Senior Health workshop: Effective data skills are vital for student achievement

Dr Hugh Shannon | HPE Lecturer, Queensland University of Technology
DATA

PRIMARY DATA

STATISTICAL ANALYSIS
“OECD Education 2030 stakeholders have co-developed the **Learning Compass 2030** that shows how young people can navigate their lives and their world. This Learning Framework 2030 offers a vision and some underpinning principles for the **future of education systems**. It is about orientation, not prescription.”

(Organisation for Economic Co-operation & Development, 2018, p.3)
The **OECD** Learning Framework 2030

**Epistemology:**
- Philosophical study of the nature, origin & limits of human knowledge
- Methods, validity & scope
- Distinction between justified belief & opinion

Figure 1. The OECD Learning Framework 2030: [http://www.oecd.org/education/2030/](http://www.oecd.org/education/2030/)
Our subject: Developmental phases & enrolment data

Primary data source: https://www.qcaa.qld.edu.au/publications/statistics
Health General Senior Syllabus 2019

Health 2019 v1.2
General Senior Syllabus

This syllabus is for implementation with Year 11 students in 2019.
Health General Senior Syllabus 2019

1.2.2 Underpinning factors

- Literacy in Health (p.6)
- Numeracy in Health (p.7)
- 21st century skills (pp.7-9):
  - Critical thinking
  - Communication
  - Creative thinking
  - Collaboration
  - Personal and social skills
  - ICT skills

Effective data planning, collection, management, analysis and reporting skills align with all of these foci
Word cloud

- Generated from Health General Senior Syllabus 2019 (QCAA) pp. 1 – 76
- Text converted to lower case
- Frequency <40 excluded
- Top ten:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Word</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>health</td>
<td>504</td>
</tr>
<tr>
<td>2</td>
<td>information</td>
<td>249</td>
</tr>
<tr>
<td>3</td>
<td>action</td>
<td>224</td>
</tr>
<tr>
<td>4</td>
<td>assessment</td>
<td>185</td>
</tr>
<tr>
<td>5</td>
<td>community</td>
<td>177</td>
</tr>
<tr>
<td>6</td>
<td>use</td>
<td>152</td>
</tr>
<tr>
<td>7</td>
<td>context</td>
<td>150</td>
</tr>
<tr>
<td>8</td>
<td>students</td>
<td>138</td>
</tr>
<tr>
<td>9</td>
<td>social</td>
<td>137</td>
</tr>
<tr>
<td>10</td>
<td>data</td>
<td>132</td>
</tr>
</tbody>
</table>
The ability to effectively plan for, **collect, manage, analyse** and **report** data is vital for student achievement in the subject Senior Health.

**Objective:** This session will provide an opportunity to think about how students can be switched on to evidence based inquiry rather than turned off by perceptions of data, statistical analysis, numeracy or literacy.
Values for consideration...

1. Investigative curiosity

Desire to explore & learn is important intrinsic motivation

2. Reliable & valid data is a critical foundation

Great writing skills can’t make up for limited data

3. An unsupported hypothesis can be a valuable result
Ethical research principles

Stage 2: Plan and act
During Stage 2, students will:

- **develop** a specific and contextualised **health issue** statement
- **synthesize** information and **data gathered in Stage 1** to prepare inquiry questions that include the approach, target group and social justice principle
- **design** and **implement** justified **data** collection methods that adhere to ethical principles
  - protection from harm
  - gaining informed consent
  - ensuring confidentiality and anonymity
- **investigate** data, trends, existing policy, practice and resources that are **relevant** to the specific, contextualised health issue

Participant data may be **identifiable** (e.g. semi-structured interview) or **re-identifiable** (e.g. questionnaire demographic data) to the researcher, but should be **de-identified** when reporting (e.g. numbered participants for descriptive case study analysis) to ensure **confidentiality**.

Source p.11: Health 2019 v1.2 General Senior Syllabus (QCAA)
Ethical research principles

**Informed consent:**
- Background & invitation to participate
- Explanation of procedures
- Potential risks (+ mitigation & management)
- Potential benefits
- Rights of inquiry & withdrawal
- Knowledge of results (participants)

**Data management:** non-disclosure & safe storage (digital & hard copies)

**Reporting:** Aggregated data (quantitative & qualitative) vs qualitative individual cases (de-identified)
The scientific method adapted for Senior Health research

1. OBSERVATIONS
   - What do we want to investigate?

2. RESEARCH QUESTION(S)
   - What do we want to know?

3. BACKGROUND RESEARCH
   - What is already known?

4. HYPOTHESIS
   - Proposed explanation based on preliminary evidence

5. METHOD (research design & ethics)
   - How will the research be conducted?
   - What primary data will be collected?
   - How will the quantitative and/or qualitative data be managed?

