

Paper 193-2013

Creating an Interactive SAS® E-Textbook with iBooks Author for the iPad

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ABSTRACT

Mobile media is becoming more popular and prevalent in today's workplace. Even though few apps on the iPad actively run SAS® programs, the iPad can be utilized as a teaching tool and reference database. iBooks Author allows for the creation of interactive textbooks from anybody that allow users to learn SAS in a self-paced environment. Widgets allow screenshots to show how programs are run and use reviews to check comprehension. These widgets also allow the inclusion of Keynote slides. These interactive textbooks are especially excellent for SAS conferences, as the text can be applied directly and include PowerPoint presentations, creating a mobile library that can be used in an easily accessible format, perfect for reference or training.

INTRODUCTION

Have you ever gone to talk with someone about SAS code and used the phrase "I'll e-mail this paper to you when I get back to my desk?" In today's current work environment, this is a hassle in the extreme. Since SAS is software, hands-on training is usually the best approach to train staff and teach coworkers best practices and tricks of the trade. It can be frustrating for people to have to look through pages of code to get things to work, which means that if you are standing there helping out, it can make the process go quicker.

Apple has heard about this problem and introduced new software to Mac computers. This software is iBooks Author. On Apple products with a touchscreen is an app called iBooks, which is similar to other e-reading software such as Amazon's Kindle app. While everyone is free to choose which app is best for him or her, Apple has created software so that anyone with a Mac computer can write a training paper, convert a NESUG talk, or transcribe general SAS knowledge, then allow anyone with an Apple product to download it.

CREATING AN E-TEXTBOOK

For the purposes of this paper, I will be converting two other NESUG papers, "Penetrating the Matrix" and "Using Simple Code to Enter Complex Data from the DATA Step to SAS/AF®", the former written by Justin Z. Smith and myself in concert, and the second just written by me.

The product that is being created is only available in the iBookstore. The iBookstore can only be accessed through Apple mobile products, such as iPads, iPhones, and iPod Touches. To see the finished product, please go to the Store and download "SAS® Presentations in E-book Format". The e-book is currently undergoing approval by Apple.

As of October 2012, iBooks Author is NOT available on Windows PC, just Mac computers. Apple has not announced when or if it will allow this software to be available on Windows computers. If it does become available from the time of this paper to the reader then reading it, this paper will focus just on how to use this for Mac computers. Also, while SAS code will be showing up for illustrative or demonstrative purposes, this paper is focusing on how to teach SAS, not actually teach the code that is being used. For information on the code that is being used, please refer to one of the papers listed above.

Therefore, this process will be easier than creating an e-book from scratch since we already have completed text, and most of that can be copied and pasted directly into the software for the e-book.

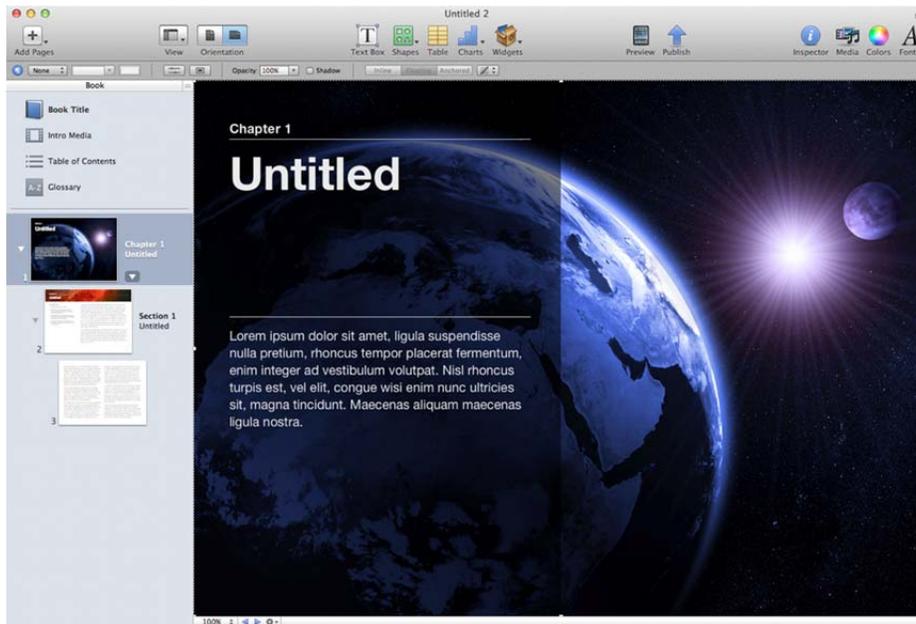
COPYING THE TEXT

So, since we are just copying text, we can start putting the text into the e-book, right? WRONG! While the text is ready to go, the outline is all set up, and the computer ready to go to work, iBooks Author first has to be told what layout that you want. Several templates come up automatically when you launch the software, or you can choose to create your own. The templates do make it easier in the short run in getting a paper quickly in there, but it can cause copious time loss in trying to change the formatting to match what you really want.

