

【原著】

## Best Methods and Practices for English Communication Course Streaming

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英語コミュニケーションコースのための最善のストリーミング法

Jordan Svien

### Abstract

English Communication, a course taught at Hiroshima Bunkyo University's Bunkyo English Communication Center (BECC), is a CEFR-aligned task based learning course taught in level-differentiated curriculum streams. To facilitate the BECC's streaming guidelines, the BECC has developed a Microsoft Excel spreadsheet that intelligently and quickly streams students based on their in-house exams scores into ready-to-use class rosters that are balanced by ability level, sex, and department. The Excel spreadsheet utilizes several key formulas such as VLOOKUP, COUNTIFS, AVERAGEIFS, RAND and RANK to simultaneously manipulate the master student list, individual class rosters, and the streaming totals chart in order to minimize user inputs while maximizing information available to the streamer. This paper follows the streaming process from start to finish via a series of formula explanations and descriptive screenshots.

### 概 要

英語コミュニケーションは広島文教大学のイングリッシュコミュニケーションセンター (BECC) で教授されている科目の一課程であり, CEFR (ヨーロッパ言語共通参照枠) レベルに則ったタスク中心法のコースで, 様々なレベルのカリキュラムを使用したコースである。BECCのストリーミングガイドライン (各レベルへの学生の振り分け) を容易にするため, BECCではマイクロソフトのエクセルスプレッドシートを作成し, これにより内部テストの点数を基に, 技能レベルや性別, 学部をバランスよく調整し, 学生を理性的かつ迅速に振り分け, 即使用可能なクラス名簿の作成ができるようになった。エクセルスプレッドシートではVLOOKUPやCOUNTIFS, AVERAGEIFS, RANDやRANKといった何種類かの重要な数式を用いることで, 使用者にとっては最小限の入力で最大限の情報利用を可能にするため, 原盤となる学生名簿や各クラス名簿, コース全体の総合表を同時に処理することができる。本論はこの振り分けの過程を一連のエクセル数式の説明と明確なスクリーンショットを通して, 初めから最後まで解説するものである。

## Overview of English Communication Course

English Communication is a four-semester task-based learning CEFR (Council of Europe, 2001; updated 2018) aligned course facilitated by Hiroshima Bunkyo University's Bunkyo English Communication Center (BECC). The course aims to promote student language proficiency and learner autonomy while fostering their interest in and motivation for language learning (Bower, Rutson-Griffiths, Kodate, Foale, Lusk Ledhe, Semmelroth, & Davies, 2017). The course is taught by nearly all teachers at the BECC (ten or more per calendar year) sharing an in-house curriculum centered around CEFR aligned can do statements. Units are grouped thematically by topic such as shopping, health, or school life, and each lesson revolves around the facilitation of a can do statement. Prior to and after each lesson, students evaluate their skill level regarding the can do and whether they can complete it easily, satisfactorily, with difficulty, or not at all. (For a discussion of the benefits of a learner-centered can do statement approach to language learning, see Faez, Majhanovich, Taylor, Smith, and Crowley, 2011, Nakai and O'Dwyer, 2011, Jacobsen, 2011, or Escribano and McMahan, 2010). The first two and second two semesters of the course are separated distinctly as Freshman English (FE) and Sophomore English (SE). Freshman English is compulsory for all students, while SE is compulsory for all students in the Global Communication Departments and optional for students in other departments (Education, Welfare, Psychology, and Nutrition). Unless students of a particular department have a specific schedule that prohibits it, the class sections are mixed interdepartmentally to encourage students to work with and socialize with peers outside of their own department.

At the beginning of the first (FE) and third (SE) semesters, students are streamed into two courses differentiated by difficulty. The less difficult stream, entitled A1–A2, is designed to advance students' abilities from the A1 to the A2 level over the four semesters, and the can do statements and related learning tasks provide A2 level challenges for students. The more difficult course stream, entitled A2–B1, is likewise designed to advance students from the CEFR A2 level to the B1 level by the end of their fourth semester and contains more advanced B1 tasks absent from the A1–A2 level course. The A2–B1 stream is further subdivided into two ability levels, A2–B1 High and A2–B1 Low, although the contents of the course remain identical for both sub-streams. Although in the past the BECC has experimented with subdividing the A1–A2 stream into higher and lower ability levels, the consensus among BECC teachers from 2016 onward was to leave the stream unfiltered. Chang (1990) notes that students placed in lower streams, despite understanding that mastery of English is impossible without constant practice, often demonstrate a lack of language confidence and resourcefulness, refraining from asking questions even when the class contents are not clear to them and failing to search for alternative solutions. In order to minimize these complications, which may result in a downward spiral of decreased language-learning motivation for roughly 25–30% of English Communication students (the number of students who would be placed in such lowest level streams), the BECC leaves this stream mixed.

## Course Streaming Overview and Guidelines

Streaming is conducted at the beginning of the first and third semesters based on the results of students' English Communication examinations. These exams, collectively titled the Bunkyo English Tests (BET), are comprised of the Bunkyo English Reading Test (BERT), the Bunkyo English Listening Test (BELT), and the Bunkyo English Speaking Test (BEST). The BERT and the BELT, paper exams completed via bubble sheet, are held in conjunction before the beginning of the first semester for incoming FE students and again as part of FE and SE students' final exams at the end of the second and fourth semesters. The BEST, which is conducted face-to-face and double rated by BECC teachers, is facilitated at the end of every semester as part of students' final exams. For a full description regarding the rationale for and structure of the BERT and BELT, see Bower, Rutson-Griffiths, and Sugg, 2014. For details about the BEST structure and teacher assessment standardization process, see Sugg and Svien, 2018.

The BERT and BELT given to incoming FE students as well as the BERT and BELT held at the end of the fourth semester test the entirety of the four-semester Freshman and Sophomore English Communication curriculum, whereas the BERT and BELT held at the end of students' freshman year test students only on the contents of Freshman English. The BEST, as it is assessed at the end of each semester, contains content specific to that semester.

Table 1 below summarizes the various exams and their respective time frames.

**Table 1.** – *Time Frame and Contents of Bunkyo English Tests*

Exam	Short Name	Time Frame	Curriculum Content	Impacts
Bunkyo English Reading Test (BERT)	BERT 1	April, Semester 1	Semesters 1-4	FE Streaming
	BERT 2	January, Semester 2	Semesters 1-2	SE Streaming
	BERT 3	January, Semester 4	Semesters 1-4	-
Bunkyo English Listening Test (BELT)	BELT 1	April, Semester 1	Semesters 1-4	FE Streaming
	BELT 2	January, Semester 2	Semesters 1-2	SE Streaming
	BELT 3	January, Semester 4	Semesters 1-4	-
Bunkyo English Speaking Test (BEST)	BEST 1	July, Semester 1	Semester 1	-
	BEST 2	January, Semester 2	Semester 2	SE Streaming
	BEST 3	July, Semester 3	Semester 3	-
	BEST 4	January, Semester 4	Semester 4	-

Freshman English students are thus streamed based on their initial BERT 1 and BELT 1 exams, while Sophomore English students are streamed based on their BERT 2, BELT 2, and BEST 2 scores. The remaining do not factor into streaming considerations. For FE students, the BERT 1 and BELT 1 scores are simply added together to form the students' BET total score. For SE students, the combined BERT 2 and BELT 2 score is weighted 60/40 against the BEST 2 score to create the overall BET score. Sophomore English students may be placed into a different course stream than they were in Freshman English.

Once the exam results have been processed, streaming is conducted by the BECC's General English Assessment Committee. The overarching goal of streaming is to place students as fairly and evenly as possible into the class sections within the three different sub-streams while meeting all of the BECC's ideal streaming criteria:

1. Choosing the ideal number of stream sections
2. Maintaining ideal class sizes
3. Placing repeater students within A1–A2 level streams
4. Balancing BET scores within stream sections
5. Balancing sex and departments within stream sections
6. Avoiding repeat teachers in SE classes

These ideas will be discussed individually henceforth.

### *1. Choosing the ideal number of stream sections*

As discussed above, English Communication students are separated into three streams: A1–A2, A2–B1 Low, and A2–B1 High. Once the student names, IDs, and BET data have been imported into the streaming spreadsheet, a scan of the data and the bell curve will reveal the ideal BET cutoff score between the streams and thus the rough proportion of students to be placed into A1–A2 and A2–B1 streams (a full example of this process follows below). While a skewed bell curve of BET scores may result in adjustments to the number of A1–A2 and A2–B1 stream sections, as a general rule a roughly equal number of A1–A2 and A2–B1 class sections are desired; however, streaming usually errs on the side of caution for first year (FE) students by having an additional A1–A2 stream class in the case of an odd number of sections, while for second year (SE) students, due to English Communication not being a compulsory course, a slightly higher number of A2–B1 stream sections is desired. This is due to the fact that these students are frequently those with enhanced motivation to study English (i.e. Education department students with English ability prerequisites for their careers), students who have lengthier experience with English (i.e. Global Communication Department students), or students who simply enjoy English classes and want to continue their studies for personal reasons.

