'From face-to-face teaching to e-learning of official statistics: collaboration in action'

Sharleen Forbes
StatEd Consultancy
New Zealand

1

Statistics New Zealand's collaboration with academics

2006/7-2014: Statistics New Zealand/ Victoria University joint appointment
- General Manager, Statistical Education and Research and Adjunct Professor of Official Statistics.

1. Primary aim – to upskill national and local government employees
2. Resulted in Certificate in Official Statistics and Honours Paper in Official Statistics
3. Led to further academic collaborations:

- With Plymouth University, UK developed web apps
- Contract for draft content for UNITAR e-learning course.

2

Four different learning platforms

1. New Zealand Certificate of Official Statistics – face-to-face classroom teaching in New Zealand and South Pacific (2007-17)
2. Honours Course in Official Statistics – simultaneous lectures in 6 of 8 New Zealand universities (2011-….
3. Web apps in Official Statistics – freely accessible web apps hosted on the ISLP website (2013 -….
4. Draft content for UNITAR MOOC (massive open online course) e-learning about statistics and data - targeted at the UN's Sustainable Development Goals (2019)

3

Common philosophical approach

1. Target content to the needs of learners
2. Set it in the real world – case studies, stories
3. Emphasize conceptual understanding rather than mathematical
4. Data focus – quality of data, exploring chance and variation in data, patterns and trends in data – what is the story our data tells?
5. Use visual and online tools – for motivation and to avoid recreating material that is freely available (e.g. statistical tools, dynamic or interactive data visualisations and YouTube videos)
6. International perspective

4

1. Certificate of Official Statistics

• Network of academics in official statistics (NAOS) from 5 universities - developed the content, taught courses and assessed students.

• Student target: Local and national government employees
• Focus: Development of statistical literacy skills when using or interpreting official statistics
• Level: Roughly first year university
• Small classes (15-25)
• Assessment: Competency based over 18 months
• Participation: New Zealand (2007-13)
Pacific Islands (2012-17)
•Just under 300 learners in total, 40% from national statistics offices

5

1. Certificate of Official Statistics

Content of the Certificate:

• **4 taught units:**
covering ethics and UN principles, basic statistics and data visualization, survey design and research evaluation (meaning of *p*-value)
(2/3 of credits for certificate)

• **1 research project:**
done in the student's workplace - must contain at least some form of bivariate statistical analysis
(1/3 of credits for certificate)

6

1. Certificate in Official Statistics - use of real case studies

- Official statistics releases (Household Labour Force, Household Economics and Retail Trade publications, Innovation in New Zealand 2005 report,)
- Other public sector surveys (New Zealand Health and Maori Language Surveys, *Children, Women and Men with 2015,Disabilities in Vanuatu. What do the data say?*)
- Research and evaluation reports (Early Start Intervention education research, Housing Insulation)
- Media articles

7

7

2. Postgraduate (Honours) course in Official Statistics

- Negotiated between Statistics New Zealand and New Zealand Universities
- Uneconomic for individual institutions with small numbers of students - video conferencing network linking universities used, students can see and hear lecturer and other students, view power points and ask questions
- Allows academics/ experts in key areas of Official Statistics to teach students at participating universities in one class
- 12 two hour lectures (video recorded and placed on course website)
- No examinations, 5 assignments submitted electronically to the setting lecturer for marking
- 30 to 50 students each year from 6 of 8 Universities

8

A Typical Year



5 participating universities + national statistics office

1 institution teaching only

1 institution with students only (no teaching)

