Reviewing three case-studies of learning analytics interventions at the Open University UK

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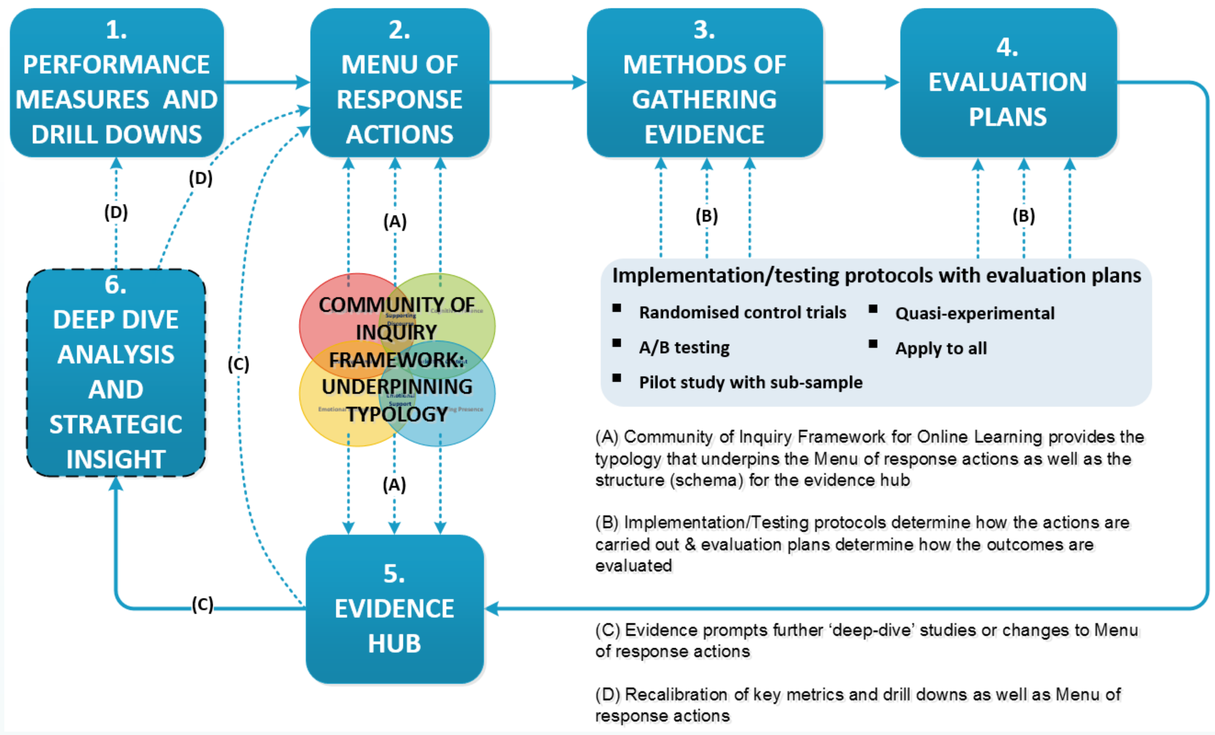
Aim and Research Questions

We used an embedded case-study design to understand how teachers designed three interactive modules and how students engaged with them:

- To what extent do existing OU learning analytics metrics and visualisations of student journeys provide an accurate picture of learning design, learning processes and outcomes across the three modules?
- To what extent can these learning analytics metrics and visualisations help teachers to implement effective interventions?

Analytics4Action Evaluation Framework (A4AEF)



- One of the largest challenges for learning analytics research is how to put the power of learning analytics into the hands of teachers.
- The A4AEF is an evidence-based framework for learning analytics with which students, researchers, educators, and policy makers can manage, evaluate, and make decisions about which types of interventions work well, under which conditions, and which do not.

Data Analysis

- In line with an embedded case-study approach, we used a mix of quantitative and qualitative data from the various instruments.
- More importantly, we discussed the visualisations of the various student engagements in the VLE and related systems with the three module teams in the period October 2014 – June 2015 during four data touchpoint meetings.
- Furthermore, initial findings from the various analyses were discussed with the respective module chairs to unpack, revise, and update our understandings of the complexities of learning and teaching.

Methodology

A. Settings

We worked with three modules:

- The first module, an introduction to Arts (labelled as Arts) is an interdisciplinary 60 credit module, presented twice a year, which came into being as a 'new' module in October 2014
- The second module, an introduction to childhood and psychology (labelled as Psychology) is also a new module that intensively used a range of technologies.
- The third module, an introduction to computer science and digital skills (labelled as Technology) was one of the largest modules at the OU, on which nearly 4000 students were enrolled.

