Are we making progress?

Data analysis

Derek Jones (derek.jones@open.ac.uk)

01 November 2015

Contents

List of tables

1 Data receipt and cleaning

1.1 Data sources and cleaning

The original 'Data specification' (dated 11 June 2015) was used to specify the necessary data, as follows.

1.1.1 Engagement

From the Data specification document, the measure of **engagement** per student was defined as:

- E1 (inverse of) Number of empty* slots
- E2 Number of views of other slots
- E3 Number of comments made on own slot
- E4 Number of comments made on other slot
- E5 Number of feedback requests
- E6 Number of pinboard slots created

* This measure was changed – see below.

Data on these engagement measures was obtained from OpenStudios on three modules: U101, T217, and T317 across a total of 8 presentations as follows:

- U101: 12J, 13B, 13J, 14B, 14J
- T217: 13J 14J
- T317: 14J

This range of sources meant that different studio versions were used to obtain data:

ODS v1	ODS v2
U101 12J	U101 13J
U101 13B	U101 14B
T217 13J	U101 14J
T217 14J	T317 14J

Table 1 List of Studio versions used in modules and presentations

This lead to three alterations to the data specification and use of it in analysis.

Firstly, ODS v1 did not track engagement measure E2: student views, meaning this data was not available for the modules U101 12J; U101 13B; T217 13J; T217 14J. This leaves a significant gap in the data and analysis which is reported on in the relevant sections.

Secondly, the format of the data outputs led to issues of calculating E1: number of empty slots. As a result, this engagement measure was changed to the 'number of completed slots'. Because this number is not fixed on T217, it presents an issue in terms of continuity of the range of data when using some of the correlation methods (e.g. PPMC). Where this is an issue in terms of analysis it has been identified specifically and care taken in the overall interpretation of the data.

Thirdly, basic data format issues meant that different data cleaning processes were required. The aim with both processes was to end up with well formatted data that could be analysed in precisely the same way regardless of the source. This was

tested using data from both sources to check basic outcomes and was checked once all analysis data was available. Whilst there is confidence that the cleaned data from different sources is relatively consistent, it would be preferable to have data from additional presentations to provide further checks (e.g. further data sets for T317 to compare relative results).

1.1.2 Success

The measure of **success** per student was defined in the original specification by:

- S1 Overall rank on a module
- S2 Qualification degree classification (banded)
- S3 Qualitative 'expert' analysis of student work

Data for S1 were obtained from OU LTI. These data were relatively clean, requiring only minor sorting and ordering to suite the analysis procedures. Data for continuous assessment results (OCAS) and end of module assessment results (OES) are combined in this data source to produce the University's standard result Rank. This data gives a percentage overall result and was used to define the measure S1, Overall rank on a module.

Data for S2 was not available for the analysis.

Data for S3 were collected from the Consensual Assessment Technique (CAT) process but were not deemed to be suitable for use as part of the quantitative evaluation due the lack of consistency from the small sample sizes used in the process.

1.1.3 Time based data

The original data specification sought to measure how the engagement measures (E_n) changed (develops) in or between modules:

- T1 Within a module (time based: weekly or by date)
- T2 By modules

These data were intended to inform the part of a larger quantitative analysis but were used only descriptively to fit the project timescale available. See Section 2.3 for these results.

1.2 Data cleaning process

ODS engagement measure data were received from OU LTS (ODS v1) and OU IT (ODS v2). These data were checked, cleaned and ordered for analysis (See appendix 2 for the full list of steps taken). Results data were received from OU LTI and required very little processing. Qualification data were manually derived from OU CIRCE MI and OU PLANET systems and collected in a single spreadsheet to isolate qualification students only.

All datasets were brought together for reporting, visualisation and analyses.

The complete set of data cleaning and analysis steps are set out in Appendices 2 and 3.

2 Results

2.1 Basic data

Data from the 8 module presentations previously listed were finally obtained and deemed suitable for analysis. The student populations of these presentations are listed in Table 1.

Module and presentation	No of Students	Number of slots
U101 12J	454	34
U101 13B	297	34
U101 13J	457	34
U101 14B	255	34
U101 14J	459	35
T217 13J	318	82
T217 14J	338	82
T317 14J	305	88

Table 2 Total number of students and structured slots per module and presentation

Table 1 also lists the total number of Structured slots for each module and presentation. This value was used in the calculation of percentage completion of structured slots in later analyses.

These structured slots are listed in Appendix 7 for each module:

2.1.1 Basic Totals

The raw totals for the engagement measures are set out below:

Module and presentation	E1 Structured Slots	E2 Slot Views	E3 Comments (own)	E4 Comments (other)	E5 Feedback requests	E6 Pinboard slots
U101 12J	11897	**	4735	15733	721	7990
U101 13B	6940	**	3898	11619	563	4965
U101 13J	12382	116670	3834	13663	790	9977
U101 14B	5547	63194	1731	6107	482	5843
U101 14J	10039	83012	2207	7886	2087	8819
T217 13J	8101*	**	934	2319	115	426
T217 14J	8530*	**	777	1970	164	443
T317 14J	4278	4278	520	2030	266	303

Table 3 Engagement measure totals per module and presentation

2.1.2 Averages of engagement criteria (En)

A more useful measure when comparing module presentations and particular difference modules is the average engagement measure per student.

These averages were taken from the step02 data (see Appendix 2, Section 5.2).

Module and presentation	E1 Structured Slots	E2 Slot Views (x0.1)	E3 Comments (own)	E4 Comments (other)	E5 Feedback requests	E6 Pinboard slots
U101 12J	26.20		11.30	35.10	2.60	19.10
U101 13B	24.50		15.10	42.40	3.10	19.20
U101 13J	27.80	25.47	11.00	34.40	3.40	25.00
U101 14B	22.20	25.69	9.00	29.20	3.00	26.60
U101 14J	22.60	18.05	6.90	20.10	6.30	22.60
T217 13J	33.10		6.00	13.50	2.90	3.00
T217 14J	35.80		6.00	12.40	3.20	3.30
T317 14J	14.00	1.40	4.50	10.90	3.90	2.60

Table 4 Average values of Engagement measures (E[n])

These data are also usefully visualised, as follows:

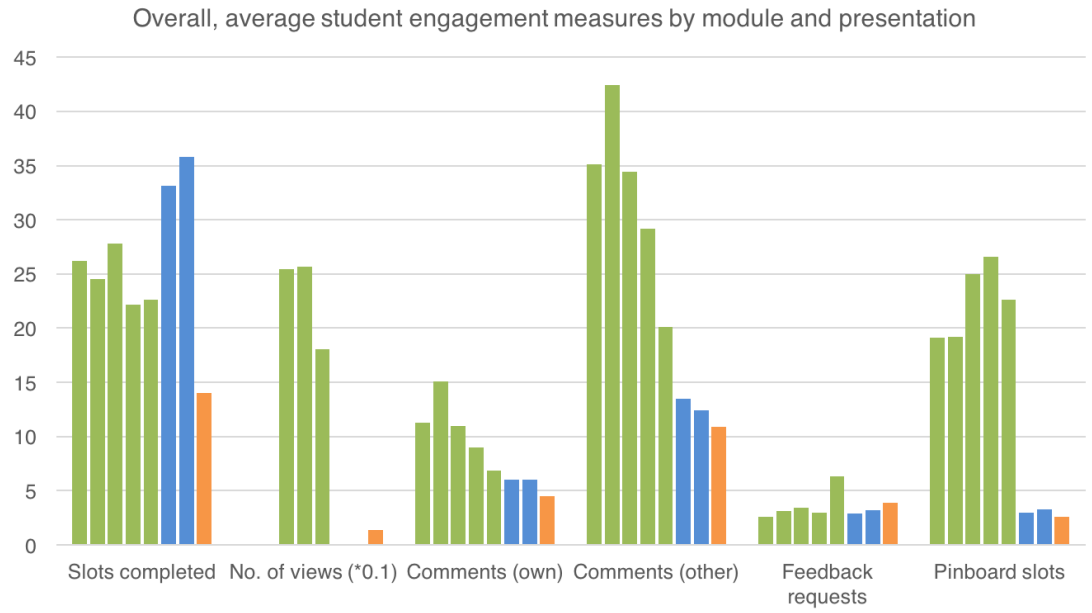


Figure 1 Overall, average student engagement measures by module (note data not available for all No. of views. See 1.1.1)

A further useful organisation is by averaging these values by study level:

Module and presentation	E1 Structured Slots	E2 Slot Views (x0.1)	E3 Comments (own)	E4 Comments (other)	E5 Feedback requests	E6 Pinboard slots
Level 1	24.66	25.58	10.66	32.24	3.68	22.50

Level 2	34.45		6.00	12.95	3.05	3.15
Level 3	14.00	1.40	4.50	10.90	3.90	2.60

Table 5 Overall, average student engagement measures by study level (note data not available for all No. of views. See 1.1.1)

And visualised :

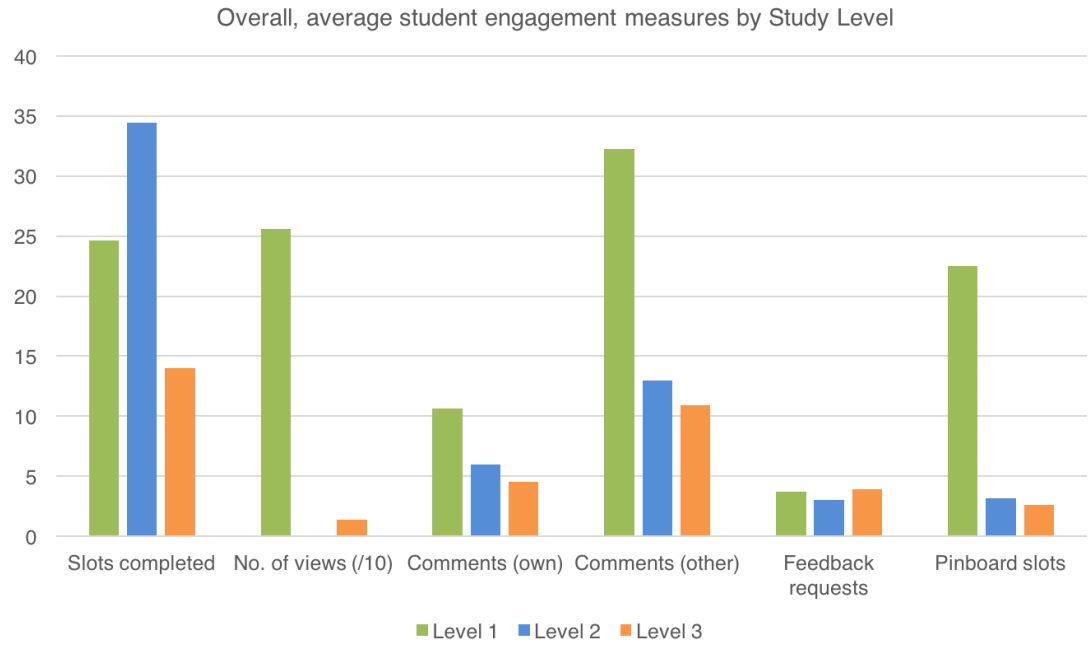


Figure 2 Overall, average student engagement measures by study level (note data not available for all No. of views. See 1.1.1)

From these data:

- There is a measurable drop in engagement measures between modules at Levels 1 and 2 and again between 2 and 3, except for Feedback requests which are consistently low for all levels.
- The lower the study level, the greater the engagement seems to be by the engagement measures used. However, additional data at level 3 is required before stating this with complete confidence
- On average, Level 1 students will complete about 73% of the planned (structured) slots required by studying in the module compared to only 16% at Level 3 and 42% at Level 2.
- U101 students are 2-3 times more likely to comment on their own slots compared to T317 students, and are 3-4 times more likely to comment on other slots;
- The average number of Pinboard slots created is similar between T217 and T317 students and both of these are significantly lower than the numbers on U101 (by a significant factor. Note that the use of multiple slots in T217 could affect this comparison and the single presentation of T317 is also an issue for this measure;

These data are perhaps better visualised using line graphs to see the relative differences clearly:

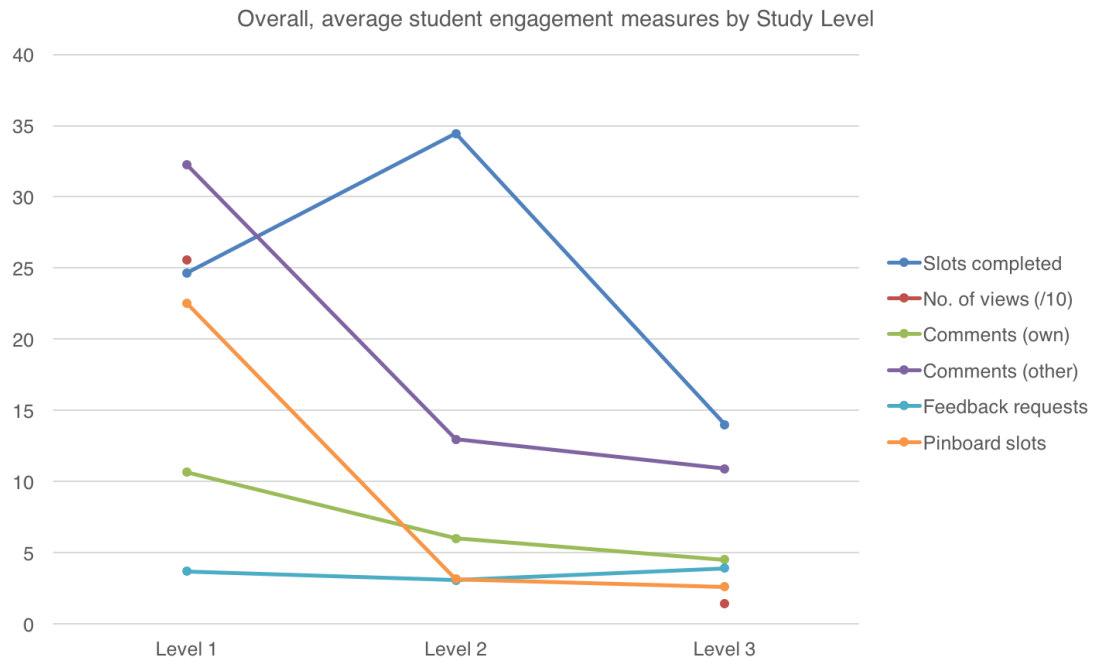


Figure 3 Overall, average student engagement measures by study level (note data not available for all No. of views. See 1.1.1)

Finally, it is worth noting that the Slots completed (totals and averages) cannot be compared directly between modules due to the number of structured slots designed in each module (See Section 2.1). This can be considered more effectively when compared as a percentage of total structured slots completed:

	E1 %age of Structured slots completed
Level 1	73%
Level 2	42%
Level 3	16%

Table 6 Total, average slots completed as a percentage of total structured slots per level

This shows that the engagement criteria structured slots completed also reduces as study level increases, which is of concern in terms of learning design at higher levels, given that these slots are intended to be for work completed as part of the main coursework.

2.1.3 Ratios

View to comment conversion ratios were initially thought to be a relevant measure, the hypothesis being that 'converting' from viewing to commenting might be a mechanism that is both measurable and desirable. These data are provided in the table below:

Module and presentation	Average views (*0.1)	Average Comments (own)	Average Comments (other)	Total average Comments	Views/Comment Ratio
U101 13J	255.00	11.00	34.40	45.40	0.18
U101 14B	257.00	9.00	29.20	38.20	0.15

U101 14J	189.00	6.90	20.10	27.00	0.14
T317 14J	14.00	4.50	10.90	15.40	1.10

Table 7 Summary of average views, comments and 'conversion' of viewing to commenting ratios

For U101, there would appear to be a reasonably consistent conversion ratio of about 15% – that is, for every 10 slots viewed made, 1.5 comments are made. For T317, interestingly, this ratio is far higher at just over 1:1. Given the relatively low numbers of active contributors on that module, however, it is not possible to identify this as a pattern without further data.

Also worth highlighting is the ratio of comments on own and other slots:

	Comments (own)	Comments (other)	Own/Other Ratio
U101 12J	11.30	35.10	0.32
U101 13B	15.10	42.40	0.36
U101 13J	11.00	34.40	0.32
U101 14B	9.00	29.20	0.31
U101 14J	6.90	20.10	0.34
T217 13J	6.00	13.50	0.44
T217 14J	6.00	12.40	0.48
T317 14J	4.50	10.90	0.41

Table 8 Ratio of average number of student comments on own to other slots per presentation

Which seems to suggest a consistency at Level 1 and 2 study, summarised in the following table:

	Comments (own)	Comments (other)	Own/Other Ratio
Level 1	10.66	32.24	0.33
Level 2	6.00	12.95	0.46
Level 3	4.50	10.90	0.41

Table 9 Ratio of average number of student comments on own to other slots per study level

These results are still preliminary given the single presentation data available at Level 3 but what seems consistent is that students are more likely to make comments on other students' slots than their own.

2.2 Correlation data

Pearson Product Moment Correlations were calculated between Engagement (E1-6) and Success Measures (S1-3) to test the hypothesis that a simple linear relationship may exist.

2.2.1 Correlation 1 – Pearson Product Moment of Correlation S1 / E[n] By presentations

The following results were obtained by module presentation.

Module /pres	E1 Structured Slots	E2 Views (other)	E3 Comments (own)	E4 Comments (other)	E5 Feedback requests	E6 Pinboard slots
U101 12J	r = 0.318**	na	r = 0.289**	r = 0.386**	r = 0.111 (p = 0.076)	r = 0.27**
U101 13B	r = 0.365**	na	r = 0.30**	r = 0.35**	r = 0.10 (p = 0.23)	r = 0.41**
U101 13J	r = -0.132*	r = 0.29**	r = 0.27**	r = 0.25**	r = 0.33**	r = 0.31**
U101 14B	r = 0.433*	r = 0.35*	r = 0.30*	r = 0.32**	r = 0.21**	r = 0.40**
U101 14J	r = 0.50**	r = 0.50**	r = 0.39**	r = 0.47**	r = 0.13*	r = 0.43**
T217 13J	r = 0.205*	na	r = 0.221*	r = 0.095 (p = 0.244)	r = 0.175 (p = 0.300)	r = 0.136 (p = 0.131)
T217 14J	r = 0.101 (p = 0.131)	na	r = 0.040 (p = 0.659)	r = 0.212*	r = -0.119 (p = 0.411)	r = 0.102 (p = 0.252)
T317 14J	r = 0.13*	r = 0.13*	r = 0.17*	r = 0.08 (p = 0.31389)	r = 0.02 (p = 0.88)	r = 0.09 (p = 0.36)

Table 10 Pearson Product Moment of Correlation of student engagement measures (E1-6) and success (S1) per module presentation ($p < 0.001$; * $p < 0.05$).**

The following observations might be made:

- There are no statistically significant, strong PPMC correlations between individual success and engagement measures shown in any of these data
- There are, however, some statistically significant weak and moderate correlations, suggesting a lack of correlation in places and a moderate correlation in others:
    - Reasonable correlation in u101, across all presentations for measure E1, E2, E3, E4, and E6
    - There are no consistent and statistically significant correlations in U101, in any presentation for measure E5
    - Overall there are very few statistically significant correlations between engagement and success in T217 and these should be considered weak correlations;
    - There are no statistically significant correlations between engagement and success in T317;
- This may infer the following:
    - That there is no reasonable linear relationship (i.e. Hypothesis is not supported across all modules)
    - That the outliers in the data are affecting the specific method being used (PPMC)
    - That there may exist another type of relationship between these measures (some early evidence suggested a first or second order polynomial);
    - That the correlation is strictly non-causal (in either direction) and is strongly dependent on the learning design

2.2.2 Correlation 2 – Spearman Rank Correlation of S1 / E[n] by presentation

To test the latter two arguments a Spearman Rank correlation was generated for each measure yielding the following results:

Module /pres	E1 Structured Slots	E2 Views (other)	E3 Comments (own)	E4 Comments (other)	E5 Feedback requests	E6 Pinboard slots
U101 12J	ρ = 0.270	**	ρ = 0.325	ρ = 0.448	ρ = 0.222	ρ = 0.286
U101 13B	ρ = 0.404	**	ρ = 0.316	ρ = 0.404	ρ = 0.172	ρ = 0.443
U101 13J	ρ = 0.079	ρ = 0.468	ρ = 0.370	ρ = 0.428	ρ = 0.390	ρ = 0.441
U101 14B	ρ = 0.422	ρ = 0.512	ρ = 0.467	ρ = 0.511	ρ = 0.400	ρ = 0.457
U101 14J	ρ = 0.463	ρ = 0.610	ρ = 0.469	ρ = 0.591	ρ = 0.198	ρ = 0.498
T217 13J	ρ = 0.233	**	ρ = 0.237	ρ = 0.228	ρ = 0.197	ρ = 0.154
T217 14J	ρ = 0.159	**	ρ = -0.014	ρ = 0.193	ρ = -0.053	ρ = 0.081
T317 14J	ρ = 0.080	ρ = 0.080	ρ = 0.260	ρ = 0.199	ρ = -0.171	ρ = 0.216

Table 11 Spearman rank correlations of student engagement measures (E1-6) and success (S1) per module presentation

To better place these in context, the difference between the Pearson and Spearman results were considered:

Module /pres	E1 Structured Slots	E2 Views (other)	E3 Comments (own)	E4 Comments (other)	E5 Feedback requests	E6 Pinboard slots
U101 12J	0.048		-0.001	-0.062	-0.111	-0.013
U101 13B	-0.039		-0.018	-0.055	-0.069	-0.039
U101 13J	-0.211	-0.177	-0.104	-0.176	-0.062	-0.130
U101 14B	0.011	-0.158	-0.169	-0.190	-0.186	-0.059
U101 14J	0.032	-0.115	-0.076	-0.118	-0.069	-0.071
T217 13J	-0.028		-0.016	-0.133	-0.022	-0.018
T217 14J	-0.058		0.054	0.020	-0.066	0.021
T317 14J	0.046	0.046	-0.086	-0.121	0.190	-0.126

Table 12 Difference between Pearson and Spearman correlations of engagement measures (E1-6) and success (S1) pers module presentation

These differences are perhaps easier to see visually:

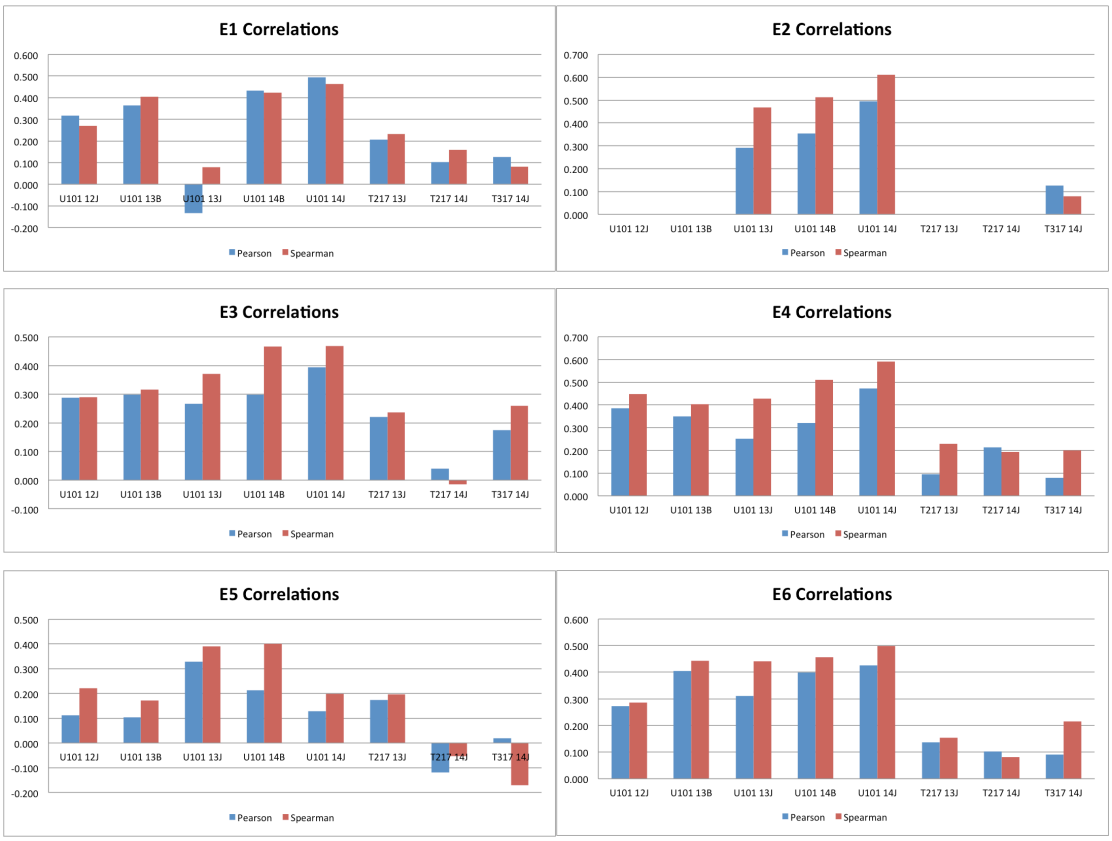


Figure 4 Comparison of Pearson to Spearman correlation for all engagement measures

These results show that :

- From the relative closeness (in magnitude) of the Pearson to Spearman correlations, the hypothesised linear relationship between the correlates S1 and E1-E6 is more likely than other relationship models. However this is not strict across all presentations, suggesting that more detailed tests might reveal other possible relationship patterns (for example that a power relationship might exist for some extreme behaviour measures such as E2 in U101:14B). This may also explain, or be caused by, the distribution results identified in 2.4 below.
- Generally, outliers do not seem to significantly affect the results for almost all measures, with the exception of:
    - The data in the 13J presentation diverges just as it does for the Pearson correlation. As before there may be some difference in the data that accounts for this.
    - U101 14B – where the Spearman correlation is higher than the Pearson, supporting the general hypothesis for this module and presentation.
    - For factors where commenting is part of the measure (E3 and E4), the divergence here may be explained by the uneven distribution of this behaviour across the student population. This is explored further in 2.4 and the results there may have a relevant effect on the correlation results for these factors.