One additional consideration is that it is desirable for A1–A2 stream classes to be 5–10% smaller than their A2–B1 counterparts. One purported benefit of the smaller class size is to allow for additional student-teacher interactions for those struggling to understand the curriculum. Second, as A1–A2 class students tend to make more mistakes and thus require more time to complete tasks than A2–B1 class students, particularly with spoken interactions and presentations, the smaller class size compensates for this increased time requirement. While the A2–B1 streams are further separated into A2–B1 High and A2–B1 Low streams, the difference in ability level is not enough to warrant a differentiation of class sizes.

## *2. Maintaining ideal class sizes*

The Blended Learning Spaces at the BECC have a traditional capacity of 28 students per classroom. Although this number can be expanded to a maximum of 32 students in the event not enough class sections are available to accommodate all students or if a large discrepancy in the BET bell curve demands higher class sizes, the base number of 28 multiplied by the number of A2–B1 class sections likely to be allocated to each course forms the basic guideline for where A1–A2 / A2–B1 BET cut scores should be placed. Thus, in a perfect scenario, the A2–B1 classrooms would be at normal capacity (28) while the A1–A2 classrooms would be at slightly below capacity (25–27 students). For example, if 350 FE students are to be placed within 13 class sections, after determining the amount of A2–B1 and A1–A2 sections (likely 6 and 7, respectively), a total of 168 students (6 times 28) would be slotted for A2–B1 stream courses assuming a normal bell curve of BET results. The remaining 182 students would be distributed into the A1–A2 stream, with 26 students per class.

If the total number of students per section is likely to exceed 32 for one of the streams and students cannot be reallocated to the other stream under any circumstances, the BECC will likely look to rearrange teacher schedules in order to add an additional section and redistribute the students.

## *3. Placing repeater students within A1–A2 level streams*

Students who are repeating the same level of English Communication due to a failing grade in a previous year are automatically placed in the A1–A2 stream, spread as evenly as possible between all of the course sections, regardless of their previous year's streaming and BET scores. This provides these students with an easier and less-intensive opportunity to pass the course. Furthermore, as there is a tendency for repeater students to withdraw from the university, placing them in the A1–A2 level courses increases the likelihood of smaller class sizes in the stream. These repeater students are added to the total number of students who need streaming before determining stream section totals.

## *4. Balancing BET scores within stream sections*

Once the number of A1–A2 and A2–B1 sections have been determined, students are streamed within the sections via a snake system, i.e. 1-2-3-3-2-1 in the case of three sections. This is used to best balance the BET scores within each stream. After this initial streaming, the total BET averages (BERT and BELT for FE, BERT, BELT and BEST for SE) are cross-checked to ensure they are as close to equal as possible. If any discrepancies occur, students will be swapped between the sections one for one to narrow the gap.

## *5. Balancing sex and departments within stream sections*

The class sections are also checked for the number of students in each department and the number

of boys and girls. As departmental mixing is not only encouraged but ideal, if imbalances occur, students of identical or near identical BET scores will be swapped within sections of the same course and level, particularly when the corresponding class section sees a reverse imbalance. This is particularly prevalent in cases where only two or fewer students of a particular sex or department are present in an individual class section, though may be also seen when the snake streaming has simply placed too many students of a department or sex into a particular class.

### 6. Avoiding repeat FE/SE teachers

A final consideration in the SE classes is to prevent students from having the same teacher two years in a row. As the BECC contains a wealth of English language teachers from different countries and backgrounds, and with them, a variety of cultural perspectives, linguistic accents and teaching styles, the BECC wishes to expose students to as wide a variety of English and English teachers as feasible. Thus, when repeat teacher instances are found in the initial SE streaming, students of the same department and near-identical BET scores are swapped within sections of the same course and level if doing so does not interfere with the preceding criteria.

## Excel Formulas and Syntax

Streaming is conducted in a formula-automated Microsoft Excel spreadsheet that facilitates the process both swiftly and effectively, allowing for same-day turnaround between the processing of exam results to the release of streamed class rosters to teachers. Knowledge of several key Microsoft Excel formulas is necessary to complete streaming as effectively as possible. The formulas that are utilized in the English Communication streaming spreadsheet are described in Table 2 below.

**Table 2.** – Key Excel Streaming Formulas

Formula	Description	
VLOOKUP	VLOOKUP is used to retrieve data from a data set by finding a specified piece of data in an index and then returning the value from a specified number of columns to the right of the matching data. The specified data can be a number, a piece of text, or a referenced cell. VLOOKUP is the most important streaming formula.	
	Syntax	Example
	=VLOOKUP( <b>reference_value,index_array, column_index,0</b> ) ➔ Excel will look for the row with the reference value in the first column of the specified index array. It will then count to the right the number of columns as indicated in the column index (with the initial column counting as 1) and retrieve the corresponding data in the matching row. The index array must contain the reference value in the first column and must extend to at least the desired column index.	=VLOOKUP( <b>G1,A:E,5,0</b> ) ➔ Excel will attempt to find the row in column A that matches the data value in G1. It will then count over five columns (to column E) and return the value found in the corresponding row. ➔ For example, if the value of G1 is found in row 10 (in cell A10), the value in cell E10 will be returned.

Formula	Description	
COUNTIF & COUNTIFS	COUNTIF counts the number of cells in a specified group of cells that match a specified text or numerical value. COUNTIFS allows multiple conditions spanning parallel rows or columns to be set to find the number of cells that match all specified conditions.	
	Syntax	Example
	<p><b>=COUNTIF(range,value)</b></p> <ul style="list-style-type: none"> <li>➔ The number of cells matching the indicated value within the range will be displayed. The value may be a cell reference.</li> </ul> <p><b>=COUNTIFS(range_1,value_1,range_2,value_2)</b></p> <ul style="list-style-type: none"> <li>➔ Assuming ranges 1 and 2 are parallel, the number of rows or columns where both the indicated value (1) within range 1 and the indicated value (2) within range 2 will be displayed.</li> </ul>	<p><b>=COUNTIF(A:A,"Psychology")</b></p> <ul style="list-style-type: none"> <li>➔ The number of cells with the text "Psychology" in column A will be counted.</li> </ul> <p><b>=COUNTIFS(A:A,"Psychology",B:B,"7")</b></p> <ul style="list-style-type: none"> <li>➔ The number of rows in which both "Psychology" is found in column A and "7" is found in column B will be counted.</li> </ul>
Formula	Description	
AVERAGEIF	AVERAGEIF finds the average value of all cells in a row or column that contain a matching specified text or numerical condition in a parallel row or column.	
	Syntax	Example
	<p><b>=AVERAGEIF(range,criteria,average_range)</b></p> <ul style="list-style-type: none"> <li>➔ For each row or column Excel finds in the specified range that meet the given criteria, Excel will average the values found in their corresponding average range (which must be parallel to the original range). The criteria may be a cell reference.</li> </ul>	<p><b>=AVERAGEIF(A:A,"FE2",B:B)</b></p> <ul style="list-style-type: none"> <li>➔ For each row that contains "FE2" in column A, Excel will average together the numerical values found in their corresponding column B cells.</li> </ul>
Formula	Description	
RAND & RANK	RAND generates a random number in a cell. RANK ranks the numerical value of a cell compared to the additional values found in a range of cells. These two formulas can be combined to create random lotteries to ensure fairness of streaming when all other factors are equal.	
	Syntax	Example
	<p><b>=RAND()</b></p> <ul style="list-style-type: none"> <li>➔ A random number will be generated within the cell.</li> </ul> <p><b>=RANK(value,range)</b></p> <ul style="list-style-type: none"> <li>➔ The numerical ranking of the value (often a cell reference) as it stands within the range will be displayed.</li> </ul>	<p><b>=RANK(A1,\$A\$1:\$A\$10)</b></p> <ul style="list-style-type: none"> <li>➔ Cell A1's numerical ranking within the range A1 to A10 will be displayed. If A1 to A10 have been randomly generated, and by copying the formula to display the rank of all ten cells, this allows for randomized selection when such is necessary.</li> </ul>
Formula	Description	
COLUMN	COLUMN displays the position of the current or a referenced column as a numerical value, counting from the leftmost column (A) as 1. COLUMN formulas serve as very useful lookup value references for VLOOKUP formulas.	
	Syntax	Example
	<p><b>=COLUMN()</b></p> <ul style="list-style-type: none"> <li>➔ The column number of the cell the formula exists in will be displayed.</li> </ul> <p><b>=COLUMN(reference_column)</b></p> <ul style="list-style-type: none"> <li>➔ The column number of the referenced column will be displayed.</li> </ul>	<p><b>=COLUMN()</b></p> <ul style="list-style-type: none"> <li>➔ If entered into cell G1, the formula will result in 7.</li> </ul> <p><b>=COLUMN(B:B)</b></p> <ul style="list-style-type: none"> <li>➔ Regardless of the cell the formula exists in, the result will be 2, which is the position of Column B.</li> </ul>

Formula	Description	
IF	IF tells Excel to check if a certain condition is met. If it is, the formula will return one result (which can be a number, text, or even another formula), and if it is not met, it will return a different result.	
	Syntax	Example
	<b>=IF(condition,result_1,result_2)</b> If the condition is met, result 1 will display, whereas result 2 will display if the condition is not met.	<b>=IF(\$A1=\$B1,"YES", "")</b> If the values of formulas A1 and B1 are identical, the word "Yes" will be displayed. Otherwise the cell will remain blank (via the double quotation marks).
Formula	Description	
IFERROR	IFERROR indicates what should be displayed if another formula would result in an error. Examples include a custom error message, a manual override value, or a blank value (often used to keep data sheets clean prior to data entry so that formulas can be prepared in advance). The other formula is embedded within the IFERROR formula.	
	Syntax	Example
	<b>=IFERROR(formula,error_value)</b> ➔ If the embedded formula results in an error, the error value will display.	<b>=IFERROR(VLOOKUP(A1,G:H,2,0), "")</b> ➔ Excel will attempt to lookup the value of cell A1 in column G and return the corresponding value in column H. If the value of cell A1 cannot be found in column G, the formula will result in a blank value.

