SAS® GLOBAL FORUM 2017

April 2 – 5 | Orlando, FL

Template Versatility—Using SAS® Macro Language to Generate Dynamic RTF Reports

Patrick Leon, MPH

USERS PROGRAM

Template Versatility—Using SAS® Macro Language to Generate Dynamic RTF Reports

Patrick Leon, MPH

Keck School of Medicine of USC

ABSTRACT

SAS® Macro Language can be used to enhance many report-generating processes. This presentation showcases the potential that macros have in populating predesigned Rich Text Format (RTF) templates. If you have multiple report templates saved, SAS® can choose and populate the correct one(s) utilizing macro programming. The autocall macro ***TRIM***, combined with a macro variable, can be attached to the output RTF template name. You can design and save as many templates as you like or need. When SAS® assigns the macro variable TEMPLATE a value, the ***%TRIM(&TEMPLATE)*** statement in the output pathway correctly populates the appropriate template. This can make life easy if you create multiple different reports based on one dataset. All that's required are stored templates on accessible pathways.

INTRODUCTION

The purpose of this ePoster is to illustrate a data management technique that can be utilized when multiple RTF templates are stored and selected based on criteria defined in a data set. This technique was developed to enhance a reporting procedure that required the development of three unique RTF templates that were each appropriate in a specific report context. A multi-year evidence-based intervention is implemented by trained facilitators, and compensation criteria varies based on the number of prescribed lessons. For this particular program, there are three levels of prescribed lessons that required separate predesigned RTF templates: 6 lessons, 12 lessons and 18 lessons.

Figure 1 illustrates the concept visually:

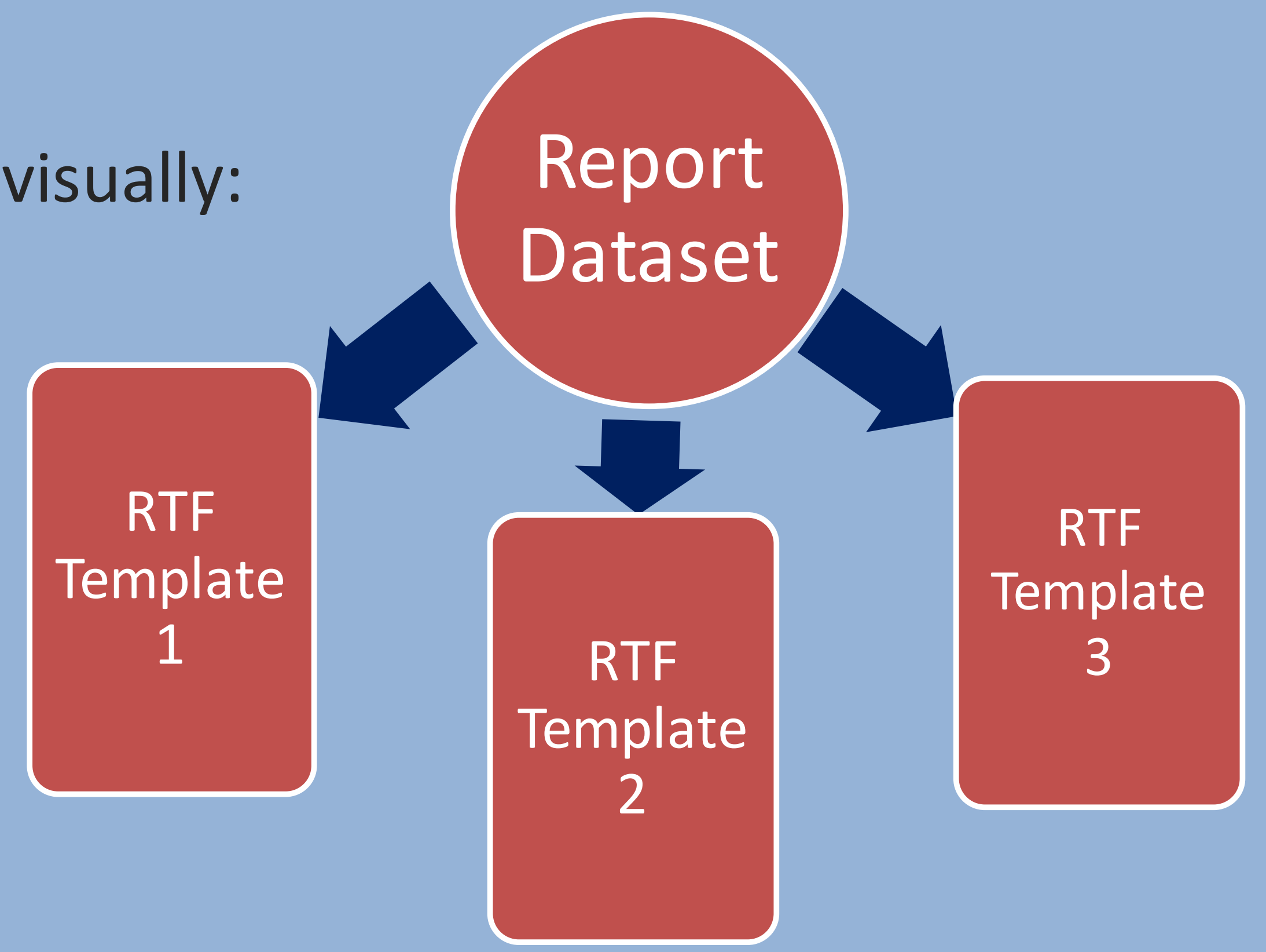
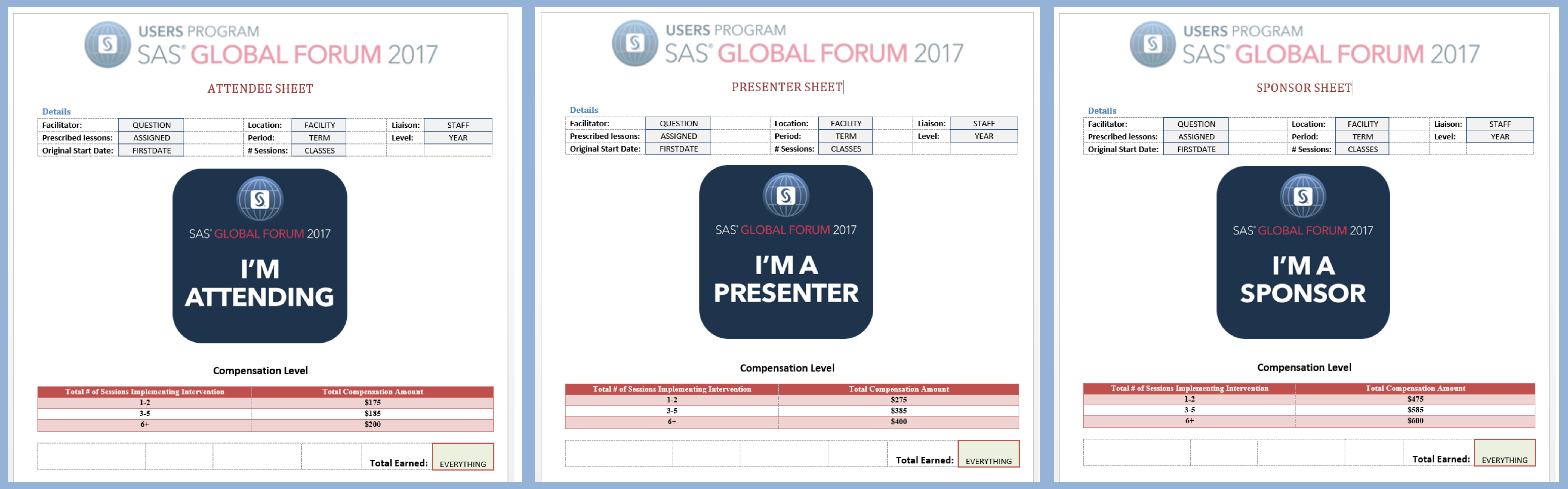


