Levelling the playing field: student and staff experiences of a curated, self-assessed, self-paced multimedia resource

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The issue

Gaps in knowledge and skills

- Subjects assume level of knowledge or skills
- Not prerequisite or core subject content
- May have been learned previously
- Time may have elapsed since learning
- Individuals have different backgrounds and competencies

⇒ Need to level the playing field
Solution

• Need a solution that is:
  – Equitable
  – Flexible
  – Minimal ongoing effort for staff and students
Potential approaches

• Digital curation
• Adaptive scaffolding design
• Multimedia elements
• Self-assessment
• Formative quizzes
• Learning object approach

Antonio and Tuffley 2015; Chen 2014; Faridhan et al. 2013; Nagel and van Eck 2012; Bradley and Boyle 2004
Potential benefits

• Improved engagement
• Improved academic performance
• Increased motivation
• Improved learning outcomes
• Allow students to develop alternative perspectives
• Find new ways to solve problems

Anderson and Jacoby 2013; Nagel and van Eck 2012, Antonio et al. 2012; MacGregor and Lou 2004; Chen 2014
Requirements identified

- Integrate with CSU’s LMS (Blackboard)
- Reusable by academic staff
- Require little to no interaction by staff once added to subject site
- Not form part of subject assessment
- Not add significant workload for students
- Self-paced and self-scaffolded resources
SkillBox - parameters

- Topic NOT specifically assessed in subject
- Depth of topic knowledge mixed in cohort
- Topic does NOT need regular interaction with Subject Coordinator
- Topic NOT listed as assumed knowledge in Subject Outline
- Topic can be learned by most students in under 10 hours
SkillBox

• Curated online resources
  – Quality videos
  – Online tutorials
  – Additional resources
  – Small repeatable self-assessment quizzes
• Scaffolded
• Student’s own pace and own time
• < 10 hours
SkillBoxes so far

- Referencing
- Basic descriptive statistics
- Matrix calculations
- Software package R
SkillBox example

• Statistical package R and R Commander
  – What is R? Installing R, RStudio and R Commander
  – Getting started with RStudio and R Commander
  – Creating summary statistics and charts
  – Working with data and packages

• Used in 8 subject across 2 Faculties
In R Commander

Make sure the dataset is "trees", as in the section on Basic Statistics. First we will create a scatter plot of girth vs height.

Click on Graphs > Scatterplot. Under x-variable select Girth and under y-variable select Height. Click OK. A scatterplot of Girth by Height is displayed.

In RStudio

First we will create a scatter plot of girth vs height. Enter

```r
> plot(trees$Girth, trees$Height)
```

![Scatter plot of Girth vs Height](image)

We can add a title, axis labels and a least squares line with the following command:

```r
> plot(trees$Girth, trees$Height, main = "Scatter plot of Girth vs Height", xlab = "Girth", ylab = "Height")
```
Video tutorial: basic stats and basic charts

Summary Statistics in R: Mean, Standard Deviation, Frequencies, etc (R Tutorial 2.7)

User: MarinStatsLectures - Added: 10/08/13
YouTube URL: http://www.youtube.com/watch?v=ACWiV16tdhY

Learn how to produce numeric summaries for both categorical and numerical variables in R. You will learn to produce frequency and contingency tables and to calculate mean, median, variance, standard deviation and many more operations using commands such as "table", "mean", "median", "var", "sd", "summary", etc.

Histograms in R (R Tutorial 2.3)

User: MarinStatsLectures - Added: 09/08/13
YouTube URL: http://www.youtube.com/watch?v=Hj1pgap4JOY

Learn how to produce histograms in R. You will also be introduced to the histogram "hist" function.
Further resources

Continue on with Code School - Try R. Work through to Chapter 4 Summary Statistics.

Also refer to the Further Resources in the previous section.

Got it! Go to the self assessment quiz
Self assessment

QUESTION 1

In the trees dataset, what is the maximum height?

QUESTION 2

What is the range of volume in the trees dataset?

From ________ to ________

QUESTION 3

Consider the following sample of 10 data points: 3.6, 4.1, 4.6, 4.4, 4.0, 3.7, 4.0, 4.3, 3.3, 4.2

If using R Commander:

Choose Data -> New Data Set -> OK and enter the data into the first column. Then choose File -> Close -> Graphs -> Boxplot, then select the name of the variable containing the data -> Click OK.