One of the core purposes of the A4AEF approach is to allow module teams to react on real-time data and insight.

B. Instruments

Learning Design

The OU learning design tools were developed using the taxonomy developed by Conole (2012). They are graphical and text-based tools that are used in conjunction with learning design activities, which are mandated at particular stages in the curriculum development process.

VLE behaviour

As found in previous research, VLE user behaviour (e.g., number of clicks, minutes spend per week) is an important proxy for VLE engagement and learning. In this study, we use data collected by the Institute of Educational Technology by means of the Module Activity Planner. We define active engagement in the VLE using a threshold of 60%, which is a (crude) proxy for active engagement by the majority of students in a particular week.

Academic retention and satisfaction

We measured the number of students who passed the module in terms of academic retention. In order to correct for the relative performance differences of a module given the positive/negative characteristics of OU students enrolled into a module, the OU uses a z-scores model, where a negative score denotes a relatively weaker performance than expected given the characteristics of the module and the respective students, while a positive score denotes a better performance given the characteristics of the students.

Actions taken on each module

- The Arts module introduced additional assignment preparation tasks – pieces of formative assessment on the VLE - one of which required students to use a wiki in preparation for a graded collaborative writing assignment.
- For the Psychology module, the module team used tutor feedback and student comments from the forum to reach a conclusion that additional support for students was needed around assessment preparation.
- For the technology module, rapid individualised feedback tools were instigated at the beginning of the module to identify whether students were on the right module or not. It simply asked students 'Are you really ready for the [Technology Module]?' and the students rated their readiness on a five point scale, with automatic support for those who indicated a need.

Results

	Average Level 1	SD	Arts	Psychology	Technology
Registered students	666.62	861.77	2234	3181	2489
% After 25FLP	94.13	5.93	94.10	87.90	86.50
% Passed	65.02	12.73	71.30	64.40	59.70
z-score	-0.19	2.87	3.80	-0.70	3.30

Table 1

As illustrated in Table 1:

- Retention (% Passed) on the Arts module was well above the average of level 1 modules
- Retention on the Psychology and Technology modules were within the range of the average of level 1.
- The z-score indicated that both Arts and Technology performed better than expected, whereby a score close to 4 indicated a strong performance for both modules. The psychology module was relatively underperforming given the characteristics of the students, although with a small effect.

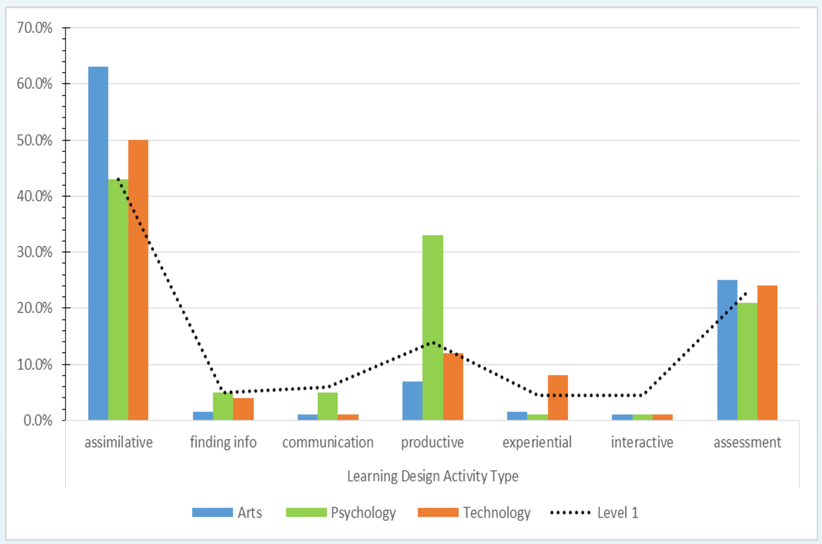


Figure 2 - Learning design of three case-studies relative to other modules in Level 1
Note that the dark dashed line in Figure 3 illustrates the average scores of the learning design activities of the other 57 mapped level 1 modules.

- The learning design of the Arts module was primarily focussed on assimilative activities (63%), where students were expected to read and engage with various print and online learning materials.
- Half of the learning activities in the Technology module were focussed on assimilative activities, while the Psychology module had exactly the same percentage of assimilative learning activities as the average level 1 module (43%).
- The Psychology module had a strong focus on productive learning activities (33%), such as producing an assignment plan for an essay about childhood.
- In terms of experiential learning, the Technology module had a relatively large number of learning activities (8% vs 4% for other modules), where students were asked to engage with an educational programming environment.
- Finally, in terms of assessment all three modules had a range of formative and summative learning activities.