Figure 1. *Criteria inside a dataset can determine which RTF template is used by SAS.*

BACKGROUND

The process of using SAS to read and write RTF files as data has been previously described. Since RTF files can be read by text editors, SAS can read and write predesigned files as data. A report template can be designed incorporating unique codes that will replace text strings with appropriate values from the report dataset (See Figures 2, 3 & 4). In this example, the unique codes are: QUESTION, FACILITY, STAFF, ASSIGNED, TERM, YEAR, FIRSTDATE and CLASSES. When SAS reads in the RTF text strings, the unique codes will be identified, replaced with values from the report dataset, and then replaced with modified RTF text strings. It is important to note that these codes should only appear in the table once so that SAS replaces the codes with the correct respective values from the report dataset.



USERS PROGRAM
SAS® GLOBAL FORUM 2017

ATTENDEE SHEET

Details

Facilitator:	QUESTION	Location:	FACILITY	Liaison:	STAFF
Prescribed lessons:	ASSIGNED	Period:	TERM	Level:	YEAR
Original Start Date:	FIRSTDATE	# Sessions:	CLASSES		

Compensation Level

Total # of Sessions Implementing Intervention	Total Compensation Amount
1-2	$175
3-5	$185
6+	$200

Total Earned: EVERYTHING

USERS PROGRAM
SAS® GLOBAL FORUM 2017

PRESENTER SHEET

Details

Facilitator:	QUESTION	Location:	FACILITY	Liaison:	STAFF
Prescribed lessons:	ASSIGNED	Period:	TERM	Level:	YEAR
Original Start Date:	FIRSTDATE	# Sessions:	CLASSES		

Compensation Level

Total # of Sessions Implementing Intervention	Total Compensation Amount
1-2	$275
3-5	$385
6+	$400

