Interdepartmental Collaboration: A Case Applying the Scientific Method to Urban Environment Design Research

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It is beneficial for students to not only learn new content knowledge in English, but be able to apply that knowledge to new linguistic and practical situations. This paper will describe a two-part activity which involved learning a new concept in English (the Scientific Method), and then applying that knowledge to a current research topic (Urban Environmental Design) being investigated by a member of the Department of Architecture at KIT. Students showed their understanding of the topic by giving a group presentation in English. We will summarize the positive aspects of the activity and suggest for ways this can be applied to other English courses and other research areas. Our goal is to increase collaboration between the English and other departments by bringing current research topics into the English language classroom, and to give students the opportunity to apply content knowledge to new situations.

Keywords: Small Group Presentations, Collaboration, Current Research, Differentiated Instruction and Learning

1. INTRODUCTION

In language learning it is important to give students the opportunity to apply content knowledge in new practical and linguistic situations. This means that students acquire content knowledge and then apply that knowledge to produce English outputs either verbally or in writing. Applying learned knowledge in new situations gives the students greater exposure to both the theme and related vocabulary. Our hope is that this will increase the chance of retaining the learned knowledge. In addition to this, it is important to bring topics into the classrooms that are both interesting to the students and relevant to their respective fields of study. One way this can be achieved is to adapt research topics from various departments within KIT into materials for the English classroom (Wright et al., 2015)\textsuperscript{1}). Developing teaching materials from current KIT research topics has several positive benefits including but not limited to i) fostering interdepartmental collaboration between the English department and other KIT departments, ii) increasing student awareness of KIT research activities and iii) being able to scaffold the materials and tasks to match students’ current English ability.
In English Topics V, lesson content is determined by the required textbooks (Reading Explorer 1 and 2 (Douglas, 2009)\(^2\) and Reading Science and Technology (Reading Science and Technology, 2013)\(^3\)). The general pattern for instruction and assessment is one new textbook reading introduced each class session followed by an assessment of students’ understanding of the material during the following week’s class. The authors believe that students would benefit more from English class if they had the opportunity to apply the knowledge they acquire to a new situation. In order to do this, we extended the usual pattern of one session per topic to two sessions per topic.

We chose the chapter titled *The Scientific Method* (from Reading Science and Technology) as we believe this topic would be relevant to science and engineering students and can be applied to a wide range of situations they may encounter in their future careers. The students then applied that knowledge to describe a series of experiments previously conducted by Dr. Marui from the Department of Architecture at KIT.

While students giving oral presentations in English courses at KIT have not been the main method for assessment, they have been used successfully in several different ways at KIT. Nguyen (2015)\(^4\) used small group presentations in her Business Communication B course and found that the majority (71%) liked the activity. Daito and Nakagawa (2014)\(^5\) had remedial-level students give individual 30-second speeches in small groups based on a different topic each class. A form of a group presentation, The Reading Circle Method (Daniels, 2002)\(^6\), was employed by Hisatsune (2013)\(^7\) in her English as a Foreign Language (EFL) courses at KIT and she determined that the method was an “effective way of making students prepare for a reading class” (p.52). In this paper the authors’ will describe another example of implementing oral presentations in EFL courses at KIT.

Prior to the Spring 2015 term, students studied one new topic each week. For the Spring 2015 term one content topic was removed from the English Topics V syllabus and replaced with the extended Scientific Method topic described here.

2. PROCEDURE

We contacted Dr. Marui to learn about his research and how the scientific method is applied to his research. Dr. Marui was kind enough to show us his research laboratory at the Yatsukaho campus. We worked together to adapt a subset of his research so that it would be possible for students to understand the content in English.

2.1 Session 1 Content Introduction

In the first class session, The Scientific Method chapter from the textbook was introduced and students studied the text and worked through a standard set of vocabulary and comprehension
activities. Following this, a short quiz was administered to assess the students’ understanding of the text.

2.2 Session 2 Knowledge Application

The task we chose for students to apply their knowledge was a group presentation (4-5 students per group) describing how the scientific method was used in an experiment conducted by Dr. Marui from the Department of Architecture. Dr. Marui’s research involves investigating optimal conditions for moss growth.

2.2.1 Materials Development

Three related activities were developed for the second session: i) a PechaKucha style introduction on the importance of moss in the urban environment, ii) a worksheet with Quick Response (QR) codes embedded with links to display pictures of the experiments and iii) a template for students to use to write a script for the presentation.