Overall, it is fair to state that the Spearman correlations and comparison generally support the original Pearson correlations derived; that there is no statistically significant effect on this correlation caused by outliers; and that there appears to be a generally linear relationship in the correlation itself.

Despite this there is some suggestion that direct correlation may not be a particularly useful descriptor of what is happening with individual students, In other words, that the general pattern may be accurate but less valuable in considering specific aspects of learning design. For example, the general inference that viewing leads to commenting cannot be made in isolation and that other data has to inform such specific correlations in individual students.

2.2.3 Correlation 4 – Correlation E2 / E4 (Views to comments)

The relationship identified in 2.1.3 was further tested by correlation to student success:

Module /pres	E2 Viewing / E4 commenting (other)
U101 13J	r = 0.703, n = 397, p < 0.00001 Strong and significant correlation
U101 14B	R = 0.616, n = 209, p = Strong and significant correlation
U101 14J	r = 0.650, n = , p = Strong and significant correlation
T317 14J	r = 0.522, n = 178, p = Strong and significant correlation

Table 13 Correlation between viewing and commenting.

Strong, positive and linear correlations are in evidence *between* engagement measures. As discussed elsewhere this is partly unsurprising but it remains an effective demonstration of what was only assumed to be a correlative behaviour in ODS. Interestingly, this strong, positive correlations between viewing (E2) and commenting (E4) is observed in both U101 and T317 (note that no data exist for T217 or for every presentation of U101).

2.3 Time based engagement

2.3.1 Engagement measures over time

Visual inspection of the time-based charts (Appendix 5) led to several basic observations for all modules and presentations.

Engagement measures increase in response to assessment points, a well-documented observation in other modes of learning and teaching (Snyder, 1971 in Gibbs & Simpson (2004)). This was an expected result but the level to which it is possible to visually determine where assessment points are by looking at engagement points is always worth restating.

As with assessment points, engagement measures respond to critical holiday points in the year (Christmas, Easter, summer, etc.) as noted by a corresponding reduction in all measures. Once again, this was an expected result which reinforced the link between engagement, assessment design and student performance.

All modules demonstrate an overall drop in all engagement measures during the module study period. This is correlates to the well-documented effect of reduced engagement in any period of study, and effect that is particularly pronounced in distance education.

For T317 the drop in average weekly engagement is less acute and for some measures it actually increases. Bearing in mind the generally low engagement in total, this may indicate either the presence of a strong core network of students who have identified a personal value in engagement through the studio, or that the project starting in the latter half of the module increases engagement.

For U101 there seems to be a clearer link between Viewing and Commenting (E2 and E4) suggesting a possible cause behind the correlation noted above. This time-based causal correlation would seem to make practical sense since students are engaging in viewing other slots and have been encouraged to do this and then comment as well. This pattern does not appear to be as strong in T317 although it is there in the overall totals (Section 2.1.1), once again suggesting a less consistent use of the studio by all students. The U101 correlation of Viewing to Commenting (E2/E4) also supports the observation that students are doing more than simply assessment-related activity. Looking at other slots is not a required part of the module assessment so students are clearly engaging in this activity for other reasons.

For T217 there is a clear difference in the volume of structured slot uploads undertaken by students. On average this is 3 times higher than U101 and double that of T317. For T217, this is a part of the activity learning design, whereby students upload greater numbers of structured slots as they progress through the module. These slots are also Collections, which allow multiple image slots to be collated into a mini portfolio. The use of these slot types *may* change the focus of the studio to more of a personal portfolio, where students view it more as tool to collate their work and less of a social space as evidenced by the much lower commenting results already noted. The learning design of the module does try to encourage social interaction but further work is required to fully understand what, precisely, in the learning design causes the difference(s) observed.

Finally, it is also worth noting that differences such as this may not be a problem in themselves. The use of and research into virtual studios is still relatively new and there are very few studies that look at development of students across long periods of time, such as qualifications.

2.3.2 Ratios over time

The ratios of comments own:others and views:comments were visualised over time (Appendix 5.5.3). These demonstrate that, as expected, the overall average weekly total of comments on both own and other slots generally decreases as the modules progress. This is most likely directly correlated to the general reduction in engagement in any course.

Despite this, if the exceptionally high comments at the start and low comments at the ends of the module are ignored, there is a plateau of total average comments, suggesting a stable community of engaged students.

2.4 Distribution of engagement

Visual inspection of the engagement distribution charts (Appendix 6) identified the following:

- Engagement is unevenly distributed across students at all levels of study. For all engagement measures (except number of structured slots), there is a near logarithmic relationship falloff in engagement. This means that a few students are engaging significantly more than others; whilst a majority are engaging less than the average.
- As an estimate, approximately one third of students at Level 1 contribute over half of the engagement activity.
- The exception to this is the distribution of completed structured slots at Level 1, where this acts in the opposite direction (i.e. that more students complete more slots than the overall average). This is not observed at Level 2 and 3 but the distribution is less uneven than all other measures at these levels.
- There are clear outliers at both ends of this distribution – an engaged minority at one end and a generally disengaged majority at the other end.
- Within the highly engaged minority, there are outliers with exceptionally high levels of engagement. To put this in perspective, it takes 100 times as many low engagement students to make up the exceptional engagement viewing slots measure for the Level 1 module. This is a significantly uneven distribution of behaviour.

2.4.1 Distribution over time

To examine this further, the distribution over time was considered in detail. A sample of students from several presentations were visualized to identify engagement patterns over time during a module presentation. The uneven distribution (below) was particularly important to understand in terms of the types of disengagement that might be happening.

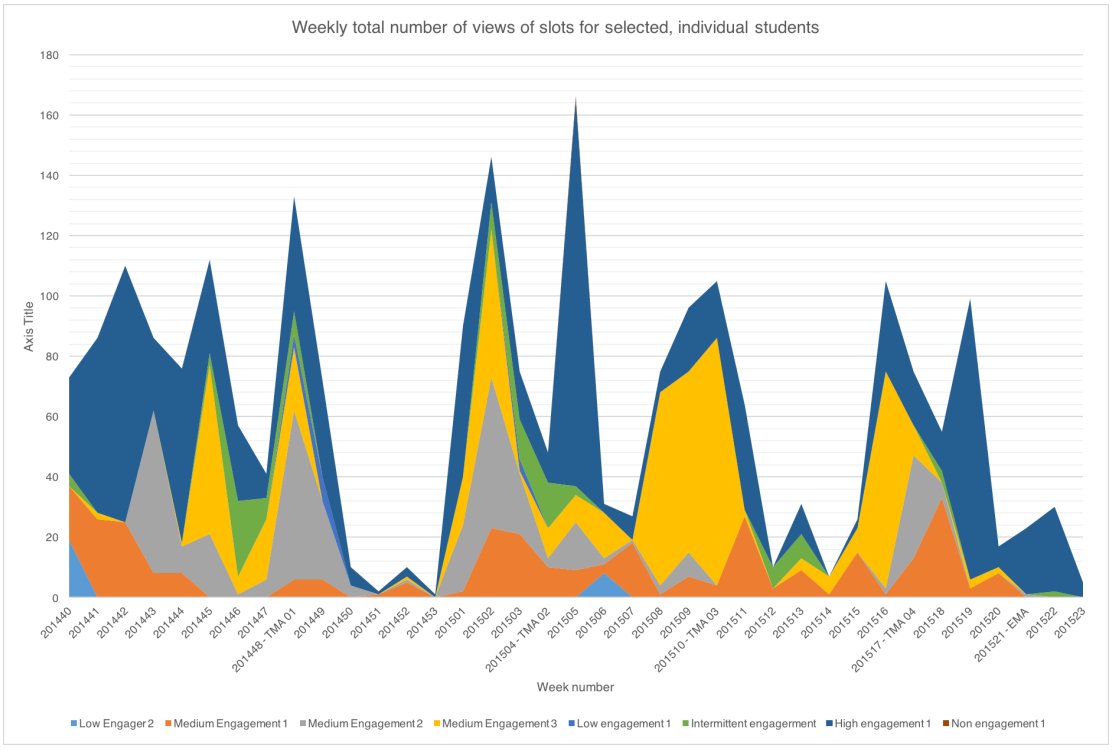


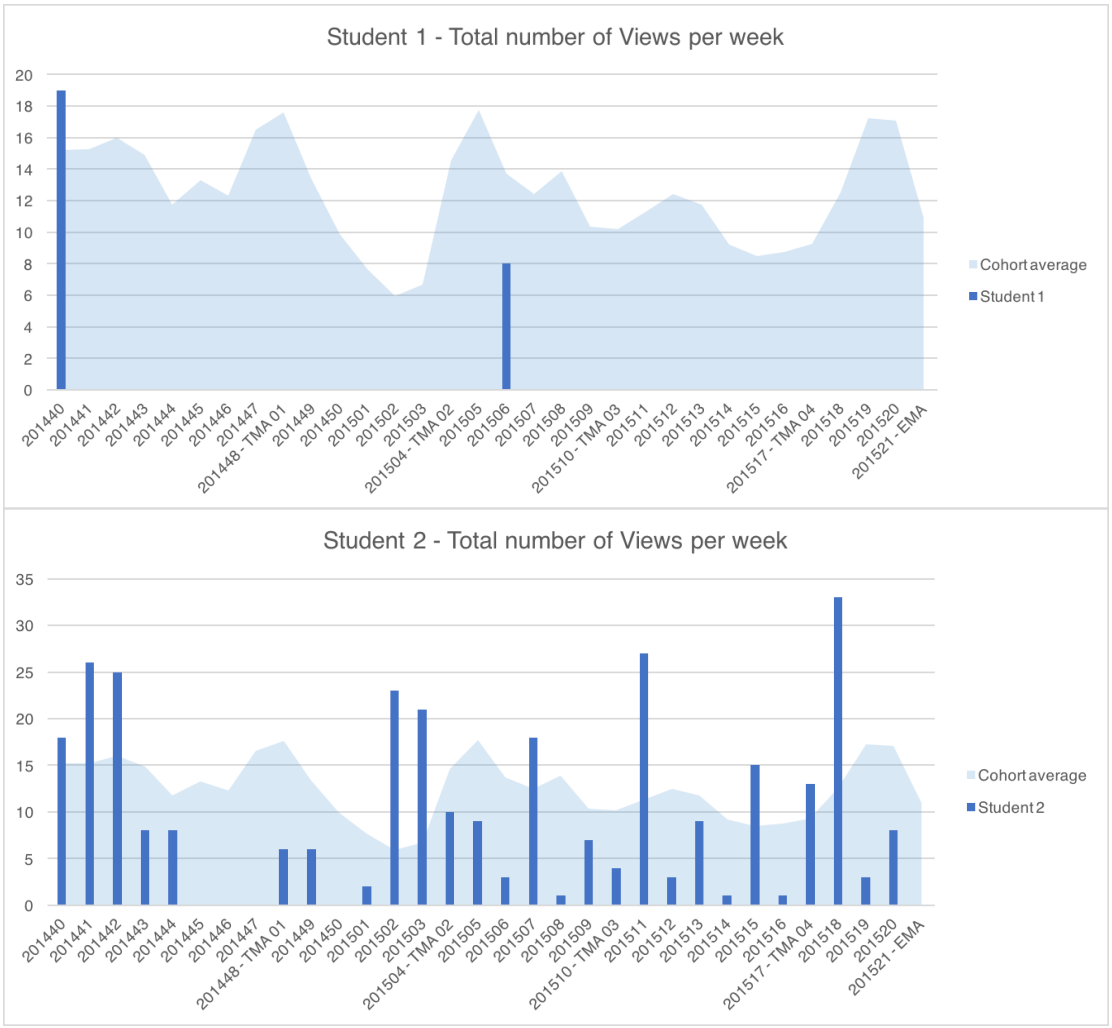
Figure 5 Weekly total number of slot views for 8 individual students

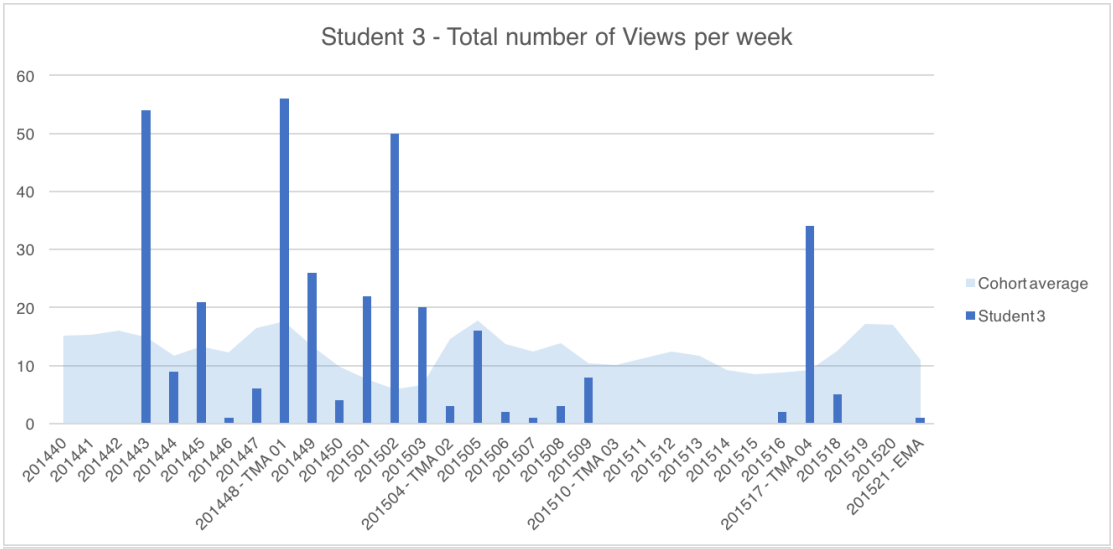
Form these visualisations it was clear that a range of different engagement activity patterns were taking place.

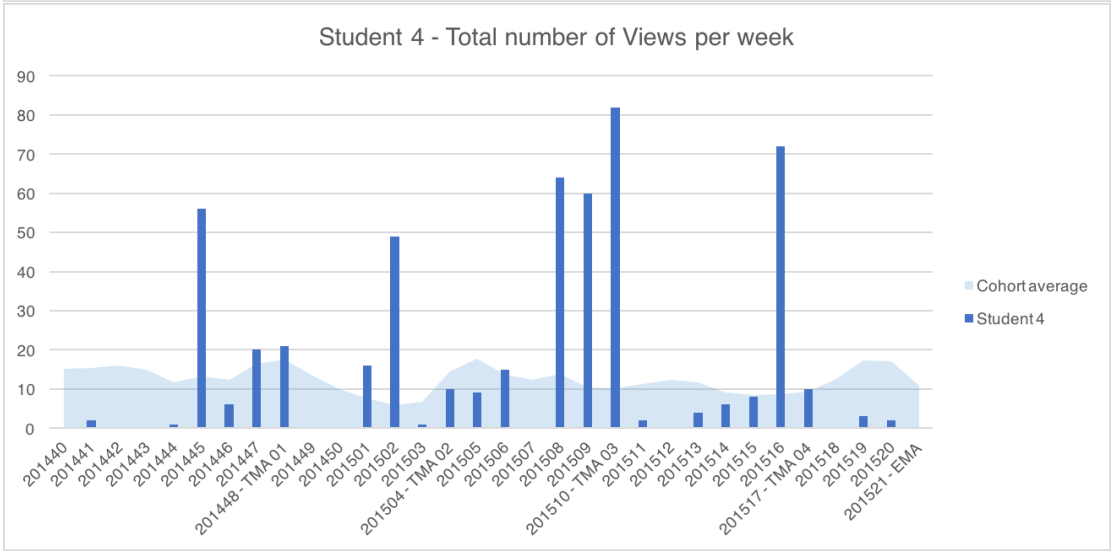
Firstly, there is the amount of activity taking place – essentially what has been the focus of the analysis so far. This includes the number of engagement actions measured each week to analyse both totals and averages. This variation of activity measures has already been identified and its uneven distribution between students is considered below.

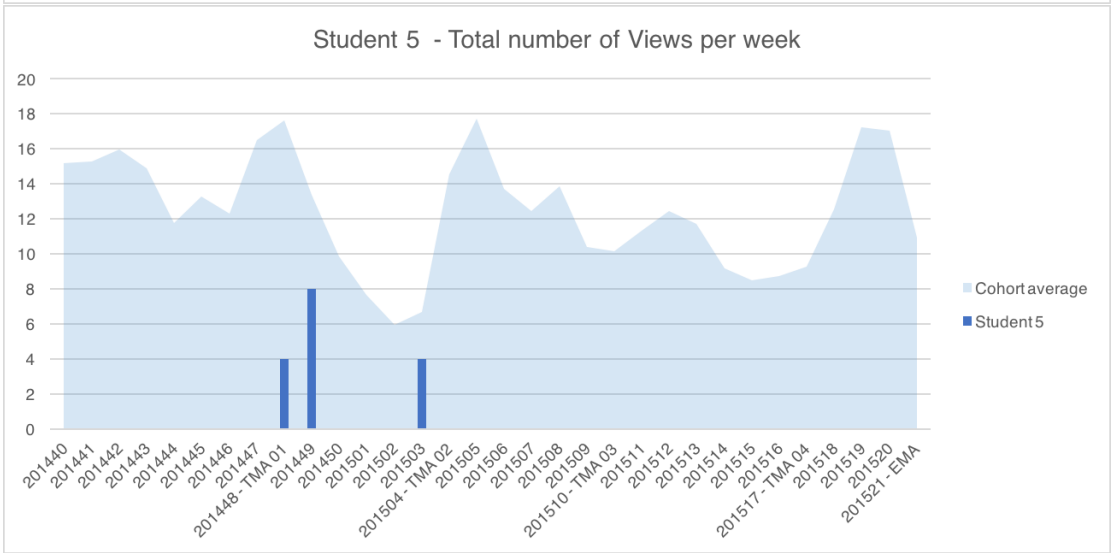
Secondly, there is a variation in distribution of activity between weeks, with most students engaging in very little activity for several weeks followed by higher activity levels in other weeks. For example, a common pattern reported informally is an increase in activity at assessment points, where students engage at a higher rate over short periods of time before returning to a lower rate of engagement between these high points.

These patterns can be seen more clearly in the following visualisations of the above example student patterns. All are shown with the overall cohort average weekly values for comparison.




Student 3 - Total number of Views per week
60
50
40
30
20
10
0
201440
201441
201442
201443
201444
201445
201446
201447
201448 - TMA 01
201449
201450
201501
201502
201503
201504 - TMA 02
201505
201506
201507
201508
201509
201510 - TMA 03
201511
201512
201513
201514
201515
201516
201517 - TMA 04
201518
201519
201520
201521 - EMA
Cohort average
Student 3


Student 4 - Total number of Views per week
90
80
70
60
50
40
30
20
10
0
201440
201441
201442
201443
201444
201445
201446
201447
201448 - TMA 01
201449
201450
201501
201502
201503
201504 - TMA 02
201505
201506
201507
201508
201509
201510 - TMA 03
201511
201512
201513
201514
201515
201516
201517 - TMA 04
201518
201519
201520
201521 - EMA
Cohort average
Student 4


Student 5 - Total number of Views per week
20
18
16
14
12
10
8
6
4
2
0
201440
201441
201442
201443
201444
201445
201446
201447
201448 - TMA 01
201449
201450
201501
201502
201503
201504 - TMA 02
201505
201506
201507
201508
201509
201510 - TMA 03
201511
201512
201513
201514
201515
201516
201517 - TMA 04
201518
201519
201520
201521 - EMA
Cohort average
Student 5

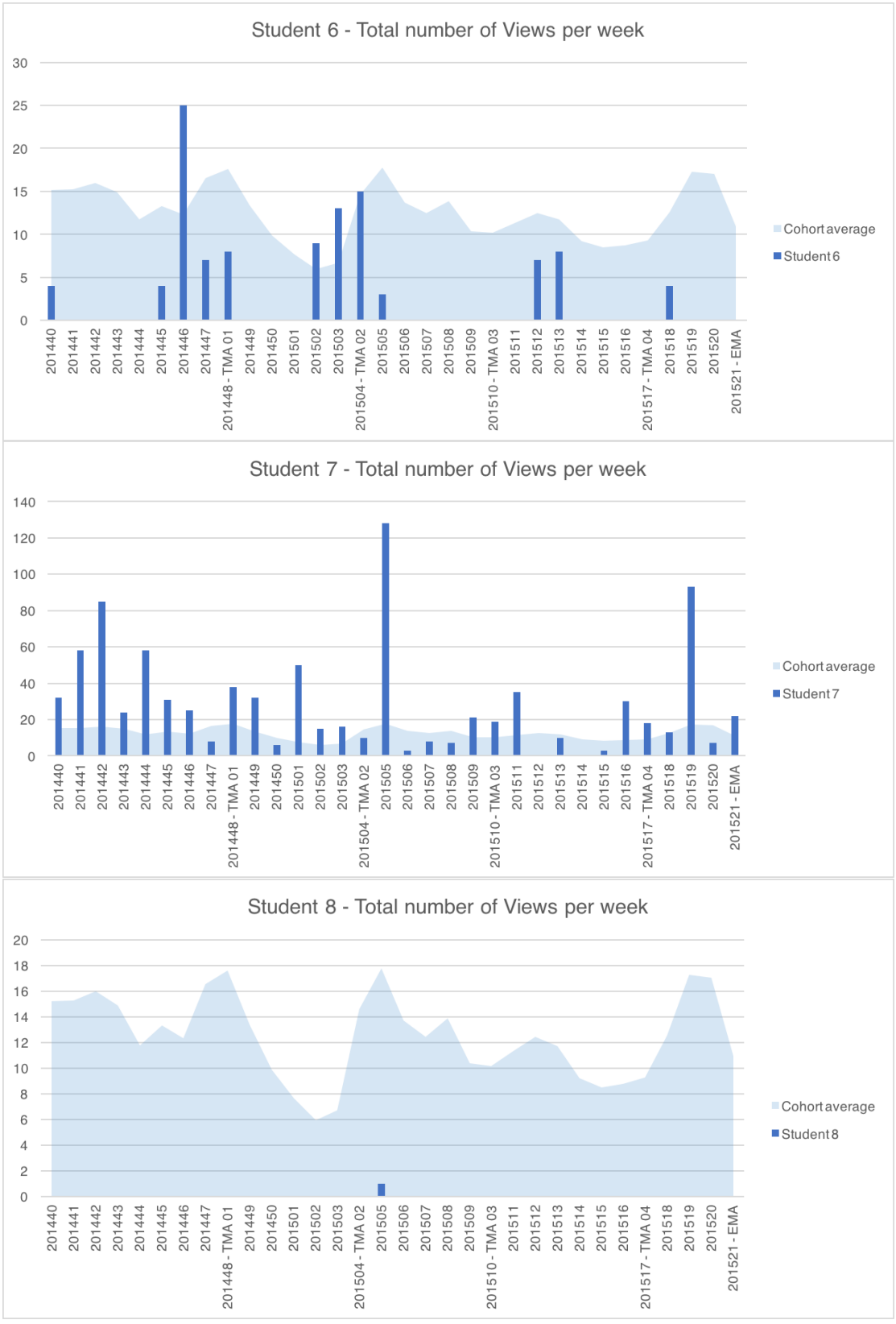


Figure 6 Total number of slot views per week overlaid on the overall cohort average for 8 example students.

Following visual inspection of a number of samples, these example students are relatively indicative of the general population. A few noteworthy patterns emerge.

Firstly, low engagement intensity and regularity can clearly be noted in students 1, 5, and 8. All three of these students have exceptionally irregular engagement with the studio.

Secondly, high engagement intensity can be noted in students 4 and 7. The distribution of this engagement is uneven through time, however, with peaks of activity appearing clearly at the assessment points. Student 4 appears to be less regularly engaged than student 7

Finally, students 2, 3, and 6 exhibit a medium engagement intensity. As with the previous group, these students exhibit a generally uneven distribution of engagement and each also has a slightly different ‘fingerprint’ of engagement distribution.

Overall, none of the individual engagement patterns relate well to the average pattern in terms of one predicting the other, with the exception of the extreme values. The overall average relates well to a qualitative assessment of engagement level; but the SD does not relate well to what might be considered a distribution of engagement (with the exception of low distributions), as can be seen in the following tables:

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Student 8
Total	27	308	344	519	16	107	905	1
Average	0.84	9.94	10.75	16.22	0.50	3.34	28.28	0.03
Standard Deviation	3.60	9.48	16.58	24.43	1.68	5.75	29.19	0.18

Table 14 Total, average and standard deviation of weekly slot views for 8 example students

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Student 8
Engagement level	Low	Med	Med	High	Low	Med	High	Low
Engagement distribution	Low	High	Med	Med	Low	Low	High	Low

Table 15 Visual assessment of engagement level and distribution of weekly slot views for 8 example students

Generally, the standard deviation of these values is not a particularly accurate predictor of engagement distribution other than as a differentiator of exceptionally low and high distributions (i.e. students 1, 5, 7, and 8 in the example set). Even then, it would not be a suitable measure to make assertions without also inspecting the individual student behaviours qualitatively.

