

The aim of presenting data to teachers is to assist them in improving pedagogy. Just as it is possible to provide students with technology that they enjoy using but learn little from, so it is possible to give data to teachers which they engage with, but which does little to improve pedagogy. It is the interface between Data Analysis, Data Architecture and Data Presentation that can provide a sound basis for teacher's questions that do lead productively to improvements in pedagogy.

DATA ANALYSIS

The beginning of the process is Data Analysis. Data analysis is the process of taking raw data and deriving relationships within it. Finding an average is a simple form of data analysis. Analysis of variance, factor analysis, confirmatory factor analysis, structured equation modelling and multilevel modelling are other forms. Assessment of the validity, reliability and robustness of inferences drawn from any element of any analysis as indicators of a pedagogical construct is a critical element of good data analysis.

The problem that exists for users is that the stronger and more robust the analysis, generally the more complex it appears. A structured equation matrix or a multilevel model requires a good deal of psychometric skill to interpret, and teachers in general do not have this. A psychometrician might produce an insightful and valid analysis that goes nowhere in advancing teachers' understanding of their practice.

DATA PRESENTATION

What a teacher finally sees on screen or on paper as a result of any data analysis is the Data Presentation. Data presentation may be as a chart of numbers, but is usually more helpful if the relationships are expressed graphically. The development of business intelligence methods, interactive methods and cloud-based computing over the last ten years has opened up many new possibilities in the ways in which data can be presented. Previous data presentation methods used static methods, whereby the user chose from a range of options provided by the presentation designer, and had to be satisfied with those. Often these had a 'catch-all' of providing for a download of all data was included as a way of allowing the advanced user to undertake more analysis, but this is rarely intuitive. Modern data presentation is visually attractive, dynamic, variable at the user command with a minimum of effort, and intuitive. Making it so is a highly technical, complex skill! Users now expect that datasets will be presented to them in this way.

The aim of good data presentation is to link together elements of the data analysis in ways which are valid, meaningful, engaging and productive. It is quite possible to have the first three of these without the fourth – it is possible to spend hours digging into Olympic stats or the ABS census and not achieve anything productive. In our context, the productive outcome is in questions which lead to improvements in pedagogy.

DATA ARCHITECTURE

Good Data Architecture is what lies between good Data Analysis and good Data Presentation. Data architecture is about taking the elements that might be available from an analysis and the experiences that are available in a data presentation platform and making the most productive matches. It involves considerations of the dimensionality of any data point, the aggregation levels within the data, the extent to which different contexts reveal or obscure pedagogical constructs, the interaction options that best need to be made available beside a given part of the representation, and then at a higher level the interplay between dimensionality, aggregation, context and interaction. It requires a precise understanding of the construct relationships within the dataset. It demands decisions on the preservation or recalculation of aggregate results. It particularly requires imagination and creativity. It is always constrained by the Data Presentation methods that are available, but as noted these are improving all the time.

The analogy of putting up a new building to the presentation of data is quite strong. Data Analysis is the preparation of the 'raw' materials, which might be simple but also might be highly technical (like an RSJ). Data Presentation is what the builders do. How the two are linked is the Architecture.