Using the Internet Effectively to Teach Mathematics:
Advice, Recommendations, Examples, and Things You Should Know

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Introduction

Goals

- Provide a sampler of the types of things I have done in my classes.
- Provide some information and resources.
- Indoctrinate you with some of my opinions about the way things ought to be

Note: All the material from this talk will be available online via my home page: http://www.calvin.edu/rpruim/ or via the Michigan NExT web page.
Chapter 1

Using Existing Stuff

1.1 Get to Know Your Support Staff

Find out

- who gets things done
- who knows what
- who really makes the decisions

These are the people who will bail you out when you get in trouble, find hardware for you when you need it, and answer all manner of questions about local peculiarities. Treat them well.

1.2 You Can’t Do It All

There is a ton of stuff to learn about using the internet, but since your main job is mathematics, not web administration, you probably don’t have the time and resources to learn everything you wish you knew.

1.3 You Don’t Need to Do It All

There is a lot of material already available for you to use. All you have to do is find it.
CHAPTER 1. USING EXISTING STUFF

Get a Little Help from Your Friends

Ask around. Find out who knows where the good stuff is.

Two large sites with mathematics resources:

- The Mathematics Archives\(^1\)
- The Math Forum\(^2\)

Use Google!

If you have never tried Google\(^3\), give it a try. I have found it to be the most useful of the search engines I have tried.

Give a Little Help to Your Friends (and Others)

If you are getting help from others, it is only fair that you return the favor.

- Tell your friends
- Better yet, tell the World (wide web)
  - Build web pages that list your favorite sites. Organize and annotate them so that they are useful to others. (Example: my web resources page\(^4\))
  - Brown Dot Web Page\(^5\) provides an automated means for sharing your web finds.

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\(^1\)http://archives.math.utk.edu/
\(^2\)http://forum.swarthmore.edu/
\(^3\)http://www.google.it/
\(^4\)http://www.cavlin.edu/~rpruim/courses/materials/
\(^5\)http://www.calvin.edu/~rpruim/next/
Chapter 2

Making Your Own Web Materials

2.1 Keep it Simple

The One Idea Rule:
A good applet it is one that presents only one main idea, but does so clearly.
David Austin\textsuperscript{1} is working on a package of Java routines that can be used to make Java applets for demonstrating mathematical ideas.

- Calculus Demonstrations\textsuperscript{2}
- Java gallery\textsuperscript{3}

2.1.1 Form should serve content

Look for web pages where the form serves to make the content clearer, not where the form is in the way of the content.

Examples

- My Home Page\textsuperscript{4} – an example?

\textsuperscript{1}http://merganser.math.gvsu.edu/david/
\textsuperscript{2}http://merganser.math.gvsu.edu/calculus/index.html
\textsuperscript{3}http://merganser.math.gvsu.edu/david/javagallery/index.html
\textsuperscript{4}http://www.cavlin.edu/~rprum/
Two Turing Machine examples

- A Turing Machine Simulator\(^5\) that spent too much time on graphics
- Another Turing Machine Simulator\(^6\) that is less involved graphically, but more useful.

Two Long Division Examples

- I found this one\(^7\) using Google.
- I wrote this one\(^8\) to show why all rationals have repeating decimal expansions

2.2 Remember Your Audience(s)

Your Students

Your Colleagues

- Document your stuff so others know how to use/modify it
- Provide source
- Use Meta tags to help search engines find you
- Post your stuff on sites where others will find it

Random People

- An email\(^9\) from a student
- The course home page\(^10\) he refers to

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\(^5\) http://sunsite.utk.edu/winners_circle/education/EDUHMO1H/applet.html
\(^6\) http://www.igs.net/~triil/tm/
\(^7\) http://barnyard.syr.edu/longdiv.html
\(^8\) /rpruim/courses/m100/S01/overheads/division.shtml
\(^9\) ./dearSir.html
\(^10\) http://www.cavlin.edu/~rpruim/courses/bucs113/F97
2.3 Check Out a TeX to HTML converter

If you are doing mathematics, you probably know TeX. There are several programs that convert (La)TeX to HTML.

Two that I have used

- TTH (Tex To HTML)
- latex2html

You’re soaking in it!

To get some idea of how they work, I wrote this presentation in LaTeX and converted it. You can view this presentation in several forms:

- TTH
- latex2html
- pdf

Some more examples

- Flatland reading questions
- This calculus review sheet shows some of the problems with tth.