The most likely explanation is that there are multiple points around which distribution of engagement actually takes place. As previously noted, the assessment points are high points in engagement activity for many students and it this ‘distribution of distributions’ that is of greater interest

It is also worth noting that the way the data was recorded for OpenStudio meant that any week within which no engagement activity was captured was not stored in any way. This is worth noting in terms of 1) it not being an accurate data point – it should be recorded as ‘0’ instead of no data entry and 2) it makes data cleaning and structuring much harder when carrying out any analysis.

This is relevant when considering designing for ‘invisible learning’, where the interest is in those behaviours that we might not normally associate with learning because

they do not fit the learning design explicitly. As an example, if we consider the number of weeks the example students have 0 views, we do see a correlation between these and the visual assessment in table 15:

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Student 8
Number of weeks with 0 slot views	28	3	11	9	29	20	2	29

Table 16 Number of weeks with 0 slot views for 8 example students

Of course, this may only indicate that the visual assessment is actually counting weeks with 0 engagement, but it may also be a useful insight into how a quantitative measure may be generated from a qualitative assessment. If this hypothesis is correct, then it reinforces the issues around distribution of engagement noted above, as can be seen from the following visualisation:

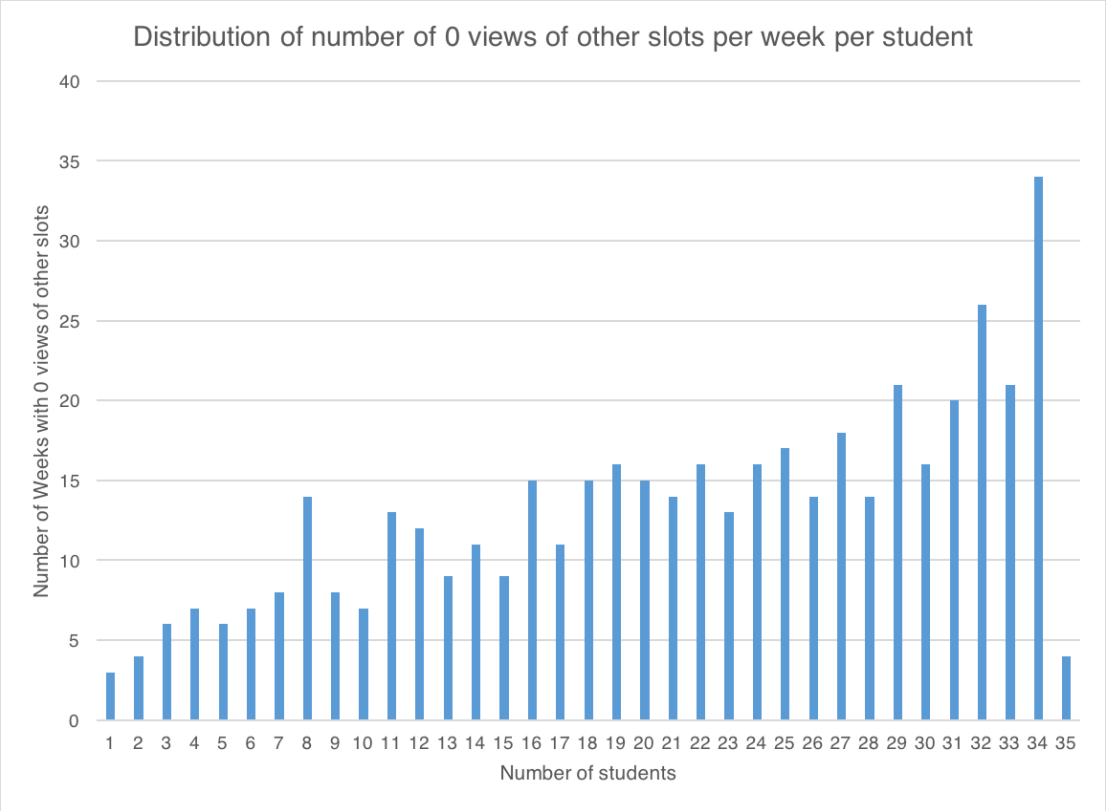


Figure 7 Distribution of number of students with no views of slots

As can be seen, there are more students with weeks of no activity than there are students with activity. Of greater concern are the relatively high number of students with very little weekly engagement, suggesting there may be a class of student for whom the studio did not form part of their regular study engagement.

Further research and analysis is required to establish which methods might be most useful to inform learning and teaching design.

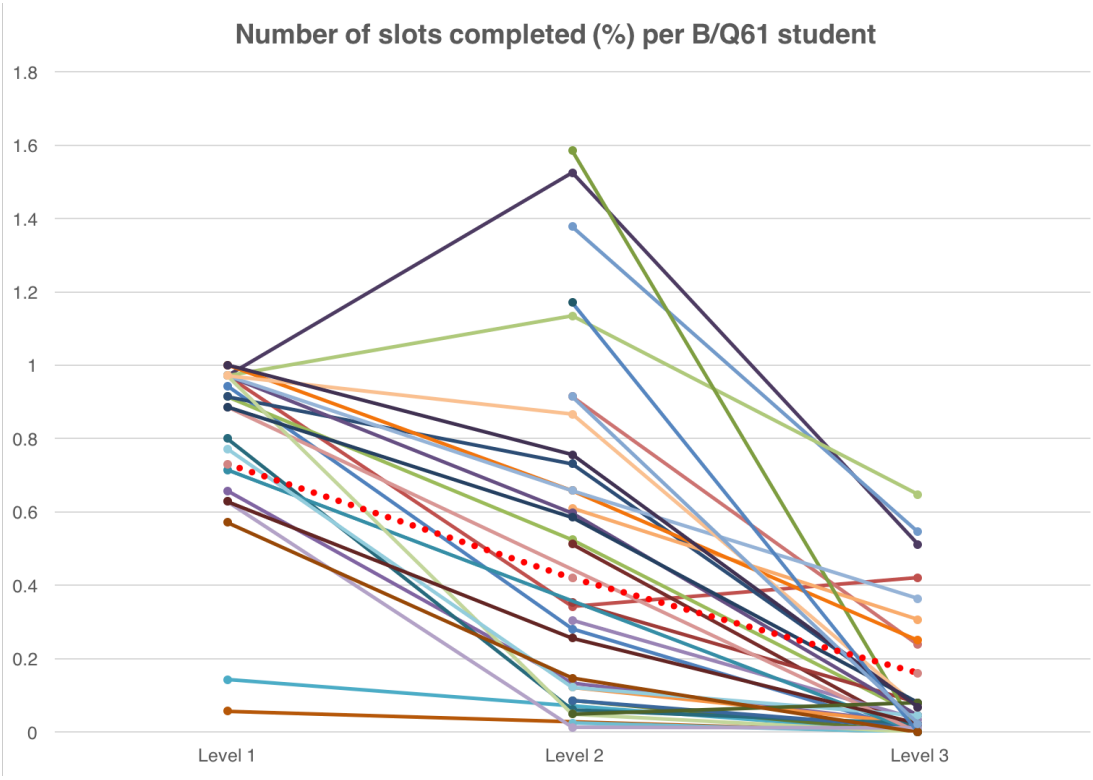
2.5 Qualification student analyses

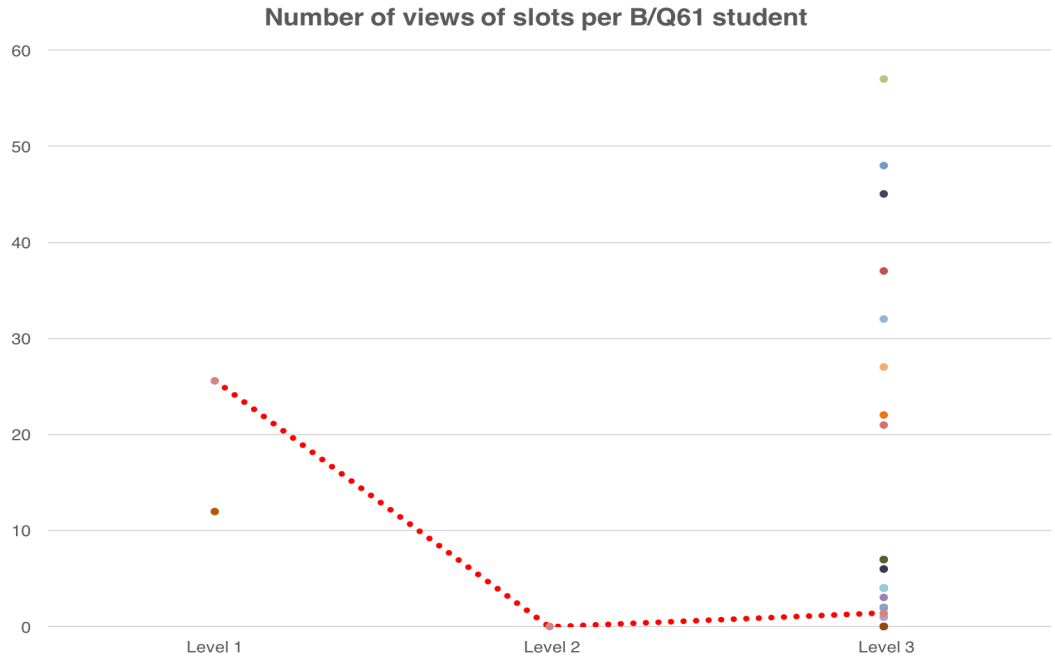
To consider specific hypotheses and particular findings, individual students who had completed the qualification and/or all three design modules (U101, T217, T317) were

isolated and analysed. This provided a dataset of 37 students. Not all students in this set had completed modules from which full data were available.

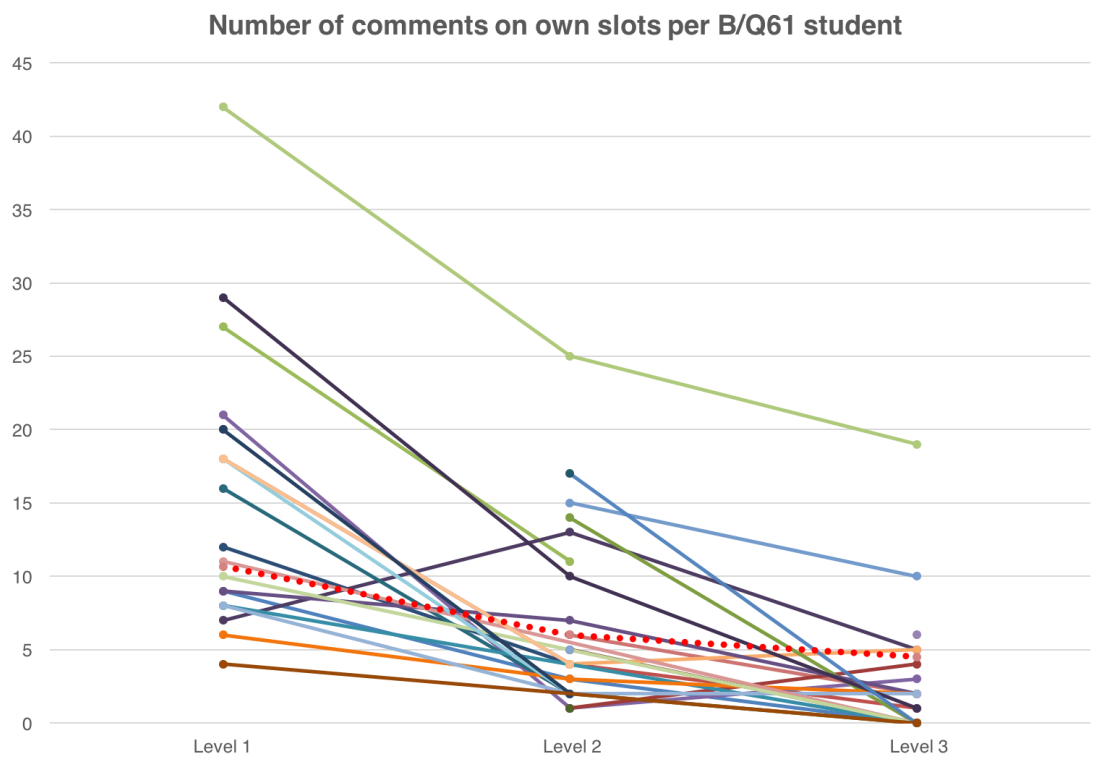
2.5.1 Average engagement measures per Qualification

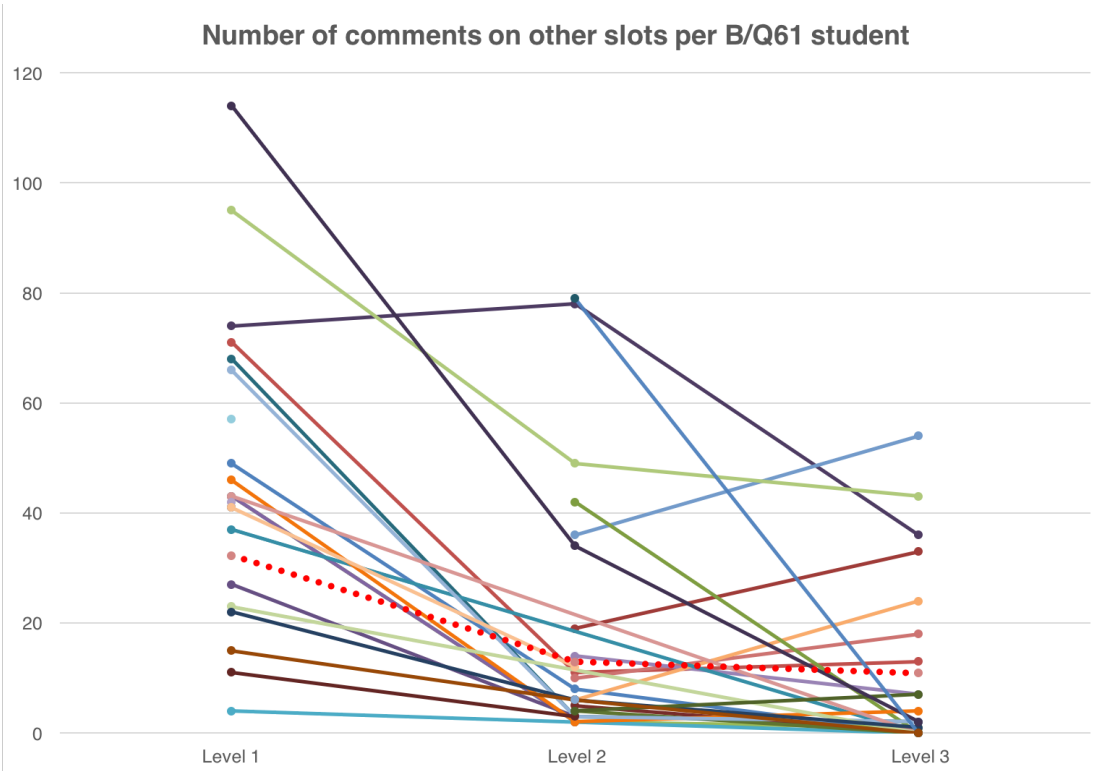
Plotting the average engagement measures visually allows consideration of the change in engagement between study levels :

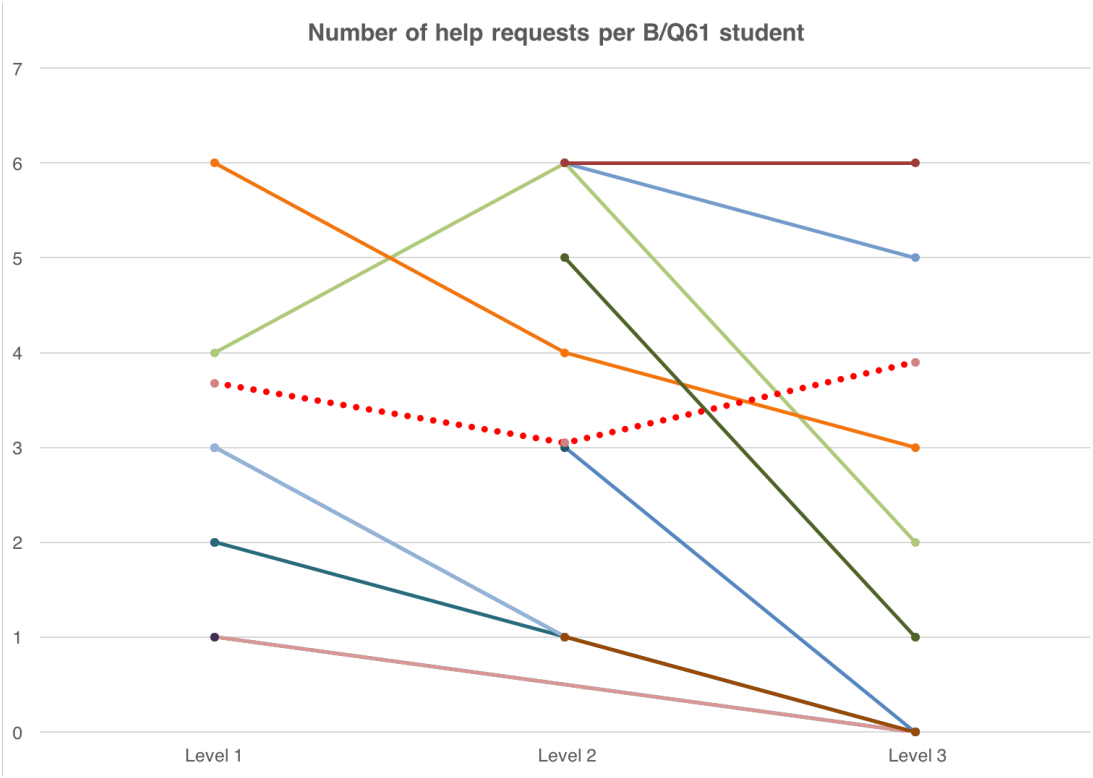


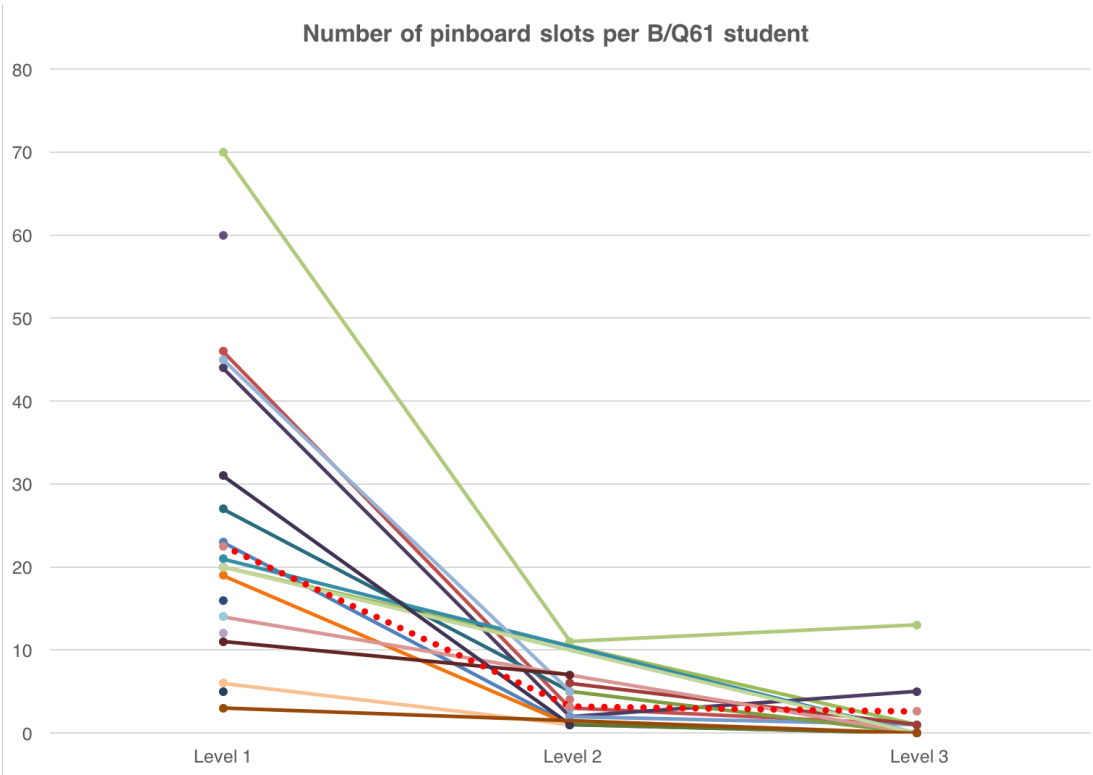


(Note: data was not available for all presentations. See Section 1.1)


Number of comments on own slots per B/Q61 student
45
40
35
30
25
20
15
10
5
0
Level 1
Level 2
Level 3


Number of comments on other slots per B/Q61 student
120
100
80
60
40
20
0
Level 1
Level 2
Level 3





Generally, engagement levels drop significantly between levels 1 and 2 and again between 2 and 3, with the exception of feedback requests.

The highest drops are between levels 1 and 2 for the more socially interactive measures. The drop in pinboard use between levels 1 and 2 is hypothesised to be due to differences in learning design around this feature of ODS. U101 makes explicit use of the pinboard in learning activities by instructing students to post to the Pinboard specifically. The design intent here is to induce the habit, by example, of

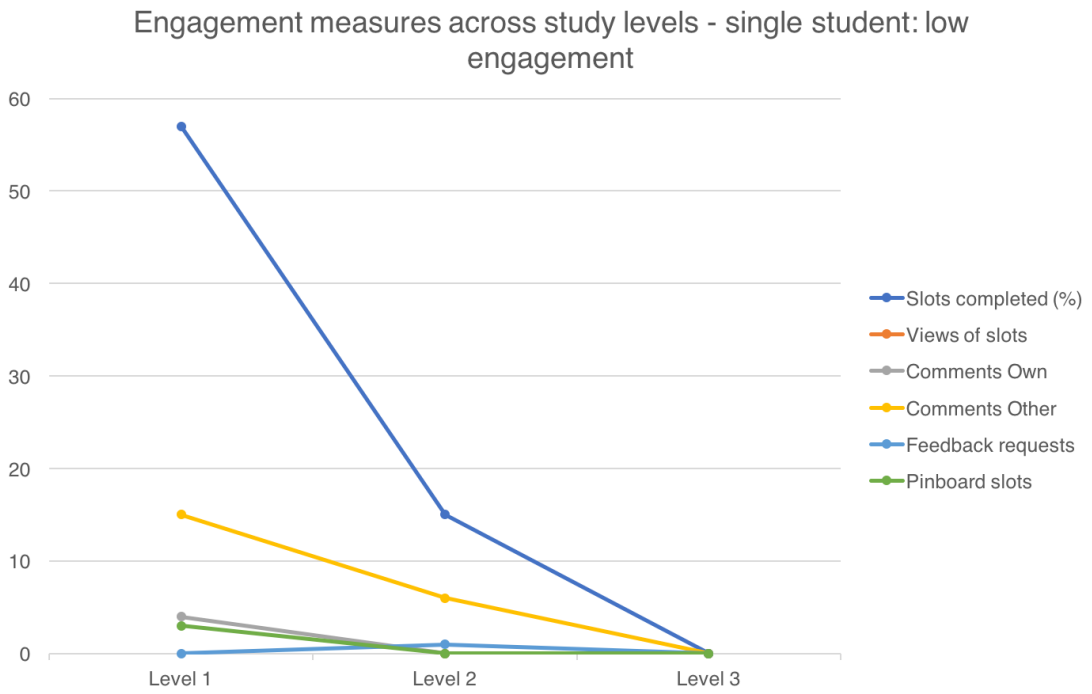
using this feature as if it were a virtual pinboard. T217 does not explicitly relate specific activities to the Pinboard, instead suggesting that students could make use of it. This difference of having either specified or general activity in the Pinboard may be the causative factor. A further cause may be the focus on multiple uploads in structured slots required in T217 – this may well encourage students to consider these as mini-pinboards, which is partly the design intent behind T217.

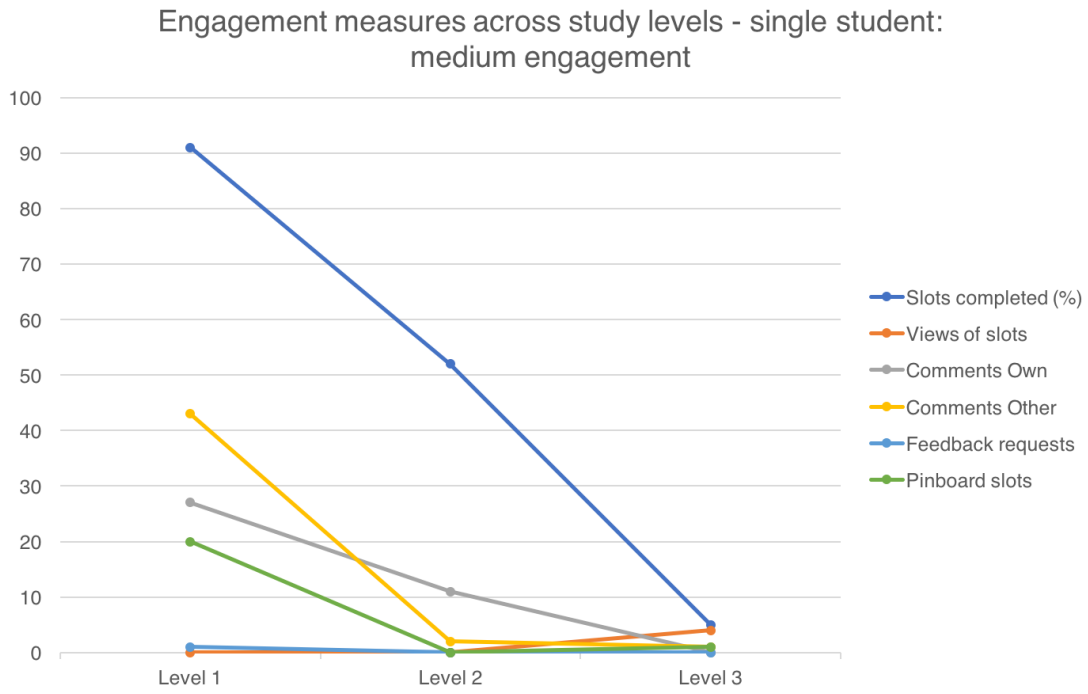
The engagement factor that reduces least is the number of structured slots completed, perhaps understandably given that should be completed as part of the learning design of all modules. But the level of students not completing the Level 3 structured slots is sufficiently low to warrant further investigation into the learning design.