Total Earned: EVERYTHING

USERS PROGRAM
SAS® GLOBAL FORUM 2017

SPONSOR SHEET

Details

Facilitator:	QUESTION	Location:	FACILITY	Liaison:	STAFF
Prescribed lessons:	ASSIGNED	Period:	TERM	Level:	YEAR
Original Start Date:	FIRSTDATE	# Sessions:	CLASSES		

Compensation Level

Total # of Sessions Implementing Intervention	Total Compensation Amount
1-2	$475
3-5	$585
6+	$600

Total Earned: EVERYTHING

Figures 2, 3 & 4. *Three examples of various predesigned RTF templates.*

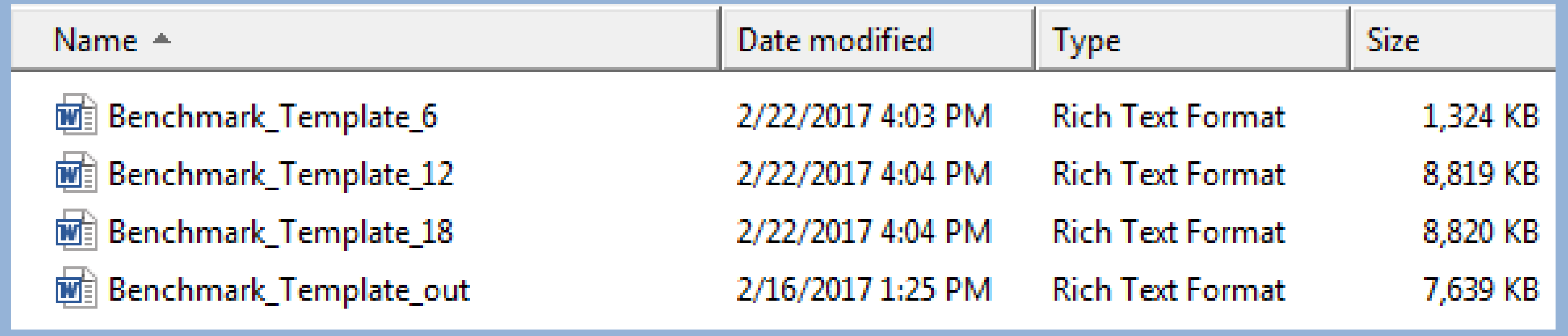
Above are three predesigned RTF templates. The templates have significant differences, but they all contain the unique keywords that SAS will identify and replace with data. Once templates have been designed, it's time to save them in a folder on an accessible pathway (See Figure 5). In order to take advantage of macro programming, give the templates the same name with a unique numeric value at the end. In order for this technique to work, the templates must follow this protocol and be saved on the same accessible pathway. Don't forget to save them as RTF!

Template Versatility—Using SAS® Macro Language to Generate Dynamic RTF Reports

Patrick Leon, MPH

Keck School of Medicine of USC

METHODS

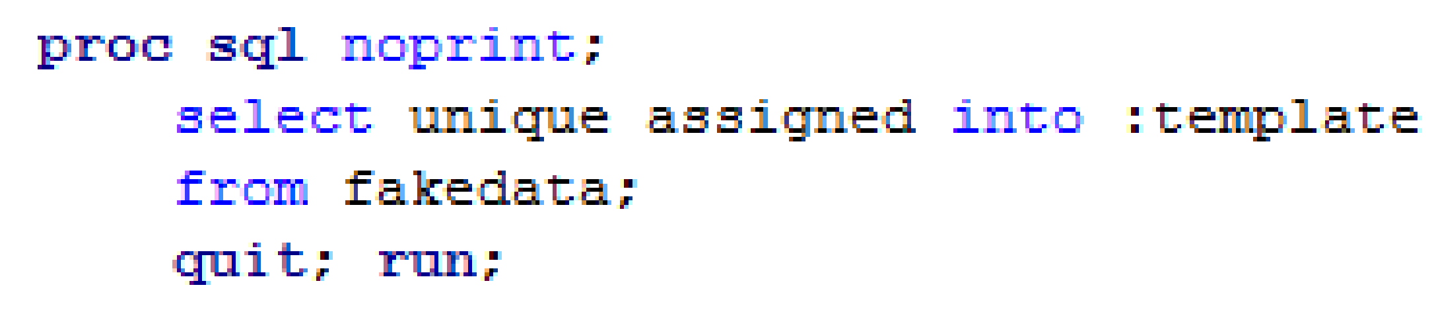


Name	Date modified	Type	Size
Benchmark_Template_6	2/22/2017 4:03 PM	Rich Text Format	1,324 KB
Benchmark_Template_12	2/22/2017 4:04 PM	Rich Text Format	8,819 KB
Benchmark_Template_18	2/22/2017 4:04 PM	Rich Text Format	8,820 KB
Benchmark_Template_out	2/16/2017 1:25 PM	Rich Text Format	7,639 KB