For me, it was easier to select a template, so I chose the contemporary template. When I do this, I see the following view:

This report is released to inform interested parties of (ongoing) research and to encourage discussion (of work in progress). Any views expressed on (statistical, methodological, technical, or operational) issues are those of the author(s) and not necessarily those of the U.S. Census Bureau.

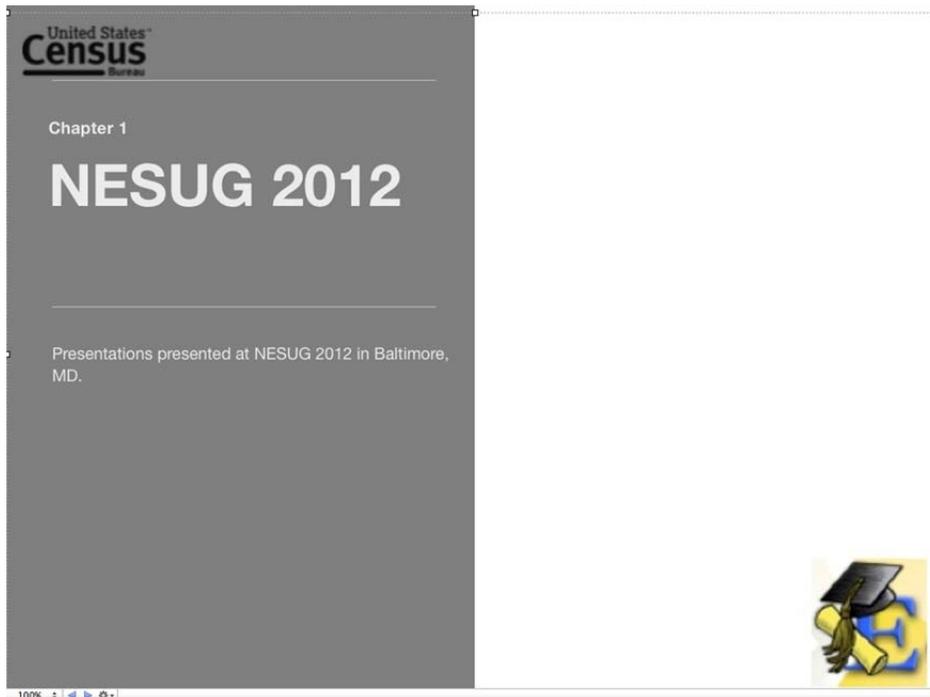
Fig. 1



I set up the title page and that was all the upfront programming that I had to do. While I was going to make each paper its own chapter, I decided that it flowed better organized by conference, in this case, NESUG 2010 and NESUG 2012. It was also easier to copy the text in blocks to ensure that the pictures and reviews were placed correctly.

While the background picture of the earth looks very pretty, iBooks Author does not match up with the subject matter at hand. I simply drag a picture over this new picture in order to create a background using the Census Bureau template developed for another e-learning project. I type in my title and chapter description and I am finally ready to copy in my text.

Fig. 2



For the most part, copy and paste functionality works very well to bring in my text. However, it does not always keep source formatting when using copy and paste, and my Mac did not have any SAS fonts available. This can create minor problems that have two workarounds. First, I could change the font types manually in iBooks Author. Otherwise, I could take a screenshot and drop the picture into the e-book. I preferred taking the screenshot, but I put in a manual copy and paste on page three of the e-textbook.

WIDGETS

iBooks Author has interactive objects called widgets that can be placed in an e-book. These widgets are superior to objects that can be placed in documents as they are integrative, allowing the user to try things out or delve deeper in order to learn how a process works. The following screen appears when clicking on the Widgets tool:

Fig. 3



These widgets can be added at any time within the e-book. While I will talk about each one briefly here, most widgets are used at some point in the presentation.

- **Gallery:** Unlike a photo object, which only allows one photo to appear, the gallery allows multiple photos to be seen by allowing the user to swipe across the widget. See pages #6-7 for an example.
- **Media:** Put video into your presentation, such as by demonstrating difficult techniques that are difficult to write.
- **Review:** Have review questions at different points of the e-book to test comprehension and use adult learning principles to reinforce teaching that is being done. See page #4 for an example.
- **Keynote:** This excellent feature allows an entire Keynote (PowerPoint for Mac) to be placed in the book. As this paper is using content from NESUG presentations, my PowerPoint presentations are placed directly in the e-book. See page #7 for an example.
- **Interactive image:** This creates an image with helpful captions that allow the user to more fully explore an image. This is great for GUI displays. See page #7 for an example.
- **3D:** This allows use of COLLADA files (.dae) to place a 3D image in the e-book. While it is an interesting widget to use, not many SAS functions use 3D imagery.
- **Scrolling Sidebar:** This allows the use of a vertical sidebar to be used, allowing more information or a larger picture to be placed on the page. See page # for more information.
- **Pop-Over:** This allows an image to act as a trigger, when selected showing additional text. See page # for more information.
- **HTML:** Put HTML forms and pages in here. While SAS/AF[®] is used in this paper, it is not a supported format for this widget.