2.4 Learn Some HTML

Even if you primarily use a high level software package to create documents or a package like WebCT or BlackBoard to make things available to your students, knowing a little HTML is worth the effort.

11http://hutchinson.belmont.ma.us/tth/
12http://saftsack.fs.uni-bayreuth.de/~latex2ht/
13.../michnext2001.html
14.../michnext2001/
15.../michnext2001.pdf
16http://www.cavlin.edu/~rpruim/courses/m100/S01/hw/Flatland.html
17http://www.cavlin.edu/~rpruim/courses/m161/F00/test-info/test01_review.shtml
CHAPTER 2. MAKING YOUR OWN WEB MATERIALS

Places to Get a Quick Introduction to HTML

One of the best ways to learn HTML is to use the "View Source" option on your browser to see how other people have done things you like. Here are some additional references (some are a bit dated, so perhaps better sites exist now.)

- Bare Bones Guide to HTML\textsuperscript{18}
- Introduction to HTML documentation\textsuperscript{19}
- WWW Viewer Test Page\textsuperscript{20}
- How do they do that with HTML?\textsuperscript{21}
- Tips for Writers and Designers\textsuperscript{22}
- Advanced HTML\textsuperscript{23}

How to Borrow a Java Applet

Everyone loves a good Java applet. But what if you find a great Java applet surrounded by a poor, misleading, insufficient or non-existent description? What if you want to put the applet into a different context?

Answer: Borrow the Applet!

Here is an example\textsuperscript{24} (A 4d polytope drawer.)

How to Borrow a CGI-driven Form

Here's how I put Google on my home page.

1. View Source on the Google home page revealed the following chunk of HTML (the form):

\textsuperscript{18}http://www.access.digex.net/~werbach/barebone_table.html
\textsuperscript{19}http://www.utirc.utoronto.ca/HTMLdocs/NewHTML/\textsuperscript{20}http://www-dsed.llnl.gov/documents/WWWtest.html
\textsuperscript{21}http://www.nashville.net/~carl/htmlguide/index.html
\textsuperscript{22}http://www.dseigel.com/tips/tips_home.html
\textsuperscript{23}http://eipo.lib.utexas.edu/~jfay/welcome.html
\textsuperscript{24}../draw4d.html
2.4. LEARN SOME HTML

```
<form action="/search" method=get name=f>
<table cellspacing=0 cellpadding=0 >
<tr align=center valign=baseline>
<td width=75>&nbsp;
</td>
<td nowrap>
<font face=arial,sans-serif size=-1>Search 1,346,966,000 web pages
</font>
</td>
</tr>
</table>
<input type=text value="" framewidth=4 name=q size=55 maxlength=256>
<br>
<input name=btnG type=submit value="Google Search">
<input name=btnI type=submit value="I'm Feeling Lucky">
</form>

2. Much of this is not terribly important. What we need is the URL for the script being run (action=), and the names and values of any parameters (for example, we see that the queried string is called q).```
CHAPTER 2. MAKING YOUR OWN WEB MATERIALS

The part we need to put this on our own web page is just