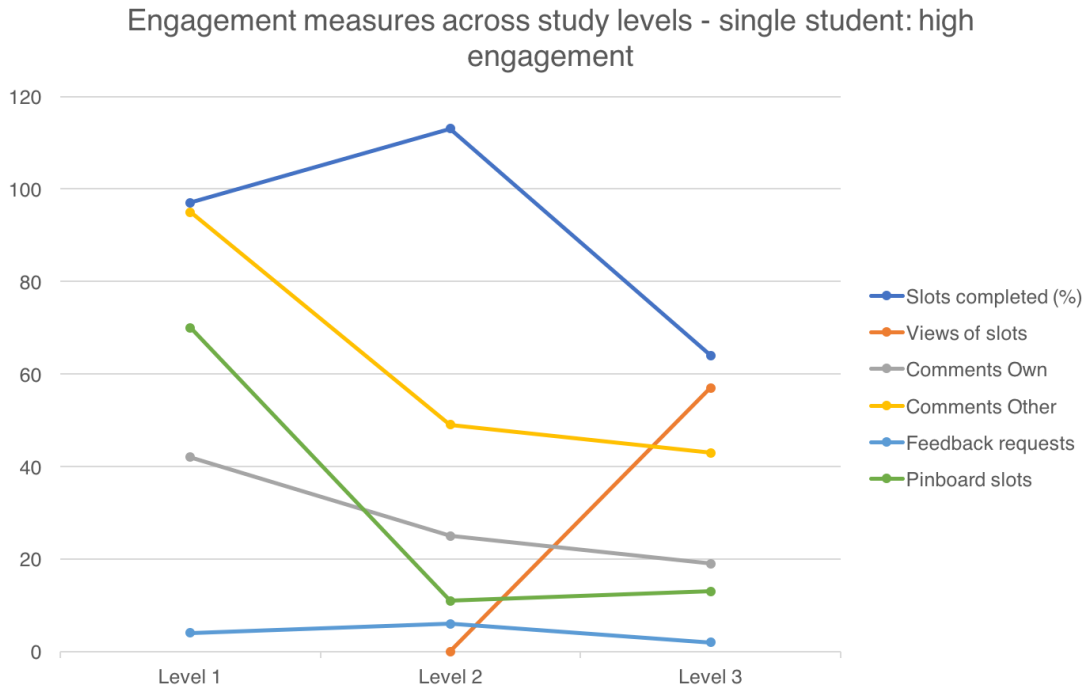
2.5.2 Individual engagement qualification students

Data from the qualification students show a similar reduction in engagement measures to that identified for the whole cohort population. This suggests that qualification students are (generally) not outliers in the distribution of engagement measures – that they are neither exceptionally high or low engagers, but are spread across the engagement spectrum.

To demonstrate this, three students qualification students are visualised below to demonstrate this spread of engagement (low, medium and high engagement measures):







These show that all individual student engagement levels reduce with study level. Moreover, a high-engagement student will reduce engagement over time just as a low-engagement student, although there is some suggestion that this reduction is greater in low engagement students. This may suggest that higher engaging students are more likely to persist with OpenStudio compared to lower engaging students.

It is perhaps worth noting that the lower the initial engagement level, the greater the overall reduction in engagement at higher levels of study. Conversely, a higher initial engagement level does not lead to as great a reduction at higher levels of study. This

may suggest that persistence (in terms of persevering with OpenStudio across levels of study) and engagement are linked.

3 Commentary

The following main comments are offered based on the major observations noted in previous sections.

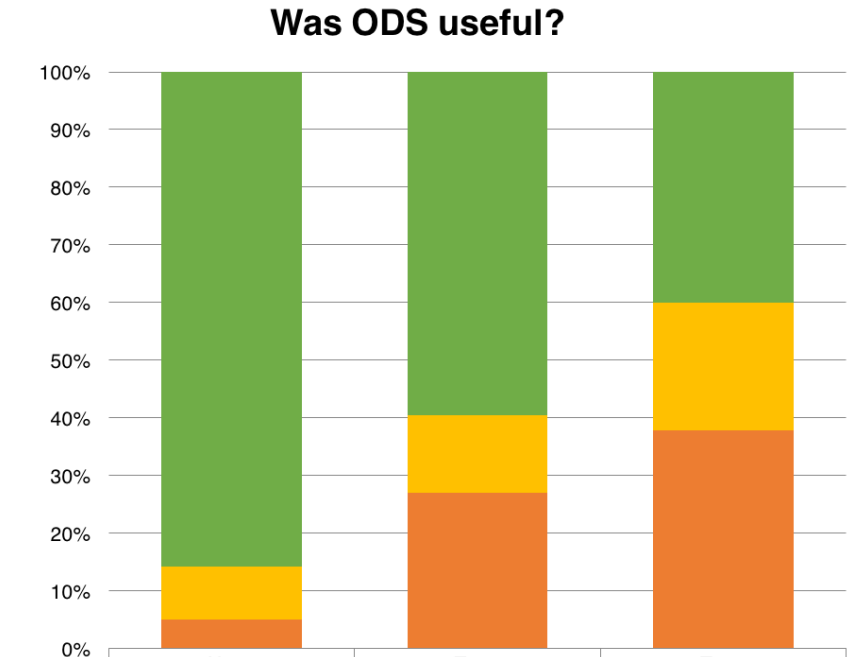
3.1 Drop in engagement across all measures across Levels of study

There is a clear drop in engagement within module presentations and between study levels. Possible explanations are:

- **The learning design**: the difference in learning design between the modules has to be considered, although this can be difficult since each module has a very different overall learning concept. U101 and T317 are (arguably) closest in terms of blending on- and off-line learning and are both presented entirely online. This does provide some ‘control’ against this as a variable, suggesting the mode is not responsible but that individual learning activity design may be the main cause.
- **The learning activity design**: The design of individual activities may have a significant effect with the hypothesis that high use on U101 is thought to be due to: quick, fun, valuable, relevant and differentiable activities. This tends to be less in evidence on T317 where greater emphasis on analysis and text is the norm. This is a similar finding in (Thomas et al., 2016): “The data suggest that students enjoy the OpenStudio activities, especially the visual nature of artefacts and the idea that shorter comments may be made, rather than longer more discursive pieces of writing.” Quick, simple and rewarding activities are thought to work best, whereas longer or more complex activities tend only to be completed by a core of students.
- **Visual interest**. Closely aligned with Learning design is the visual interest generated by the activities. If this content is not interesting (primarily through visual attention) then the activity required may not be generated and the critical mass momentum attained.
- **Momentum:** created a critical mass of posts with which students can engage. Even though level 2 asks students of many structured uploads, momentum and critical mass seems not to be created. A reason for losing momentum might be the blended nature of the learning design, which focuses on readings in books followed by larger, longer and more complex activities in OpenStudio. The quick, fun, discursive nature of U101 OpenStudio use is altered in the T217 studio.
- **The level of study**: students at Level 3 study may start to view the studio as a ‘lower’ form of learning – something that is no longer relevant or useful. Other factors may include study fatigue; a greater focus on outcome towards the end of a degree; or simply a greater emphasis on strategic study (either consciously ‘gaming’ or implicitly working to what is required). This is thought to have a significant impact on momentum, which seems to be absent at level 3.
- **ODS Shock**. The population of T317 contains a large percentage of students who have not studied a module that uses ODS, perhaps suggesting that learning to use it at lower levels may be a requirement for successful use at higher levels. Experience from other modules making use of it, however, suggests that this is only partially true. Its use on A844 (a Masters level course) is successful but this does have introductory material between it and

the predecessor course A843. OpenStudio induction might be key to every module that uses it, regardless of level.

- **Transient Students**: T317 has a known ‘transient’ student population. That is, a large proportion of students are studying other subjects (mainly engineering) and this 3rd level module is their first exposure to design. This population may suffer from ‘ODS Shock’ (above) but there may also be subject specific issues, such as the radical shift in attitude and approach required from engineering and design at the OU. Many students do not deal well with the transition to open-ended, non-deterministic problems set within a problem-based learning context.
- **Interrupted flow**. Students can study modules in any order they wish to and whilst there is some indication that many students study the 3 main design modules in order, other students will experience discontinuity of subject learning. This will mean they might not have continuous exposure to ODS perhaps meaning it becomes less central to their learning experience.
- **Bridging modules**. Like Interrupted flow, T217 may not be the needed ‘bridge’ between U101 and T317 – or U101 and T317 may not be appropriate endpoints of such a linking process. The data shows that the use of ODS on T217 is very different, possibly due to the learning design itself but also the intensity of use (see weekly average and totals charts). Further study would be required to understand but a strong hypothesis is that a qualification design approach would make the single biggest difference here in terms of having continuity of approach in OpenStudio.
- **Habits of independent learning**: Linked to the different student populations and the level of study, the use of studio based methods may not suit students who have learned to prefer independent learning. That is, students may prefer simply getting a book and remembering things rather than engaging in other modes of learning because it is far easier to self-manage and habituate to (Moore, 1973).
- **Perceived value of OpenStudio**: This difference in engagement is further supported by feedback in another study undertaken (yet to be reported) which found that the perception of usefulness of ODS was greatest in U101 and least in T317.



	U101	T217	T317
Yes	85.71%	59.46%	40.00%
Not sure	9.18%	13.51%	22.22%
No	5.10%	27.03%	37.78%

- **Seasonal effects**: In terms of population only, there is a known (but untested) difference between B and J presentations. Typically, B presentations tend to have lower student engagement and retention, and this seems to be reflected in the figures for U101.
- **Lack of stable core**: The importance of a stable core network – especially for particularly engaged students – is evident and this stability may be breaking down between modules. At the very least it may be that ‘restarting’ a social network in each module is difficult – that perhaps a core network stable across study level would be preferred. There is informal evidence to support this demand from students.
- **Social learning aversion**: The comment “I didn’t join the OU to speak to other students” is encountered regularly in open comments and reflects the fact that some student do not wish to engage socially for a range of different reasons. For these students, the OU is a natural choice of study mode and there is some informal evidence from tutor feedback to suggest that a group of students simply do not like to engage with others and resent being forced to do this.
- **Active learning aversion**: As with social learning, there is a core of students who do not wish to engage in active learning. This is also similar to independent learning habits but differs in that this is an innate preference for some students. Again, this comes from informal evidence from tutors and some open feedback comments. For some students, actively enacting what they have learned or are trying to learn is not how they conceptualise learning to take place, perhaps preferring more assimilative or prescriptive methods and modes of learning.

Despite this, considering the other results and the number of students it is fair to say that student population size alone does **not** appear to be a significantly affective

factor when considering the intersection of other variables. For example, the number of views of other slots in T317 when compared to U101 is not dependent on the student population. So, whilst population may be a factor, it is contributive and not causative, as can be seen in the average data.

3.2 Correlation between engagement and success?

It’s clearly disappointing that no explicitly clear and statistically significant correlation is evident between all engagement measures and student success. There are some moderate correlations, especially at Level 1, and these generally support the initial starting hypotheses (that there is some simple relationship between engagement and success).

But the more interesting finding here is that such descriptive statistics are insufficient to explain the data in a useful or valuable way – i.e. in terms of making sense of it in a learning and teaching context.

This is perhaps also not surprising given the nature of the subject of study. Education is a difficult enough domain within which to carry out intersectional analysis (Cohen et al., 2011; Charmaz, 2000; Unsworth, 2000). Social environments – particularly those designed for some specific purpose – are also notoriously challenging for research methods (Koskinen et al., 2011). Between these two difficulties is the tangled world of social learning environments, where it is arguably the practice of teaching that is far more important than objective methods of assessment (Donelan et al., 2010).

3.3 Stable core

The stability of the overall average comments totals (2.3) suggests a core of engagement activity. This was an early hypothesis generated from the pilot study (Lotz et al., 2015).

The distribution identified in 2.4 suggests that this is most likely a group of more engaged and actively contributing students – i.e. that this is not a large group or a particularly normally distributed group.

3.4 Social learning markers

The consistent ratio of higher comments on other slots compared own slots. Students are clearly aware of other students’ work and are more likely to engage with that than their own work – particularly at Level 1. One hypothesis for this behaviour is that students are orienting themselves, comparing their own work to other students’ and, in doing so, leaving more comments. In terms of studio learning, this would be a positive pedagogical activity.

But the difference in commenting ratios between levels 1, 2 and 3 may suggest a difference in social engagement generally. In U101 students make around 3 times more comments on other slots than their own – in T217 this drops to about twice as many. This suggests a change in general engagement with other students and a move from engaging in other students’ work to their own work

This could be due to

- Reduction in the size of cohort at level 2 may have an impact on a stable core network or simply not produce enough activity to generate a ‘social momentum’ – even an unevenly distributed one may contribute to an overall socially engaged cohort;

- The learning design focuses on the creation of multiple groups of slots representing a student’s concentrated work over a period of time. There is some evidence from tutors and open comments that these forms of artefact may be harder to engage with as either individual slots or as a collection;
- One reason for losing social momentum might be the blended nature of the learning design, which focuses on readings in books followed by larger, longer and more complex activities in OpenStudio. The quick, fun, discursive nature of U101 OpenStudio use is altered in the T217 studio.

Again, further research is required to consider the detail of what may contribute to the drop in these engagement factors.

3.5 Assessment drives engagement

The observation made in 2.3.1 was expected but it is always worth restating: students engage far more with those elements of learning design that are explicitly and obviously linked to assessment.

This has an implication for learning design but it should be noted that the level of activity observed was far higher than that required only for assessment. As with other findings from this study, there is clear evidence that students are engaging to a greater extent than absolutely necessary, suggesting purely formative learning as well as summative assessment is taking place.

A further observation is the informal observation that many students ask whether activity in ODS is assessed, suggesting that they take a decision not to engage with this activity since it carries no value for them (i.e. they are focused only on what is assessed, presumably to gain a particular module result). With the increase in fees and the focus on employment, this redirected focus from course learning to course results is more likely to increase.

3.6 Request feedback feature

The Request feedback feature is not currently working as expected or designed.

Firstly, the lack of engagement with this feature suggests that it is primarily a function that is of little value to students, possibly due to the context within which it is presented in design (i.e. that of presenting the students’ own work and admitting that they need help to be creative or to come up with ideas). Likewise, students who consider themselves on similar level as other learners’ might not feel competent and confident enough to give feedback.

Secondly, there is some evidence that this feature is used somewhat frequently at the start of modules but far less frequently in later stages. Although this finding is not entirely consistent across all modules, the low level of the data values (i.e. use of the feature) make it exceptionally difficult to detect a significant effect other than the lack of use.

Finally, a similar reduction in frequency of use is noted as the study level increases – that is, students are less likely to make use of this feature in later levels of study. Analysis of the qualification students supports this lack of engagement and that it decreases with study level.

A change in the scope of the feedback request function could be considered. It could be used as tuition tool rather than peer feedback tool, meaning that if a request is made, a tutor should attend to this.

3.7 Viewing to Commenting conversion

The ratio of viewing to commenting appears consistent at 15% in U101. Unfortunately, data for all presentations was not available to suggest any general pattern.

This also has to be seen within the context of other results. On average, this conversion is good but when the distribution is taken into account it may not be as effective as initially thought. For example, the possibility that relatively few students are actually regularly viewing slots is of great concern (2.4.1).

3.8 Descriptive statistics

As identified in 2.4.1, purely descriptive statistics may not be entirely appropriate and the divergence of results given in the totals and averages compared to an inspection of individual students has shown an important difference that cannot be ignored. The key, then, becomes finding suitable models that bridge this gap between saying something too general to be meaningful or useful.

This may be resolved by generating a model for distributed engagement behaviours and testing this against different presentations. For example, given the known distribution around assessment points and the planned distribution in terms of structured / pinboard slots, it would be possible to create an ideal student engagement distribution pattern.

Further research would be required to develop and test such models.

3.9 Pinboard slots

The Pinboard is used very differently at each level of study and this is reflected in the learning design.

In U101 the use of the Pinboard is part of the module design and is, therefore, used regularly and reflected in the engagement measure. This use drops significantly in T217 where its use is not generally part of the learning design in terms of formal, structured use.

The significant drop in Pinboard use between U101 and T217 does not recover in T317. The other factors affecting engagement at level 3 make it difficult to establish whether this is an issue of the failure to recover to Leve 1 engagement or that there is no prior habit of use established in previous study (see 3.1 above).

4 Summary Are we making progress?

Before considering any outcome, one outcome from this research was that this is work that is not generally considered in the University, meaning our understanding of progress in an academic sense is incomplete. To date the institution has relied on progress as defined by successive completion on modules through passing assessment(s) in these modules. The presumption behind this, although not stated, is that each level of module is a fit predecessor/successor to the next one in terms of individual learning and teaching, in much the same way as progress through an individual module might be.

On detailed inspection, this assumption has to be challenged in terms of how effective this is for individual students. Research and teaching knowledge has not sought to enquire how such progress takes place in enough detail to understand it beyond a statistical pattern (i.e. students continue to pass therefore there must be progress).

This research has shown that there are inconsistencies and changes between modules that make it very difficult for students to connect certain aspects of their education. The use of Open Studio is one of those discontinuities, where the design of the activities that contribute to the studio changes between modules, which seems to then lead to differences in behaviour and use of the studio, observed through the difference in engagement measures.

To demonstrate the lack of detailed knowledge in this area we cannot answer the question of whether this is necessarily a good or bad thing. Structurally there are factors beyond individual module design that will still contribute to steps in learning experience (module pathway and study order; incoming student populations).

To return the starting question in the title of the project, “Are we making progress?” the answer most likely has to be … yes and no!

We are certainly making progress in terms of knowledge of distance design education but there are differences between the use of ODS on the modules. From all the data analysed it is clear that ODS is used far less intensively in T317 and that when it is used it is less effective for the students using it.

The analysis here provides valuable hypotheses and suggestions on how the learning design in individual modules can be considered as part of a longitudinal ‘learning journey design’. There are a multitude of complex, interrelated behaviours, attitudes and events that contribute to sustained engagement in a virtual design studio. This study shows that such engagement is rewarding for students across many of these factors – not simply those large learning outcomes we might wish to see as educators.

Indeed, it may be summarised that it is perhaps better to look for the little actions and behaviours to inform learning design. Something as simple as viewing another student’s work has been shown to correlate to a set of far more complex and valuable learning outcomes. This provides a simple, single focus around which learning design can take place and be tested effectively.

5 Appendices

5.1 Appendix 1: Definitions

Results from the following modules:

- U101: 12J, 13B, 13J, 14B, 14J
- T217: 13J 14J
- T317: 14J

The measure of **engagement** per student is defined by:

- E1 (inverse of) Number of empty slots
- E2 Number of views of other slots
- E3 Number of comments made on own slot
- E4 Number of comments made on other slot
- E5 Number of feedback requests
- E6 Number of pinboard slots created

We measure **success** per student by:

- S1 Overall rank on a module
- S2 Qualification degree classification (banded)
- S3 Qualitative ‘expert’ analysis of

5.2 Appendix 2: Data cleaning steps

5.2.1 S1 data

Source file renamed to ph2_data_s1_all_step_00.xls and the following steps taken.

ph2_data_s1_all_step_00.xls	Source data
ph2_data_s1_all_step_01.xlsx	Table created adding all PIs and all results. Will inform S1-1: Student success by module based on Rank; Pivot table to above created by PI to find PIs with 1, 2, 3 module results; Table created based on above to generate average Rank

5.2.2 E[n] data: ODS v1.0

ph2_data_e_t217-13j-14j_step_00 ph2_data_e_u101-12j_step_00 ph2_data_e_u101-13b_step_00	Source data
ph2_data_e_t217-13j-14j_step_01 ph2_data_e_u101-12j_step_01 ph2_data_e_u101-13b_step_01	All sheets converted to tables (except lookup tables at end); All tables sorted Ascending by PI
ph2_data_e_t217-13j-14j_step_02.xls ph2_data_e_u101-12j_step_02 ph2_data_e_u101-13b_step_02	All #na PI entries deleted from each sheet Pivot table created for each sheet (e[n]_tot) Totals and average data taken for **3.1 Basic data** section
END	This final version is then used for analysis

5.2.3 E[n] data: ODS v2.0

All data in single file.

ph2_data_e_4mods_step_00	Source data

ph2_data_e_4mods_step_01	All sheets converted to tables (except lookup tables at end); All tables sorted Ascending by PI
ph2_data_e_4mods_step_02	All PI entries stating with 0 deleted from each sheet (these represent tutors)
ph2_data_e_t317-14j_step_02 ph2_data_e_u101-13j_step_02 ph2_data_e_u101-14b_step_02 ph2_data_e_u101-14j_step_02	Files split into individual modules Pivot table created for each sheet (e[n]_tot). NOTE: Max of E1 required to capture this measure. Totals and average data taken for **3.1 Basic data** section
END	This final version is then used for analysis

5.3 Appendix 3: Data analysis steps

5.3.1 C data: ODS v1.0 and v2.0

	Starting data
ph2_data_c_t217-13j-step_03.xls ph2_data_c_t217-14j-step_03.xls ph2_data_e_u101-12j_step_03 ph2_data_e_u101-13b_step_03 ph2_data_e_u101-13j_step_03 ph2_data_e_u101-14b_step_03 ph2_data_e_u101-14j_step_03 ph2_data_e_t317-14j_step_03	Delete non presentation relevant data; Added results from S1 data **Added Pearson Correlation of E[n] to S1:** • Copy pivot table data to new sheet • Rename tab • Convert data to table • Add result lookup as third column • Delete #na results and any other non-numerical artefacts • Calculate Pearson (and add n = and p=) • Add chart with straight line, rename axes • Add results to report • Collect results in summary tables
ph2_data_c_t217-13j-step_04 ph2_data_c_t217-14j-step_04 ph2_data_e_u101-12j_step_04 ph2_data_e_u101-13b_step_04 ph2_data_e_u101-13j_step_04 ph2_data_e_u101-14b_step_04 ph2_data_e_u101-14j_step_04 ph2_data_e_t317-14j_step_04	Added Spearman rank correlation of E[n] to S1 to each correlation tab:

ph2_data_c_t217-13j-step_05 ph2_data_c_t217-14j-step_05 ph2_data_e_u101-12j_step_05 ph2_data_e_u101-13b_step_05 ph2_data_e_u101-13j_step_05 ph2_data_e_u101-14b_step_05 ph2_data_e_u101-14j_step_05 ph2_data_e_t317-14j_step_05	Step 05 is a fork in the data files where some tabs were deleted to work on the time-based analysis. All pivot tables changed: • Filter by PI • Row labels = Year/Week • Tab renamed to e[n]_tot Tab copied and : • Value set to average of e[n] • Tab renamed to e[n]_avg Two new tabs were created to collect this data and bring it together: • Weekly_tot and Weekly_avg tabs created • Year / Week number copied from tabs above • Manual shifting of data to suit weeks with no data entries • Graphs generated for both to visualise and analyse Finally, a total row was added to weekly_avgs to derive the maximum average weekly engagement measures per student
	Add correlation of views / comments (applies only to ODS v2 data: • Add new tab • Copy data from e2_tot • Add lookup data from e4_tot • Calculate Pearson
ph2_data_distributions_01.xls	For distribution data, this file takes Step 04 data : • Copies _tot data • Creates an ordered table (Decreasing) • Visualises the distribution of those data
ph2_data_c_t217-13j-step_05 ph2_data_c_t217-14j-step_05 ph2_data_e_u101-12j_step_05 ph2_data_e_u101-13b_step_05 ph2_data_e_u101-13j_step_05 ph2_data_e_u101-14b_step_05 ph2_data_e_u101-14j_step_05 ph2_data_e_t317-14j_step_05	Step 6 was intended for time based activity distributions – intensity and distribution
TO DO:	
	Add correlation of E[n] to S2: • Copy pivot table data to new sheet • Rename tab

	• Convert data to table • Add result lookup as third column • Delete #na results and any other non-numerical artefacts • Calculate Pearson (and add n = and p=) • Add chart with straight line, rename axes • Add results to report