In addition to formulas, knowledge of some basic Excel syntax characters is also necessary to best facilitate the streaming process. These are described in Table 3 below.

**Table 3.** – Key Excel Syntax Characters

Excel Syntax Character	Description	Example
"	<b>Single Quotation Marks</b> – This mark can be placed around a text string to allow text to be included in a formula.	<b>=COUNTIF(A:A,"Education")</b> ➔ Excel will count how many cells contain the word "Education" in column A.
&	<b>Ampersand</b> – This mark allows for combinations of cell references, formulas, and text/number characters to be used to create desired strings.	<b>=A1&amp;"- "&amp;B1</b> ➔ Excel will create a string that contains the contents of A1, a dash, and the contents of B1.
""	<b>Double Quotation Marks</b> – This mark is used to indicate a blank cell. It is often set as a result in an IF formula to do nothing if a condition is not met. It also can be used in conjunction with IFERROR to mark a cell as blank if an error occurs. This is convenient when formulas are prepared in advance before the data is ready to avoid a messy looking spreadsheet.	<b>=IF(A1&gt;28,"Capacity Exceeded", "")</b> ➔ If the value of A1 is higher than 28, Excel will display the message "Capacity Exceeded". If not, the cell will remain blank. <b>=IFERROR(AVERAGE(A1:A10), "")</b> ➔ Excel will average the values of cells A1 through A10. If an error exists (for example, these cells are all blank), Excel will display nothing rather than a #DIV/0! error.

\$	<p><b>Dollar Sign</b> – When a formula is copied to another cell, the referenced cells automatically update by the same number of rows or columns as the copied formula. Placing dollar signs around the cell reference “locks” the cell reference and prevents the column, row, or both from moving when the formula is copied to another cell.</p>	<p><b>=A1</b>                  ➔ Neither the row or column are locked, and the cell reference will move to A2 or to B1 if the formula is copied and pasted down or right, respectively.</p> <p><b>=\$A1 / =A\$1</b>                  ➔ The column/row is locked and will not follow the pasted formula.</p> <p><b>=\$A\$1</b>                  ➔ Both the row and column are locked and will not follow the pasted formula.</p>
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### Streaming Spreadsheet – FE Process Example

From here on, the BECC’s streaming process and spreadsheet, including the way in which the formulas and Excel syntax in Tables 2 and 3 facilitate the process, will be described in detail with an example streaming scenario. In this example, 270 Freshman English students, including five repeater students, will be streamed into 10 FE class sections, with the amount of class sections of each of the three streams left to be determined<sup>1</sup>.

#### Spreadsheet Formulas and Setup

The main working tab of the Excel streaming spreadsheet is comprised of two main sections: a list of all students with an input area for streaming, and a streaming totals chart. Figure 1 below shows the former, a sampling of the completed data input screen from whence streaming can commence.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Class ID						BERT	BELT	BET	FE	FE Class	FE	FE	
2	Index	SID	Dept Name	Last	First	Sex	(52)	(37)	(89)	Repeater?	Index	Class	Course	Period
3	-1	194015	Psychology	Hano	Iwane	M	45	31	76					
4	-2	191021	Ed-Primary	Okane	Chigusa	F	43	30	73					
5	-3	193021	Welfare	Kuroda	Ryou	F	43	29	72					
6	-4	192045	Ed-Secondary	Tokuda	Eimu	F	43	28	71					
7	-5	191033	Ed-Primary	Umesaka	Junko	F	39	31	70					
8	-6	191022	Ed-Primary	Omori	Sachio	F	39	30	69					
9	-7	192021	Ed-Secondary	Kashiwa	Maki	F	36	32	68					
10	-8	195001	Nutrition	Enatsu	Saki	F	42	26	68					
11	-9	192035	Ed-Secondary	Muranaka	Natsu	F	41	26	67					
12	-10	193013	Welfare	Jin	Tami	F	42	25	67					
13	-11	194047	Psychology	Tabata	Ayuka	F	39	28	67					
14	-12	192006	Ed-Secondary	Egawa	Hikari	F	36	30	66					
265	-263	191040	Ed-Primary	Yoshimoto	Utamara	M	10	4	14					
266	-264	194033	Psychology	Mori	Shuncho	M	8	6	14					
267	-265	194067	Psychology	Yoshimoto	Isono	F	3	6	9					
268	-266	182003	Ed-Secondary	Ueki	Wako	F				Y				

Figure 1. – Sample Completed Data Entry Screen (all data fabricated for example purposes)

1 In all subsequent figures, student names, ID numbers, departments, BET scores, and teacher names have been completely fabricated to avoid disclosing personal identification.

In Figure 1, student names, ID numbers, departments<sup>2</sup>, and BERT and BELT scores for all students have been input into the streaming spreadsheet, and the data has been filtered and sorted by BET score (a sum of the BERT and BELT score). Repeater students (one of whom is displayed in Figure 1) do not contain a BET score as they will be automatically placed into the A1–A2 stream. Each of these columns has been named via Excel’s name manager function, and these column names will be referenced in future formulas. For the time being, the darkened FE Class Index column, where each student’s stream will be decided, is left blank as attention is turned to the totals chart panel as seen in Figure 2 below.

	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
2	FE Class Index	FE Class	FE Course	Period	Teacher	Classroom	Students	Ed-Primary	Ed-Secondary	Welfare	Psychology	Nutrition	F	M	BERT Average	BELT Average	BET Average
3		FE1		1	Adam	831	0	0	0	0	0	0	0	0			
4		FE2		1	Becky	232	0	0	0	0	0	0	0	0			
5		FE3		1	Charles	263	0	0	0	0	0	0	0	0			
6		FE4		1	Donovan	833	0	0	0	0	0	0	0	0			
7		FE5		1	Edith	831	0	0	0	0	0	0	0	0			
8		FE6		2	Adam	832	0	0	0	0	0	0	0	0			
9		FE7		2	Becky	832	0	0	0	0	0	0	0	0			
10		FE8		2	Charles	834	0	0	0	0	0	0	0	0			
11		FE9		2	Donovan	833	0	0	0	0	0	0	0	0			
12		FE10		2	Faith	835	0	0	0	0	0	0	0	0			
13																	
14															Course	Average	Average
15															A1-A2		
16															A2-B1 Low		
17															A2-B1 High		

Figure 2. – Class Totals Chart Pre-Streaming

Figure 2, the totals chart, displays several pieces of information. Freshman English Communication teachers, class section numbers, and periods have been input based on the BECC administration’s semester schedules, with class sections labeled FE1 through FE10. The columns for the number of students (W), departments and sex (X through AD), and BET averages (AE through AG) contain formulas (COUNTIF, COUNTIFS, and AVERAGEIF, respectively) that will update automatically once the students have been streamed. These formulas are described in detail in Table 4 below.<sup>3</sup>

Table 4. – Class Totals Formulas

Column(s)	Example Cell	Formula (Refer to Figures 1 and 2)	Outcome
Students (W)	W3	=COUNTIF( <b>FE_Class</b> , <u>\$R3</u> ) ➔ <b>FE_Class</b> = Students’ assigned FE class (Figure 1, Column L) ➔ <u>\$R3</u> = Cell reference to the first class name, FE1.	Once students have been streamed, Column L in Figure 1 will display students’ class section names. These will be counted and totaled respectively for each class section.

2 Due to freshman Global Communication department students following a different course schedule than other departments at the university, such example students will not be included in Figure 1 or any subsequent Freshman English example figures.

3 In Table 4 and all tables onward, references to named columns inside formulas be bolded, while specific cell references will be underlined.