Figure 5. *RTF templates stored in a folder on an accessible pathway.*

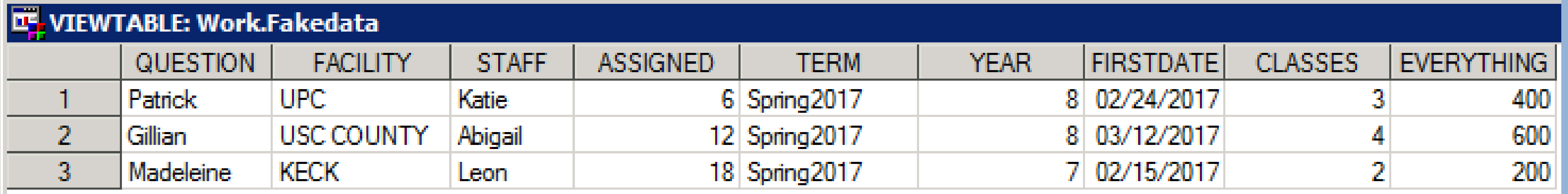
Once your templates are designed and saved, it's important that you save a blank RTF template for SAS to output to. It may be helpful to save it to the same pathway as your templates, but that is not required. The pathway to the folder in Figure 5 is: H:\SAS\Global Forum 2017.

To begin coding to call the various predesigned RTF templates, a macro variable can be created to contain values that represent the various RTF templates. The SQL statement in Figure 6 creates a macro variable called template. In this dataset, there are three unique values of assigned that are now inside the template macro variable: 6, 12 and 18. Recall that there was an RTF template with each of these unique values in its title saved on the pathway.



```
proc sql noprint;
    select unique assigned into :template
    from fakedata;
    quit; run;
```

Figure 6. *A macro variable called template has been created in a SQL statement.*