2.2.1.1 PechaKucha style introduction

PechaKucha is a style of presentation in which twenty images, each one displayed for twenty seconds, advance automatically while the presenter narrates along to the images (PechaKucha 20x20)⁸. In the interest of time we chose to use ten rather than twenty images. The PechaKucha style introduction was developed to give the students some background context about the importance and role moss plays in the urban environment. Dr. Marui prepared a ten slide PowerPoint presentation explaining the importance of moss in the urban environments. The oral part of the presentation, which Dr. Marui narrated in English, was then recorded with the assistance of Casey Bean. Finally, the audio track was synchronized to match the images.

2.2.1.2 QR code embedded worksheet

Next, we developed a worksheet in which students identified the key components of the five steps of the scientific method (see Appendix 1). The steps are i) ask a question, ii) create a hypothesis, iii) identify variables, iv) analyze results and v) draw a conclusion. At two points in the worksheet, QR codes were used to provide visual information that was needed to complete the worksheet. The QR codes had links to Google Slides embedded in them. The first QR code provided a schematic diagram of one of four moss experiment designs and the second QR code showed photos of moss growth on porous foam tiles.

2.2.1.3 Presentation Template

We made a template to help students write a short script based on the information from the worksheet (see Appendix 2). We believe that having the students prepare and read the script had two main benefits, i) it gave the students an additional opportunity to engage with vocabulary in a written sense and ii) it made reading the information for their presentation easier (than reading from
2.3 Implementation

The first class session was a typical one; students studied the textbook, reviewed, and then took a short quiz.

In the second class session, students first watched the PechaKucha style presentation to learn the importance of moss in the urban environment. Next, students got into groups of four to five to complete the worksheet describing the moss experiments. After the worksheet was completed, groups prepared the script for their group presentation. Each member of the group was responsible for talking about one step of the scientific method.

3. DISCUSSION

3.1 Materials

The development of the materials described in this paper is another example of how a research topic from a department within KIT can be adapted for use in the English classroom (Wright et al., 2015). This approach can be simplified as a two-step process. Step 1 is to find an interesting research topic currently under investigation at KIT (of which we believe there are many) and Step 2 is to find a way to bring the material into the classroom that allows the students to interact with the material and apply their knowledge at a level that matches their English ability. While we acknowledge that, due to in-class time constraints and the English level of the students, the research content has been simplified, we still believe that students can benefit from i) learning about current research topics and ii) applying knowledge to different situations. Moreover, having materials that allow students to work together in completing a task, at their level, can lead to enhanced language learning (Swain, 2000)9).

3.2 Implementation

Session 1 materials followed the usual format for the majority of English Topics V classes, in which introduction, interaction, comprehension review and a quiz to test understanding of the text, covered 90 minutes of in-class time.

The session 2 materials followed a similar format, such that Dr. Marui’s PechaKucha style presentation provided students with a 10-15 minute introduction. The students then spend 30-40 minutes interacting with the worksheet and look at the visual materials provided in the QR codes to complete the worksheet. The students then spent 20-30 minutes reviewing the material by writing out their scripts and practicing their oral presentation. Finally their understanding of the material was assessed by way of short (2-3 minute per group) oral presentations.

3.3 Student survey
During the week 15 class, students completed a questionnaire in Japanese about the group presentation activity. The motive for student feedback was to get their impression of the activity and look for ways to improve it for implementation in future courses. The questionnaire consisted of eight questions related to the activity. We will highlight responses to three questions here.

There were a total of 250 enrolled students in eleven classes in which this lesson was given. The questionnaire was piloted in two classes (43 students) and then edited for clarity. One class did not receive the questionnaire due to time constraints (22 students). Hence there were 185 potential respondents in the authors’ classes. A total of 131 students responded (70%). The discrepancy between potential and actual respondents can be attributed to student absences on the day the survey was given.

To the question "Did you understand the content? (Was there enough time?)" 110 students answered yes (86%) and 18 (14%) responded no (128 responses). One purpose of this activity was for students to apply what they learned to a new situation. The reason most frequently given for not understanding the content was lack of time.

To the question "Did the presentation and presentation preparation go well?" 109 (85%) responded yes and 19 (15%) answered no (128 responses). The main reason given for why the presentation went well was that there was good communication within the group. Several respondents mentioned that they made a LINE group in order to communicate. The reasons for negative responses included that they were unsure of the pronunciation of certain words and that there was not enough time.

To the question "Which do you think is more appropriate: one class per topic or two classes per topic?" 97 (74%) responded two classes per topic and 34 (26%) responded one class per topic (131 responses).

While a majority of students responded that they understood the content, we would like to see that number be higher. If there were more time to spend on comprehension exercises more students may have understood the content. Similar numbers resulted from the question about how the preparation and presentation went. While we are pleased that so many students worked well in groups to complete the task, there were still many (15%) that felt their presentations did not go well. With more time to cover the content and for pronunciation practice we believe more students would have responded positively to this question.