Best Methods and Practices for English Communication Course Streaming

Departments (X-AB)	X3	<p>=COUNTIFS(<b>FE_Class</b>,<u>\$R3</u>,<b>Dept_Name</b>,<u>X\$2</u>)</p> <ul style="list-style-type: none"> <li>➔ <b>FE_Class</b> = Students' assigned FE class (Figure 1, Column L)</li> <li>➔ <u>\$R3</u> = Cell reference to the first class name, FE1</li> <li>➔ <b>Dept_Name</b> = Students' department (Figure1, Column C)</li> <li>➔ <u>X\$2</u> = Cell reference to the first department name, Ed-Primary</li> </ul>	Counts of rows that contain both the class name (as referenced by cell R3) and the appropriate department (as referenced by cell X2) will be displayed. The dollar signs in the formula lock the column and row in the class and department cell references, respectively.
Sex (AC-AD)	AC3	<p>=COUNTIFS(<b>FE_Class</b>,<u>\$R3</u>,<b>Sex</b>,<u>AC\$2</u>)</p> <ul style="list-style-type: none"> <li>➔ <b>FE_Class</b> = Students' assigned FE class (Figure 1, Column L)</li> <li>➔ <u>\$R3</u> = Cell reference to the first class name, FE1</li> <li>➔ <b>Sex</b> = Students' sex (Figure1, Column F)</li> <li>➔ <u>AC\$2</u> = Cell reference to the first sex, F (female)</li> </ul>	This formula works identically to the department formula above outside of the different cell and column references.
BET Class Averages (AE-AG of top chart)	AG3	<p>=IFERROR(AVERAGEIF(<b>FE_Class</b>,<u>\$R3</u>,<b>BERT_Score</b>),"" )</p> <ul style="list-style-type: none"> <li>➔ <b>FE_Class</b> = Students' assigned FE class (Figure 1, Column L)</li> <li>➔ <u>\$R3</u> = Cell reference to the first class name, FE1</li> <li>➔ <b>BERT_Score</b> = Students' BERT scores (Figure 1, Column G)</li> </ul>	Averages of the BET scores of all students in each class will be displayed. As no averages can be calculated prior to streaming, the IFERROR formula prevents an error message from displaying for spreadsheet cleanliness.
BET Course Averages (AE-AG of bottom chart)	AG15	<p>=IFERROR(AVERAGEIF(<b>FE_Course</b>,<u>\$AD15</u>,<b>BERT_Score</b>),"" )</p> <ul style="list-style-type: none"> <li>➔ <b>FE_Course</b> = Students' assigned FE course (Figure 1, Column M)</li> <li>➔ <u>\$AD15</u> = Cell reference to the first course name, A1-A2</li> <li>➔ <b>BERT_Score</b> = Students' BERT scores (Figure 1, Column G)</li> </ul>	Averages of the BET scores for all students in each course will be displayed. The IFERROR formula functions identically to the BET Class Averages formula above.

Interaction between the data in Figures 1 and 2 hinges upon the FE Class Index numbers. Due to class and teacher schedules, the class numbers do not bear any relation to the course they belong to; i.e. FE1 is not necessarily an A2–B1 High class nor is FE10 necessarily an A1–A2 class. This means that once the courses for each class section have been determined, it is not necessarily convenient to stream students via their actual class numbers as it may lead to some complicated bookkeeping where one must remember or constantly reference the class-section to course chart (in Figure 2) when assigning and later changing class sections for each student. Instead, this system uses a class index system of 1 through 10 (due to the ten total FE classes), where the class sections are arranged first numerically by their course in order of A2–B1 High, A2–B1 Low, and A1–A2 and second by their class number. Thus, the two A2–B1 High classes are indexed as 1 and 2, the three A2–B1 Low classes as 3 through 5, and so on. The remaining columns in Figure 1 (FE Class, FE Course, and Period found in Columns L through N) utilize VLOOKUP formulas that reference the respective FE class, course stream, and period in Figure 2 (an area that has

been given the name “Index to Period” in Excel’s name manager) based on the matching FE Class Index number, as demonstrated in Table 5 below:

**Table 5.** – *FE Class Reference Formula*

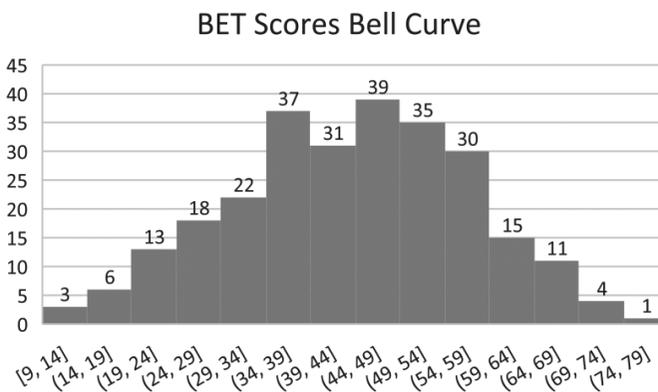
Column(s)	Example Cell	Formula (Refer to Figures 1 and 2)	Outcome
FE Class (L)	L3	=IFERROR(VLOOKUP(\$K3, <b>Index_to_Period</b> ,2,0),””) ➔ <b>\$K3</b> = This student’s assigned FE class index ➔ <b>Index_to_Period</b> = The block of columns Q to T (FE Class Index to Period) in Figure 2	The FE Class name, being the second column of the Index to Period area of Figure 2 (Columns Q through T), will display based on the indicated FE class index (cell K3). The IFERROR formula prevents an error message from occurring prior to the entry of the index numbers.

The FE Course and Period columns have identical formulas to the one found in Table 5, apart from using lookup values of 3 and 4, respectively, to recall the appropriate columns. Alternatively, cell references to the COLUMN index formulas as described later in this paper can be used instead of numbers.

Thus, once this setup has been completed and the number of course streams along with the assignment of teachers and class numbers to those streams has been completed, all streaming, and as a result, all student, department, sex, BET class average, and BET course averages totals will be conducted via the single FE Class Index column (K) in Figure 1.

*Determining the Number of Course Sections*

By observing a bell curve of BET results, the number of course sections (between A2–B1 High, A2–B1 Low, and A1–A2) can be estimated. The bell curve for this example data set can be seen in Figure 3 below.



**Figure 3.** – *Example BET Score Bell Curve*

From this data, a determination must be made regarding how to split the classes into the respective course streams. The two most logical approaches would be:

- A five / five split between A1–A2 and A2–B1 streams, with the number of A2–B1 High and Low streams determined by a closer examination of the BET results.
- A six / four split between A1–A2 and A2–B1 streams (with two A2–B1 High and Low streams each).

While the latter approach is more cautious by both raising the average ability level of the lower classes and having the majority of students enrolled in a slightly-lower pressure environment, the bell curve in Figure 3 indicates the former approach is preferable in this instance. This is mainly due to the dip at the 44 point marker, indicating that this point is a natural divide point where students to the left of the marker will be placed in the A1–A2 course and students to the right of it will be placed in A2–B1. Furthermore, a roughly equal number of students are on either side of this marker. As the gap between students scoring above or below 59 points is quite drastic, this data set indicates two A2–B1 high streams and three A2–B1 low streams (likely to be separated in the middle of the 54–59 point column), in addition to the five A1–A2 streams. This streaming plan is entered into Figure 2 after internal departmental consultation about the best teacher breakdown of these course streams, a hypothetical of which is shown in Figure 4 below. To divide the streams by teacher as evenly as possible, each teacher who teaches two class sections has received one A1–A2 stream and one A2–B1 stream.

Q	R	S	T	U
FE Class Index	FE Class	FE Course	Period	Teacher
	FE1	A2-B1 High	1	Adam
	FE2	A1-A2	1	Becky
	FE3	A1-A2	1	Charles
	FE4	A2-B1 Low	1	Donovan
	FE5	A1-A2	1	Edith
	FE6	A1-A2	2	Adam
	FE7	A2-B1 High	2	Becky
	FE8	A2-B1 Low	2	Charles
	FE9	A1-A2	2	Donovan
	FE10	A2-B1 Low	2	Faith

Figure 4. – Stream Assignments

Q	R	S	T	U
FE Class Index	FE Class	FE Course	Period	Teacher
1	FE1	A2-B1 High	1	Adam
2	FE7	A2-B1 High	2	Becky
3	FE4	A2-B1 Low	1	Donovan
4	FE8	A2-B1 Low	2	Charles
5	FE10	A2-B1 Low	2	Faith
6	FE2	A1-A2	1	Becky
7	FE3	A1-A2	1	Charles
8	FE5	A1-A2	1	Edith
9	FE6	A1-A2	2	Adam
10	FE9	A1-A2	2	Donovan

Figure 5. – Index Assignments

The final preparatory step is to assign class index numbers, as seen in Figure 5 above, which has been shaded by course stream. Class sections have been indexed, first by stream and second by class number, and subsequently sorted by index number.

### Conducting the Streaming

To split the students as fair as possible within streams, streaming is conducted in a snake drafting system, where in order of BET score one student is assigned to each class within a stream, followed by another set of students being assigned in reverse order. As the index numbers 1 and

2 were assigned to the A2–B1 High classes in Figure 5 (FE1 and FE7, respectively), these numbers are placed in the FE Class Index column to stream students. A sampling of the A2–B1 high streaming can be seen in Figure 6 below.