5.3.2 Individual analysis

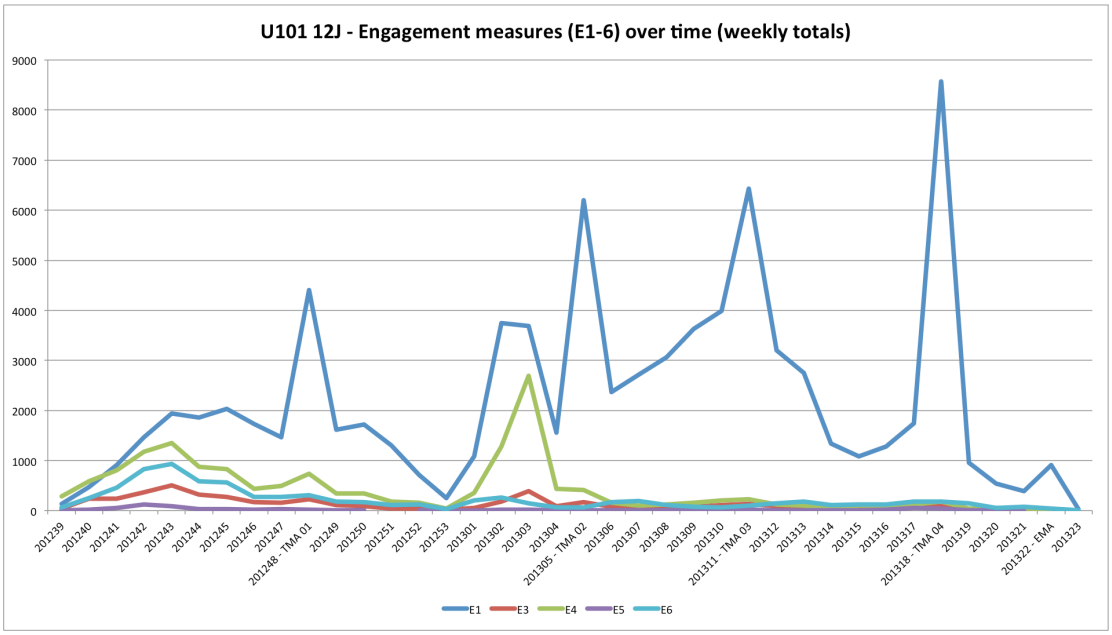
ProgressionQ61B61PIAlldetails_07 file:

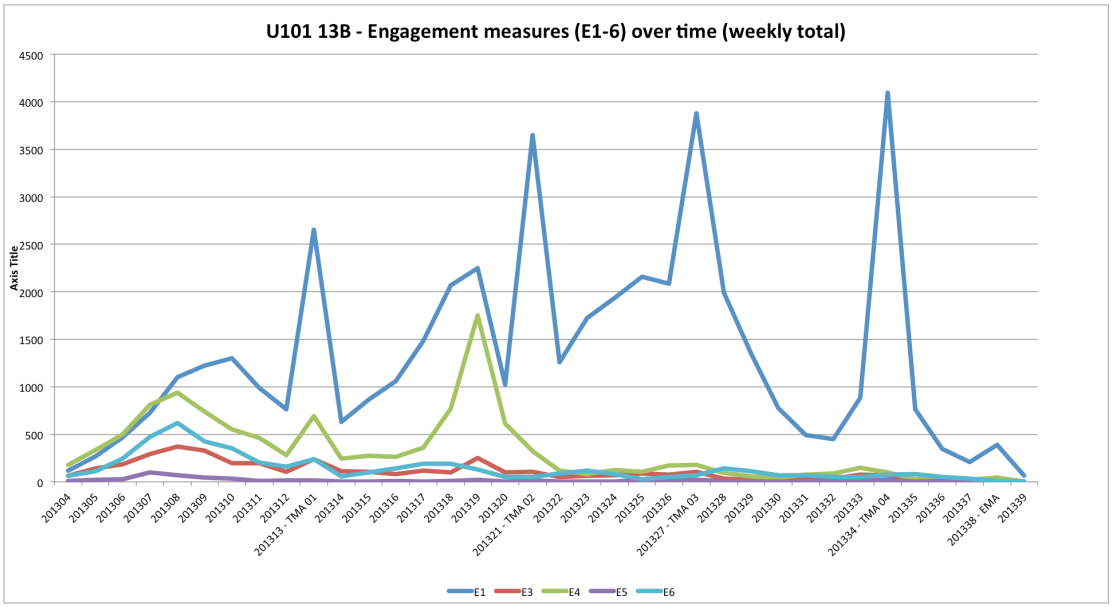
- Basic student data converted to table
- Pivot table created to sum student types by qualification gained or not
- All engagement data added by tab – multiple presentations for U101 and T217 – to create overall totals sheets

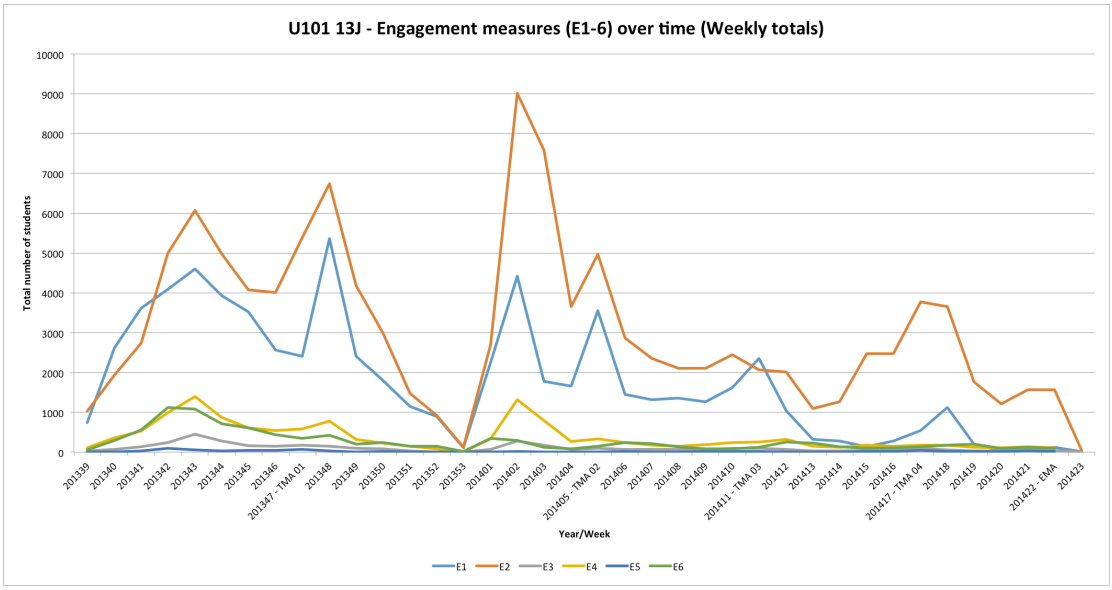
Appendix 4: Correlation charts

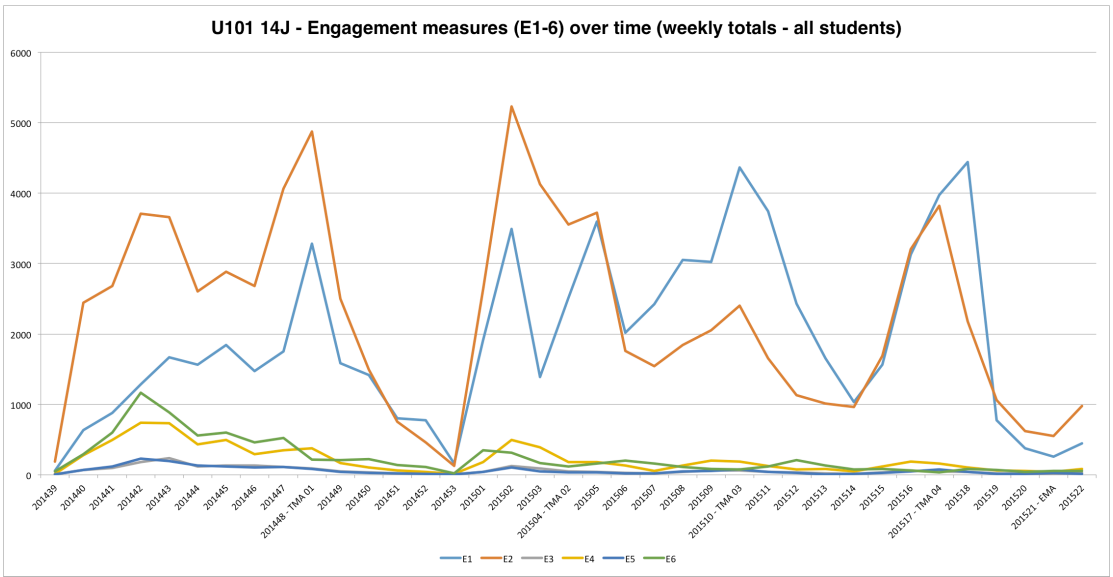
5.4 Appendix 5: Time charts

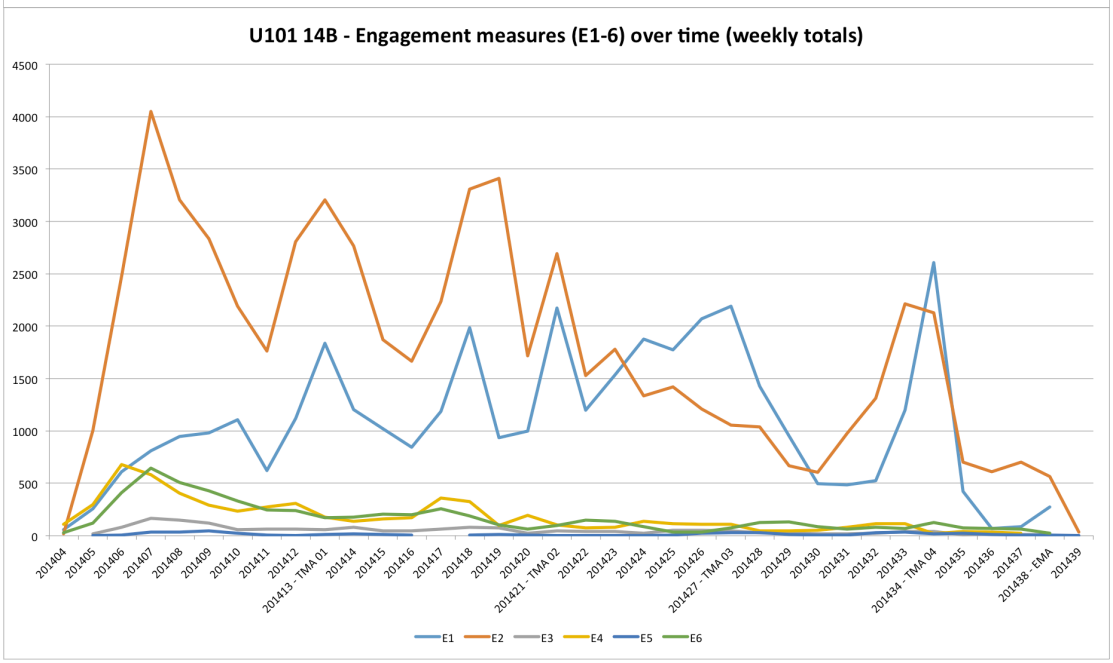
5.4.1 Weekly totals

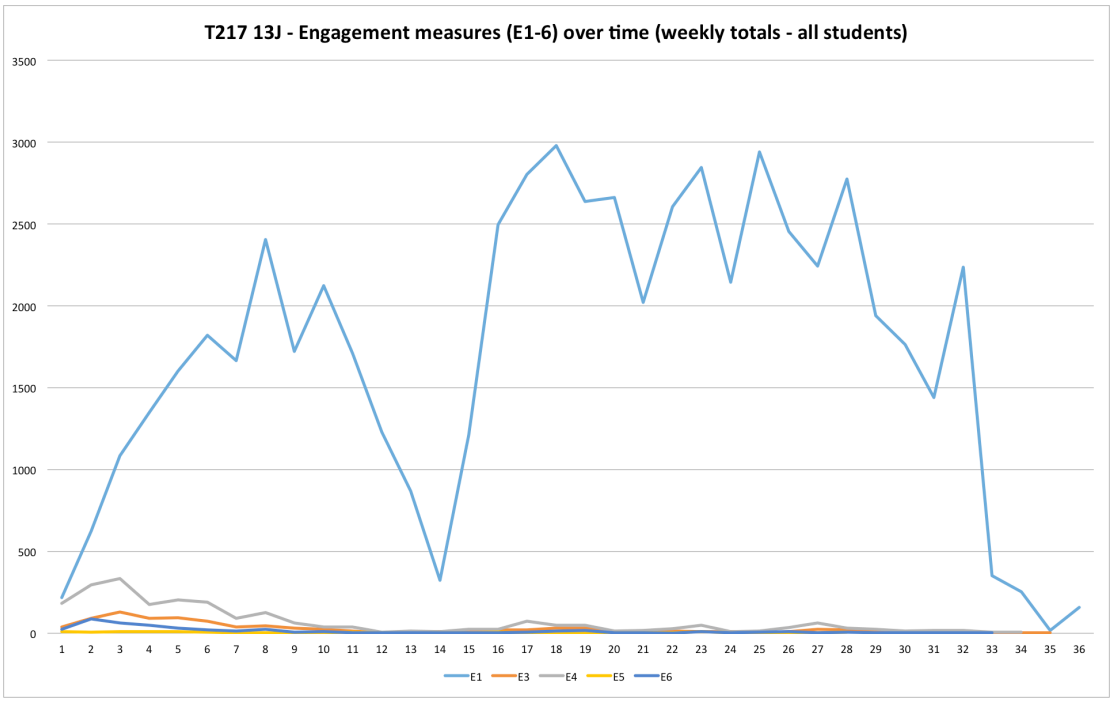


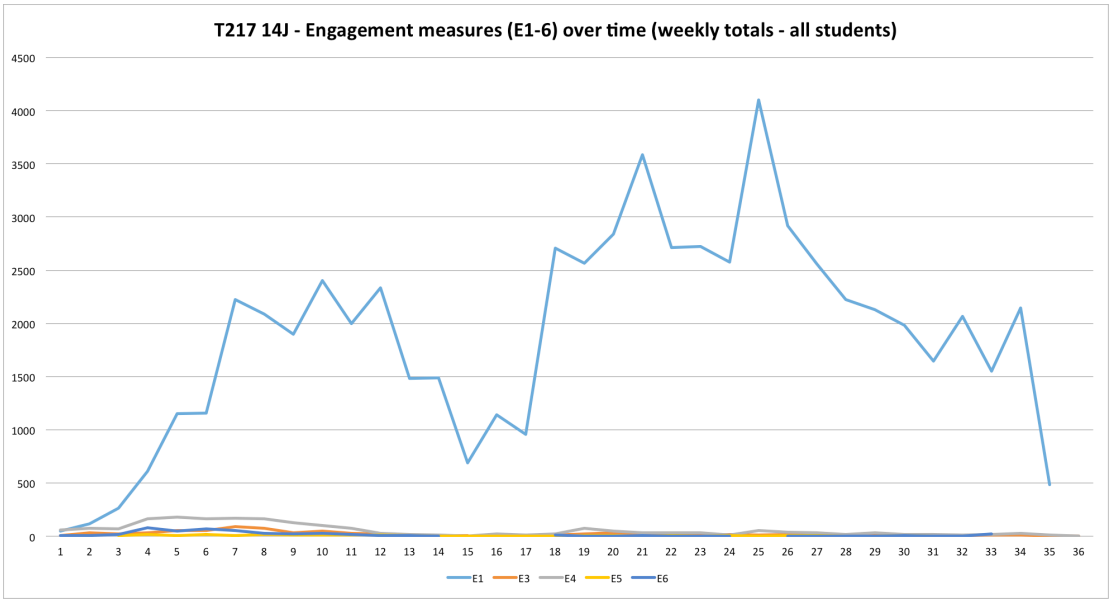


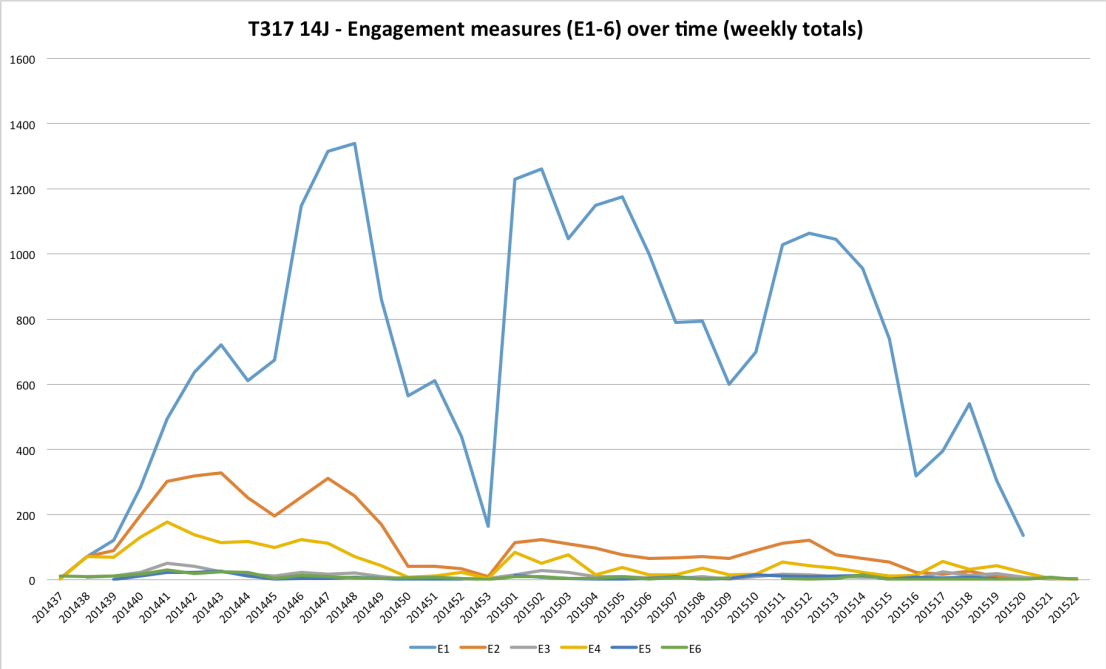

U101 13J - Engagement measures (E1-6) over time (Weekly totals)
Total number of students
Year/Week
E1
E2
E3
E4
E5
E6


U101 14J - Engagement measures (E1-6) over time (weekly totals - all students)
E1
E2
E3
E4
E5
E6

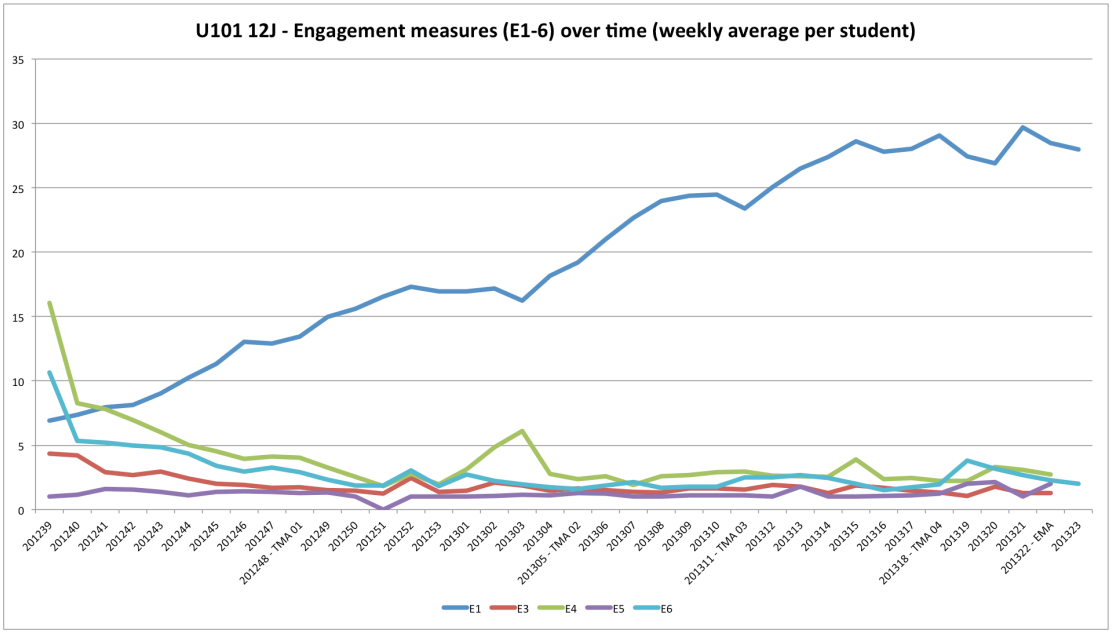

U101 14B - Engagement measures (E1-6) over time (weekly totals)
E1
E2
E3
E4
E5
E6

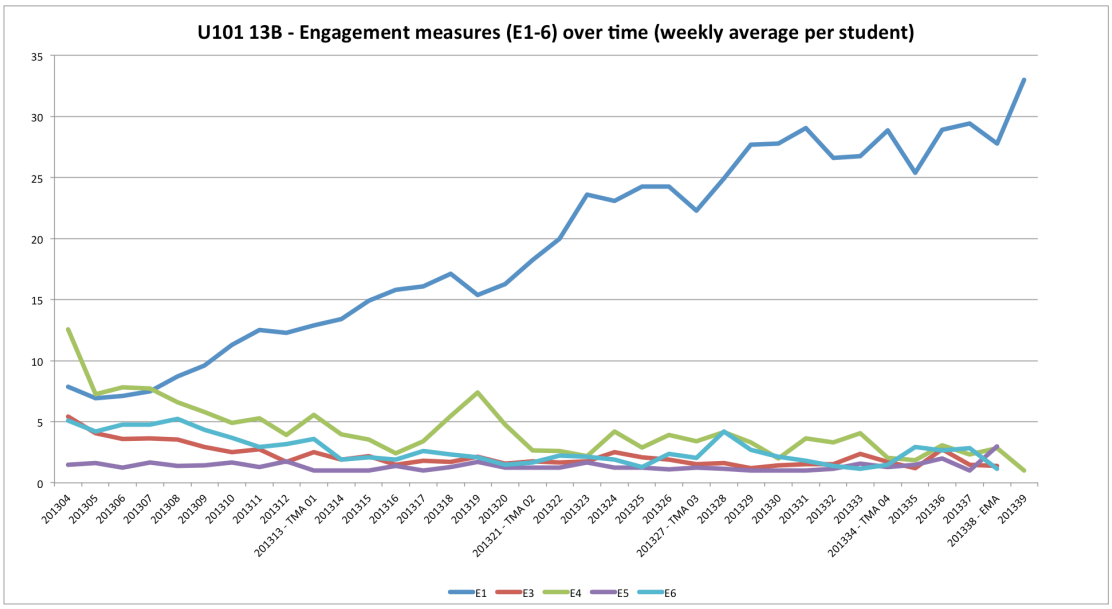

T217 13J - Engagement measures (E1-6) over time (weekly totals - all students)
3500
3000
2500
2000
1500
1000
500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
E1 E3 E4 E5 E6

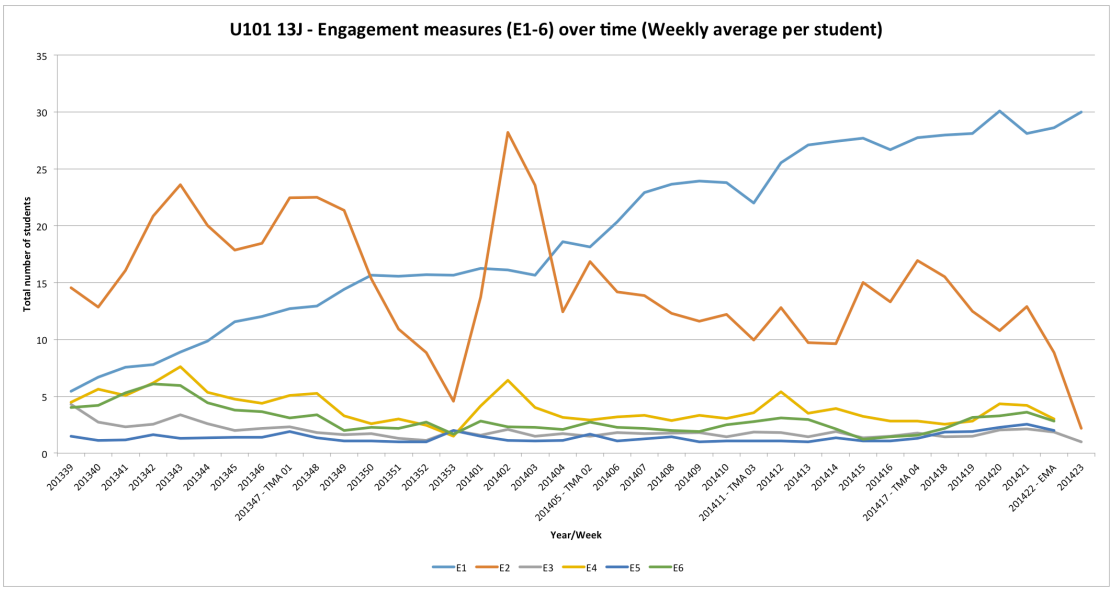

T217 14J - Engagement measures (E1-6) over time (weekly totals - all students)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
E1 E3 E4 E5 E6