REALLY COPYING THE TEXT

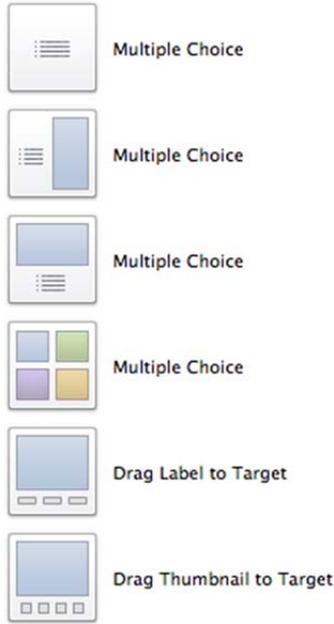
I copied and pasted the first portion of my text into the e-book. Sometimes, you will get a warning that you do not have SAS fonts available, so make sure to download that font if you want to keep that font. When I pasted in my SAS code, notice how the colors were not pasted with it. If this is important, then you must format the text after pasting it.

Since the table does not copy as we did not use excel when writing the paper, I had to create a table and paste the values in the table manually. All of this brings us to our first widget!

The Review Widget can be placed anywhere, and is a great way to check comprehension and help the reader focus on what is important to you, as the author. For a Coder's Corner paper, a comprehension check is overkill, but it is important to note that this is not a graded quiz, but a quick check. If an answer is missed, the reader can still try again. Unfortunately, feedback cannot be given upon incorrect answers at this time.

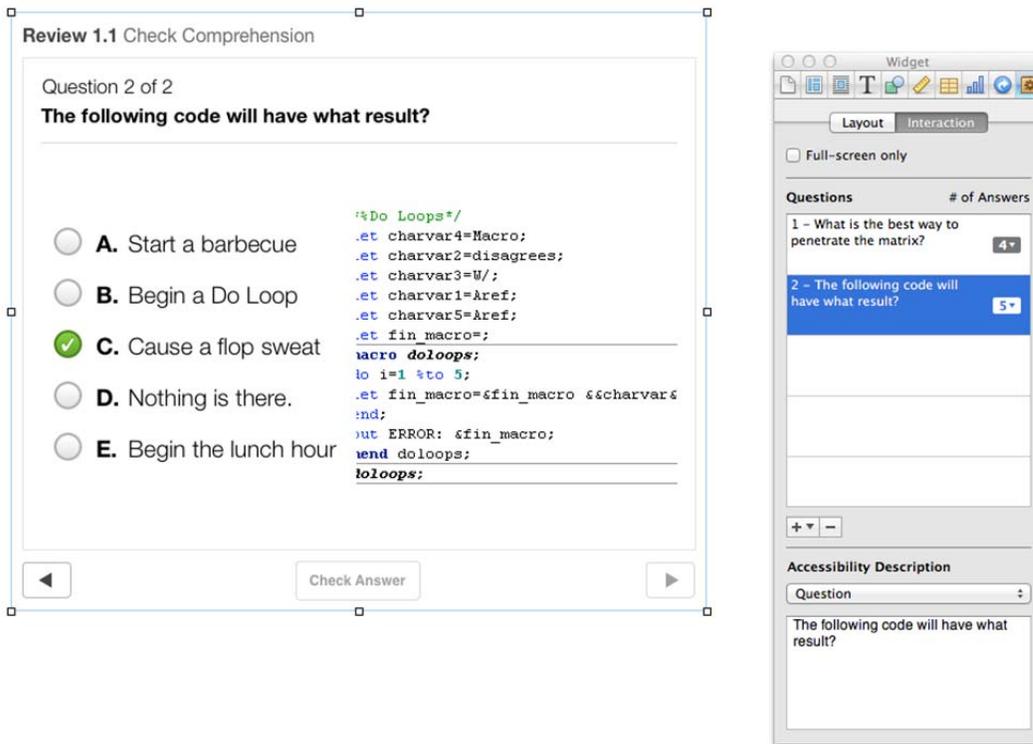
The following question types are available:

Fig. 4



The big blank spaces on the question types are images. These images can be used to allow readers to see some picture and match the correct answer to it. For example, a picture of my code was used in one of my questions. This permitted me to allow readers to see the formatting, but also to give me the room necessary to ask the question. The image in iBooks Author looked like figure 5:

Fig.5



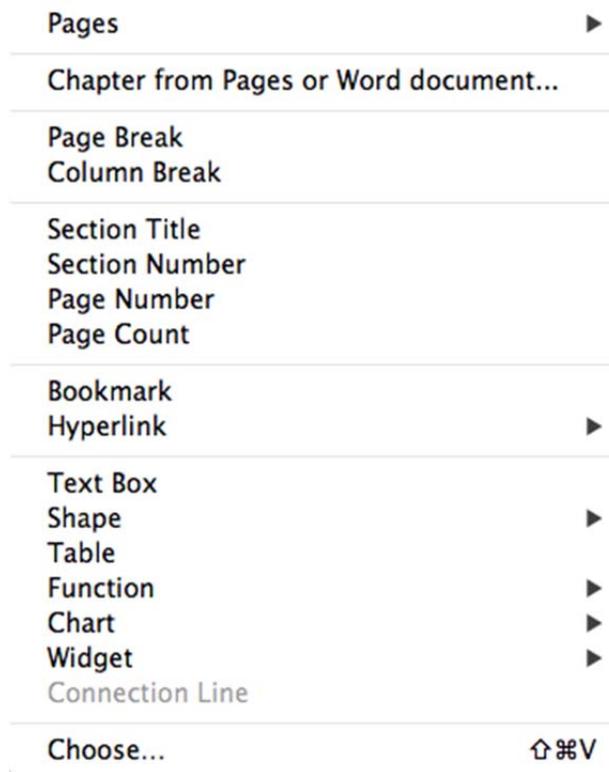
Notice that an editor pops up to help us see the full picture of the widget. That editor shows us which questions have been asked, and the question highlighted is the one currently being edited. However, the picture size can also cause problems. The image does not allow zoom, so in the current example, some of our lettering is not visible. Also, iBooks Author does not know the correct answer, so it will accept an incorrect answer, as shown above. Another problem illustrated by figure 5 is that the zoom function can cause problems with the picture, and as such, does not accurately capture the necessary view.

AN EASIER WAY

While manually cutting and pasting was able to get the job done, there is an easier solution. On the insert menu, we are able to insert chapters or sections directly from Word or Pages documents. This is an easier and faster way to bring in graphics and options, but some other problems can occur.

This method gives the user the most control over the formatting and layout of the e-book. However, there is an easier way to bring the information in and keep the formatting that we lose through copy and paste. There is an insert function to add chapters or sections into iBooks Author that keeps formatting much better than adding the documentation in yourself. When selecting insert, figure 6 appears:

Fig. 6



By selecting that option to insert a section into our e-book, it automatically adds everything. However, it went a little strange on the spacing, at which point I had to go in and clean up what had been done. The view from this work looked like figure 7. The left column has been corrected while the right column has been left as formatted:

Fig. 7

Table 2

Minimum Information Criterion

| Lags | MA 1 | MA 2 | MA 3 | MA 4 | MA 5 | MA 6 | MA 7 |
|------|----------|----------|----------|----------|----------|----------|----------|
| AR 2 | -8.88938 | -8.87657 | -8.89979 | -8.88173 | -8.86487 | -8.84228 | -8.84288 |
| AR 3 | -8.94442 | -8.92118 | -8.90444 | -8.89207 | -8.86915 | -8.86154 | -8.86481 |
| AR 4 | -8.92167 | -8.89854 | -8.88296 | -8.87913 | -8.85824 | -8.84391 | -8.84388 |
| AR 5 | -8.89854 | -8.87564 | -8.86011 | -8.85737 | -8.83558 | -8.82066 | -8.82182 |
| AR 6 | -8.87571 | -8.85268 | -8.84426 | -8.83715 | -8.81434 | -8.81242 | -8.80423 |
| AR 7 | -8.89687 | -8.87379 | -8.85815 | -8.83566 | -8.81606 | -8.80399 | -8.78121 |

By observation, we can see that the minimum of this matrix is the value -8.94442, which we've highlighted in Table 2, corresponding to the AR 3 and MA 1 location. Therefore, we want our macro variables to be $p = 3$ and $q = 1$.

Our first solution was to make a dataset for each column, calculate the minimum in each dataset using PROC MEANS, and keep the column with the minimum of the minimums. Then we'd loop through that dataset and note the row for which the minimum occurred. This was a slow process for the simple matrix we were using and it would be even slower using matrices with many more rows and columns.

Our second solution was to use PROC IML. We read in the `MINICDATA` dataset, and looped through the rows (i) and columns (j), telling SAS to store i and j where the matrix entry was the minimum. PROC IML is different from other PROCs, as it does not use the data or set statements in the DATA step. While the use statement is like the set statement, no columns are read into IML unless the read statement is used. We use the "read all into" command to bring in the `MINICDATA` dataset into IML as a matrix. We need to tell PROC IML the name of the rows and columns. The matrix name is `rowmat`, with the observations becoming the `rowname` and the variables being listed as starting with the string `ma`.

```
proc iml;
use minidata;
read all into rowmat[ROWNAME=rowname COLNAME=ma_];

Next, we get the number of rows and columns. These values will be used in the DO loops to loop over the rows and columns. We also calculate the minimum of the matrix here. Note that calculating the minimum outside the DO loops is more efficient than calculating the minimum inside the DO loops because we only need to calculate it once, not repeatedly.

nrow=nrow(rowmat);
ncol=ncol(rowmat);
minmatrix=min(rowmat);

Below are the DO loops. Here we store the values of  $i$  and  $j$  to macro variables if that  $(i,j)$  location holds the minimum identified above. The print option is not required in this step, but it is useful to confirm that the matrix was created correctly. Printing the nrow and ncol confirms that we have the correct number of rows and columns in the matrix, giving us a further check that the data was created properly.

print rowmat nrow ncol;
do i=1 to nrow;
do j=1 to ncol;
if rowmat[i,j]=minmatrix then call symput('i',left(char(i)));
```

11

As I found out, the table came out in a very uniform format, which makes it difficult to read. Additionally, all SAS code was double-spaced for some reason. The paragraph spacing was also large, so I proceeded to put more information on the page. However, this might be too much information on an iPad screen, so remember to double check on the iPad itself before finalizing any spacing options.