Class ID	Index	SID	Dept Name	Last	First	Sex	BERT (52)	BELT (37)	BET (89)	FE Repeater?	FE Class Index	FE Class	FE Course	Period
3	FE1-1	194015	Psychology	Hano	Iwane	M	45	31	76		1	FE1	A2-B1 High	1
4	FE1-1	191021	Ed-Primary	Okane	Chigusa	F	43	30	73		2	FE7	A2-B1 High	2
5	FE7-2	193021	Welfare	Kuroda	Ryou	F	43	29	72		2	FE7	A2-B1 High	2
6	FE1-2	192045	Ed-Secondary	Tokuda	Elmu	F	43	28	71		1	FE1	A2-B1 High	1
7	FE1-3	191033	Ed-Primary	Umesaka	Junko	F	39	31	70		1	FE1	A2-B1 High	1
8	FE7-3	191022	Ed-Primary	Omori	Sachio	F	39	30	69		2	FE7	A2-B1 High	2
9	FE7-4	192021	Ed-Secondary	Kashiwa	Maki	F	36	32	68		2	FE7	A2-B1 High	2
10	FE1-4	195001	Nutrition	Enatsu	Saki	F	42	26	68		1	FE1	A2-B1 High	1
11	FE1-5	192035	Ed-Secondary	Muranaka	Natsu	F	41	26	67		1	FE1	A2-B1 High	1
12	FE7-5	193013	Welfare	Jin	Tami	F	42	25	67		2	FE7	A2-B1 High	2
13	FE7-6	194047	Psychology	Tabata	Ayuka	F	39	28	67		2	FE7	A2-B1 High	2
14	FE1-6	192006	Ed-Secondary	Egawa	Hikari	F	36	30	66		1	FE1	A2-B1 High	1

Figure 6. – Streaming Sample

This process continues until the first streams reach capacity (in the BECC’s case, 28 students per class), which can easily be confirmed by checking the automatically updated class totals in the totals chart. If students are tied via their BET scores for the final placements in the stream, a simple lottery using RAND and RANK is conducted to determine placements. In Figure 7 below, eleven students scored 55 points on the BET, but only six final slots existed in the A2–B1 High streams. The RAND and RANK lottery randomly selected six of these students (the ones whose random numbers were the highest), and these students were added to the high stream. The remaining students who scored 55 points will be added to the A2–B1 Low stream.

Class ID	Index	SID	Dept Name	Last	First	Sex	BERT (52)	BELT (37)	BET (89)	FE Repeater?	FE Class Index	FE Class	FE Course	Period		
47	FE1-23	192016	Ed-Secondary	Ichihara	Saika	F	29	27	56		1	FE1	A2-B1 High	1		
48	FE7-23	192023	Ed-Secondary	Kiyota	Isoruko	M	34	22	56		2	FE7	A2-B1 High	2		
49	FE7-24	192043	Ed-Secondary	Suou	Haya	F	34	22	56		2	FE7	A2-B1 High	2		
50	FE1-24	192056	Ed-Secondary	Yoritaka	Oki	F	31	25	56		1	FE1	A2-B1 High	1		
51	FE1-25	193014	Welfare	Kabuto	Tokiyu	F	36	20	56		1	FE1	A2-B1 High	1		
52	FE7-25	195002	Nutrition	Eto	Aoba	F	30	26	56		2	FE7	A2-B1 High	2	RAND	RANK
53	-1	191011	Ed-Primary	Kawada	Kuni	F	35	20	55						0.13777	10
54	FE7-26	191031	Ed-Primary	Tsukuda	Maiko	F	31	24	55		2	FE7	A2-B1 High	2	0.81101	3
55	-2	191034	Ed-Primary	Umezawa	Hidetada	M	31	24	55						0.17896	8
56	FE1-26	192001	Ed-Secondary	Aihara	Hikosaburo	M	37	18	55		1	FE1	A2-B1 High	1	0.29228	6
57	FE1-27	192018	Ed-Secondary	Isozaki	Mareo	M	36	19	55		1	FE1	A2-B1 High	1	0.40073	5
58	-3	194006	Psychology	Chijimatsu	Mochihito	M	34	21	55						0.16971	9
59	-4	194029	Psychology	Kudou	Ima	F	39	16	55						0.12766	11
60	FE7-27	194030	Psychology	Kumagai	Isako	F	32	23	55		2	FE7	A2-B1 High	2	0.95683	1
61	FE7-28	194055	Psychology	Tsuji	Harumi	F	34	21	55		2	FE7	A2-B1 High	2	0.84733	2
62	FE1-28	194060	Psychology	Yabuta	Miyoko	M	36	19	55		1	FE1	A2-B1 High	1	0.41455	4
63	-5	195042	Nutrition	Utada	Tomomi	F	32	23	55						0.24552	7
64	FE4-1	191027	Ed-Primary	Suga	Tokuhei	M	33	21	54		3	FE4	A2-B1 Low	1		
65	FE4-2	192005	Ed-Secondary	Chiziwa	Kino	F	31	23	54		3	FE4	A2-B1 Low	1		

Figure 7. – A2–B1 High / Low Stream Lottery

The process is repeated for the A2–B1 Low streams and the A1–A2 streams, with a second lottery held for students on the bubble between the streams, as shown in Figure 8 below, where five students of the six who scored 44 BET points needed to be placed in the A2–B1 Low stream. As opposed to Figure 7, the A1–A2 streaming has already been conducted in Figure 8, with the remaining student who scored 44 BET points streamed into the first A1–A2 class section.

Best Methods and Practices for English Communication Course Streaming

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
2	Class ID	SID	Dept Name	Last	First	Sex	BET (52)	BET (37)	BET (89)	FE Repeater?	FE Class Index	FE Class	FE Course	Period		
131	FE4-25	191032	Ed-Primary	Tsuzuki	Fumiya	F	26	19	45		3	FE4	A2-B1 Low	1		
132	FE8-25	192034	Ed-Secondary	Moriyama	Suko	F	30	15	45		4	FE8	A2-B1 Low	2		
133	FE10-25	193028	Welfare	Nakao	Kiminobu	M	24	21	45		5	FE10	A2-B1 Low	2		
134	FE10-26	194003	Psychology	Azuma	Kuri	F	22	23	45		5	FE10	A2-B1 Low	2		
135	FE8-26	194027	Psychology	Kamino	Amari	F	24	21	45		4	FE8	A2-B1 Low	2		
136	FE4-26	195032	Nutrition	Seta	Kinuko	F	22	23	45		3	FE4	A2-B1 Low	1		
137	FE4-27	195043	Nutrition	Yabuta	Suzuko	F	26	19	45		3	FE4	A2-B1 Low	1		
138	FE8-27	192030	Ed-Secondary	Matsushita	Hami	F	24	20	44		4	FE8	A2-B1 Low	2		
139	FE2-1	193002	Welfare	Ebisawa	Chisa	F	30	14	44		6	FE2	A1-A2	1	0.0895	6
140	FE10-27	193042	Welfare	Urushido	Iho	F	27	17	44		5	FE10	A2-B1 Low	2	0.61857	2
141	FE10-28	194044	Psychology	Sakuma	Yoshiaga	M	22	22	44		5	FE10	A2-B1 Low	2	0.2117	4
142	FE8-28	195007	Nutrition	Harigae	Masae	F	28	16	44		4	FE8	A2-B1 Low	2	0.39945	3
143	FE4-28	195028	Nutrition	Noya	Rebun	F	26	18	44		3	FE4	A2-B1 Low	1	0.70566	1
144	FE3-1	194022	Psychology	Ide	Kiku	F	25	18	43		7	FE3	A1-A2	1		
145	FE5-1	194037	Psychology	Nitta	Tsuramatsu	M	23	20	43		8	FE5	A1-A2	1		
146	FE6-1	191013	Ed-Primary	Kawahara	Akio	M	24	18	42		9	FE6	A1-A2	2		
147	FE9-1	191025	Ed-Primary	Shinohara	Shunsuke	M	26	16	42		10	FE9	A1-A2	2		

Figure 8. – A2-B1 Low / A1-A2 Stream Lottery

This process continues to the end of the list, with repeater students included in the A1-A2 stream. Once all students have been assigned, the totals chart as shown in Figure 9 below displays the breakdown of the initial streaming. The next step is to determine where modifications regarding department balance, sex balance, or BET score average should be made.

	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	
2	FE Class Index	FE Class	FE Course	Period	Teacher	Classroom	Students	Ed-Primary	Ed-Secondary	Welfare	Psychology	Nutrition	F	M	BET Average	BET Average	BET Average	
3	1	FE1	A2-B1 High	1	Adam	831	28	3	13 *	4	5	3	20	8	36.6	36.0	61.4	
4	2	FE7	A2-B1 High	2	Becky	832	28	8	6	4	9	1 *	23	5	36.0	25.4	61.3	
5	3	FE4	A2-B1 Low	1	Donovan	833	28	7	7	5	1 *	8	21	7	29.2	20.0	49.2	
6	4	FE8	A2-B1 Low	2	Charles	834	28	4	8	2 *	8	6	19	9	28.3	21.0	49.3	
7	5	FE10	A2-B1 Low	2	Faith	835	28	0 *	5	8	13 *	2 *	18	10	28.9	20.4	49.3	
8	6	FE2	A1-A2	1	Becky	232	26	3	6	7	7	3	20	6	19.4	13.4	32.8	
9	7	FE3	A1-A2	1	Charles	263	26	5	3	6	8	4	19	7	18.9	14.0	32.8	
10	8	FE5	A1-A2	1	Edith	831	26	3	5	3	9	6	19	7	19.0	13.8	32.9	
11	9	FE6	A1-A2	2	Adam	832	26	4	4	5	6	7	18	8	18.2	14.4	32.7	
12	10	FE9	A1-A2	2	Donovan	833	26	4	5	8	2 *	7	21	5	18.6	13.9	32.5 *	
13																		
14																		
15															Course	Average	Average	Average
16															A1-A2	18.8	13.9	32.7
17															A2-B1 Low	28.8	20.4	49.2
															A2-B1 High	36.3	25.1	61.4

Figure 9. – Initial Streaming Totals (stars added to highlight discrepancies)

From this breakdown, the number of students in each class is ideal, with the A2-B1 streams at full capacity (28 students) and the A1-A2 streams slightly under capacity (26 students). The male to female ratio within streams looks acceptable, and the BET averages of class sections within each course stream are all nearly identical to each other except for FE9.