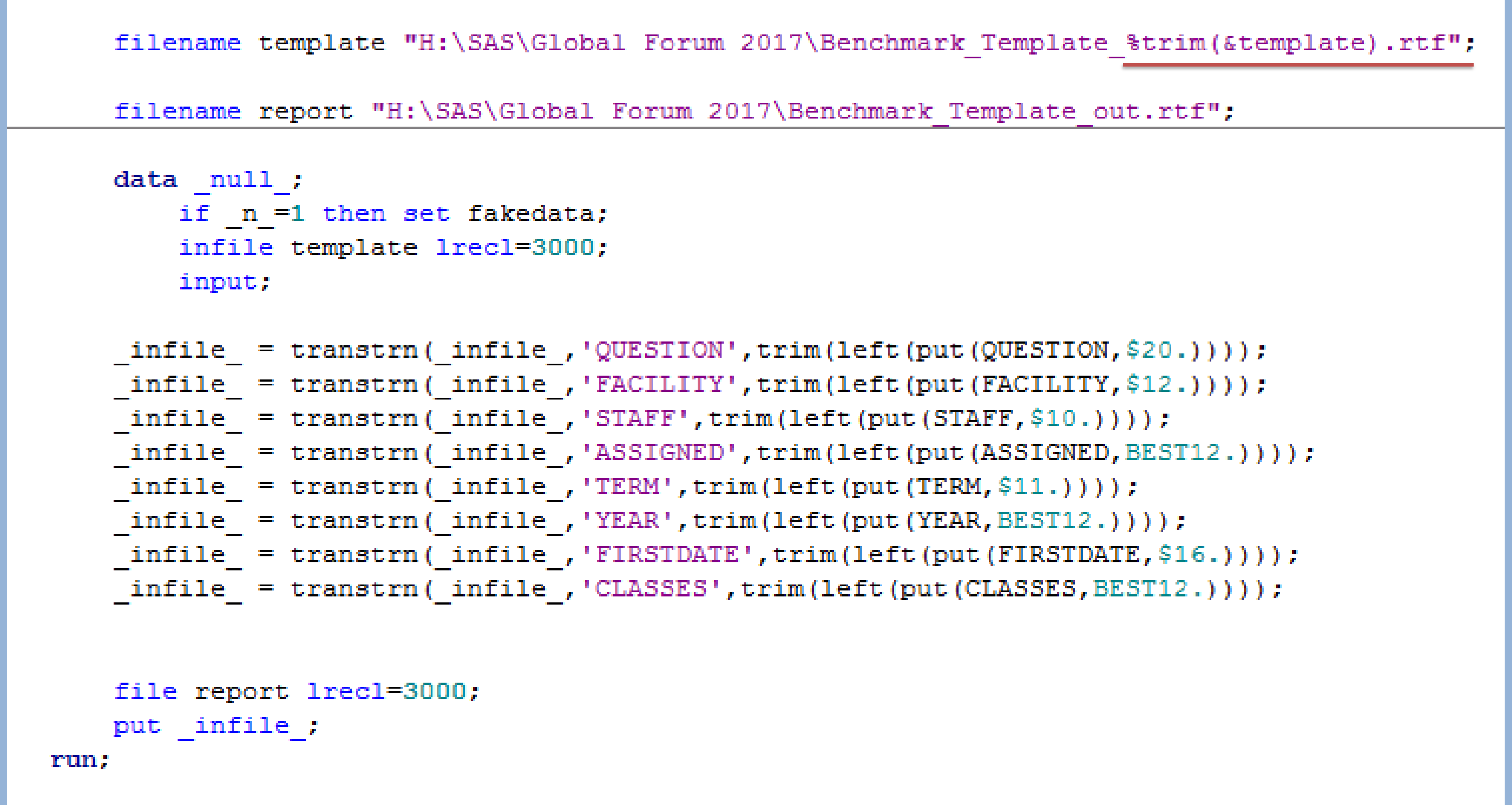
VIEWTABLE: Work.Fakedata

	QUESTION	FACILITY	STAFF	ASSIGNED	TERM	YEAR	FIRSTDATE	CLASSES	EVERYTHING
1	Patrick	UPC	Katie	6	Spring2017	8	02/24/2017	3	400
2	Gillian	USC COUNTY	Abigail	12	Spring2017	8	03/12/2017	4	600
3	Madeleine	KECK	Leon	18	Spring2017	7	02/15/2017	2	200

Figure 7. *A sample of the report dataset revealing the three unique conditions of the variable assigned.*

In this dataset, the columns correspond to the special codes that were created and placed in tables on the RTF files. The corresponding values in the dataset will populate the appropriate template, based on the ***&template*** value. For example, if the value of assigned is 18, SAS can select the row based on the value of 18 being in the previous SQL statement and also at the end of the template pathway.

METHODS (continued)



```
    filename template "H:\SAS\Global Forum 2017\Benchmark_Template_%trim(&template).rtf";

    filename report "H:\SAS\Global Forum 2017\Benchmark_Template_out.rtf";

    data _null_;
        if _n_=1 then set fakedata;
        infile template lrecl=3000;
        input;

    _infile_ = transtrn(_infile_,'QUESTION',trim(left(put(QUESTION,$20.))));
    _infile_ = transtrn(_infile_,'FACILITY',trim(left(put(FACILITY,$12.))));
    _infile_ = transtrn(_infile_,'STAFF',trim(left(put(STAFF,$10.))));
    _infile_ = transtrn(_infile_,'ASSIGNED',trim(left(put(ASSIGNED,BEST12.))));
    _infile_ = transtrn(_infile_,'TERM',trim(left(put(TERM,$11.))));
    _infile_ = transtrn(_infile_,'YEAR',trim(left(put(YEAR,BEST12.))));
    _infile_ = transtrn(_infile_,'FIRSTDATE',trim(left(put(FIRSTDATE,$16.))));
    _infile_ = transtrn(_infile_,'CLASSES',trim(left(put(CLASSES,BEST12.))));


    file report lrecl=3000;
    put _infile_;
run;
```

Figure 8. *Fileref specifications and the data step that allows SAS to interact with the respective RTF template(s).*