4 institutions with students and teaching

9

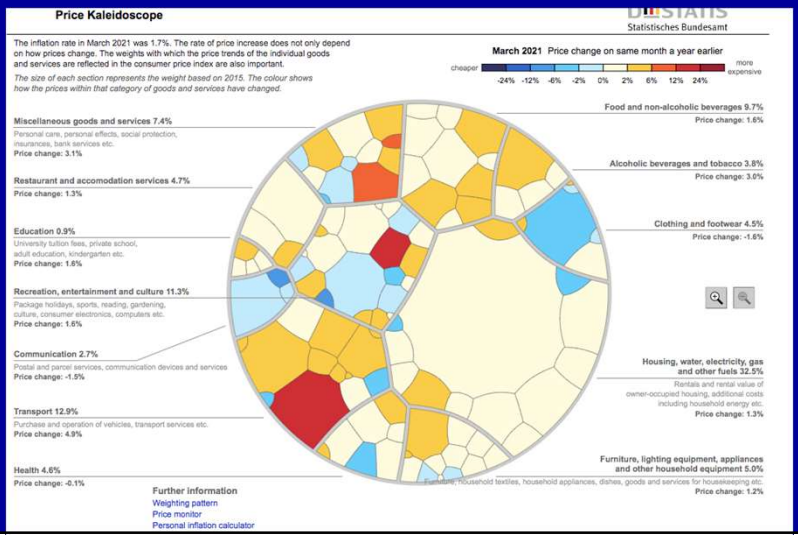
Honours course in Official Statistics - Typical topics covered

- Underlying principles of official statistics
- Administrative data measurement and framework concepts.
- Survey data – sample/population, etc.
- Demography – fertility, mortality, migration – mobility and age structure analysis, life tables, cohorts, policy implications
- Health statistics – age standardization, morbidity statistics, data registers and access, relative risk, odds ratios, other risks, confounding
- Data Visualisation and GIS – spatial analysis
- Data matching – probabilistic linking of data sets
- Economic statistics, time series, seasonal adjustment, indices - CPI, PPI, National accounts GDP

10

Uses videos and visual tools e.g Consumer Price Index

https://service.destatis.de/Voronoi/PriceKaleidoscope.svg



11

3. Official Statistics web apps

- Beginning 2013, joint project New Zealand academics and staff from the Royal Statistical Society Centre for Statistics Education (RSSCSE) at Plymouth University, UK
- Used and extended material from the previous Certificate and Honours paper.
- Wanted tools that:
  - focus on problem rather than technique
  - are freely available on a variety of IT platforms (PCs, laptops, tablets and Smart Phones)
  - link to rather than recreate good material
  - provide interactive content (less like static e-books and more like a miniature learning environment including questions, quizzes, animation, videos and interactive tables and graphs)
  - have international applicability (e.g for Africa, South Pacific)

12

3. Three web apps Developed

-hosted on International Statistical Literacy Project (ILSP) website

1. Measuring Price Change with focus on the CPI, working with price indices, change of base, time series in connection with the CPI, moving averages, trends, seasonality, and policy uses.
   http://iase-web.org/islp/apps/gov_stats_priceindices
2. Comparing populations (over time, between countries and between groups within countries) including aspects of demography such as fertility, mortality, migration, life tables, population pyramids, age standardisation, odds ratios.
   http://iase-web.org/islp/apps/gov_stats_populations
3. GraphIt in Excel emphasising data presentation and giving instructions for the creation of simple graphs including boxplots and population pyramids.
   http://iase-web.org/islp/apps/gov_stats_graphing

13

3. Features of web apps:

Scalability from pc/ android to smart phone



Laptop/pc/iPad –horizontal view

Smartphone
-vertical view



14

Scalability from pc/ android to smart phone (Tables)

Construction - Percentage Change

Consumer Price Index: Base Period October 2010 = 100

	Mar 13	Apr 13	May 13	Jun 13	Jul 13	Aug 13	Sep 13	Oct 13	Nov 13	Dec 13	Jan 14	Feb 14	Mar 14
Summary Index													
All Items	106.3	107.1	107.0	106.9	106.4	106.6	106.8	106.9	105.9	107.1	109.5	110.1	111.4
Food	108.4	109.5	109.1	110.1	108.8	108.0	108.8	108.5	106.6	109.3	112.8	114.0	116.5
Housing	100.0	100.6	100.6	100.6	101.3	101.2	101.2	101.2	101.4	101.4	101.4	101.6	101.6
Household Operations	101.8	103.3	104.8	103.2	102.8	104.0	104.2	104.2	104.2	104.3	104.4	104.5	104.6
Clothing and Footwear	104.6	104.6	104.6	104.6	104.6	104.6	104.6	104.6	104.6	104.6	117.8	117.8	117.8
Transportation	115.1	114.7	112.1	110.5	112.2	114.1	114.4	114.1	112.7	112.3	113.9	114.9	114.4
Tobacco, Alcohol and Kava	99.1	99.2	99.2	99.2	99.2	100.3	100.3	100.3	100.3	100.4	100.4	100.4	100.4
Miscellaneous Goods and Services	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.6	102.6	104.1	104.1	104.2
Local	102.5	104.5	105.2	105.8	104.7	103.8	102.9	102.3	99.9	102.7	105.8	107.6	110.1
Imported	109.2	109.0	108.2	107.7	107.7	108.7	109.6	110.2	110.3	112.1	112.1	111.9	112.4