Using the course averages from the bottom of Figure 9, the bell curve in Figure 3 can be revisited to gain a clearer perspective of the effectiveness of the streaming, as shown in Figure 10 below. Figure 10 shows that the initial streaming has succeeded in placing students into three distinct ability levels. As expected from the initial curve in Figure 3, the streaming has made cutoff points at the 56 point and 44 point thresholds, the latter of which was predicted due to the dip in the bell curve in the middle. The three average BET scores are each separated by at least 10 points. Also, the A1-A2 stream sees 74 out of 125 students (59%, which excludes the five repeater students) with a higher BET score than average stream score, meaning that the majority of students even in the lowest stream will be at the higher end of the ability spectrum. Thus, this streaming plan can be moved forward with toward the next step of balancing the individual class sections.

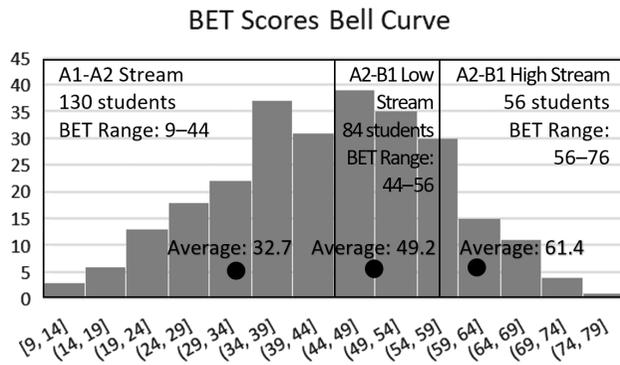


Figure 10. – Example BET Score Bell Curve Final Totals

### Balancing the Class Sections

Looking at the department totals in Figure 9, there exist several classes with too few (two or fewer) or too many students in a particular department (starred in Figure 9 for clarity). Following this, intra-stream swaps of students of the needed departments with near identical BET scores will be made to resolve the departmental imbalances, while minor swaps between FE9 and another A1–A2 class (likely FE5 as it currently has the highest BET average) will be conducted to resolve the BET score imbalance.

As an example, the totals chart in Figure 9 showed the initial streaming had placed no Primary Education students into FE10, while only one Psychology student had been placed into FE4. Conversely, FE4 has an abundance of Primary Education students and FE10 has too many Psychology students. Thus, these classes, being in the same A2–B1 Low course stream, match up well for a swap. As the BET scores of these classes are almost identical, students with the same BET scores should be targeted for the swap. Also, as the number of boys in FE10 outnumbers girls, boys are eligible to be moved from FE10 to FE4 but not the other way around.

							OLD FE			NEW FE					
Class ID							BET	Class	OLD FE	Class	NEW FE	NEW FE	FE	Course	Period
2	Index	SID	Dept Name	Last	First	Sex	(89)	Index	Class	Index	Class	Index	Class	Course	Period
13	FE10-1	191011	Ed-Primary	Kawada	Kuni	F	55	3	FE4	5	FE10	A2-B1 Low	2		
18	FE4-1	194006	Psychology	Chijimatsu	Mochihito	M	55	5	FE10	3	FE4	A2-B1 Low	1		
19	FE10-2	194029	Psychology	Kudou	Ima	F	55	5	FE10	5	FE10	A2-B1 Low	2		
30	FE4-2	191027	Ed-Primary	Suga	Tokuhei	M	54	3	FE4	3	FE4	A2-B1 Low	1		
34	FE10-3	191023	Ed-Primary	Sakakibara	Inaho	F	53	3	FE4	5	FE10	A2-B1 Low	2		
37	FE4-3	194036	Psychology	Nakata	Kioko	F	53	5	FE10	3	FE4	A2-B1 Low	1		
39	FE10-4	194018	Psychology	Himi	Noburo	M	52	5	FE10	5	FE10	A2-B1 Low	2		
162	FE10-16	194032	Psychology	Mitsui	Satoko	F	52	5	FE10	5	FE10	A2-B1 Low	2		
165	FE4-16	191006	Ed-Primary	Ichinomiya	Honami	F	51	3	FE4	3	FE4	A2-B1 Low	1		
177	FE4-17	194042	Psychology	Oyama	Ren	F	51	3	FE4	3	FE4	A2-B1 Low	1		
178	FE10-17	194065	Psychology	Yoshihara	Tsukiko	F	50	5	FE10	5	FE10	A2-B1 Low	2		
179	FE10-18	194019	Psychology	Himura	Sakue	F	48	5	FE10	5	FE10	A2-B1 Low	2		
188	FE10-19	194038	Psychology	Nomura	Mizuko	F	47	5	FE10	5	FE10	A2-B1 Low	2		
191	FE10-20	194046	Psychology	Suga	Hitomi	F	47	5	FE10	5	FE10	A2-B1 Low	2		
195	FE10-21	191012	Ed-Primary	Kawahara	Yu	F	46	3	FE4	5	FE10	A2-B1 Low	2		
197	FE4-18	191030	Ed-Primary	Teramoto	Katsumoto	M	46	3	FE4	3	FE4	A2-B1 Low	1		
201	FE4-19	194020	Psychology	Hiroi	Miho	F	46	5	FE10	3	FE4	A2-B1 Low	1		
203	FE10-22	194066	Psychology	Yoshikuni	Au	F	46	5	FE10	5	FE10	A2-B1 Low	2		

Figure 11. – Departmental Swap Example

Best Methods and Practices for English Communication Course Streaming

To find eligible students, the student list data is filtered to include only students of the needed departments and class indexes. Figure 11 above, which contains added columns labeled “Old FE Class Index” and “Old FE Class” for demonstration purposes, displays the Primary Education and Psychology students in FE4 and FE10 (indexed as 3 and 5 as noted in Figure 5). Three sets of student swaps are found and recorded in Table 6 below:

**Table 6.** – FE4 and FE10 Student Swaps

Old Class (Index)	Department	Student ID	Sex	BET Score	New Class (Index)	Swapped With SID
FE4 (3)	Primary Education	191011	Female	55	FE10 (5)	194036
		194006	Female	53		191012
		191023	Female	46		194020
FE10 (5)	Psychology	194036	Male	55	FE4 (3)	191011
		191012	Female	53		194006
		194020	Female	46		191023

Simply reversing the class indexes (in the FE Class Index column, relabeled as “NEW FE Class Index” in Figure 11 for clarity) of these students completes the exchange process and automatically updates the totals. This process is then repeated for each departmental, sex, or BET average imbalance until totals are deemed satisfactory.

After resolving all of the department and BET average imbalances in Figure 9, the updated totals are reflected in Figure 12 below.

Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	
FE Class Index	FE Class	FE Course	Period	Teacher	Classroom	Students	Ed-Primary	Ed-Secondary	Welfare	Psychology	Nutrition	F	M	BET Average	BELT Average	BET Average	
1	FE1	A2-B1 High	1	Adam	831	28	5	11	4	6	2	20	8	36.6	24.8	61.4	
2	FE7	A2-B1 High	2	Becky	832	28	6	8	4	8	2	23	5	36.0	25.4	61.4	
3	FE4	A2-B1 Low	1	Donovan	833	28	4	7	5	6	6	19	9	28.9	20.3	49.2	
4	FE8	A2-B1 Low	2	Charles	834	28	4	8	4	8	4	19	9	28.4	20.9	49.2	
5	FE10	A2-B1 Low	2	Faith	835	28	3	5	6	8	6	20	8	29.1	20.2	49.3	
6	FE2	A1-A2	1	Becky	232	26	3	6	7	7	3	20	6	19.4	13.4	32.8	
7	FE3	A1-A2	1	Charles	263	26	5	3	6	8	4	19	7	18.9	14.0	32.8	
8	FE5	A1-A2	1	Edith	831	26	3	5	5	7	6	19	7	18.7	14.0	32.7	
9	FE6	A1-A2	2	Adam	832	26	4	5	6	7	6	18	8	18.2	14.4	32.7	
10	FE9	A1-A2	2	Donovan	833	26	4	5	6	4	7	21	5	18.9	13.8	32.7	
13																	
14														Course	Average	Average	Average
15														A1-A2	18.8	13.9	32.7
16														A2-B1 Low	28.8	20.4	49.2
17														A2-B1 High	36.3	25.1	61.4

**Figure 12.** – Post-Swapping Class Averages

As can be seen above, the intra-stream swaps have evened out most of the discrepancies between department, sex, and BET average, resulting in balanced classes.