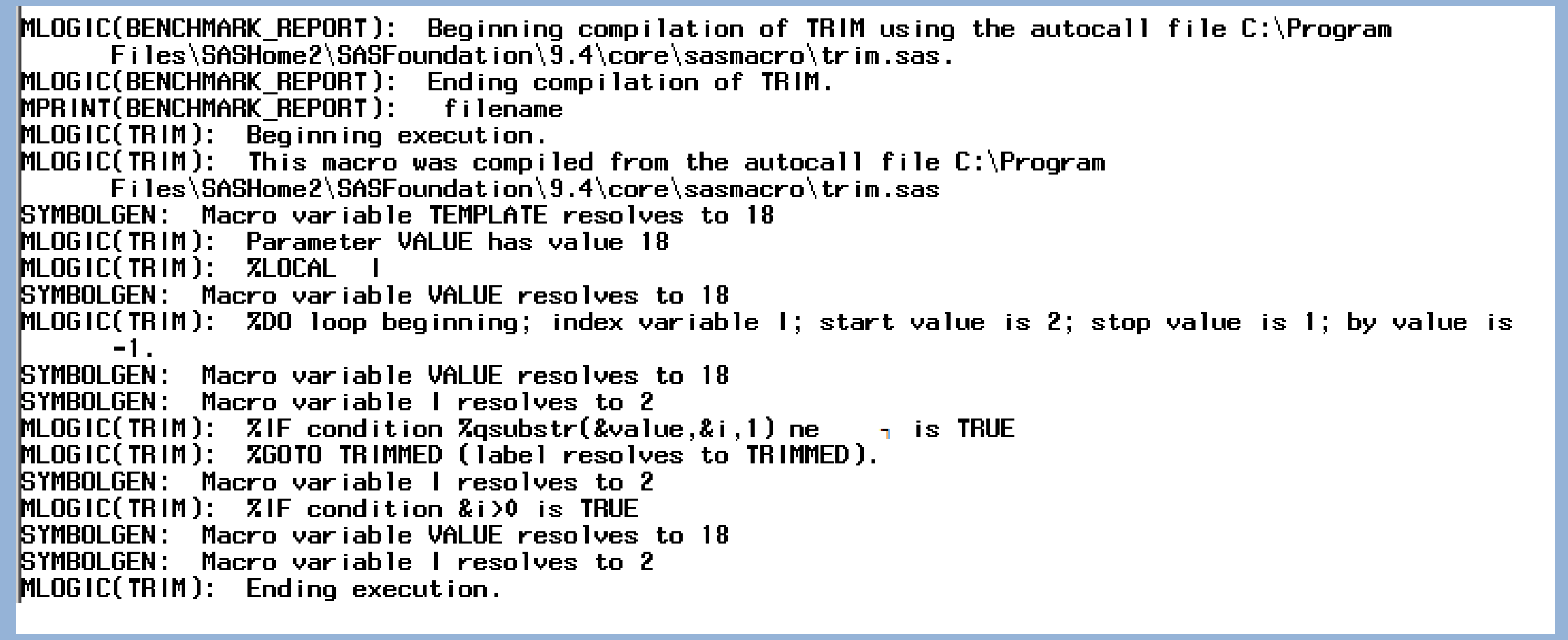
The *fileref* TEMPLATE utilizes an autocall macro (***%trim***) and the macro variable ***&template*** in the RTF pathway to denote the correct predesigned RTF template for SAS to access. For example, if the macro value of template resolves to 18, SAS will read in the RTF template located at: "H:\SAS\Global Forum 2017\Benchmark_Template_18". The REPORT *fileref* will be ouput to the specified pathway: "H:\SAS\Global Forum 2017\Benchmark_Template_out.rtf". The LRECL option has been set to 3000, although it would be rare to see line length exceed 3000. The automatic variable _INFILE_ reads each RTF line as its own entity. The strings are searched and the TRANSTRN function replaces the respective text codes with formatted values from the dataset. After following this methodology, a macros report program can be executed, e.g. ***%benchmark_report***, that includes the SQL statement as well as the data step in Figure 8. In this example, the dataset work.fakedata (see Figure 7) represents the dataset to be used in the report.