The final highlighted question deals with a new syllabus structure implemented for this class. The majority (74%) of students preferred having two classes for one topic. Unfortunately, we did not ask for reasons to go with their responses. Our hope for spending twice as long on one topic was that students would have more opportunities to deal with the material (content and vocabulary)
in the textbook. While this may not be the exact reason for students' positive responses, we were encouraged that students' preferences were similar to the authors'.

3.4 Collaboration

We are grateful to Dr. Marui for the time he spent discussing his research with us and for allowing us to use his research content for the development of the material described in this paper. Dr. Marui’s input was vital in creating PowerPoint presentations and the audio track for the PechaKucha style presentation. We hope that this type of collaboration can continue in the future.

4. CONCLUSION

Through the implementation of the materials described here we have found that in general students prefer spending more time on one topic (i.e. learning about the content and then applying the knowledge to a different situation). Students also responded positively to giving presentations in class and seemed to think time was adequate to understand the content.

Developing the material has provided us the opportunity to collaborate with Dr. Marui from the Department of Architecture at KIT. With Dr. Marui’s assistance we were able to create a series of activities that gave students an opportunity to apply their knowledge to current research.

We hope to expand on the two sessions per topic format in future English courses as well as continue to collaborate with other departments to provide students with the opportunity to interact with current and interesting research topics at KIT.

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References

Appendix 1: QR Code Embedded Worksheet

Applying The Scientific Method – An example using moss

Introduction: Each year the population of our cities increases. Most of the population of Japan lives in urban areas. The increase in city population means parks and green spaces in the city are being replaced by houses, buildings, and roads. Less green areas mean that the temperatures are higher in the city. This adds to the heat island effect. It is important for us to think about this problem.

Do you know about moss? It can be used as a new kind of building material, to keep us cool, and can make us feel peaceful.

What is the best way to grow moss? Some researchers believe that moss grows best when it is facing north. We will now investigate an experiment to see if this is true or not.

I. Ask a Question: Use the information in the box to make a question.

Does moss grow __________________________________________________________________________________?

II. Formulate a Hypothesis: Now write a hypothesis from your question, using if and then.

If

then

IMPORTANT – Teacher must check before you scan QR Code.

QR Code 1
https://goo.gl/vCOFXO
III. Plan the Investigation: Using the information on the slide, describe your experimental design.

There are 2 porous (小穴の多い) foam blocks. Moss will grow on the foam blocks. One foam block is ______________________________, the other one is_______________________________.

IV. Understand the Variables: In the space below list the variable in the experiment.

i) Independent Variable (the thing that is different)

____________________________________________________________ is the independent variable.

ii) Dependent Variable (the thing you are trying to measure)

____________________________________________________________ is the dependent variable.

iii) Controlled variables (the things that are the same)

In this experiment the controlled variables are ________________________________

___________________________________________________________________________________

V. Collect and Analyse the Data: Look at the slides and determine which one has the best moss growth.

The best result for moss growth_____________________________________________

___________________________________________________________________________________

VI. Draw a Conclusion: Write a short conclusion and state whether the results support or refute the hypothesis.

In this experiment the ___________________________ better than ______________________.

Our hypothesis was “If_________________________________________________________, then

__________________________________________________________________________________

These results ______________________________________the hypothesis.

* Extra Challenge: Limitations or suggestions: Can you identify any problems with the experiment or suggest any changes?

__________________________________________________________________________________

__________________________________________________________________________________
Appendix 2: Presentation Script

We believe that moss can help keep our cities cooler. We want to investigate the best way to grow moss by using the Scientific Method

First, we asked a question: Does_____________________________________________________
_______________________________________________________________________________

Next, we formulated a hypothesis: Our hypothesis was
If ______________________________________________________________________________
then ___________________________________________________________________________.

The next step was to plan the investigation. We looked at the slides and saw that ______________
_______________________________________________________________________________

One foam block is ________________________, and the other one is _______________________

It is important that we understand the variables.
The independent variable is _________________________________________________________.
The dependent variable is___________________________________________________________.
The controlled variables are _________________________________________________________.

The final step was to collect and analyse the data. We looked at the slides and found that
________________________________________________________________________________

In conclusion, we will summarize the experiment.
In this experiment, the _________________________ better than ______________________.
Our hypothesis was "If_________________________________________________________,then
________________________________________________________________________________

These results __________________________________________ the hypothesis.

(*Extra Challenge)
We identified these problems with the experiments: _____________________________________
We suggest changing the experiment by _______________________________________________
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