*Creating and Distributing Class Rosters*

The final step in the streaming process is generating class rosters for teachers. The Excel streaming spreadsheet contains a worksheet tab for each of the class sections, the data of which

is linked to the main student list via a student class-ID indexing system.

	A	B	C	D	E	F	L
	Class ID						FE
2	Index	SID	Dept Name	Last	First	Sex	Class
3	FE9-1	182003	Ed-Secondary	Ueki	Wako	F	FE9
4	FE6-1	183012	Welfare	Oshita	Kazuki	M	FE6
5	FE5-1	183022	Welfare	Hironaka	Konomi	F	FE5
6	FE3-1	185044	Nutrition	Okubo	Yuichiro	M	FE3
7	FE2-1	185088	Nutrition	Kawahara	Kumiko	F	FE2
8	FE5-2	191001	Ed-Primary	Chiyotanda	Tsugumichi	M	FE5
9	FE3-2	191002	Ed-Primary	Endo	Eba	F	FE3
10	FE7-1	191003	Ed-Primary	Hamano	Machi	F	FE7
11	FE7-2	191004	Ed-Primary	Handa	Rieko	F	FE7
12	FE6-2	191005	Ed-Primary	Hiroto	Yumi	F	FE6
13	FE4-1	191006	Ed-Primary	Ichinomiya	Honami	F	FE4
14	FE3-3	191007	Ed-Primary	Imamura	Yoshihiro	F	FE3
15	FE9-2	191008	Ed-Primary	Kamenashi	Hatsuka	F	FE9

Figure 13. – Class ID Index

In Column A of Figure 13 above, each student has been assigned a class-ID based on their FE class number and their positioning in the list itself via the formula found in Table 7 below:

Table 7. – Class-ID Formula Explanation

Column	Example Cell	Formula	Outcome
Class ID (A)	A3	$=L3\&"\&COUNTIF(L\$3:L3,L3)$ ➔ <u>L3</u> = The student's FE class number ➔ <u>L\$3:L3,L3</u> = The number of instances of the class number (in L3) being found from the range L3 to L3	The formula generates an index number consisting of the student's class name, a dash, and a count of how many times that class name has appeared in the column up to this row.
	A15	$=L15\&"\&COUNTIF(L\$3:L15,L15)$ ➔ <u>L15</u> = The student's FE class number ➔ <u>L\$3:L15,L15</u> = The number of instances of the class number (in L15) being found from the range L3 to L15	Cell A3 Result: FE9-1 ➔ The FE9 in row 3 is the first instance of FE9 found in column L.  Cell A15 Result: FE9-2 ➔ The FE9 in row 15 is the second instance of FE9 found in column L.

This indexing system gives every student a unique identifier that is used as a VLOOKUP value for the individual class lists. The master class list is then sorted by Student ID, which arranges each individual class roster by their student numbers despite them being mixed together in the master class list.

Best Methods and Practices for English Communication Course Streaming

	A	B	C	D	E	F	G	H	I	
1			<b>Teacher</b>	Donovan						
2			<b>Class</b>	FE9						
3			<b>Level</b>	A1-A2						
4			<b>Period</b>	2						
5			<b>Classroom</b>	833						
6			<b>Students</b>	26						
7										
8	<b>Class-ID</b>	<b>Index</b>	<b>Number</b>	<b>SID</b>	<b>Last</b>	<b>First</b>	<b>Combined Name</b>	<b>Sex</b>	<b>Department</b>	<b>Repeater?</b>
9	FE9-1	1	182003	Ueki	Wako	Wako Ueki	F	Ed-Secondary	Y	
10	FE9-2	2	191008	Kamenashi	Hatsuka	Hatsuka Kamenashi	F	Ed-Primary		
11	FE9-3	3	191017	Nagai	Yoshisada	Yoshisada Nagai	M	Ed-Primary		
12	FE9-4	4	191018	Nakagome	Atsuko	Atsuko Nakagome	F	Ed-Primary		
13	FE9-5	5	191025	Shinohara	Shunsuke	Shunsuke Shinohara	M	Ed-Primary		
14	FE9-6	6	192007	Fujimura	Tane	Tane Fujimura	F	Ed-Secondary		
15	FE9-7	7	192014	Homura	Roka	Roka Homura	M	Ed-Secondary		
16	FE9-8	8	192015	Horiuchi	Kazuki	Kazuki Horiuchi	M	Ed-Secondary		
17	FE9-9	9	192027	Komuro	Romi	Romi Komuro	F	Ed-Secondary		
18	FE9-10	10	193006	Hayabusa	Wakayo	Wakayo Hayabusa	F	Welfare		
19	FE9-11	11	193022	Matsushita	Ere	Ere Matsushita	F	Welfare		
20	FE9-12	12	193023	Mikami	Kura	Kura Mikami	F	Welfare		

Figure 14. – Individual Class Roster

Figure 14 above shows an example individual class roster tab. The Class-ID Index in Column A consists simply of a cell reference to the class name (cell D2), a dash, and the number in column B. Once combined, this ID number provides a constant identical to the Class-ID Index in Column A of Figure 13 for VLOOKUP formulas. This allows the formulas to recall all the individual student data of the particular class. Furthermore, the class information at the top of Figure 14 is also recalled via VLOOKUP from the totals chart data in Figure 12, referencing the FE class name in Column S. Having had sorted the master list by student ID number, the list in Figure 14 is already in ID order, further adding a level of convenience to teachers and administrators. Each class roster tab functions and is formatted identically to each other, with the only variance between them being the class name displayed in cell D2.

While these VLOOKUP formulas, especially their lookup values, may need maintenance if columns in the master list or totals chart are added, moved, or removed, relying on these formulas to create the individual class rosters both greatly expedites the roster creation process and removes the propensity for user error when copying and pasting data if lists were to be created manually. Furthermore, in order to promote maximum formula integrity, the streaming spreadsheet simplifies the lookup value process by using Excel’s COLUMN formula, as demonstrated in Figure 15 and Table 8 below.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Class ID			BERT BELT BET FE FE Class FE FE										
2	Index	SID	Dept Name	Last	First	Sex	(52)	(37)	(89)	Repeater?	Index	Class	Course	Period
3	FE1-1	194015	Psychology	Hano	Iwane	M	45	31	76		1	FE1	A2-B1 High	1
4	FE7-1	191021	Ed-Primary	Okane	Chigusa	F	43	30	73		2	FE7	A2-B1 High	2
5	FE7-2	193021	Welfare	Kuroda	Ryou	F	43	29	72		2	FE7	A2-B1 High	2
6	FE1-2	192045	Ed-Secondary	Tokuda	Eimu	F	43	28	71		1	FE1	A2-B1 High	1

	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	
1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
	FE Class					Ed-		Ed-					BERT			BELT		BET
2	Index	FE Class	FE Course	Period	Teacher	Classroom	Students	Primary	Secondary	Welfare	Psychology	Nutrition	F	M	Average	Average	Average	
3	1	FE1	A2-B1 High	1	Adam	831	28	5	11	4	6	2	20	8	36.6	24.8	61.4	
4	2	FE7	A2-B1 High	2	Becky	832	28	6	8	4	8	2	23	5	36.0	25.4	61.4	
5	3	FE4	A2-B1 Low	1	Donovan	833	28	4	7	5	4	8	20	8	29.1	20.1	49.2	

Figure 15. – Column Reference Values for Student List (Top) and Totals Chart (Bottom)

Table 8. – Column Reference Explanation

Cell Reference in Figure 15	Formula	Outcome
A1 through N1	=Column()	The column numbers, counting Column A as 1, are displayed.
Q1 through AG1	=Column()-Column(\$Q:\$Q)	The column number minus the position of column Q (17) will be displayed. Accordingly, column R shows 1 (18 – 17) and so on.

Table 8 above shows how two sets of column reference numbers are created, both of which set the key VLOOKUP index values (Class-ID Index in the student list and FE Class in the totals chart) at 1. In the student list in Figure 15, the class-ID index is already in column A, meaning no special formulas are necessary, while in the totals chart, the formula as described in Table 8 sets cell R1 of the FE Class column to 1. Thus, the column index portion of the VLOOKUP formulas in Figure 14 do not contain text numbers, which can easily result in broken formulas as Excel has no way of automatically updating their values if changes to the structure of the spreadsheet occur, but rather a cell reference to the appropriate column index number in Row 1 of the class list or the totals chart. These references will remain even if the structure of the spreadsheet changes later. Table 9 summarizes the differences.

Table 9. – VLOOKUP and Column Index Referencing

Figure + Cell Reference	Formula	Outcome
Figure 14, Cell C9 (Student ID Column)	=IFERROR(VLOOKUP(\$A9, Student_List,2,0),"")	<b>Weak Formula:</b> Due to the 2 in the column index portion of the formula, the data in the second column of the Student List index array will be returned, regardless of whether this is always the student ID or not.
	=IFERROR(VLOOKUP(\$A9, Student_List,'FEstreaming'!\$B\$1,0),"")	<b>Strong Formula:</b> Because the 2 has been replaced by a cell reference, the data in the column number that is displayed in cell B1 of the student list index array (Figure 15) will be returned, which is always the Student ID column due to the referenced cell's COLUMN formula. (The cell reference contains 'FEstreaming!', the name of the student list tab, due to the class roster in Figure 14 being on a separate Excel tab.)