Template Versatility—Using SAS® Macro Language to Generate Dynamic RTF Reports

Patrick Leon, MPH

Keck School of Medicine of USC

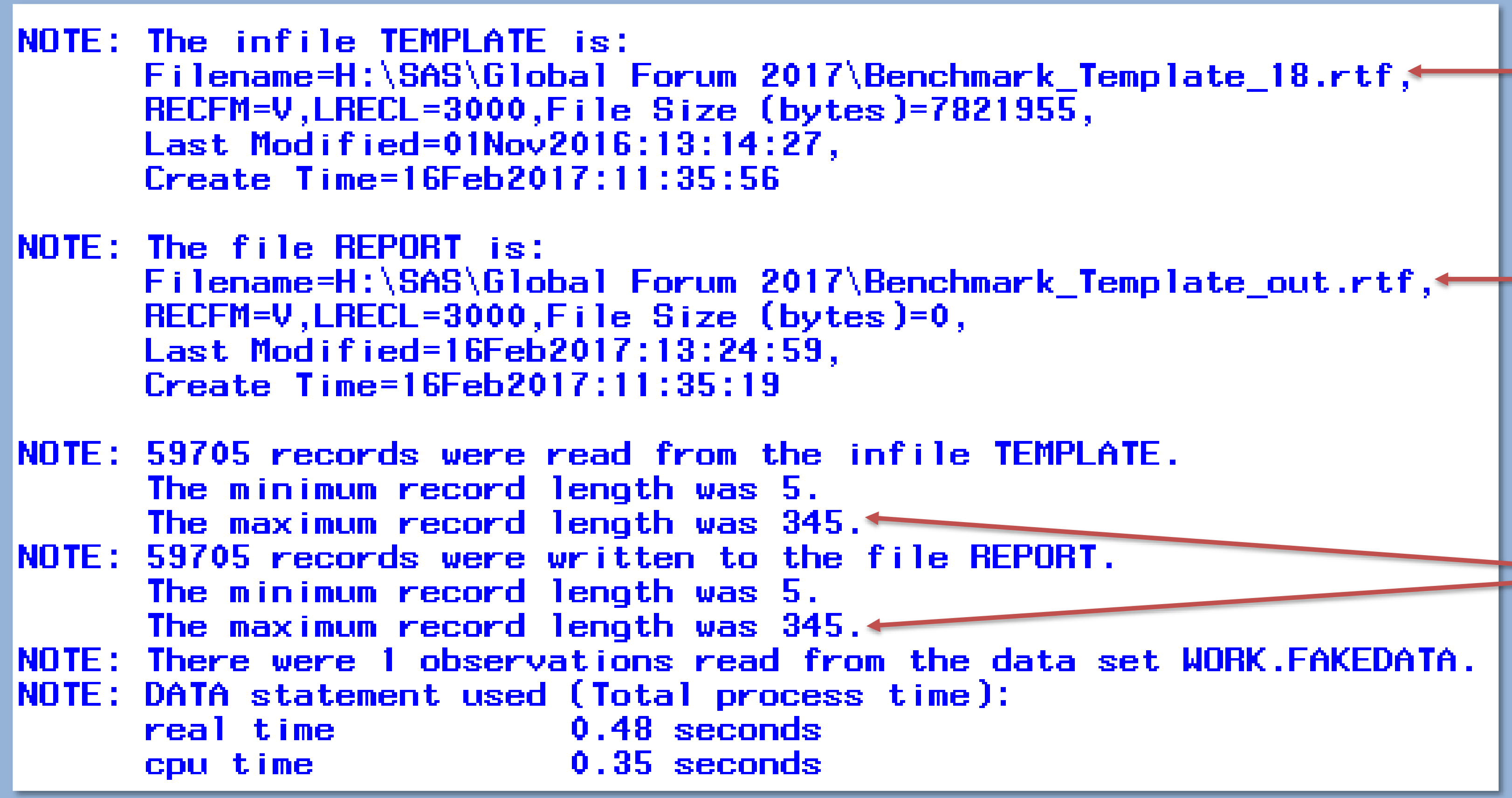
RESULTS



```
MLOGIC(BENCHMARK_REPORT):  Beginning compilation of TRIM using the autocall file C:\Program
      Files\SASHome2\SASFoundation\9.4\core\sasmacro\trim.sas.
MLOGIC(BENCHMARK_REPORT):  Ending compilation of TRIM.
MPRINT(BENCHMARK_REPORT):   filename
MLOGIC(TRIM):  Beginning execution.
MLOGIC(TRIM):  This macro was compiled from the autocall file C:\Program
      Files\SASHome2\SASFoundation\9.4\core\sasmacro\trim.sas
SYMBOLGEN:  Macro variable TEMPLATE resolves to 18
MLOGIC(TRIM):  Parameter VALUE has value 18
MLOGIC(TRIM):  %LOCAL  I
SYMBOLGEN:  Macro variable VALUE resolves to 18
MLOGIC(TRIM):  %DO loop beginning; index variable I; start value is 2; stop value is 1; by value is
      -1.
SYMBOLGEN:  Macro variable VALUE resolves to 18
SYMBOLGEN:  Macro variable I resolves to 2
MLOGIC(TRIM):  %IF condition %qsubstr(&value,&i,1) ne     ¬ is TRUE
MLOGIC(TRIM):  %GOTO TRIMMED (label resolves to TRIMMED).
SYMBOLGEN:  Macro variable I resolves to 2
MLOGIC(TRIM):  %IF condition &i>0 is TRUE
SYMBOLGEN:  Macro variable VALUE resolves to 18
SYMBOLGEN:  Macro variable I resolves to 2
MLOGIC(TRIM):  Ending execution.
```

***Figure 9.** In the log above, the **TRIM** autocall macro removes the padding blanks from a message in the log.*

After the SAS macro program ***%benchmark_report*** is executed, the report pathway corresponding to the ***&template*** value is pulled in to SAS with the help of the invocation of the ***TRIM*** autocall macro. Figure 9 shows the log following the ***TRIM*** macro in action. By following the MLOGIC system option, the ***TRIM*** macro invocation can be followed from compilation through execution.



```
NOTE: The infile TEMPLATE is:
      Filename=H:\SAS\Global Forum 2017\Benchmark_Template_18.rtf,
      RECFM=V,LRECL=3000,File Size (bytes)=7821955,
      Last Modified=01Nov2016:13:14:27,
      Create Time=16Feb2017:11:35:56

NOTE: The file REPORT is:
      Filename=H:\SAS\Global Forum 2017\Benchmark_Template_out.rtf,
      RECFM=V,LRECL=3000,File Size (bytes)=0,
      Last Modified=16Feb2017:13:24:59,
      Create Time=16Feb2017:11:35:19

NOTE: 59705 records were read from the infile TEMPLATE.
      The minimum record length was 5.
      The maximum record length was 345.
NOTE: 59705 records were written to the file REPORT.
      The minimum record length was 5.
      The maximum record length was 345.
NOTE: There were 1 observations read from the data set WORK.FAKEDATA.
NOTE: DATA statement used (Total process time):
      real time           0.48 seconds
      cpu time            0.35 seconds
```