If using RStudio:

In the Console enter

> boxplot(c(x, y, ..., z))

where x, y,...,z are the numbers given above.
Other features

• Links between sections – basic scaffolding

Got it! Go to the self assessment quiz

More explanation please! Go to the video tutorial.
Research Methodology

Subject coordinators

Pre-engagement survey

Promoted SkillBox

Post-engagement survey

Follow-up survey

Follow-up survey

Students

SkillBox

Attitude
Confidence
Knowledge

Feedback
Most / least useful
Time spent
Survey

QUESTION 1
I am confident in the topic of R

QUESTION 2
I am not interested in R

QUESTION 3
I can see the relevance of R to my degree

QUESTION 4
I think it will take me longer to understand R than the average person
## Research Participation

### Overall student access (March 2015 – July 2016)

<table>
<thead>
<tr>
<th>Enrolled in SkillBox subject</th>
<th>Accessed SkillBox</th>
<th>Completed at least 1 quiz</th>
</tr>
</thead>
<tbody>
<tr>
<td>281</td>
<td>125 (44.5%)</td>
<td>82 (29.2%)</td>
</tr>
</tbody>
</table>

### Student research participation (March 2015 – July 2016)

<table>
<thead>
<tr>
<th>Invited to participate in research</th>
<th>Completed pre-survey</th>
<th>Completed post-survey</th>
<th>Completed follow-up survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>234</td>
<td>26 (11.1%)</td>
<td>13 (5.5%)</td>
<td>4 (1.7%)</td>
</tr>
</tbody>
</table>

### Staff research participation

<table>
<thead>
<tr>
<th>Invited to participate in research</th>
<th>Completed follow-up survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3 (50%)</td>
</tr>
</tbody>
</table>

Accessed over 400 times (unique hits, duplicate students possible) since July 2016
Quantitative Results

Changes in confidence and attitude pre- and post-engagement

“"I am confident in the topic,”
“"I think it will take me longer to understand the topic than the average person,”
“"I know I can handle difficulties in the topic,”
“"I am not interested in the topic,”
“"I find the topic frightening,”
“"I think understanding the topic will be important in this subject,”
Quantitative Results

Self-reported confidence and accuracy

Average time spent using SkillBox:
3 hours 28 minutes
(40 minutes – 20 hours)
Qualitative Results

“A number of elements were useful: use of simple examples to highlight core principles, easy to access format and repeated access” (Student – Matrix SkillBox)

“I really relied on SkillBox... SkillBox provided me with all the relevant information I needed to get started with the subject and as a reference tool to return to later... It was for me at least a very valuable tool” (Student – Matrix SkillBox)

“I was very satisfied with the SkillBox experience” (Student – Matrix SkillBox)

“I liked that it was quite basic instruction” (Student – Matrix SkillBox)

“(Most useful were) the video tutorials and the quizzes offered” (Student – Descriptive Statistics SkillBox)

“Explain more what can be learned from the examples...What it teaches us” (Student – Descriptive Statistics SkillBox)

“(Need) more examples of the application / relevance ... early on” (Student – Matrix SkillBox)

“I would recommend incorporating SkillBox in as many other subjects as possible” (Student – Matrix SkillBox)

“(I would promote the use of SkillBox as) it provides engaging meaningful content which helps students get prepared for the subject” (Subject coordinator – Matrix and R SkillBoxes)
Discussion

• Lots of students used one or more SkillBoxes
• Not many participated in the research
  – Research design?
  – Students oversurveyed?
• Some started using a SkillBox then stopped
  – SkillBox unnecessary because they already possessed the skills and knowledge?
  – Or confusing or not useful?
Findings

• Increase in confidence pre- and post-engagement with SkillBox

• Correlation between confidence and accuracy of answers
  – Was confidence gained because of SkillBox content?
  – Or did students already possess confidence in and knowledge of the topic?
Findings

• Students and staff found SkillBox useful and liked the way it was structured
• No extra workload for subject coordinators
  – One way to provide rich multimedia resources with minimal time and effort
• SkillBox promotes equity for students
  – Could improve student satisfaction, retention, academic performance
Lessons learned

• Need the right support and resources to carry out SoTL research
  – Research design, survey design, improving response rates, qualitative analysis

• SoTL research should be given the same status as discipline-based research
  – In many academic circles it is not

• How to increase academic engagement in SoTL research?
Conclusion

• SkillBox can contribute to:
  – Increasing confidence in a topic
  – Improving content knowledge
  – Improving attitudes towards the topic
  – Increasing student satisfaction, engagement, motivation, retention and academic performance

• Resources like SkillBox are needed
Where to from here?