Source: Tongan Statistics Office 2014

Laptop/pc –horizontal view

Smartphone -vertical view

Food	
Mar 13	108.4
Apr 13	109.5
May 13	109.1
Jun 13	110.1
Jul 13	108.8
Aug 13	108.0
Sep 13	108.8
Oct 13	108.5
Nov 13	106.6
Dec 13	109.3
Jan 14	112.8
Feb 14	114.0
Mar 14	116.5

Housing	
Mar 13	100.0
Apr 13	100.6
May 13	100.6
Jun 13	100.6
Jul 13	101.3
Aug 13	101.2
Sep 13	101.2
Oct 13	101.2
Nov 13	101.4
Dec 13	101.4
Jan 14	101.4

15

3. Structure of the web apps

Comparing Populations

About Populations
- World Populations
- National Populations

Analysing Populations
- Life Expectancy
- Comparing Populations
- Comparing Groups

World Population > Explanation

Populations can be compared in many ways, for example changing world and national populations across time, differences between national populations and differences between groups (for example, ethnic groups) within a national population.

World Population - Explanation

Watch the video by Dr Hans Rosling on world population, this formed part of the BBC programme *The Joy of Stats*. If the video does not work correctly you can download a version of the clip here.



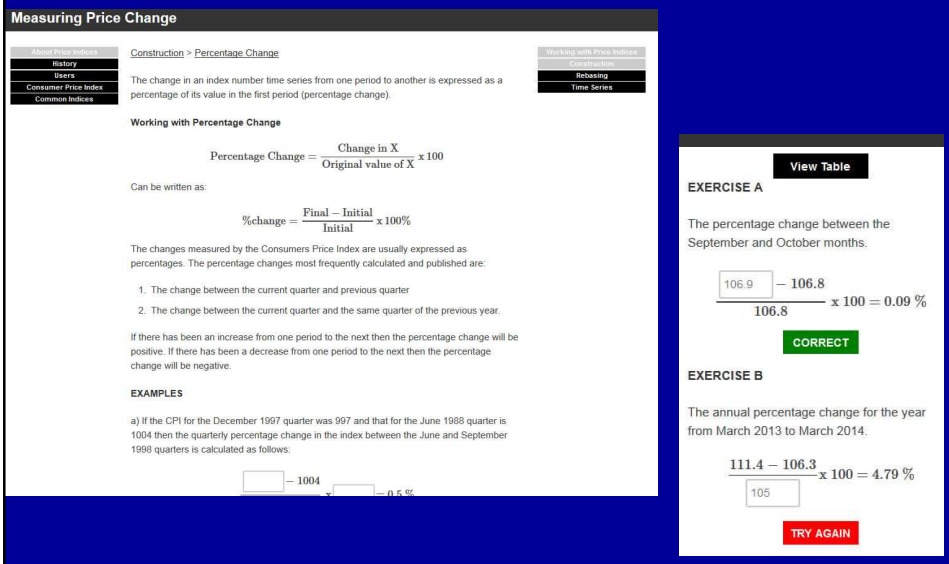
The video clip is ©Wingspan Productions Ltd 2010

The world population reached one billion for the first time in the early 1800s then took over a century to reach two billion in the late 1920s. It took less and less time to reach three (just over 30 years), four (about 15 years), five (roughly 13 years) and six (about 12 years) billion.

16

Features

Interactive exercises – structured learning



17

3. Web Apps

Unique visits November 2017 until 1 February 2020,

Measuring Price Change	14872
Comparing populations	10534
Graph It in Excel	15257

1. Measuring Price Change http://iase-web.org/islp/apps/gov_stats_priceindices
2. Comparing populations http://iase-web.org/islp/apps/gov_stats_populations
3. GraphIt in Excel http://iase-web.org/islp/apps/gov_stats_graphing

18

Translation into other languages

- Not needed for maths, numbers and graphs
- Quick first step – use Google translate
  - Visit: https://translate.google.co.uk
  - Copy and Paste the resource address into the box
  - The initial language will be detected, select the translation language.
  - Click the 'Translate' button.