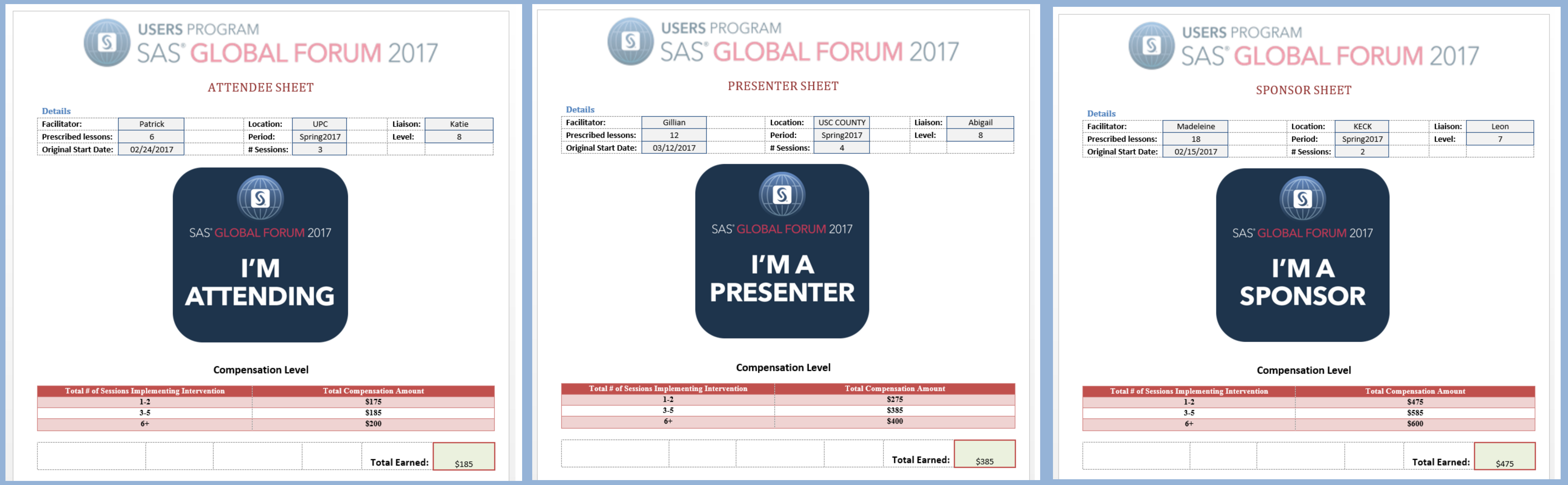
Notes from the log indicate that the correct RTF template was read in by SAS.

Notes from the log indicate that the REPORT *fileref* was successfully output.

Notes from the log indicate that the maximum record length encountered as well as length written was 345.

***Figure 10.** Notes from the log after running a macros report where assigned = 18.*

RESULTS (continued)



USERS PROGRAM
SAS® GLOBAL FORUM 2017

ATTENDEE SHEET

Details

Facilitator:	Patrick		Location:	UPC		Liaison:	Katie
Prescribed lessons:	6		Period:	Spring2017		Level:	8
Original Start Date:	02/24/2017		# Sessions:	3			

SAS® GLOBAL FORUM 2017
I'M ATTENDING

Compensation Level

Total # of Sessions Implementing Intervention	Total Compensation Amount
1-2	$175
3-5	$185
6+	$200

Total Earned: $185

USERS PROGRAM
SAS® GLOBAL FORUM 2017

PRESENTER SHEET

Details

Facilitator:	Gillian		Location:	USC COUNTY		Liaison:	Abigail
Prescribed lessons:	12		Period:	Spring2017		Level:	8
Original Start Date:	03/12/2017		# Sessions:	4			

Compensation Level

Total # of Sessions Implementing Intervention	Total Compensation Amount
1-2	$275
3-5	$385
6+	$400

Total Earned: $385

USERS PROGRAM
SAS® GLOBAL FORUM 2017

SPONSOR SHEET

Details

Facilitator:	Madeleine		Location:	KECK		Liaison:	Leon
Prescribed lessons:	18		Period:	Spring2017		Level:	7
Original Start Date:	02/15/2017		# Sessions:	2			

Compensation Level

Total # of Sessions Implementing Intervention	Total Compensation Amount
1-2	$475
3-5	$585
6+	$600

Total Earned: $475

***Figures 11, 12 &13.** Three examples of output RTF files that have been read and written by SAS.*

The RTF tables above demonstrate the results of the report code being run for all three previously described conditions. The ***&template*** value has been assigned to each unique condition, and the appropriate RTF template was read in, the codes were replaced and the modified template was output by SAS to the specified pathway.

CONCLUSIONS

Reports may require different templates, for various reasons. If the reason is represented by a variable in the report dataset, it can be utilized to create distinct pathways using SAS macros programming. This can save time and tremendously shorten report code if your report templates are stored as RTF files. Through this process, multiple RTF templates can be stored, and the correct template can be selected by SAS and the document can be successfully read and written as data.

REFERENCES

- Carpenter, Art. 2012. Carpenter's Guide to Innovative SAS® Techniques. Cary, NC: SAS Institute, Inc.
- Carpenter, Art and Fisher, Dennis, 2012. "Reading and Writing RTF Documents as Data: Automatic Completion of CONSORT Flow Diagrams." Proceedings of PharmaSUG2012, http://www.pharmasug.org/proceedings/2012/TF/PharmaSUG-2012-TF16.pdf

SAS® GLOBAL FORUM 2017

April 2 – 5 | Orlando, FL