Understanding student experience in the age of personalised study

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Take three outline tuition models
1. Straightforward, one tutor per student
2. Many students per module, with sequential modules – allows teachers to teach to their strengths
3. Offer choice and flexibility to students - partially lift the time constraint by offering several choices of time to study each module (retaining a sequential format).
   - Though each module may be taught by a different tutor

As we increase choice, flexibility and personalisation, we will also increase the complexity

Note: am ignoring concurrent study
• No teacher really knows about each student’s experience in our current context.
• Makes the need to find new ways to understand student experience and effectiveness of curriculum more urgent
This straightforward programme of study

We can also increase complexity by designing in choice. This is a network representation of our psychology degree. At each level (year) there is a choice but then this is followed by a compulsory module that completes study at that level.

By our standards this is a **compact and well constrained programme of study**, and it was a surprise to us when we worked out just how many potential routes there really are.

The red arrows indicate a set of paths we decided to focus on in trying to get a sense of the overall student experience.
Leads to this fragmentation of cohorts

By drawing them as a **branching diagram** we clearly see the fragmentation as students get further through their studies. As students arrive at the final module, they could have reached it by one of 64 different paths, and this has implications for our understanding of the student experience and potentially how we approach our learning design of new modules.

OU students also generally have the flexibility to choose to complete their degree at a **full time equivalent or to take years** over their studies.

All these factors combine to paint a very complex picture of student experience. We have to find a way to make sense of it if we are to be able to gain an understanding of the effectiveness of our curriculum and make improvements.

A fully scalable version - Figshare. [https://doi.org/10.6084/m9.figshare.5829762.v1](https://doi.org/10.6084/m9.figshare.5829762.v1)
It often feels like

The information we want
always seems out of reach
Colleagues at our institution have built ways to analyse path and have produced some great Sankey diagrams and other infographics. However, it is clear that these take considerable effort to produce, and because they take so much effort to produce, cannot readily be produced to answer a slightly modified question. In some ways these super visualisations hide a fundamental issue

I have begun to think it is most likely the way we structure and organise our data that makes this so problematic – and the roots for our institutional approach were set very early in our history.
Perhaps...
The patterns are there but hard to see with our data structures

If we could restructure data now, how would we do it?

This year, I have with a colleague, asked, if we could restructure data now, how would we do it?

• if our primary use for the data is to enhance the student experience, or to put it another way,
• to make our curriculum as effective as possible. And this is our purpose within our roles as data wranglers.
Rethinking data structure

Clarity of intention:
- Continuous improvement of the student experience
- Making curriculum as effective as possible
- Aim for as real time information as possible

Fundamental element to accrue study experience data
- The combination of:
  Student - Module - Presentation

Mostly straightforward:
Except the need for a real time view of experience is due (at our Institution) to the length of time it takes students to complete and the variation in this. The element:

- The student has to be within this element and cannot be reduced further
- The module is our fundamental unit of curriculum
- Each module is presented multiple times, and a single student may have more than one attempt at completing (for a variety of reasons)

Demographics, assessment scores, attendance at tutorials, timeliness of handing in work, any other variable that might impact on a student’s experience could accrue to each element.

Important to note: that the student is an important factor within their own experience
Rethink database environment

- Move from relational database to multi-model database
- Multi-model database has collections rather than tables
- And has two kinds of collection:
  - Node collection of documents, like records
  - Edge collection of documents

We selected ArangoDB and so far this is proving to be a good choice.
The structure

- Hypothesis: four data entities will be sufficient:

We are working on the hypothesis that four data entities will give us the facility to extract data readily for any analysis we can currently conceive.

Study – a node data collection around the [student-module-presentation] element
Path – and edge collection of the links between what a student attempts to study and what they attempt next

Module – a node collection of data for each module, includes first presentation, length, number of credits...
Qualification – an edge collection linking modules into study paths to qualifications
Our choice of data structure should help us see the patterns in our data.
Arango enables

- Graphical queries like:

```cql
FOR v, e, p in 1..10 OUTBOUND 'Modules/Start' Qualifications
  OPTIONS {uniqueEdge: 'path'}
  FILTER e.`Qual` == "Q07"
  RETURN DISTINCT e
```

- Which plots,

We are still relative beginners in Arango, know we have lots to learn but are already finding this very useful

A test database of records for 37,209 anonymised students
54,389 records of ‘attempts’ at studying a module.
Also...

• Simple powerful queries. Like this one to select all the records for students passing Module2 **DIRECTLY** after Module1:

```javascript
FOR doc IN Study
    FILTER doc.`Module` == "Module1" && doc.`Outcome` == "Pass"
FOR itm in OUTBOUND doc._id Path
    FILTER itm.`Module` == "Module2" && itm.`Outcome` == "Pass"
RETURN DISTINCT itm
```
And...

• ...or **SOMETIME** after

```javascript
FOR doc IN Study
    FILTER doc.`Module` == "Module1" && doc.`Outcome` == "Pass"
FOR itm in 1..10 OUTBOUND doc.`_id` Path
    FILTER itm.`Module` == "Module2" && itm.`Outcome` == "Pass"
RETURN DISTINCT itm
```
Questions

• Does any of this resonate with your experience?
• Do you agree with my suggestions wrt data structure?
• Is the idea of the compound entity for accruing student experience relevant to you/your institution?