In chapter 1, Section 1 on the e-textbook is my manually cutting and pasting example, while section 2 is allowing iBooks Author to put the section in by itself. It was much easier to allow iBooks Author to add in the information, and then go back to tweak those items I wanted to change.

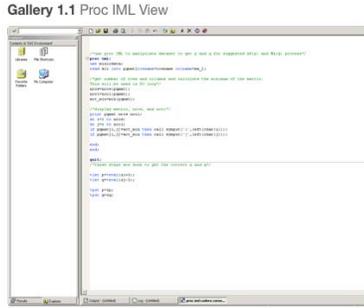
WIDGETS FOR ALL!

When we put in our text, it reads like a PDF. While a PDF is a great tool, it lacks many of the interactive features found in today's multimedia. The iBooks app allows users to download PDFs, which means that users can just download the paper from LexJanson or the NESUG site. Why go to the trouble to make an e-book?

As discussed earlier, widgets bring a new level of interactivity to the paper. The Review widget, mentioned earlier, is just one example. The first widget I used in my paper is the Photo Gallery. The Photo Gallery is a great widget that allows me to put multiple photos in one space. For example, when writing my paper, I left out the log and truncated the output because they took up too much space. With Photo Gallery, when I put in the program editor, I was also able to put in my log and output windows, all in the space of just one picture.

When the reader sees the widget in the iBooks app, instead of seeing just one picture, they will see that the photo can be swiped. When the photo changes, the description underneath the photo changes as well. The photo gallery is great for SAS textbooks as well since SAS usually has at least three parts, program editor, log, and output window. The photo gallery can combine all of those things and uses the same space as the program editor used previously. Figures 8-10 show the three images that are combined into one space. What is great about this method is that the text at the bottom can change when swiping between the pictures.

Fig. 8



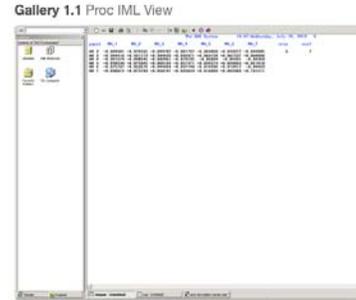
The Program Editor shows the Proc IML Program. Swipe the image to see the Log and Output windows.

Fig. 9



The Log shows what messages you can expect to see. Swipe left to see the Program Editor, and right to see the Output Window.

Fig. 10



The Output window shows the results we can expect to see. Swipe left to see the Log and Program Editor windows.

The next widget I used is the Keynote widget. When creating my paper for NESUG, I have to prepare a PowerPoint presentation to present at the conference. With a PDF, I cannot include that presentation. With the Keynote widget, I can take PowerPoint slides and save them as Keynote slides. Once they are saved in Keynote format, they can be put into the e-book. While the reader can only go forward through the slides, it is an excellent tool that allows the author to put all materials into one place. However, as an interactive image, the image can take up the entire screen and as such, the full functionality of the Keynote widget is unlocked, allowing the slides to progress forward when swiping right, and backwards when swiping left.

The final widget used in the e-book is the interactive image. The interactive widget is just like a regular picture, but information can be included in the picture. This picture allows the reader to zoom in on specific areas and includes definitions about specific parts of the picture. Figure 11 shows how the regular image appears. Figure 12 shows how the interactive image appears, and figure 13 shows what the interactive view of that image looks like when the user selects "Pushbutton".