However, behind these average numbers some interesting subtle differences were present. For example:

- the Arts module included continuous assessment in the form of a wiki,
- whilst the Psychology module included an assignment e-bootcamp.
- The Technology module did not only include written assessments but the activities in the educational programming environment also contributed to the students' overall scores.

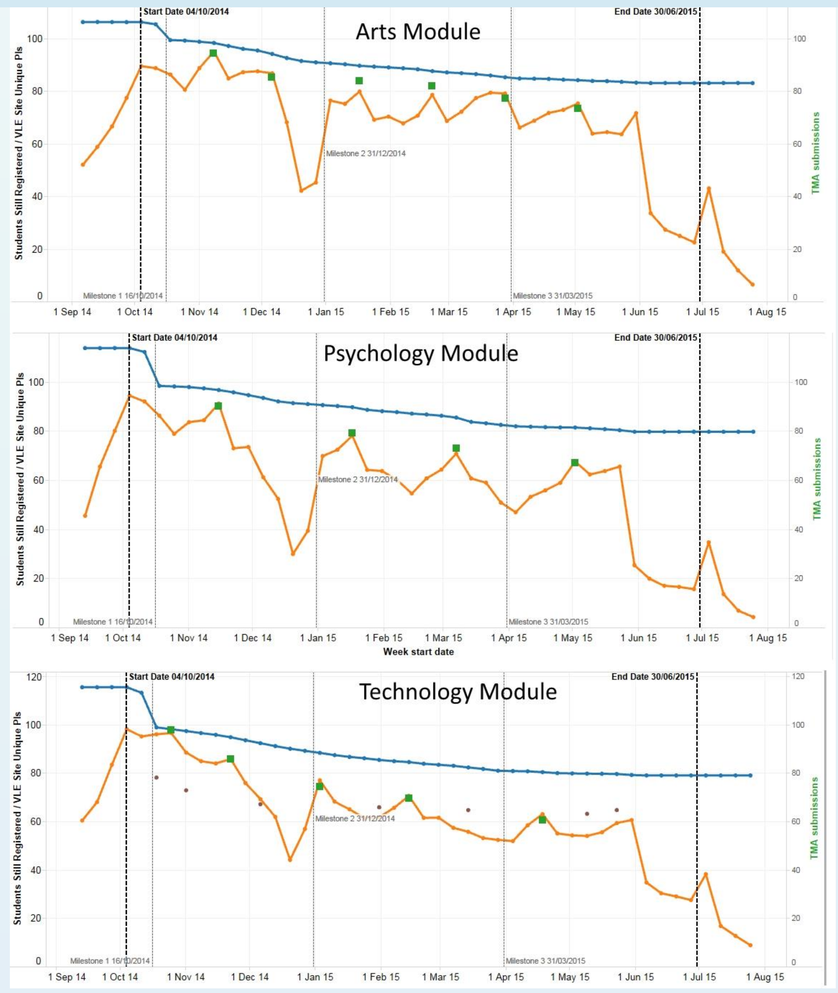


Figure 3
Note: Orange line = VLE Engagement per week; Blue line = registered students;
Green dots = Submission rate of assessments

Three trends can be identified from the Module Activity Chart visualisations in Figure 1.

1. In all three modules the learning design led to a continuous engagement of the vast majority of students, as illustrated by the orange lines.
2. Assessment drives learning and learning engagement.
3. VLE engagement patterns across the three modules followed subtly different trajectories.

6. Discussion

- Focussing on basic learning outcomes measures might lead to ill-informed decisions by managers and teachers alike.
- We will elaborate on the follow-up interventions that were initiated based upon the discussions with the Analytics4Action team in the three modules indicated that small changes in learning design could be traced effectively with current VLE data.
- Based upon the learning analytics visualisations, *the Arts module* introduced additional assignment preparation tasks – pieces of formative assessment on the VLE -- one of which required students to use a wiki in preparation for a graded collaborative writing assignment.
- For the *Psychology module*, introduction of the final assessment e-bootcamp provided guidance for their students about how to prepare for the final assessment, addressing some of their concerns and ran four OU Live sessions dedicated to the different aspects of the final assessment.
- For the *Technology module*, rapid individualised feedback tools were instigated at the beginning of the module to identify whether students were on the right module or not.
- By working together in interdisciplinary teams consisting of teachers, learning designers, learning analytics specialists, educational psychologists, data interpreters, IT specialists and multi-media designers, the OU aims to continuously refine the learning experiences of our large cohorts of learners to meet their specific learning needs in an evidence-based manner.

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