- Not prefect but usable English to Portugese

19

4. UNITAR e-learning course

- **New Zealand academics contracted - provide draft content**
- **Target: Public sector employees** (government, local authorities)
- **Focus: Monitoring progress towards the UN's 17**



20

4. Resource Material

(re-use as much as possible)

Certificate of Official Statistics (Statistics New Zealand)

Honours Course in Official Statistics (across University collaboration)

Web apps in Official Statistics
https://iase-web.org/islp/Resources.php?p=Apps

Otago University statistics videos
https://www.stats.otago.ac.nz/videos/statistics/

National Statistics Office data

Academic colleagues

Current survey and research papers e.g 2019 Nobel Prize winners
- Banerjee, Duflo, and Kremer " (RCCT)

Online tools, data sources and data visualisations
e.g. GapMinder, WHO data

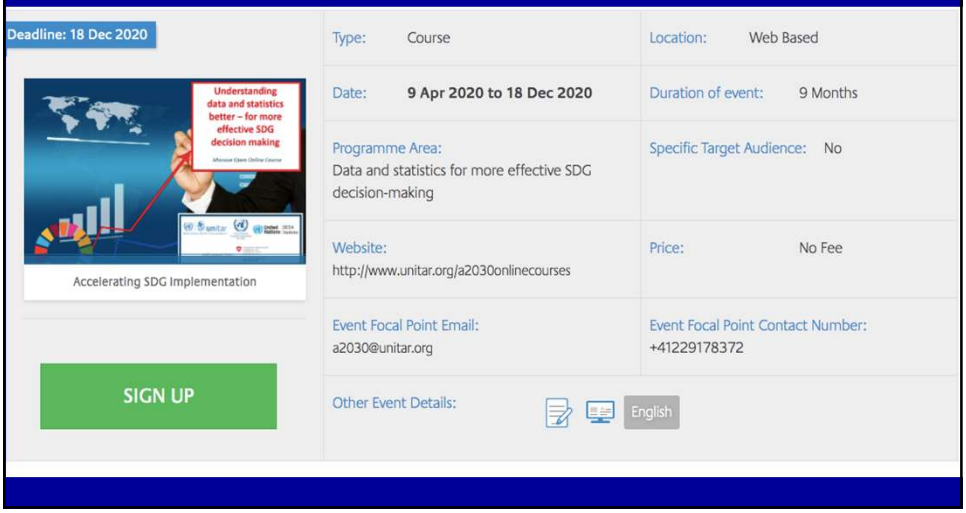
21

21

4. UNITAR course: Understanding Data and Statistics Better –for more effective SDG decision making

https://www.unitar.org/event/full-catalog/understanding-data-and-statistics-better