Fig. 11

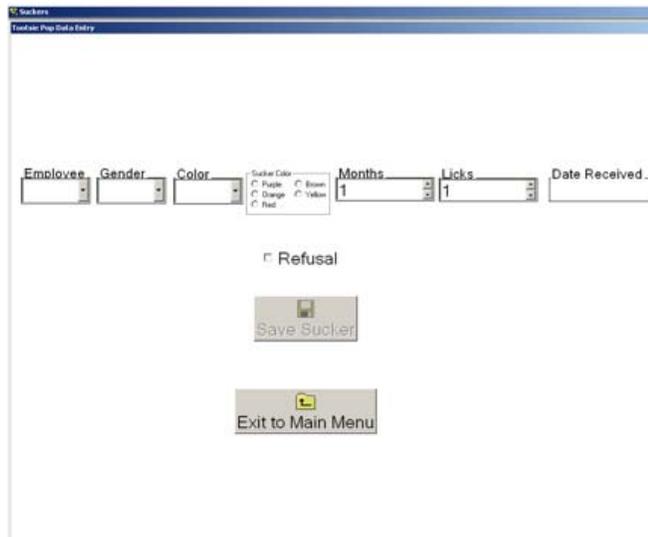


Fig. 12

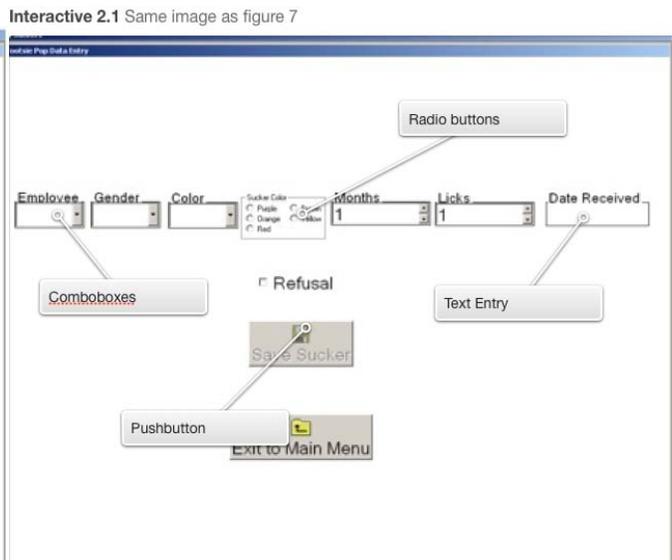
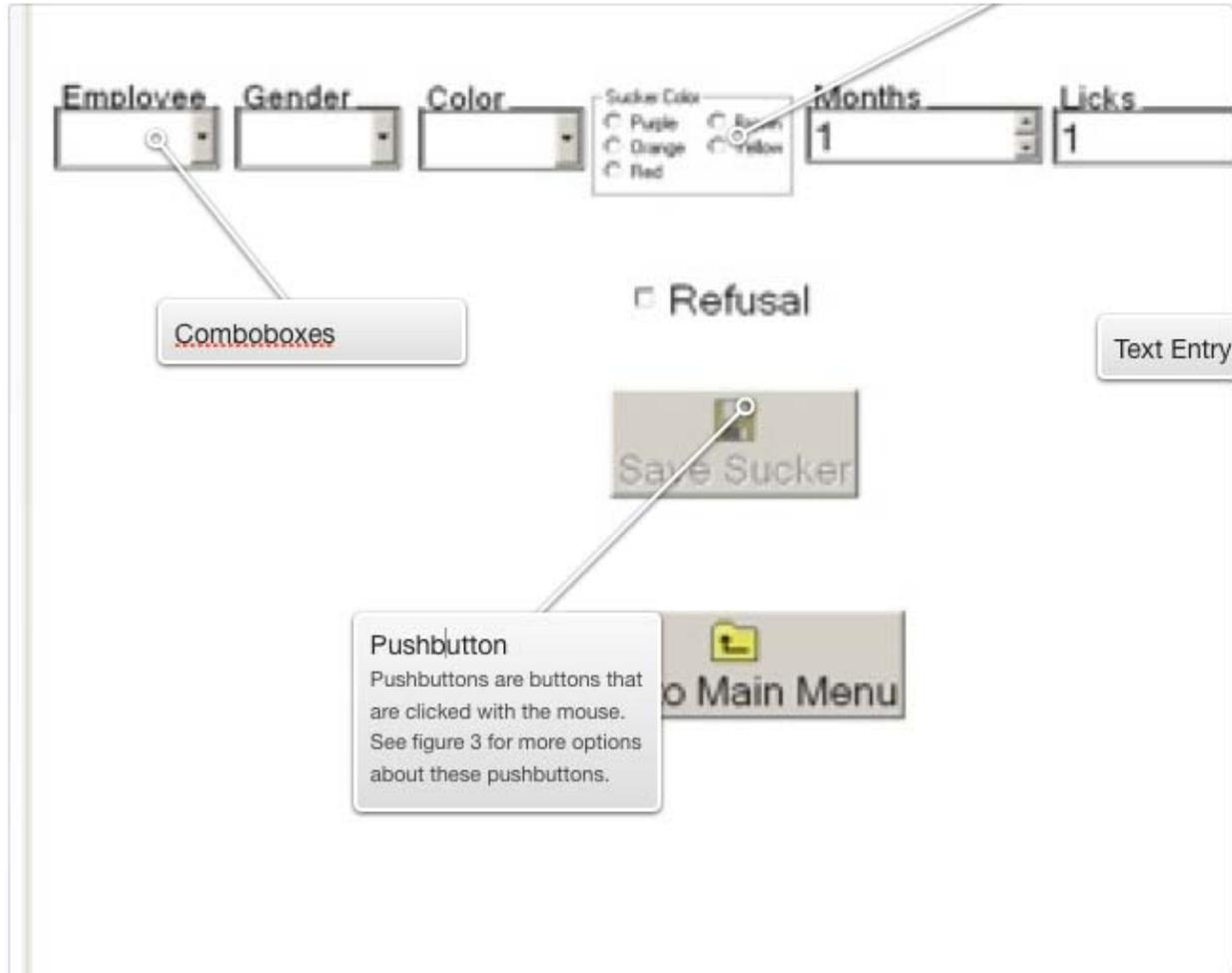


