −8.8% to 3.7%), \( P = .43 \). Similarly, for the Comp. category, the mean was 80.7 (± 2.3%) in 2014 and 81.0 (± 2.4%) in 2015 which represents a 0.2% difference (95% CI: −6.4% to 6.9%), \( P = .94 \).

4. Discussion

The main finding of this study was that the implementation of flipped classroom methodology resulted in higher levels of performance in spoken English proficiency and in communication and interpersonal skills. This study has shown that implementation of flipped methods for basic medical history taking for first-year students resulted in an overall 9.6% (\( P < .001 \)) increase in student performance despite 15 fewer lesson hours. Statistically significant improvements were seen in SEP and CIS categories. No significant changes were seen in the ICE and Comp. categories. It could be argued that ICE and Comp. focus more on knowledge and understanding and are thus more likely to be affected by the amount of self-study a student does rather than an increase in class time speaking with peers. It is notable that despite 15 hours less class time, the performance outcomes of ICE and Comp. in 2015 were similar to those in 2014. This could be interpreted as evidence to support the effectiveness of the methodology.

Using a flipped approach to raise student in-class speaking time resulted in better performance outcomes in English speaking and interpersonal communication skill. This finding is consistent with other studies examining the effects of flipped approaches on medical students’ performance outcomes\(^{1-13}\). Additionally, engaging students in more active learning during class through flipped methods may be a useful part of a global accreditation attainment strategy with respect to Social Accountability (B 1.1.8) and Aspects of Global Health (Q 1.1.2)\(^{14}\).

Regarding the limitations of this study, it should be noted that the students were all evaluated by one instructor so objectivity could not be guaranteed. Also, given the vast number of uncontrollable factors that can influence a student’s performance, it cannot be said with any degree of certainty that flipped methods resulted in better performance. Finally, the results of the study were analyzed given the basic assumption that less class time would naturally result in lower performance outcomes, an assumption that is not substantiated. This study’s results are consistent with other similar studies which found that flipped methods can lead to improved performance outcomes\(^2, 8, 15, 16\).

In future studies, it may be useful to examine student performance results with more granularity by analyzing the scores within each of the categories rather than just simply the broad categories (SEP, CIS, ICE and Comp.). Longitudinal studies tracking the progress of individual students over an extended period of time could be very informative. Including qualitative assessments of student attitudes could also be potentially enlightening.

5. Conclusion

Flipped classroom methodologies appear to have contributed to an increase in English skills among first-year students performing role plays of basic medical history taking. This study provides evidence to support the claim that flipped classroom methodologies are effective in improving English performance skill.
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