The power of the browser:

embedding Desmos and other content

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Chapter 1

Introduction

This content was made as part of the University of Bath "Creating Accessible Online resources" bookdown away day 2022.

The aim is to:

- cover the how, why and pitfalls with embedded content
- introduce the Desmos graphing calculator.

Chapter 2

Why embed content?

2.1 Why include "media"?

The benefits of the web (over a static document) are:

- access to up to date information
- adding external image/video sources without worrying about copyright
- **interactive** widgets can support the flow of learning, assessment for learning, exploration, etc

I'll talk about the downsides later...

Chapter 3

How? | Embedding content

3.1 The gitbook format is a fully functioning website!

You can include:

- links
- image/video embeds
- webpage/webapp embeds (e.g. twitter feed, desmos graphical calculator)
- inline html, javascript, css with `<tags>` (e.g. `<p>Markup you markdown!<\p>`)

3.2 Adding links

Links:

- are simple
- work in all formats (including PDF)
- give students control over accessing resource

Accessibility tips for links:

- use descriptive links where possible (e.g. Join the bookdown usergroup instead of https://teams.microsoft.com/l/team/19%3a...)
- don't force users to open links in new tab/window

3.3 Adding images from the web

Educational Exceptions: you can use copyrighted images (e.g. figure from journal)

in your lecture notes if:

1. it is for internal student use
2. it directly illustrates the content

It can be useful to point to an image on the web if you:

- host publicly (e.g. github)
- use cat .gifs to support learning!

3.4 Adding videos

Copy and paste the embed code from *any* site - including Panopto!

Note: this Panopto video has quiz questions as you play through it!

3.5 Embedding other web content

- Desmos graphing calculator
- Xerte (see quiz example)
- Microsoft Forms (general polls don't show the results to student, but quiz allows you to give individuals instant feedback after all question have been submitted)
- Mentimeter results slides (this is NOT for voting as audience paced voting slides don't show the results)
- Twitter feed
- A webpage (*tread carefully*)

Chapter 4

Desmos | a simple & interactive graphing calculator

4.1 Desmos graphing calculator

View Damped Harmonic Oscillator

View Travelling and standing wave plot

4.2 Desmos at a glance

Why use Desmos?

- *Interactive* - students can play with parameters
- Fast to create (+ easy animation)
- Digitally Accessible
- Free

Plotting in desmos

- 2D Cartesian/polar coordinates
- Domain/range restrictions/piecewise functions,
- Shade area with inequalities, Differentiation, ...
- Paste tabular data from clipboard (1000 points) and fit

4.3 Making plots in Desmos

1. Sign up for a free account on Desmos
2. Create graph (see Graphing Calculator: Essential Skills)
3. Copy embed code

Desmos Tips

- Add points on graph for quick sliders in the embed

4.4 How to embed a Desmos graph

1. Get the embed code from Desmos
2. Paste in embed code to .Rmd file
3. Change some embed code parameters
   - `width="100%"`
   - `height="500px"` (even 600px is probably ok even for iphone)
4. Add a direct link (fallback for PDF and the *edit on desmos* button doesn't display on mobile)

4.5 Adding a Desmos embed as a figure

Same as a "normal" bookdown figure but instead of `knitr::include_graphics()` use `knitr::include_url(URL)`

Example

View Travelling and standing wave plot. Upper: two identical but counter-propogating travelling waves will result in a standing wave below.

Bookdown Source

{r echo=FALSE, wavesanim , out.width='70%', fig.show='hold', fig.cap="View Travelling and standing wave plot. Upper: two identical but counter-propogating travelling waves will result in a standing wave below."} knitr::include_url("https://www.desmos.com/calculator/qy6jc8mfi9?embed")

Figure embed notes

- Note: the figure referencing doesn't work for in ioslides (you are unlikely to be cross-referencing anyway)

- Reference as usual with `\@ref(fig:label)` (e.g. `\@ref(fig:wavesanim)` becomes Figure 4.5)
- Captions make good places to links to graph

4.6 Desmos shortcomings

- The embed only shows the plot, but *not* the left hand panel - you have to add sliders or student visit page to view the source
- Not all Greek letters letters recognised! (Fix: Chrome/Edge addin for full Greek alphabet
- No permalinks - Desmos updates URL after each save
- Graphs are public - don't put any personal/private data there
- It's possible but generally not recommended to embed the whole calculator (see 5.1)

What about my PDFs/offline support?

If there is no connection to the internet, the iframe will *not* load.

If you compile to a PDF, nothing is displayed, which is why a link is important! Possibly, one can do something clever in R to add use an image if knit to PDF...

4.7 Take away messages

- It's easy to embed web content with bookdown
- Embeds don't work for offline/PDF use
- Desmos is free, interactive for students and easy to use: give it a try!

Chapter 5

Appendicies

5.1 Embedding the whole Desmos calculator

This is **not** generally recommended:

- if you alter a parameter, you get an annoying "do you want to leave this page" when trying to read next page
- can be a squeeze on smaller screens

5.2 General tips for iframes and bookdown

- don't have too many iframes per page (can be slow to load, take up resources)
- student interactions aren't persistent and nothing gets saved: they get reloaded by a student every time they visit a page
- Consider mobile/tablet users where the screen sizes are smaller: sometimes a link is better?
- Avoid sites with advertising or a cookie requests that distracts from the content.
- there isn't always much space, so pick simple things to embed (bookdown has comfortable margins)
- an iframe won't display for students if they're offline or viewing the PDF.

5.3 iframes and accessibility pitfalls

There are no intrinsic accessibility issues with iframes.

However

- not all iframes work nicely on mobile browsers.

- the organization of the pages may not be clear to screen readers.
- navigation (via keyboard or due to increased zoom/limited size) can be challenging.

Accessibility suggestions

- Test how it appears on your phone
- Pick shorter/simple pages or sites that generate an embed code, rather than write your own.
- Present a direct link alternative

Stock images from undraw (open source, colour-customisable images that can be used without attribution)