Best Methods and Practices for English Communication Course Streaming

As Table 9 shows, even if another column is inserted between the Class-ID Index and the Student ID columns in Figure 15 (shifting the Student ID column from B to C), the COLUMN value in the Student ID column (now cell C1) will automatically update from 2 to 3, and the VLOOKUP formula will likewise update its cell reference to cell C1. The totals chart reference formulas are likewise secured.

Toward maximizing user-friendliness among teachers, once finalized, a copy of the Excel spreadsheet is placed into the BECC teacher server in a folder specifically for English Communication administrative documents. Using Excel's copy and paste values function, all formulas are removed from this copy of the spreadsheet and all non-class roster tabs are deleted. Thus, teachers can open the final document and find their class roster with little confusion or risk of inadvertently breaking a formula link. If an update needs to be made to a class roster (for example, after-the-fact requests from the university regarding additional repeater students or students who need specific period placements), the modifications are made in the original streaming spreadsheet and an updated copy is placed on the server using the same process described above.

	A	B	C	D	E	F	G	K	L	M	N	O	P
	Class		FE	FE	BERT 2 + BEST			BERT 2 /		BEST 2 /		Weighted Average	SE Class
2	ID	SID	Department	Class	Teacher	Last	First	BELT 2	2	89	15	+ BEST (40%)	Index
3	-1	182011	Welfare	FE4	Donovan	Sueoka	Kahoru	68	14.8	76%	99%	85.3%	
4	-2	185003	Global Communication	FE13	Gina	Gomi	Miwako	72	13.5	81%	90%	84.5%	
5	-3	181015	Ed-Primary	FE10	Donovan	Higa	Mai	65	14.9	73%	100%	83.6%	
6	-4	181043	Ed-Primary	FE5	Edith	Uchida	Sae	71	13.3	80%	89%	83.4%	
7	-5	181012	Ed-Primary	FE12	Faith	Hakuryū	Kamlyn	71	12.6	80%	84%	81.6%	
8	-6	184002	Nutrition	FE3	Charles	Hata	Yayoi	68	13.3	76%	89%	81.3%	
9	-7	182001	Welfare	FE12	Faith	Akagawa	Maiko	67	13.2	75%	88%	80.4%	
10	-8	181002	Ed-Primary	FE4	Donovan	Arashi	Taya	56	15.0	63%	100%	77.8%	
11	-9	183001	Psychology	FE1	Adam	Asato	Ayuri	60	13.9	67%	93%	77.5%	
12	-10	181018	Ed-Primary	FE3	Charles	Inai	Eitsu	56	14.5	63%	96%	76.3%	

Figure 16. – SE BET Calculations

### Sophomore English Streaming

The process for Sophomore English streaming is largely identical to Freshman English, with the exception being the inclusion of the BEST score in the BET calculation and the additional check and prevention of students from having the same SE teacher as they had in FE. In lieu of a full streaming example, only the differences between this and the FE process will be shown.

Figure 16 above demonstrates Sophomore English's BET calculation, where the combined BERT 2 and BELT 2 score comprises 60% of the total BET score, and the BEST 2 comprises the remaining 40%. As the raw scores (Columns K and L) are out of different denominators (89 and 15, respectively), they are first equated to percentages out of 100 (columns M and N) and then weighted (Column O) to form the BET scores for course streaming.

AS	AT
Last Year's FE Class	Last Year's FE Teacher
FE1	Adam
FE2	Becky
FE3	Charles
FE4	Donovan
FE5	Edith
FE6	Faith
FE7	Adam
FE8	Becky
FE9	Charles
FE10	Donovan
FE11	Edith
FE12	Faith
FE13	Gina

		Weighted Average BERT/BELT (60%) SE Class										Same Teacher		SE Repeater	
Class	ID	SID	Department	Class	Teacher	Last	First	+ BEST (40%)	Index	SE Class	SE Course	Period	SE Teacher	Teacher	Repeater
SE2-1	181015		Ed-Primary	FE10	Donovan	Higa	Mai	83.6%	1	SE2	A2-B1 High	1	Adam		
SE4-1	181043		Ed-Primary	FES	Edith	Uchida	Sae	83.4%	2	SE4	A2-B1 High	1	Becky		
SE4-2	181012		Ed-Primary	FE12	Faith	Hakuryū	Kamlyn	81.6%	2	SE4	A2-B1 High	1	Becky		
SE2-2	181002		Ed-Primary	FE1	Adam	Arashi	Taya	77.8%	1	SE2	A2-B1 High	1	Adam		
SE2-3	181018		Ed-Primary	FE3	Charles	Inai	Etsu	76.3%	1	SE2	A2-B1 High	1	Adam	Yes	
SE4-3	181020		Ed-Primary	FE13	Gina	Kaneko	Orino	74.1%	2	SE4	A2-B1 High	1	Becky		
SE4-4	181042		Ed-Primary	FES	Becky	Uchida	Umi	73.7%	2	SE4	A2-B1 High	1	Becky	Yes	
SE2-4	181046		Ed-Primary	FE12	Faith	Wakata	Rii	71.2%	1	SE2	A2-B1 High	1	Adam		
SE2-5	181049		Ed-Primary	FE9	Charles	Yoshimi	Seka	69.9%	1	SE2	A2-B1 High	1	Adam		
SE4-5	181003		Ed-Primary	FE2	Becky	Asai	Ishi	69.3%	2	SE4	A2-B1 High	1	Becky	Yes	
SE4-6	181030		Ed-Primary	FE4	Donovan	Nishikiri	Kinuye	68.1%	2	SE4	A2-B1 High	1	Becky		
SE2-6	181040		Ed-Primary	FE1	Adam	Toda	Tokyo	67.7%	1	SE2	A2-B1 High	1	Adam	Yes	
SE2-7	181010		Ed-Primary	FE4	Donovan	Hagiwara	Hanae	67.6%	1	SE2	A2-B1 High	1	Adam		
SE4-7	181019		Ed-Primary	FES	Edith	Ishiwata	Yuki	67.0%	2	SE4	A2-B1 High	1	Becky		

Figure 17. – Duplicate FE and SE Teacher Flagging

Also unique to the Sophomore English streaming spreadsheet are columns that flag students who are assigned to a teacher whom they already had as an FE student. The previous year's FE teachers are kept in a list adjacent to the totals chart, as shown in Figure 17 above. In Figure 17, SE2 and SE4 (both A2–B1 High classes and indexed as 1 and 2), have been assigned to Adam and Becky, respectively. Both the FE Teacher column (E) and the SE Teacher column (T) contain VLOOKUP formulas to recall the respective teachers based on the FE and SE class names. The Same Teacher column (U) contains an IF formula that flags the cells with “Yes” if the names of the two teachers match. Like the department swaps in Figure 11, these students' SE class index numbers are simply changed to a different teacher. If this results in an odd number of students per class, any other eligible student with the same or near-similar BET score is swapped until the numbers are equal. This consideration, however, is of the lowest priority as described in the streaming guidelines: if no eligible swap partner is found due to a lack of nearby BET score or the swap creating department or sex imbalances, the student will simply remain with the same teacher as he or she had in Freshman English.

## Conclusion

The Freshman English streaming example demonstrated the BECC's process of streaming English Communication students into three distinct levels as well as into class sections that are balanced by student numbers, department counts, sex, and average BET score via the BECC's Excel streaming spreadsheet. Due to the prewritten formulas of the spreadsheet, there is minimal document maintenance needed between cohorts. Once a clean copy of the spreadsheet has been saved and student names, ID numbers, departments, BET scores, and stream index numbers have been removed, the only additional upkeep necessary is to update the class section teaching plan for the current year, and in the case for SE, to add the previous year's FE teaching plan to allow for duplicate teacher checks. Thus, streaming can be conducted quickly and efficiently year after year with the same spreadsheet with no additional need for infrastructure building on the front end or guesswork during the process.

While the preceding example contained both an even number of students and classes for simplicity's sake, complications often emerge when conducting actual streaming that can make the process less smooth, such as period-locked students or departments due to class schedules,

class sizes that are larger than ideal, students who were absent from the BETs and thus lack a placement indicator, or late course registrants that throw off balanced streaming numbers after the fact. The experience administrator knows that while a perfect streaming scenario as demonstrated above is the ideal, such complications are natural and should be worked around as best as possible in order to preserve as much as possible the goals of the streaming process.

Furthermore, even with ideal streaming, there will inevitably exist students who are misplaced due to an outlier test score that puts them above or below their actual ability. In addition, as English Communication centers on raising students from the A1 and A2 CEFR levels to A2 and B1, respectively, the course has little ability to cater to students lower than the A1 level or already at a B1 or higher level. However, as the BECC's BERT, BELT, and BEST testing systems continue to be refined and see improvements year by year, it is the BECC's goal that our streaming can become more and more pinpoint in placing students at the appropriate CEFR-delineated class levels in order to provide the best and most exact level of English education to all students.

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