6. DATA COLLECTION
   - Does the data support the hypothesis?
   - What conclusions can be drawn?

7. DATA ANALYSIS & CONCLUSIONS
   - What are the key findings, strengths and limitations of the investigation?
   - How will the findings inform future research?

8. REPORT RESULTS
**Data types – Overview**

**Quantitative**

...data are measures of values or counts and are expressed as numbers; quantitative data are data about numeric variables (e.g. how many; how much; or how often) (ABS 2013)

**Qualitative**

...data are measures of 'types' and may be represented by a name, symbol, or a number code; qualitative data are data about categorical variables (e.g. what type) (ABS 2013)

**Mixed methods**

**Source p.102:** Health 2019 v1.2 General Senior Syllabus (QCAA)
Terminology

• **Descriptive statistics:** Measuring a trait or characteristic of a group without any intention to generalize beyond the group

• **Inferential statistics:** Making generalisations or inferences from a smaller group (sample) to a larger group (population)
  
  – Q. Is the sample group representative?
Activity

1. Take a sticky note, jot down your favourite colour and a brief reason, then stick it on the wall

2. What descriptive data can we extract? Sort the sticky notes to manage and analyse the data
   - Quantitative methods
   - Qualitative methods

Post activity discussion – Examples: Range, frequency counts, graphing (visualise), colour groupings (warm, cool, neutral) and grouping according to justification.
Quantitative data & analysis

• Measures of central tendency
  – Mean
  – Median
  – Mode

• Measures of variability
  – Range
  – Standard deviation (amount of variation or dispersion)

Reporting example:
Sample group age range 17 – 56 years ($M = 38.60$, $SD = 10.25$)

Microsoft Excel functionality

Example MS Excel functions:

1. =
2. Function (capitalised)
3. Target cells (list cell coordinates or place colon between end points for a range)
Microsoft Excel functionality

Discussion – Data set comparisons:
1. Meaningful criteria (e.g. classification)
2. Student interpretation (e.g. the mid-point for this scale is 3 not 2.5)
3. Variability (dispersion)

Examples of MS Excel functions:
=SUM
=AVERAGE
=COUNT
=STDEV
=MIN
=MAX
Qualitative data & analysis

- Systematically extracting meaning from textual data (e.g. interview transcripts, focus group transcripts, questionnaire written responses, field observations, notes etc.)

- **Coding** = Analytical process of labelling, organizing, sorting & synthesising qualitative data

- Labelling usually involves assigning a word, phrase, number or symbol to each coding category

- **A priori codes** = the starting list which is modified as the process unfolds (e.g. similar codes/constructs might be merged to achieve a more manageable number)

Example: ‘help seeking behaviour’
Questionnaire design

- Scales:
  - Dichotomous (e.g. yes/no)
  - Interval (e.g. Likert scale – odd vs even)
  - Continuous (e.g. visual analogue scale)

- Strategy: Negatively phrased statements and reverse scoring
**Activity: Observed or potential issues?**

- Data collection, management, analysis & reporting

<table>
<thead>
<tr>
<th>Issues?</th>
<th>Preventive solutions?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Potential problems to be mindful of

- **Measurement error**

- **Selection bias**: Is the sample representative?

**Selection bias example**: Sunshine State College

- Students required to collect data associated with school community perceptions & investigate sociocultural health determinants
- Participants selected from one year level & house (vertical structure)
- Students attempt to draw conclusions about the school community from a non-representative sample

Potential problems to be mindful of

- **Hawthorne effect**: Presence of researcher impacts upon participant behaviour

- **Halo effect** (cognitive bias): Researcher has an expectation about participant performance (immediate judgement)

Example – Year 10 Health: Field observation data

- **Scenario:** Pre & post intervention use of playground/oval area for recreational purposes during school breaks
- **Camera positioning:** drone* (altimeter & GPS), camera tripod (reference point alignment)
- **Timed sequence of photographs and student count**
- **Data visualisation – Graphing? Examples: time and density**

*Safety considerations & CASA regulations

**Image credit:** Dr Ian Renshaw (Skill acquisition – Queensland University of Technology)
Activity – Action planning

1. Data type(s)?
   - Quantitative
   - Qualitative
   - Mixed methods

2. Methods of data collection – Examples:
   - Reflective journal
   - Semi-structured interviews
   - Focus groups
   - Observation
   - Questionnaire
   - Others
More sophisticated quantitative data analysis

• Feel free to discuss more sophisticated data analysis (e.g. sample size calculation, t-Tests & ANOVA) with me

• Link up with an experienced mathematician on staff at your school
ACHPER Queensland

- 2019 HPE Week: Showcase your school and teachers
- 2019 Awards: Consider nominating colleagues and students
Questions and correspondence

Dr Hugh Shannon
HPE Lecturer – Queensland University of Technology

Email  h.shannon@qut.edu.au
Phone  +61 7 3138 3577
@Hugh_Shannon
au.linkedin.com/pub/hugh-shannon/65/a61/791/