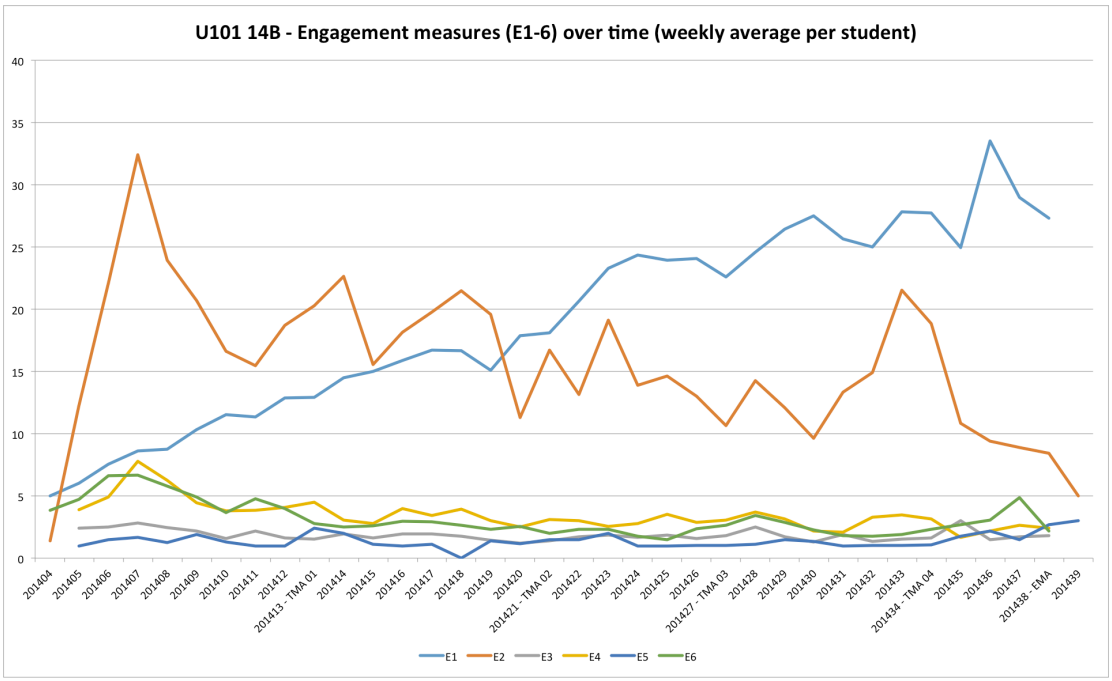


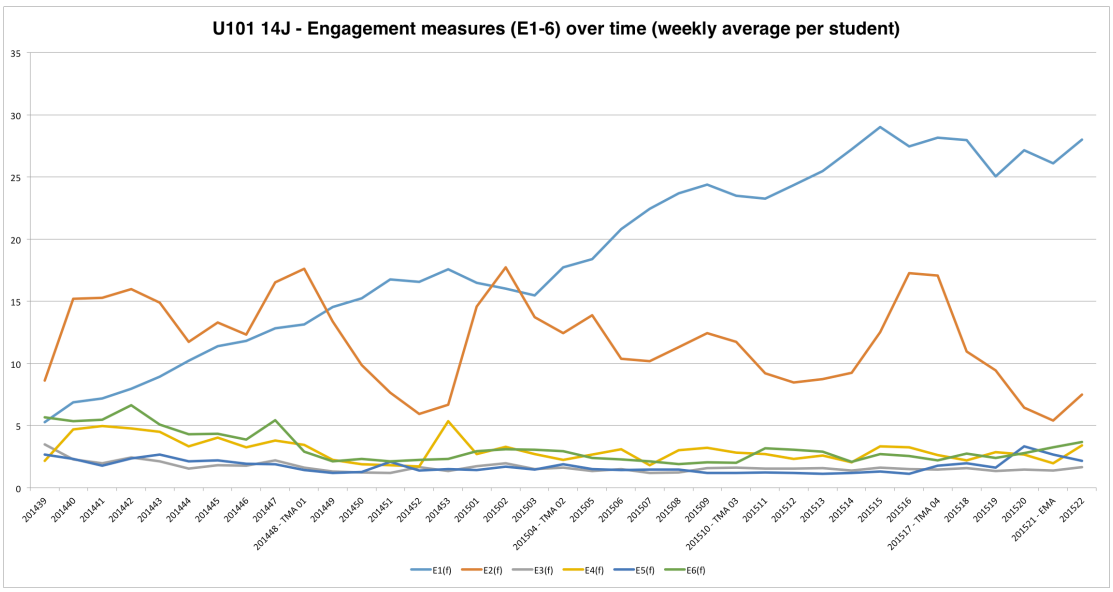
5.4.2 Weekly averages

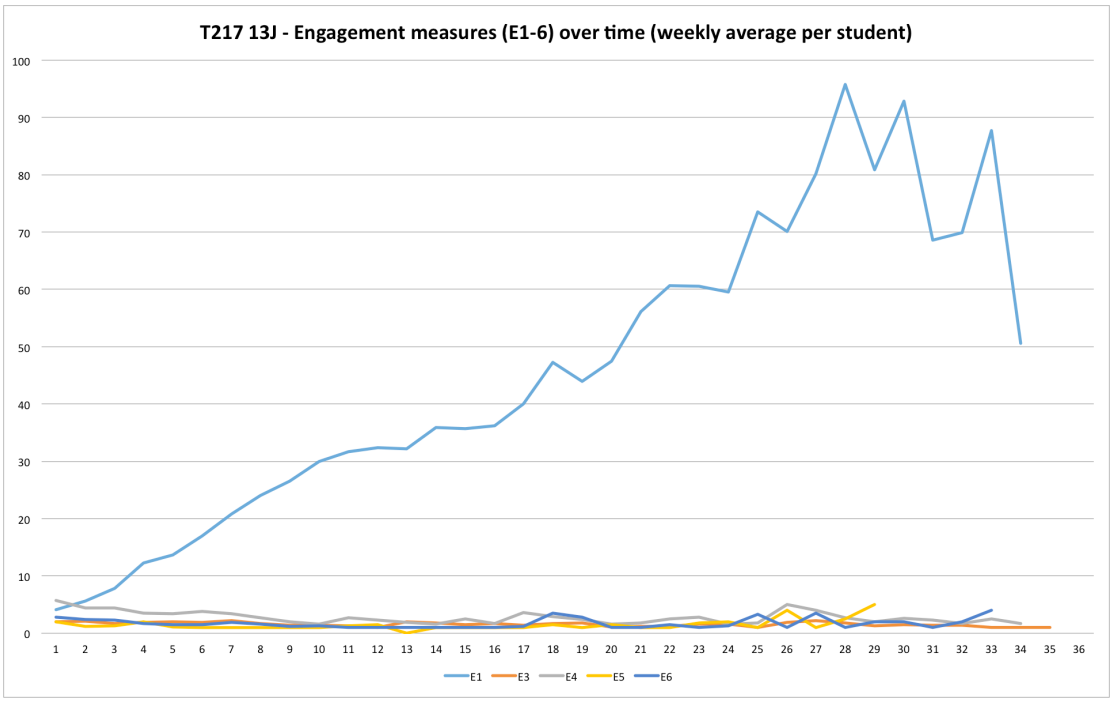


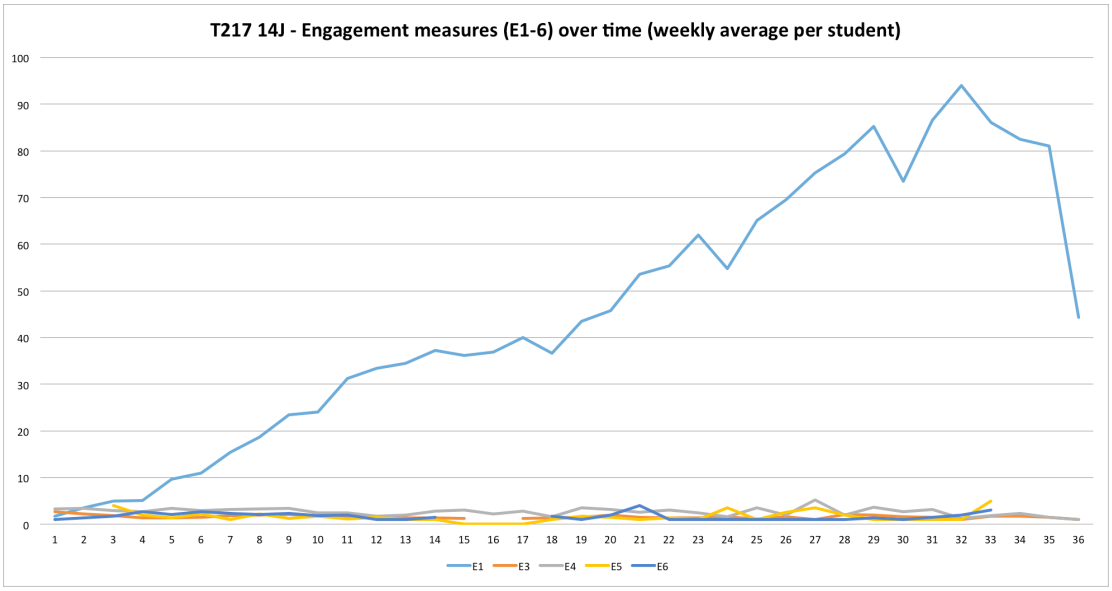

U101 13B - Engagement measures (E1-6) over time (weekly average per student)
35
30
25
20
15
10
5
0
201304
201305
201306
201307
201308
201309
201310
201311
201312
201313 - TMA 01
201314
201315
201316
201317
201318
201319
201320
201321 - TMA 02
201322
201323
201324
201325
201326
201327 - TMA 03
201328
201329
201330
201331
201332
201333
201334 - TMA 04
201335
201336
201337
201338 - EMA
201339
E1
E3
E4
E5
E6

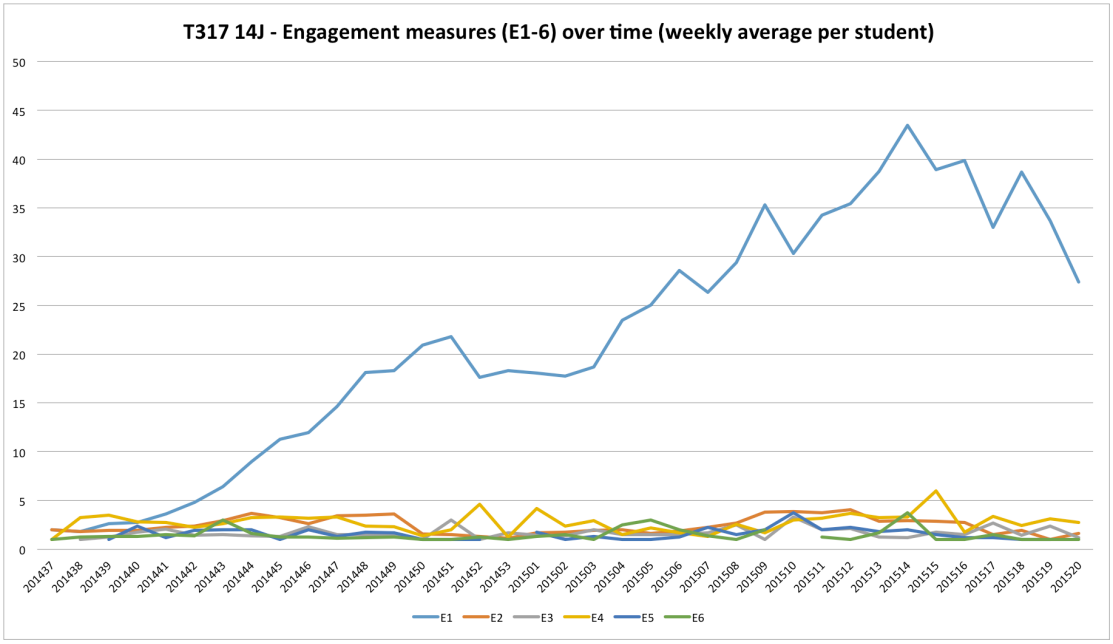

U101 13J - Engagement measures (E1-6) over time (Weekly average per student)
Total number of students
35
30
25
20
15
10
5
0
201339
201340
201341
201342
201343
201344
201345
201346
201347 - TMA 01
201348
201349
201350
201351
201352
201353
201401
201402
201403
201404
201405 - TMA 02
201406
201407
201408
201409
201410
201411 - TMA 03
201412
201413
201414
201415
201416
201417 - TMA 04
201418
201419
201420
201421
201422 - EMA
201423
Year/Week
E1
E2
E3
E4
E5
E6


U101 14B - Engagement measures (E1-6) over time (weekly average per student)
E1
E2
E3
E4
E5
E6

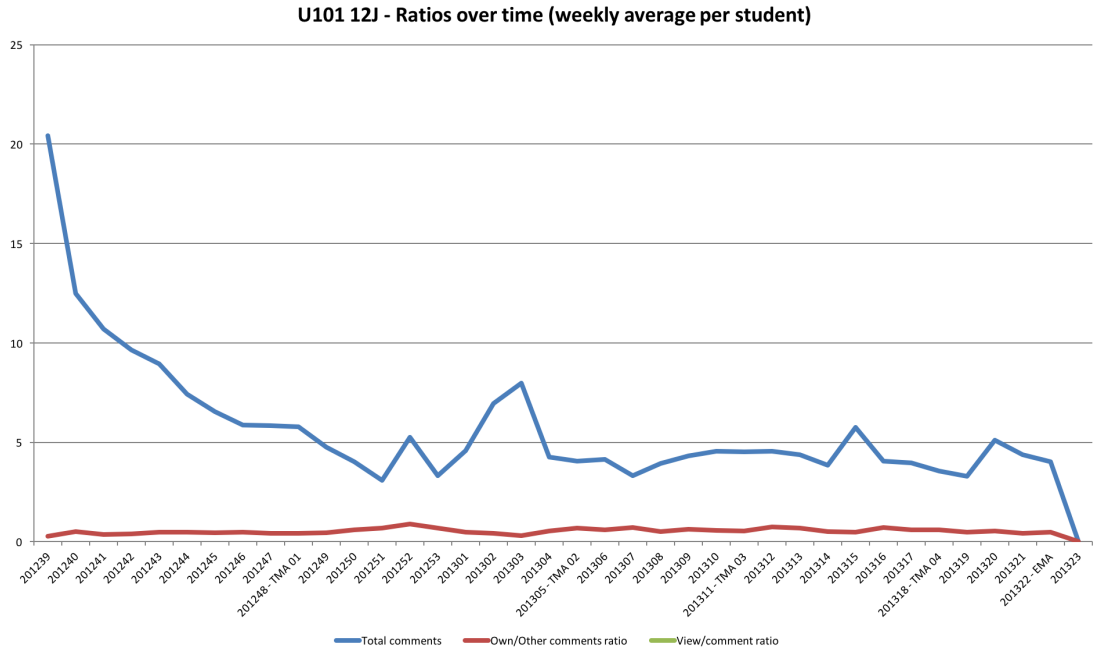

U101 14J - Engagement measures (E1-6) over time (weekly average per student)
E1(f)
E2(f)
E3(f)
E4(f)
E5(f)
E6(f)

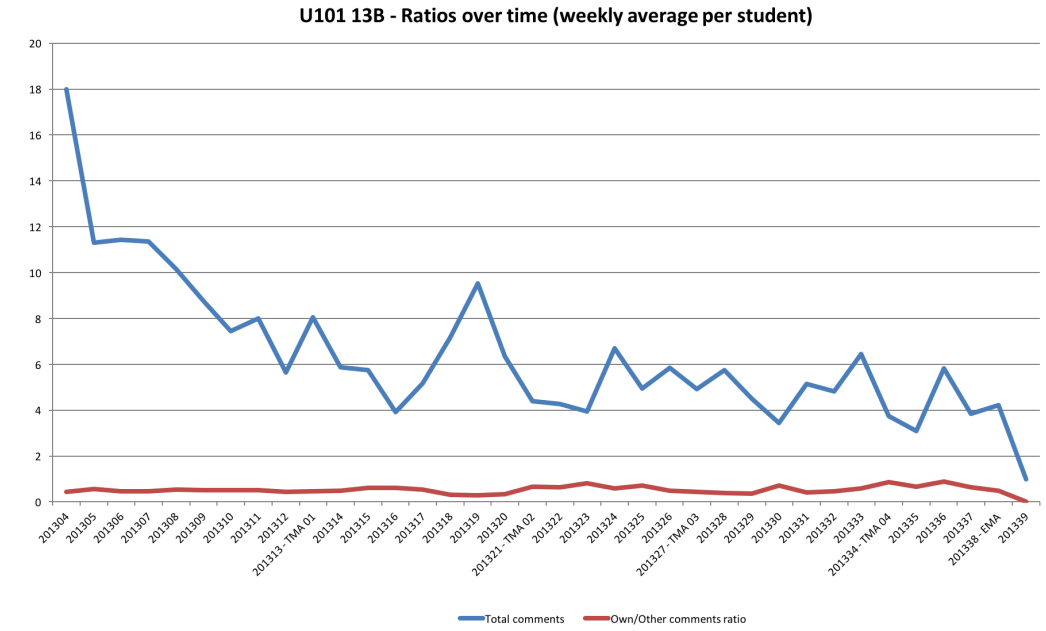

T217 13J - Engagement measures (E1-6) over time (weekly average per student)
100
90
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
E1 E3 E4 E5 E6

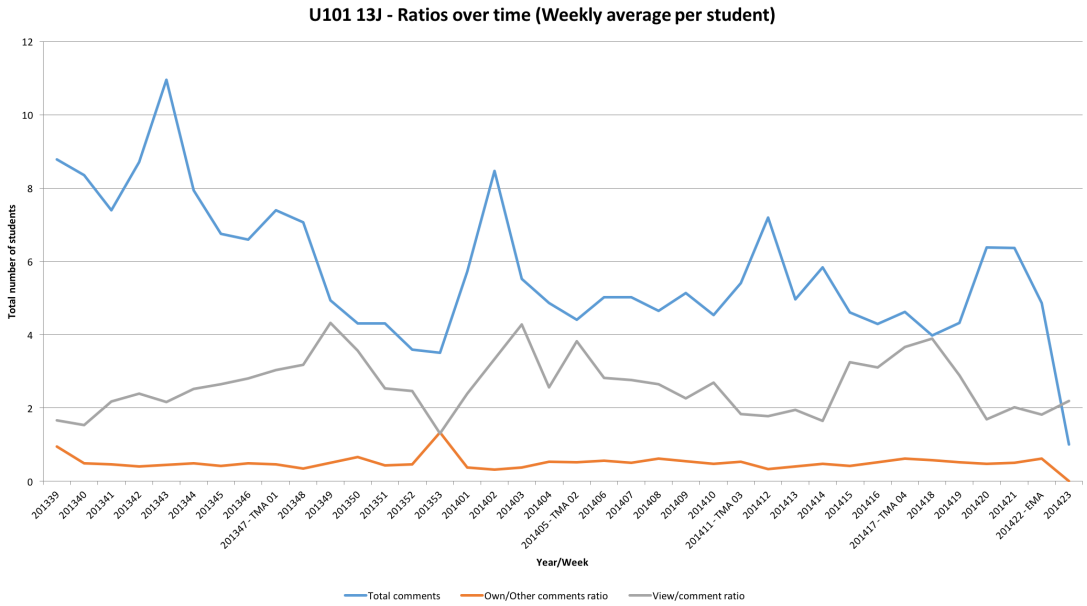

T217 14J - Engagement measures (E1-6) over time (weekly average per student)
100
90
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
E1 E3 E4 E5 E6

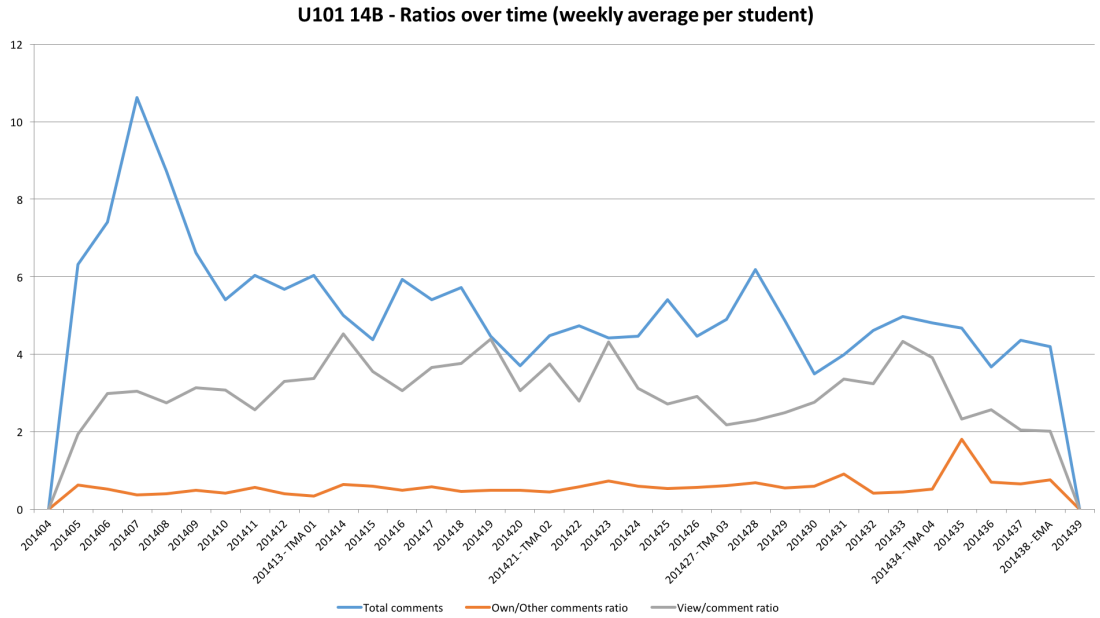

T317 14J - Engagement measures (E1-6) over time (weekly average per student)
50
45
40
35
30
25
20
15
10
5
0
201437
201438
201439
201440
201441
201442
201443
201444
201445
201446
201447
201448
201449
201450
201451
201452
201453
201501
201502
201503
201504
201505
201506
201507
201508
201509
201510
201511
201512
201513
201514
201515
201516
201517
201518
201519
201520
E1
E2
E3
E4
E5
E6