Over 800 students – many from Africa and Asia

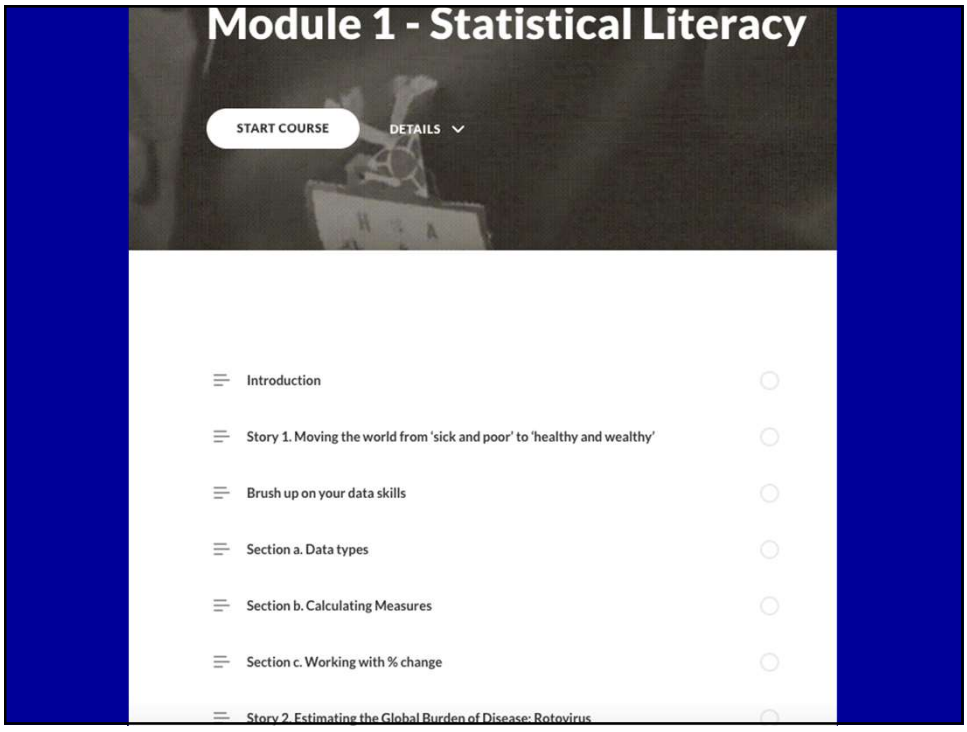


22

Course Content
(about data and telling stories with data)

- Module 1. Statistical literacy
- Module 2. Interpreting and assessing the fitness for purpose of data
- Module 3. Communicating with data
- Module 4. Data sources for SDG indicators and policy analysis
- Module 5. Policy formulation, monitoring and evaluation
- Final assessment

23



24

4. Case studies and telling stories –use of videos

View the first 7-8 minutes of the video about estimating the global burden of Rotovirus disease in young children available at (source).



25

4. UNITAR course - doing Exercises

The Excel file, Module 1- Exercises Spreadsheets Sheet 2 is labelled Ex 1. and contains data the daily readings of the concentration of sulphur dioxide (units rounded to the nearest integer) on 80 consecutive days in one city and 40 consecutive days in a second city.

Using this spreadsheet calculate the mean, median, and standard deviation for each of the two sets of readings.

XLS module-1-exercise-1.xlsx
9.5 KB

(a) Which city has the highest mean pollution?

City 1

Acceptable responses: City 2

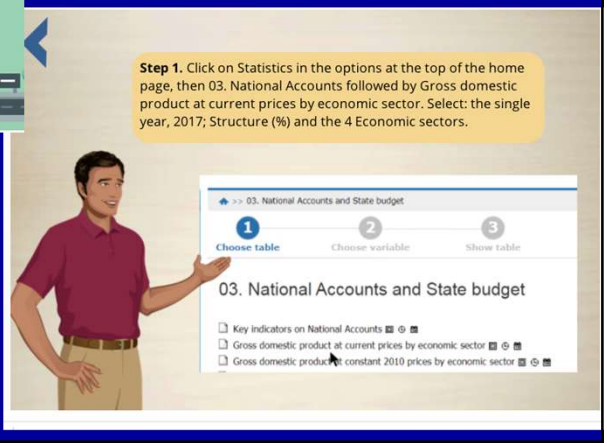
26

4. UNITAR course - doing Exercises



'Game-playing'

Direct link to National Statistics Office data



27

4. The Big Issues

Data Data Data

- Too little (e.g. Rotavirus targeting)
- Too much (e.g Climate data)
- Quality (e.g. citizen generated, web scraping)
- Format (e.g. satellite images)

• Internationalisation

• Assessment (formative and summative) how much?

28

4. Successes

- Monitoring progress OR Designing interventions
  - where is the data? (data sources)
  - how good is the data? (data quality)
  - what can we learn from the data?
- Progress not Perfection - Cost of doing nothing greater than the cost of doing something?
- Multi-disciplinary cooperative team members with diverse skills including information technology and course design experts
- Course free and self-paced
- International perspective

29

Final comments

Common treads

- Academics and national statisticians working together
- Emphasis on 'playing with the data' and 'telling stories'

In a new world with

- different modes of teaching and assessment, emphasis on concept rather than mathematics
- new collaborations (between universities, government and university, etc.)
- use of visualisation rather than mathematisation, free of '*the tyranny of the computable'* Cobb (2007)
- growing importance of time and place (geography) in data
- links between problem criticality and statistical significance (or confidence), decision-making in the context of real questions.

30

30

Thank you for listening

Sharleen Forbes
Sharleen.forbes@gmail.com

31