Fig. 13

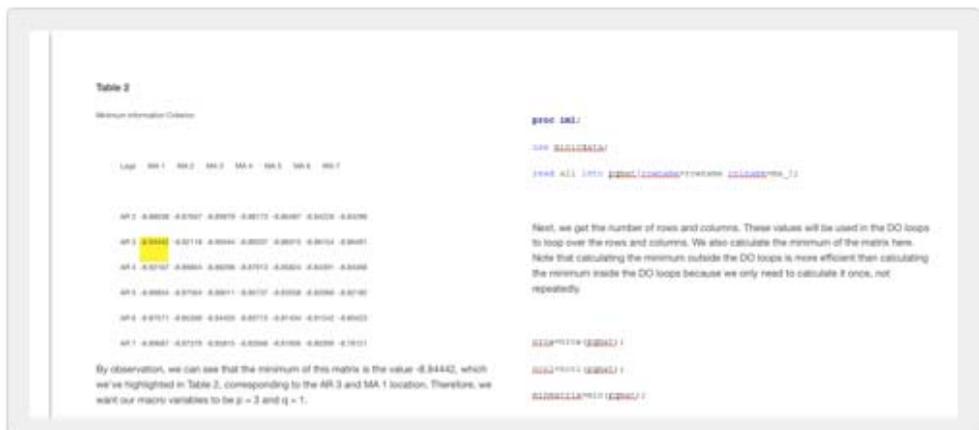
Interactive 2.1 Same image as figure 7



The opportunities for training with this widget abound. On the iPad, the reader can even enlarge the screen of the widget to full screen. I connected my iPad with an HDMI adapter and showed the screen of the iPad using a projector or TV. Once a book is published, if those slides are included, anyone can give that same presentation anywhere with their own mobile media. This option is not recommended for those users who profit from their presentations.

The last two widgets demonstrated here are new to iBooks Author 2.0, released in October 2012. The scrolling sidebar widget allows for large pictures or text to be viewed. This is a great way to have large amounts of information available on a single page. I usually use this widget for large images that would take up too much space on the page. Figure 14 is the same as figure 7, but only takes up half the page in the e-book.

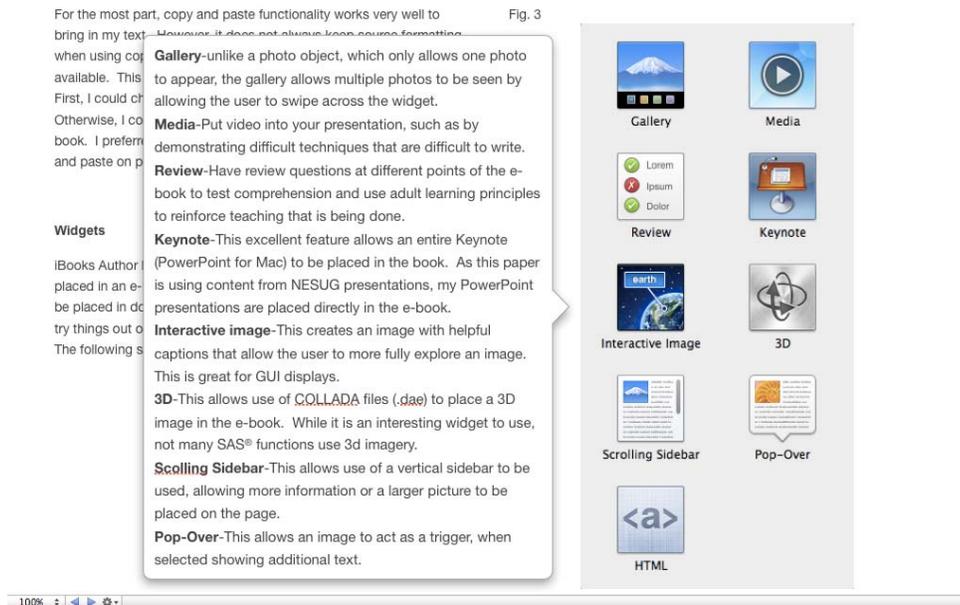
Fig. 14



The last widget shown here is the Pop-Over widget, which is a useful tool that allows an image to act as a trigger for a text explanation. This widget saves space and gives the reader the option to see the additional

information or choose not to. Figure 15 shows what the view would look like in the e-book. Notice how this compares to page 3.

Fig. 15



PUBLISH THE EBOOK

When the e-book has reached its finished product, it is time to publish. While an entire paper could be dedicated to just this one phase, I will give a brief summation on the process here.

First, I would like to mention that the e-book does not have to be published. It can be saved in draft format on individual mobile devices. Those devices have to be connected via dock, and then iBooks Author needs to preview the e-book. This technique would only work with a small, localized group.

Second, publishing does carry inherent risks with problems of copyrights and intellectual property. There are multiple pages, some of which will be shown in this paper. If you are interested in creating paid e-books, then there are even more documents to sign.

Therefore, in iBooks Author, I have finished my entire e-book.