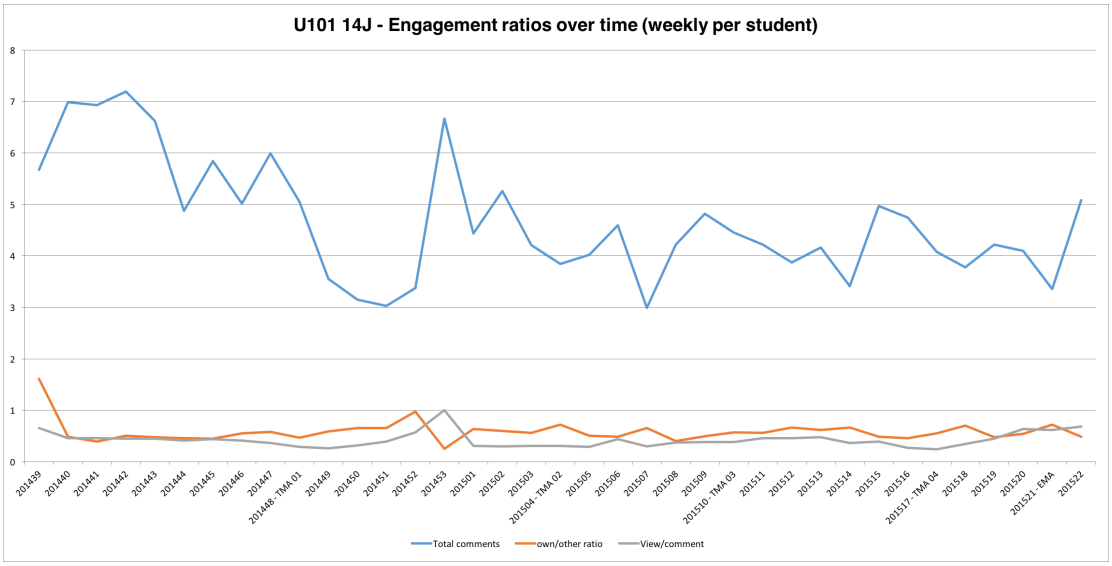
5.4.3 Weekly Comment totals and Ratios

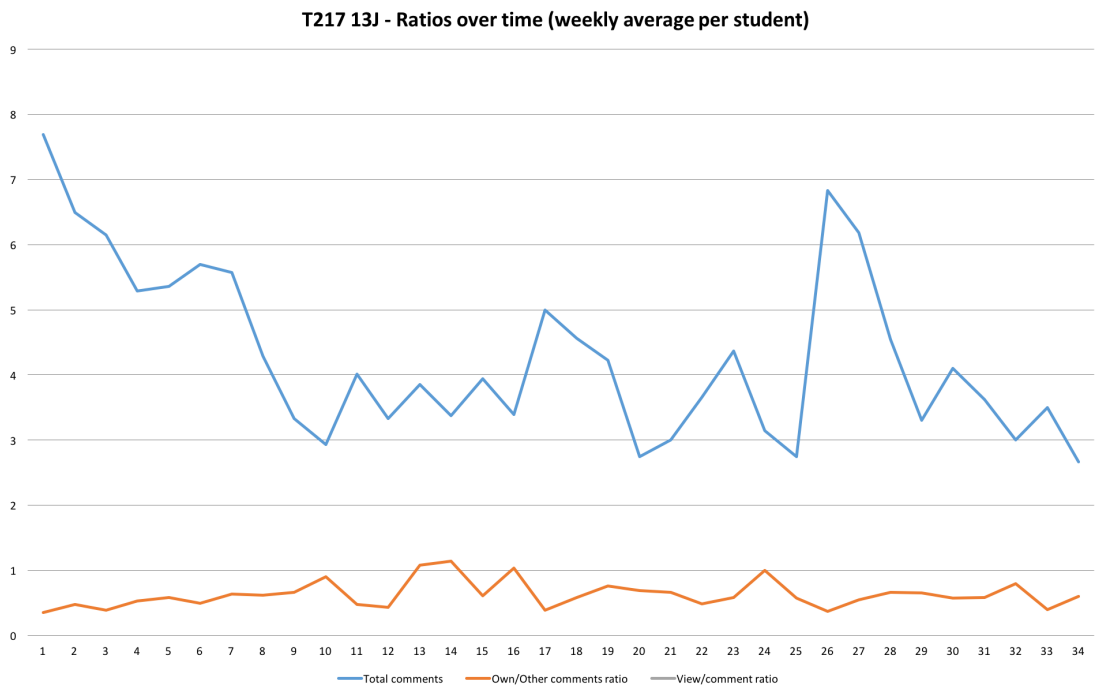


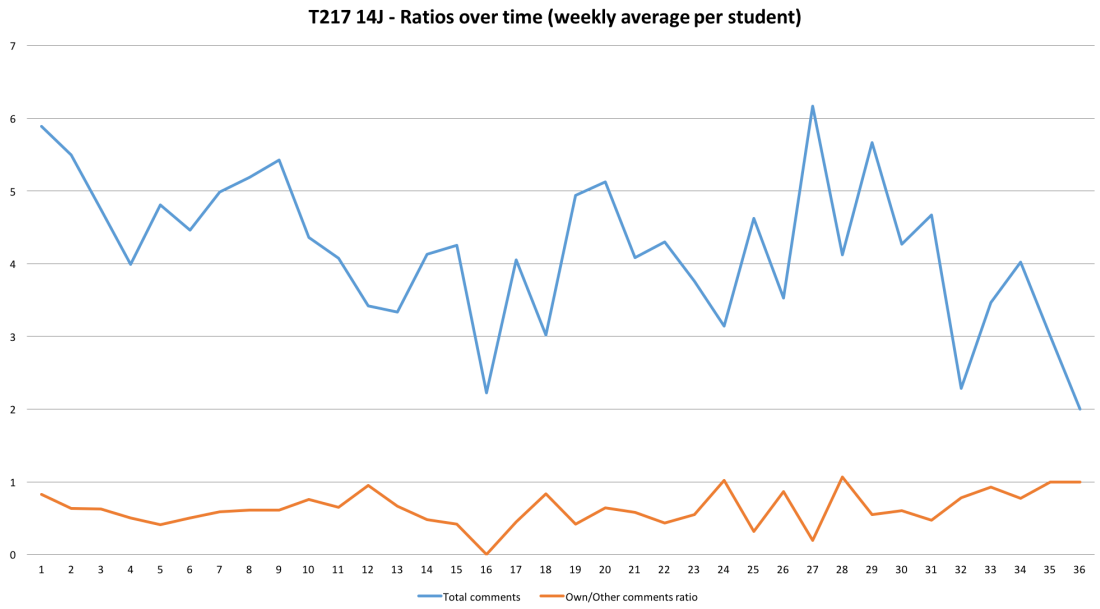


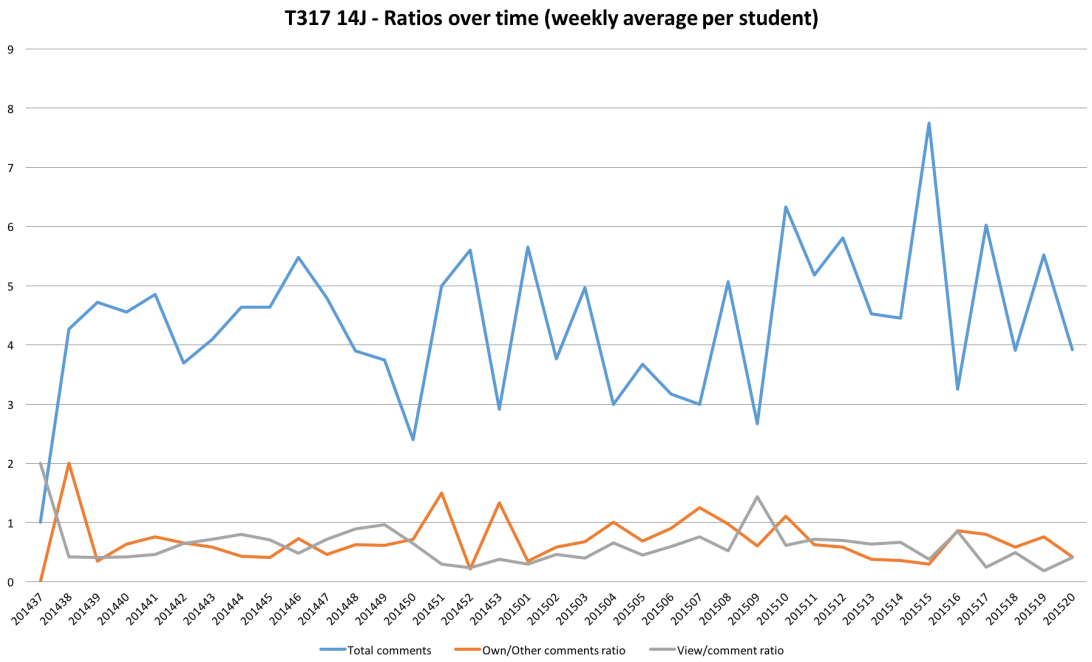

U101 13J - Ratios over time (Weekly average per student)
Total number of students
Year/Week
Total comments
Own/Other comments ratio
View/comment ratio


U101 14B - Ratios over time (weekly average per student)
Total comments
Own/Other comments ratio
View/comment ratio


U101 14J - Engagement ratios over time (weekly per student)
Total comments
own/other ratio
View/comment

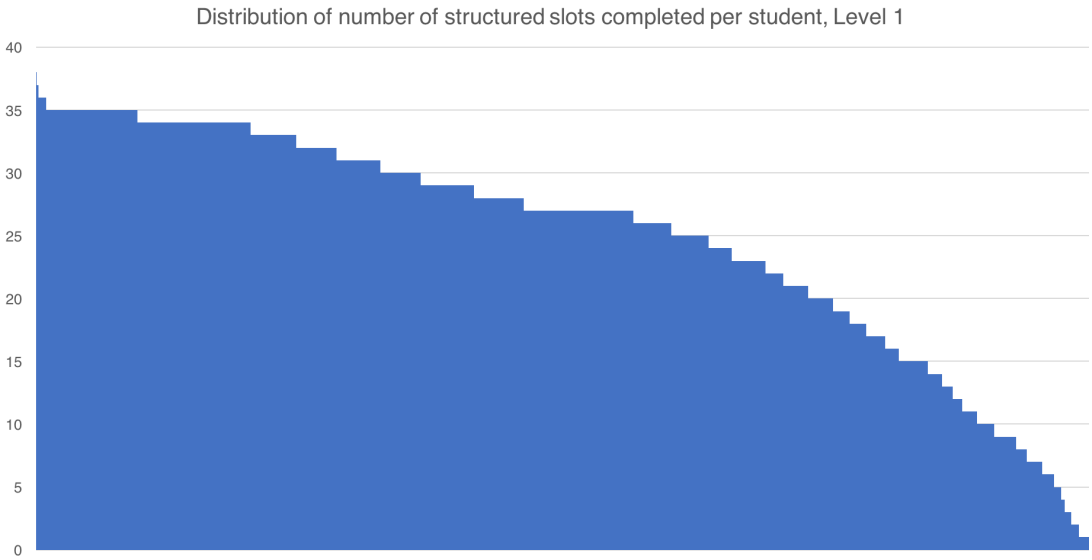

T217 13J - Ratios over time (weekly average per student)
9
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
Total comments
Own/Other comments ratio
View/comment ratio

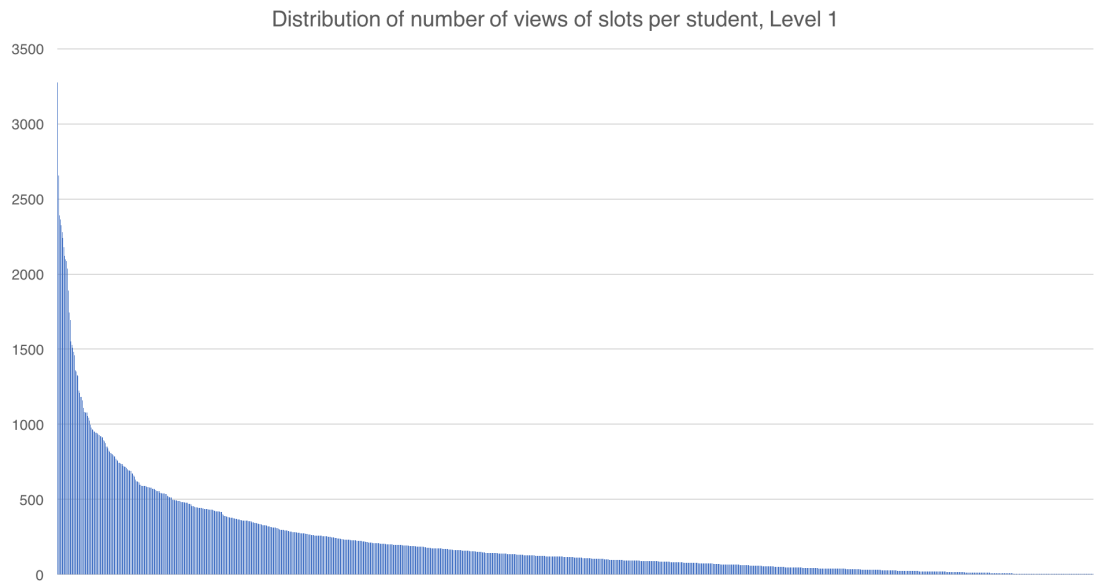

T217 14J - Ratios over time (weekly average per student)
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Total comments
Own/Other comments ratio

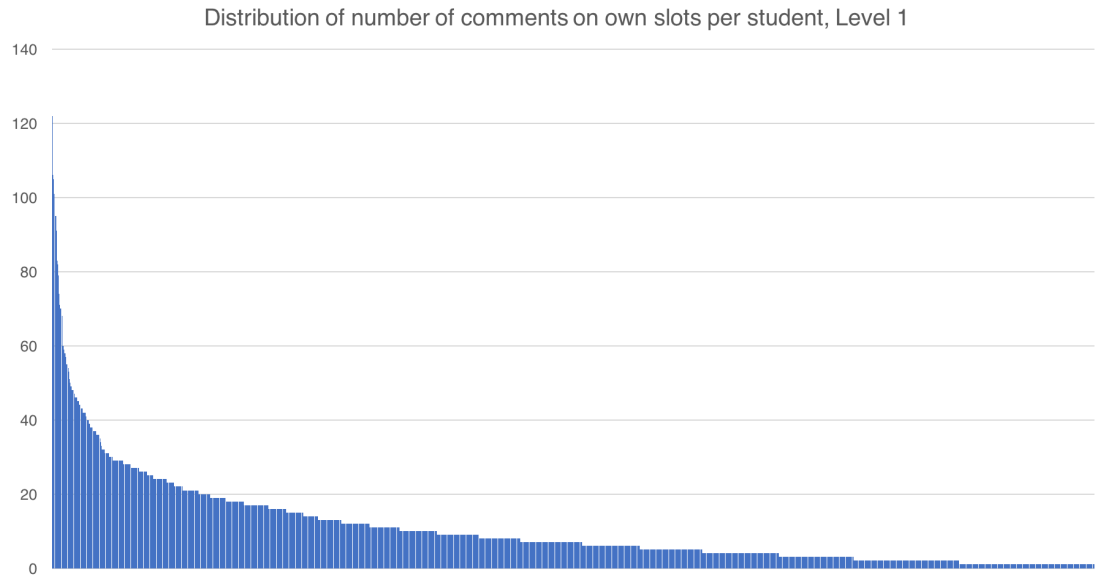


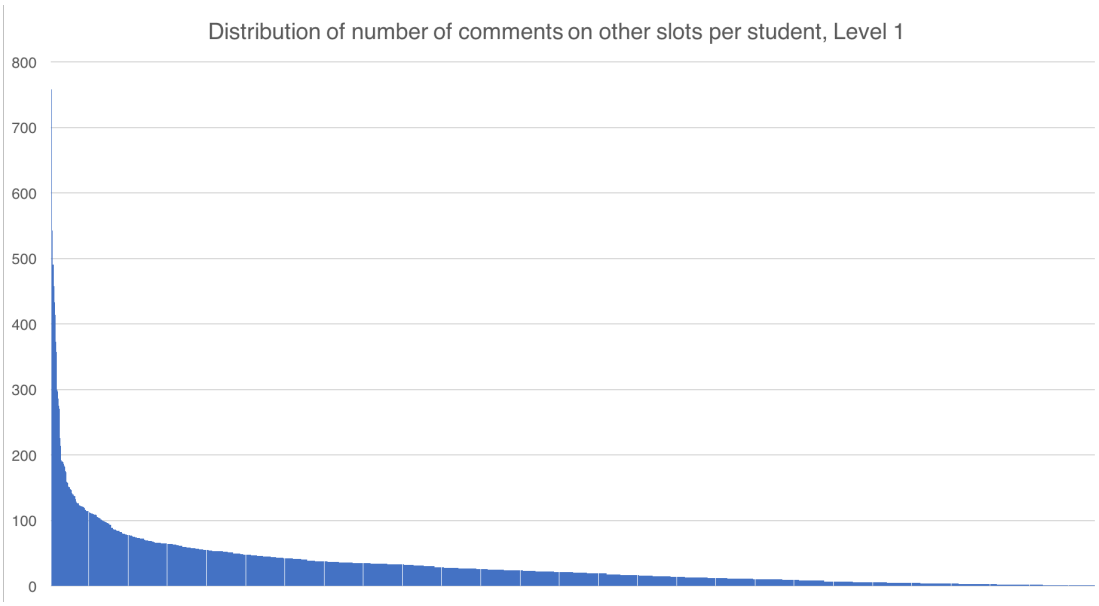
5.5 Appendix 6: Distribution charts

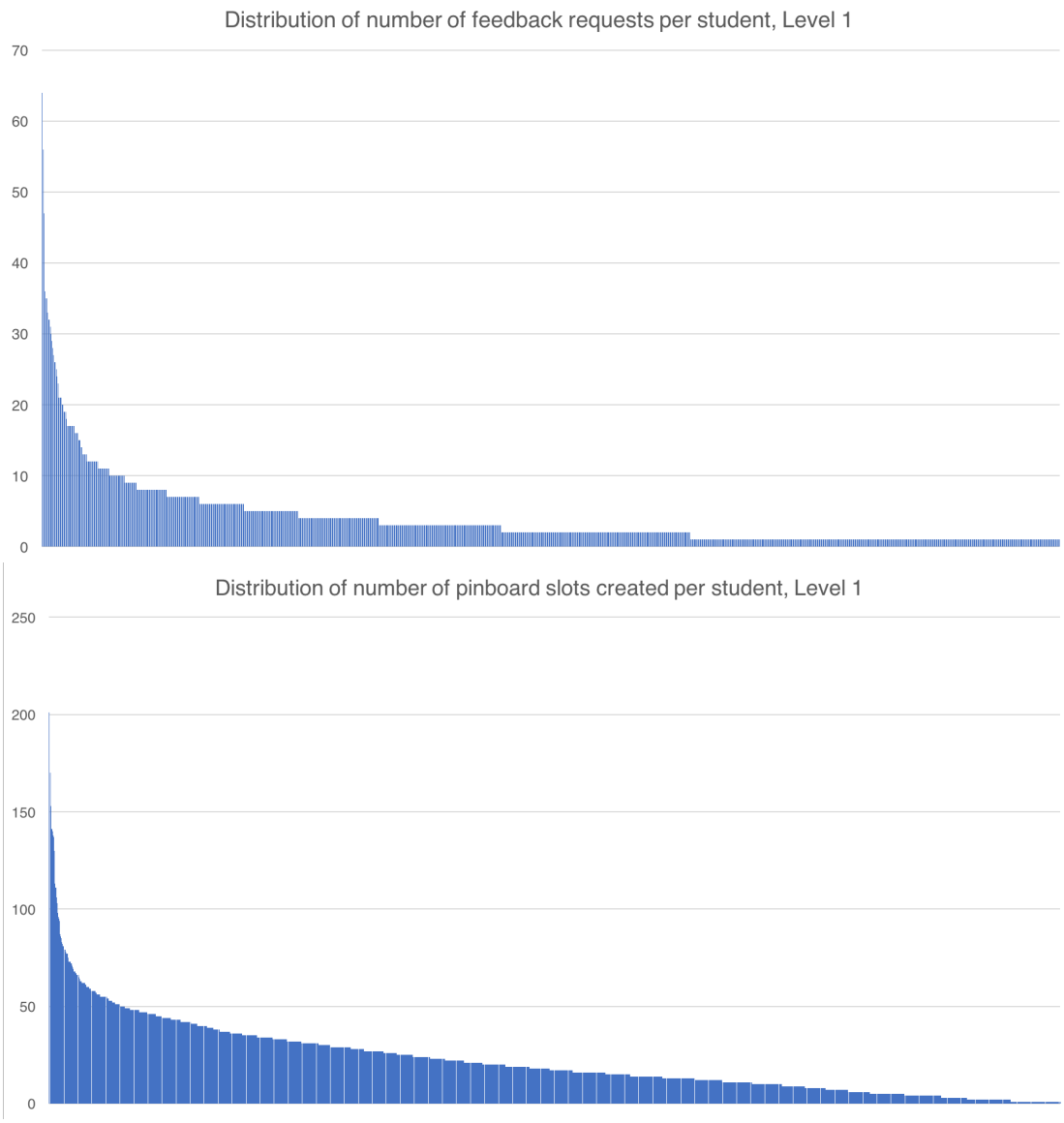
5.5.1 Distribution of student engagement per measure – Level 1



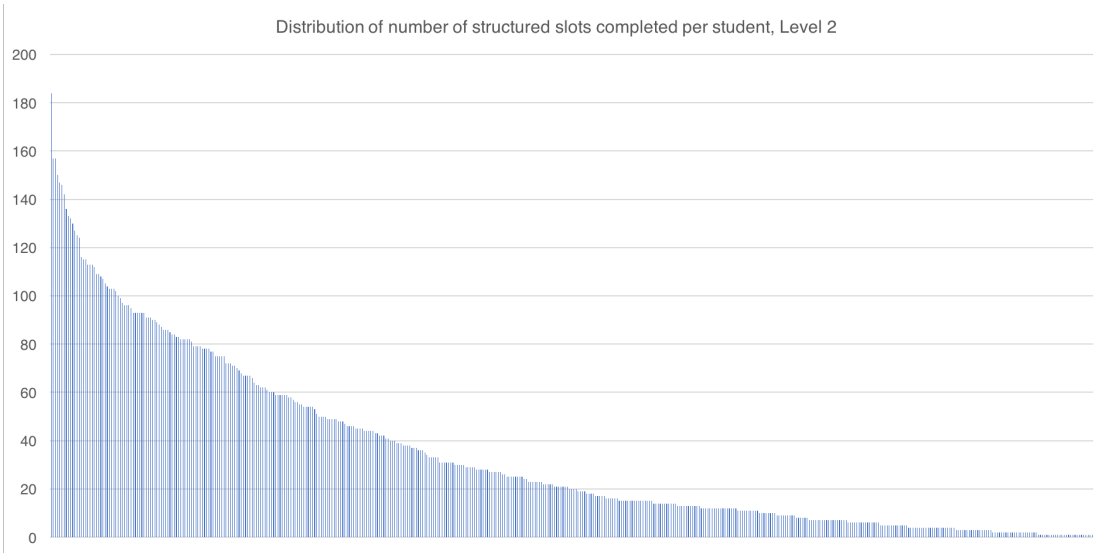

Distribution of number of views of slots per student, Level 1
3500
3000
2500
2000
1500
1000
500
0

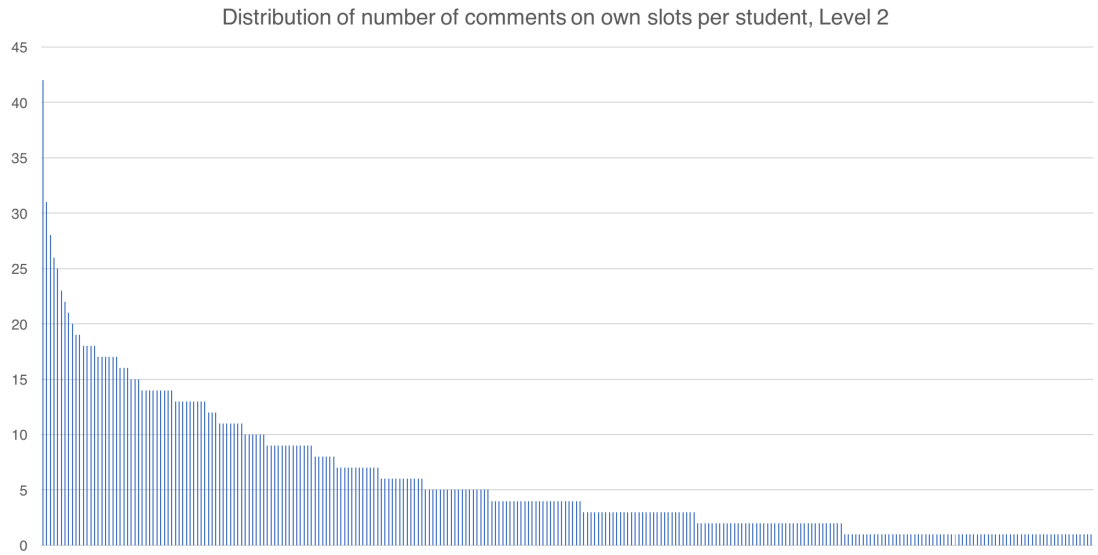

Distribution of number of comments on own slots per student, Level 1
140
120
100
80
60
40
20
0

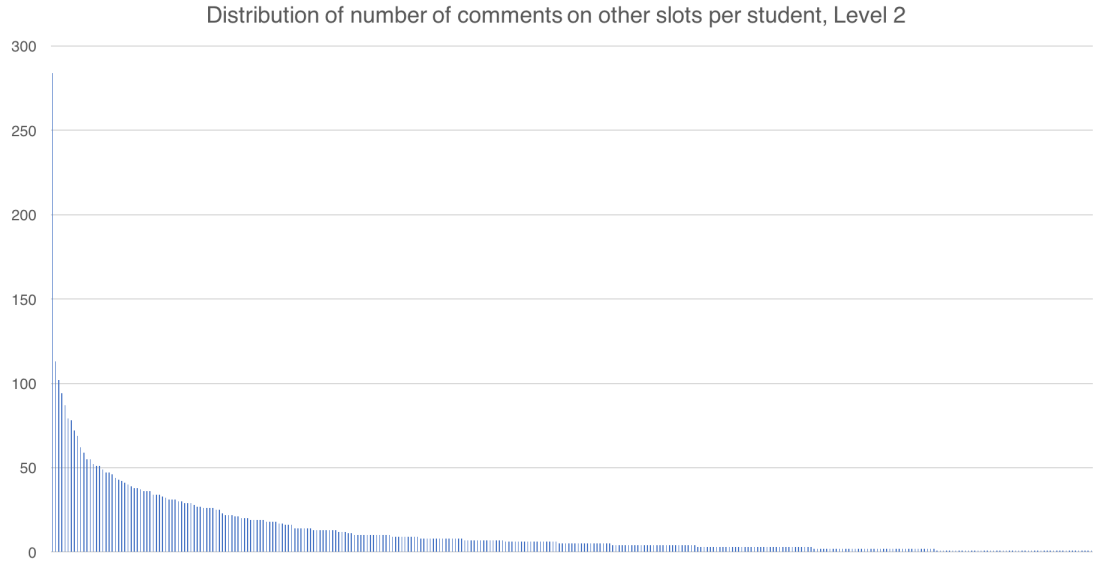

Distribution of number of comments on other slots per student, Level 1
800
700
600
500
400
300
200
100
0

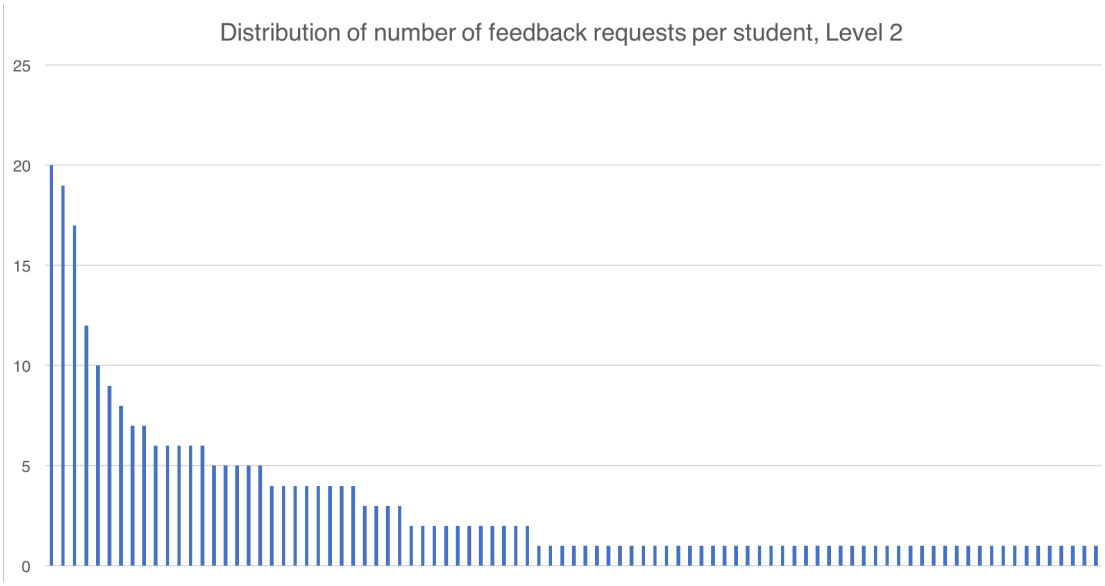

Distribution of number of feedback requests per student, Level 1
70
60
50
40
30
20
10
0
Distribution of number of pinboard slots created per student, Level 1
250
200
150
100
50
0