```html
<form method="get"
action="http://www.google.com/search">
<input type="text" name="q" value="Calvin Mathematics">
<br>
<input type="submit" value="Google Search" name="B1">
<input type="reset" value="Clear" name="B2">
</form>
```

So a little copy and paste and a bit of editing and we have a search engine anywhere we like it.

More Examples of Borrowing

- Histogram Bin Size Demo\(^{25}\) [here is the original\(^{26}\) by Webster West]

Use Style Sheets

Style sheets allow the separation of form from content in HTML documents. Even though browsers do not support stylesheet perfectly or consistently, the basics of stylesheets are still a nice way to give your web pages a consistent look and feel while making it easy to change the appearance on any number of web pages by making changes only in the style sheet file (.css).

To find out more about cascading style sheets or other more advanced HTML topics, visit one of these sites:

- Advanced HTML\(^{27}\)
- Cascading Style Sheets Quick Reference\(^{28}\)
- Style Sheet Validator\(^{29}\)
- W3C\(^{30}\) (WWW Consortium)

\(^{25}\)http://www.cavlin.edu/~rpruim/courses/materials/stats/demos/histogram.shtml
\(^{26}\)http://www.stat.sc.edu/~west/javahtml/Histogram.html
\(^{27}\)http://eipo.lib.utexas.edu/~jfay/welcome.html
\(^{28}\)http://www.cwi.nl/~steven/www/css1-qr.html
\(^{29}\)http://jigsaw.w3.org/css-validator/
\(^{30}\)http://www.w3.org/
2.5. THESE ARE A FEW OF MY FAVORITE THINGS

- HTML Validator\(^{31}\)
- HTML Tidy\(^{32}\) (cleans up sloppy html)
- CGI 101 Tutorial\(^{33}\)
- CGI Resource Index\(^{34}\)
- CGI.pm library\(^{35}\) (perl)
- Use Fore Site\(^{36}\) (good source of tutorials)
- Big Nose Bird\(^{37}\) (another good source of tutorials)
- Animated GIFS from Harry the Cat\(^{38}\)

Don’t Ever Use Frames (well, hardly ever)

Perhaps this is just a personal preference, but I strongly suggest avoiding the use of frames.

2.5 These Are a Few of My Favorite Things

To end, let me put together a few of my favorite mathematical web resources.

- Info Sheet\(^{39}\): I used to tape small photos of my students to their info sheets, now I let a web form generate the info sheet with the picture already there.

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\(^{31}\)http://validator.w3.org/
\(^{32}\)http://www.w3.org/People/Raggett/tidy/
\(^{33}\)http://www.cgi101.com/class/
\(^{34}\)http://cgi.resourceindex.com/Documentation/
\(^{35}\)http://www-genome.wi.mit.edu/ftp/pub/software/WWW/cgi_docs.html
\(^{36}\)http://www.useforsite.com/
\(^{37}\)http://www.bignosebird.com/
\(^{38}\)http://www.harrythecat.com/graphics/
\(^{39}\)http://www.calvin.edu/~rpruim/courses/m100/S01/hw/info.shtml
CHAPTER 2. MAKING YOUR OWN WEB MATERIALS

- *Language, Proof and Logic*\(^{40}\) by Barwise and Etchemendy comes with some very nice accompanying software that uses the internet to do electronic grading and grade reporting.

Unfortunately this is not completely platform independent yet, so you can’t run the software over the web, but here are some screen shots:

- Tarski’s World\(^{41}\) lets students build models and explore logical consequence in first order logic. The language uses blocks of different sizes, shapes and locations.

- There is also software the allows students to make formal proofs and to build truth tables.

- Students can submit solutions to homework problems and get email back indicating if the problems are correct. When they are ready, they can have a grade report sent to the instructor. Here is an example report\(^{42}\).

- WebStat\(^{43}\): a reasonably well-featured statistical package presented as a java applet. Especially handy for Chi-square calculations (because they don’t require much data entry).

- Data collection form\(^{44}\) for Intro Stats course: Ever wish you could collect a bunch of data from your students without having to enter it all into the computer yourself? Let them each enter their own online.

- Normal Distributions Demo\(^{45}\) from *Seeing Through Statistics*: This applet tries to give students a better feel for normal distributions and \(z\)-scores. The interface is very intuitive and simple.

- Golfballs in the Yard\(^{46}\): Some day I would like to use Java to improve the display of this interactive demo, but I like the ideas behind it a lot and have used the current version successfully in classes.

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\(^{40}\)http://www-csli.stanford.edu/hp/LPL.html
\(^{41}\)http://www-csli.stanford.edu/hp/Tarski1.html
\(^{42}\)http://pl-report.txt
\(^{43}\)http://www.stat.sc.edu/webstat/
\(^{44}\)http://www.cavin.edu/~rpruim/courses/m143/F00/data/survey01.shtml
\(^{45}\)http://psych.colorado.edu/~mcclella/java/normal/handleNormal.html
\(^{46}\)http://www.cavin.edu/~rpruim/courses/materials/stats/demos/golfballs.shtml
2.5. **THESE ARE A FEW OF MY FAVORITE THINGS**

- ANOVA lecture\(^{47}\): Here is an example of turning a PowerPoint presentation into a web presentation. I used the PowerPoint slides in class and gave the students access to the web version (and the PowerPoint version) via the course web page.

- Statistical Slogans\(^{48}\): This is an example of what I call a web overhead. Nothing very fancy, but it works as well or better than an overhead, is easily modified, and can be accessed by the students anytime.

- Correlation Guessing Game\(^{49}\)

\(^{47}\) [http://www.cavlin.edu/~rpruim/courses/m143/F00/overheads/ANOVAf00/]  
\(^{48}\) [http://www.stat.uiuc.edu/~stat100/java/GCApplet/GCAppletFrame.html]  
\(^{49}\) [http://www.stat.uiuc.edu/~stat100/java/GCApplet/GCAppletFrame.html]