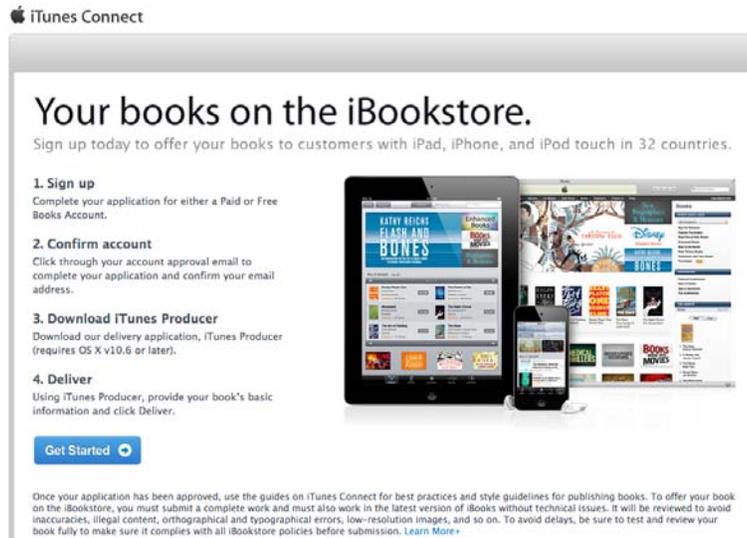
How do I get it into wide distribution? In the file menu, there is an option called Publish. This exports the e-book into the .ibooks format, which is ready to be published. When this is completed, the following image appears:

As figure 16 shows, in order to produce an e-book, the user needs an iTunes Connect account and iTunes Producer. iTunes Connect is an account within iTunes that allows iTunes accounts to be matched with authors. Essentially, it is the account used to upload content into the iTunes library.

When creating an account, this image appears:



Fig. 17



Before anything can be done, this account needs to be set up. It really is exciting to be producing content that can be viewed by everyone in the world. At the same time, it is a little nerve-wracking to be producing content that can be viewed by everyone in the world. At this point, going through all of these forms and documents while getting ready to publish was grating. I would recommend setting all of this up at the beginning, taking my time to go through all the forms that are required. This iTunes Connect account only needs to be set up once, and of everything, it is the easiest to set up if the author already has an iTunes account. If the author has a Mac, more than likely that person has an iTunes account. The iTunes Connect account ties into the regular iTunes account.

The type of account also depends on what kind of e-book the author is producing. If the author wants a

paid account, which means that the e-books may or may not be free, then a paid account needs to be set up. Otherwise, if the author never intends to charge for e-books, then it is best to sign up for the free account. According to online posts, however, once an author signs up for a free account, they cannot change that into a paid account. (<http://www.apple.com/itunes/content-providers/book-faq.html>)

iTunes Producer is software that is geared for delivering the package into iTunes Connect. There are many required fields that must have information in order to publish the book. The biggest field I missed was the book description, which takes up the entire right side of the screen. One problem I ran into, though, was that the book cover art had to take up a large amount of the screen, which was larger than any pictures I had available. An error report was generated when I tried to develop my e-book, which was very helpful to identify which problems were occurring.

PUBLISHING IS A PROBLEM

Publishing goes through a review process at Apple. When adding my content through iTunes Producer, I received the following e-mail:

Please fix the following problem(s) before attempting to re-upload your e-book file: 1. Book uses generic placeholder images from iBook Author. Please replace images with your own original images. 2. Some Font sizes used are too small for many to read easily on iPad, see pg. 26 for example. 3. Some illustrations are too small to be read properly, see Fig 2 pg. 25 for example. 4. pg. 39 is unrelated to the book and appears as left over content from a test version of the book.

I will continue to work with Apple in order to publish the e-book, and it will be interesting to find out what hurdles need to be overcome to publish with them. While I bring this up, it is to mention that Apple has specific standards for publishing, and those standards must be met in order to publish at Apple's iBookstore. I later found out that iBooks Author was not updating the publication file correctly.

WARNINGS

So, who should be using this software? Apple gives some warnings, mentioned before, that need to be reiterated. First, if you want to charge for an e-book, then copyright issues abound. In addition, Apple claims all intellectual property, so do NOT include proprietary information or processes in your e-book. If you have a paid account, then additional copyright issues might occur. Just a quick warning to read all of the agreements that Apple requires in the publication phase.

CONCLUSION

iBooks Author is a great reference tool that can either be used locally on the author's mobile media or published on the Apple iBookstore. This tool allows interactive additions to SAS papers, which allows better learning of subject material. Even better, it allocates space better than traditional papers, allowing more information to be placed in the e-book and the reader to decide which info they want to see. While the e-books created are for individual mobile media, those devices can be connected to projectors or TVs and allow for group learning just as easily. This method allows authors to be able to contribute to the learning experience throughout the world, allowing SAS users everywhere to freely share knowledge.

REFERENCES

Smith, Justin Z. "Penetrating the Matrix". Published Nov. 2012 by NESUG.

Zupko, William "Gui" Edward II. "Using Simple Code to Enter Complex Data from the DATA Step to SAS/AF®". Published Nov. 2010 by NESUG.

ACKNOWLEDGEMENTS

I would like to thank the U.S. Census Bureau and SAS for this opportunity to write and present this paper. I would also like to thank Jan Lattimore and Dianne Rhodes, as well as Christian Burkhart for a previous version, at the U.S. Census Bureau, who took time to edit and check this paper to make sure that it was factually and grammatically sound.

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