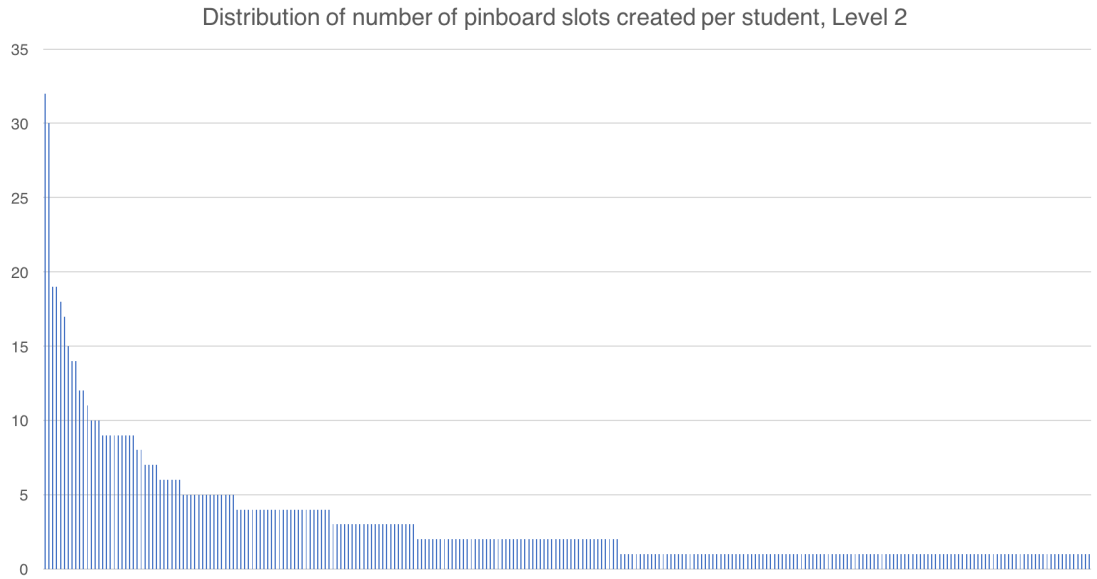
5.5.2 Distribution of student engagement per measure – Level 2



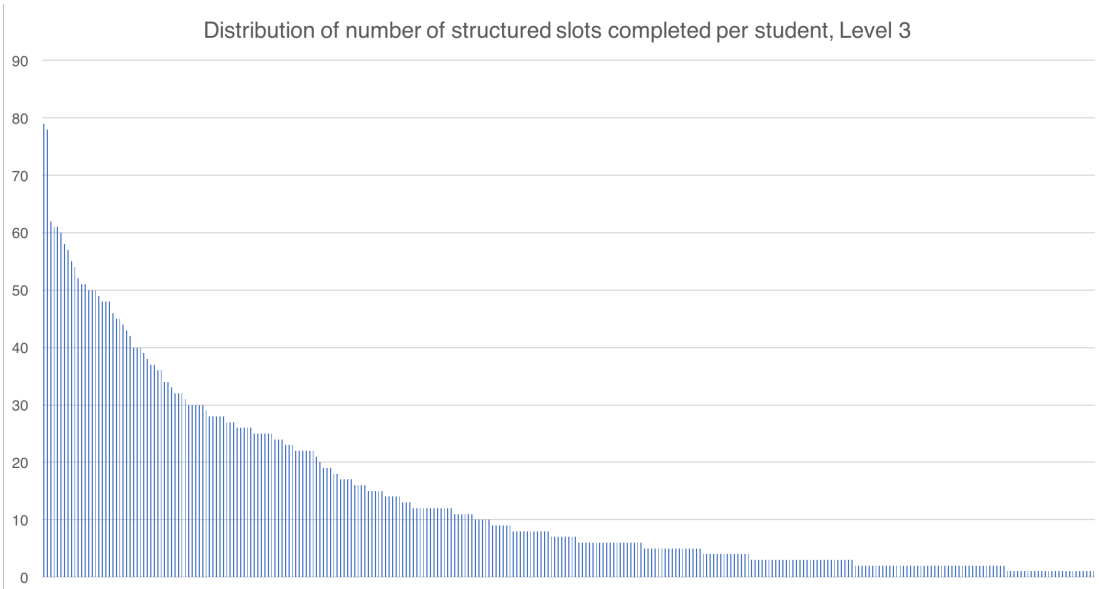


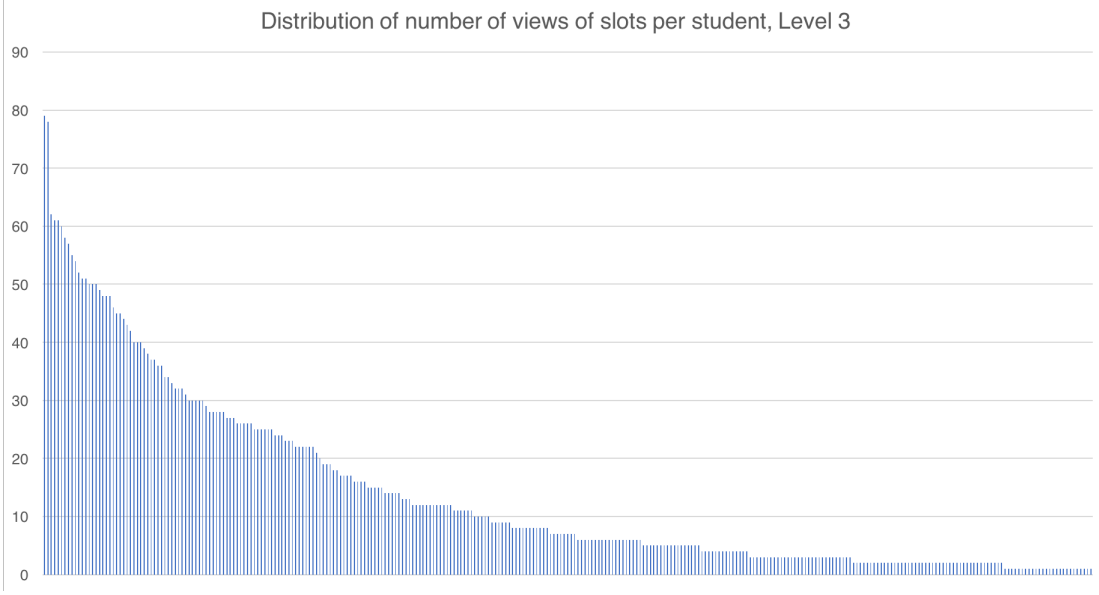


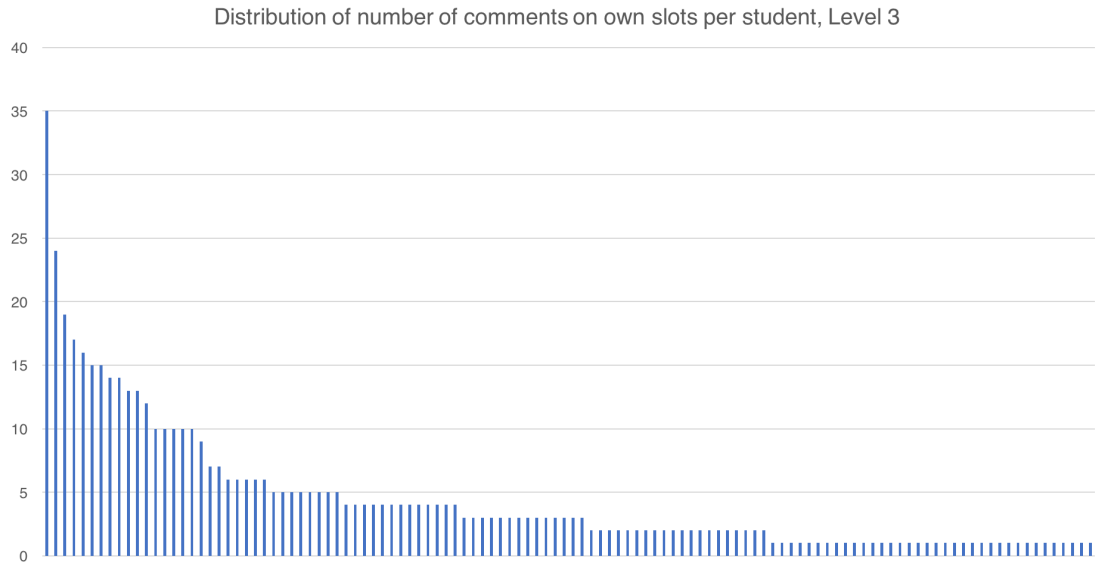

Distribution of number of feedback requests per student, Level 2
25
20
15
10
5
0

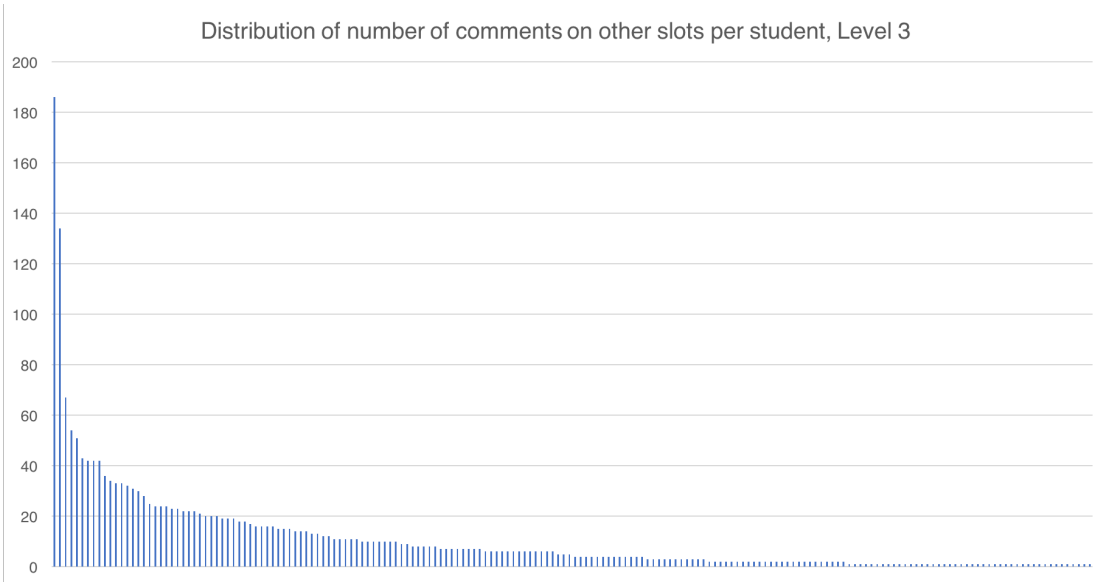

Distribution of number of pinboard slots created per student, Level 2
35
30
25
20
15
10
5
0

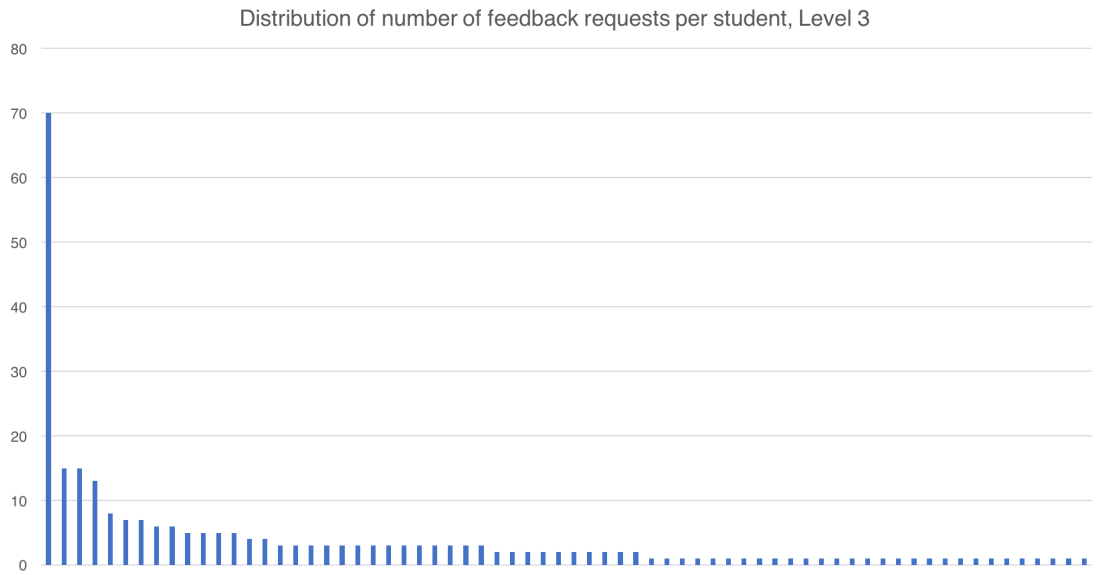
5.5.3 Distribution of student engagement per measure – Level 3

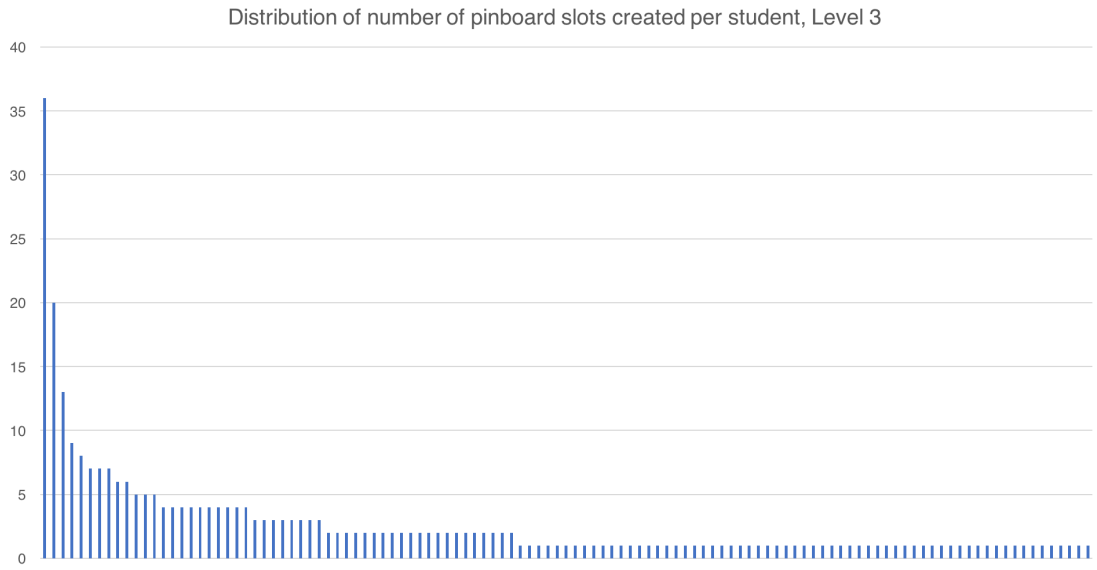







Distribution of number of comments on other slots per student, Level 3
200
180
160
140
120
100
80
60
40
20
0


Distribution of number of feedback requests per student, Level 3
80
70
60
50
40
30
20
10
0


Distribution of number of pinboard slots created per student, Level 3
40
35
30
25
20
15
10
5
0

5.6 Appendix 7 List of slots per module

Week number	Level 1: U101	Level 2: T217	Level 3: T317
Week -1			
Week 0			
Week 1			Activity 1.1 Looking for opportunities for innovation Activity 1.2 Share your favourite innovation
Week 2	My Pinboard: Aeroplane My Pinboard: Banana My Pinboard: House of Cards *My Studio Work: Circles* *My Studio Work: Person Shape* *My Studio Work: Aeroplane* *My Studio Work: Decision Made* *My Studio Work: Sticky Note Counties* *My Studio Work: Banana* *My Studio Work: House of Cards* My Pinboard: Webobject Experiment		Activity 2.1 Your innovation image

	My Pinboard: My Physical Space		
Week 3	My Pinboard: My Cup My Pinboard: Object That I Like 1 My Pinboard: Object That I Like 2 My Pinboard: Object That I Like 3 My Pinboard: Scan a Squiggle My Pinboard: Scanned Object My Pinboard: Photograph a Page My Studio Work: Hand Photo My Studio Work: Hand Scan		Activity 3.1 Share your cycle lane Activity 3.3 Improving bicycle parking Activity 3.4 The image of cycling in Copenhagen
Week 4	My Studio Work: Design I Find Frustrating My Studio Work: Design That Makes Me Happy		Activity 4.1 Material things and innovation Activity 4.2 People and bikes Activity 4.3 Material things in use Activity 4.5 Relating products, services and systems Activity 4.6 Sharing a vision for innovation Activity 4.8 Drawing your own innovation framework
Week 5	My Pinboard: Visual Repetition My Pinboard: Rule of Thirds		

	My Pinboard: Figure and Ground *My Studio Work: Abstraction 1* *My Studio Work: Abstraction 2* *My Studio Work: Abstraction 3*		
Week 6			Activity 1.3 A view of sustainability Activity 1.4 Rebound behaviour Activity 1.5 Living off the interest
Week 7			Block 2 - Activity 2.4 Design narratives Block 2 - Activity 2.5 Product to service Block 2 - Activity 2.6 Comparing innovation in practice
Week 8	My Studio Work: My T Shirt Design		Block 2 - Activity 3.1 WEEE Block 2 - Activity 3.2 Environmental impact Block 2 - Activity 3.3 Biomimicry Block 2 - Activity 3.4 Emotional durability Block 2 - Activity 3.5 Ecological design comparison Block 2 - Activity 3.6 Design for Sustainability
Week 9	My Studio Work: My Life Story		Block 2 - Activity 4.1 Social innovation Block 2 - Activity 4.2 Whole systems

			design Block 2 - Activity 4.3 Innovation map
Week 10	My Pinboard: OU Live Whiteboard My Pinboard: My Adapted Product My Pinboard: Barcelona Chair My Pinboard: A Modification My Pinboard: Packaging *My Studio Work: Design That Makes Others Happy*		
Week 11	My Pinboard: An Advert I Like My Pinboard: An Advert I Dislike My Pinboard - My Alarm Clock *My Studio Work: Storyboard*		Block 3 - Activity 1.2 Focussed innovation opportunity Block 3 - Activity 1.9 Envision a day in a life 20 years hence
Week 12	My Pinboard: Thirty Second Sketch My Pinboard: My Flipbook Animation My Pinboard: Random Input My Pinboard: Bottle Play My Pinboard: My Spoon		Block 3 - Activity 2.7 Debating your vision
Week 13	My Studio Work: My Problem		Block 3 - Activity 3.9 Representing your vision
Week			Block 3 - Activity 4.11 Responsible

14			vision
Week 15	My Studio Work: My Design Proposal View 1 My Studio Work: My Design Proposal View 2		
Week 16	My Pinboard: My Idea for Unwanted Mobile Phones My Pinboard: 60 Second Idea *My Studio Work: Old Community* *My Studio Work: New Community*		Project - Activity 1.2 What else could you print? Project - Activity 1.4 Project – Problems and opportunities
Week 17	My Pinboard: My Community Bubble Diagram My Pinboard: Modernist Building My Pinboard: My Field Notes *My Studio Work: Service Map*		Project - Activity 2.2 A familiar innovation process Project - Activity 2.3 Project – Reframing the problem Project - Activity 2.4 Project – Planning what you need to know
Week 18	My Studio Work: Game I Played My Studio Work: My Game Idea My Pinboard: Design Council and RSA Profiles		
Week 19			Project - Activity 4.1 Project - People mapping Project - Activity 4.2 Project - Planning your people research

			Project - Activity 4.3 Project - Researching people aspects of your project Project - Activity 4.4 Project - Creating a design brief Project - Block 4 Project notes
Week 20			Project - Activity 1.1 Project - Initial ideas Project - Activity 1.2 Project - Ideas and concepts 1
Week 21	My Studio Work: My Game Prototype My Studio Work: My Game Proposal		Project - Activity 2.1 Project - Ideas and concepts 2 Project - Activity 2.2 Project – Choosing three ideas or concepts
Week 22	My Pinboard: Values of Artefacts My Pinboard: My Punctuality *My Studio Work: My Global Food* *My Studio Work: My Global Stuff* *My Studio Work: My World Map*		Project - Activity 3.1 Project - Progress checklist Project - Activity 3.2 Project - Mapping concepts Project - Activity 3.4 Project - Selecting a final concept Project - Activity 3.5 Project - A description of your selected concept
Week 23	My Pinboard: My Characters My Pinboard: Emoticons		Project - Activity 4.1 Project - Sketching Project - Activity 4.2 Project - User perspectives

	My Pinboard: My Storyboard My Pinboard: Cash Machine My Pinboard: What Happened Next?		Project - Activity 4.3 Project - Design for adaptation Project - Block 5 Project notes
Week 24			
Week 25	My Studio Work: My Problem Statement		Project - Activity 1.3 Project – Value creation and stakeholders Project - Activity 1.6 Project – Value creation in your design or innovation
Week 26			Project - Activity 2.2 Project – Your financial assessment method Project - Activity 2.4 Project – Applying the MET matrix Project - Activity 2.7 Project – Refining your project
Week 27	My Studio Work: My Design Problem My Studio Work: My Design Concepts My Studio Work: My Design Solution		Project - Activity 3.10 Project – The mini-pitch
Week 28			Project - Block 6 Project notes
Week 29			

Week 30			

5.7 Appendix 8 Alternative table of correlation values

Full table of Pearson correlations:

Module /pres	E1	E2	E3	E4	E5	E6
U101 12J	r = 0.318, n = 397, p < 0.00001 Weak and significant correlation ρ = 0.270 Linear	**	r = 0.289, n = 374, p = <0.00001 Weak and significant correlation ρ = 0.325 Linear	r = 0.386, n = 395, p = <0.00001 Moderate and significant correlation ρ = 0.448 CHECK	r = 0.111, n = 256, p = 0.076 No correlation ρ = 0.222 CHECK	r = 0.27, n = 375, p = < 0.00001 Weak and significant correlation ρ = 0.286 Linear
U101 13B	r = 0.365, n = 222, p = <0.00001 Moderate and significant correlation ρ = 0.404 Linear	**	r = 0.30, n = 210, p = < 0.00001 Moderate and significant correlation ρ = 0.316	r = 0.35, n = 219, p = < 0.00001 Moderate and significant correlation ρ = 0.404	r = 0.10, n = 149, p = 0.23 No correlation; not ss ρ = 0.172	r = 0.41, n = 208, p = < 0.00001 Moderate and significant correlation ρ = 0.443
U101 13J	r = -0.132, n = 311, p = 0.019877 No correlation; not SS! ρ =	r = 0.29, n = 315, p = < 0.00001 Moderate and significant correlation ρ =	r = 0.27, n = 270, p = < 0.00001 Moderate and significant correlation ρ =	r = 0.25, n = 299, p = < 0.00001 Moderate and significant correlation ρ =	r = 0.33, n = 197, p = < 0.00001 Moderate and significant correlation ρ =	r = 0.31, n = 303, p = < 0.00001 Moderate and significant correlation ρ =
U101 14B	r = 0.433, n = 167, p = < 0.00001 Moderate and significant correlation ρ =	r = 0.35, n = 167, p = < 0.00001 Moderate and significant correlation ρ =	r = 0.30, n = 192, p = 0.000027 Moderate and significant correlation ρ =	r = 0.32, n = 153, p = 0.000054 Moderate and significant correlation ρ =	r = 0.21, n = 131, p = 0.014 Weak and significant correlation ρ =	r = 0.40, n = 158, p = < 0.00001 Moderate and significant correlation ρ =
U101 14J	r = 0.50, n = 304, p = < 0.00001	r = 0.50, n = 305, p = < 0.00001	r = 0.39, n = 241, p = < 0.00001	r = 0.47, n = 289, p = < 0.00001	r = 0.13, n = 240, p = 0.046	r = 0.43, n = 275, p = < 0.00001

	Moderate and significant correlation ρ =	Moderate and significant correlation ρ =	Moderate and significant correlation ρ =	Moderate and significant correlation ρ =	Weak and significant correlation ρ =	Moderate and significant correlation ρ =
T217 13J	r = 0.205, n = 220, p = 0.002 Weak correlation ρ =	**	r = 0.221, n = 143, p < 0.01 Weak correlation ρ =	r = 0.095, n = 152, = p = 0.244 No correlation; not SS! ρ =	r = 0.175, n = 37, p = 0.300 No correlation; Not SS! ρ =	r = 0.136, n = 125, p = 0.131 No correlation; Not SS! ρ =
T217 14J	r = 0.101, n = 225, p = 0.131 No correlation; Not SS! ρ =	**	r = 0.040, n = 124, p = 0.659 No correlation; Not SS ρ =	r = 0.212, n = 154, p = 0.008 Weak correlation ρ =	r = -0.119, n = 50, p = 0.411 No correlation; Not SS ρ =	r = 0.102, n = 128, p = 0.252 No correlation; not SS ρ =
T317 14J	r = 0.13, n = 274, p = 0.037 No correlation; Not significant ρ =	r = 0.13, n = 274, p = 0.037 No correlation; Not significant ρ =	r = 0.17, n = 108, p = 0.037 No correlation; Not significant ρ =	r = 0.08, n = 167, p = 0.31389 No correlation; Not significant ρ =	r = 0.02, n = 61, p = 0.88 No correlation; Not significant ρ =	r = 0.09, n = 104, p = 0.36 No correlation; Not significant ρ =

Table 17 Pearson Product Moment of Correlation of student engagement measures (E1-6) and success (S1) per module presentation

References

Charmaz, K. (2000) ‘Grounded Theory: Objectivist and Constructivist Methods’, 2nd ed. in Denzin, N. K. and Lincoln, Y. S. (eds), *Handbook of Qualitative Research*, London, Sage.

Cohen, L., Manion, L. and Morrison, K. (2011) *Research methods in education*, 7th ed. Oxon, Routledge.

Donelan, H., Kear, K. and Ramage, M. (eds.) (2010) *Online Communication and Collaboration: A Reader*, 1st ed. New York, Routledge.

Gibbs, G. and Simpson, C. (2004) ‘Conditions Under Which Assessment Supports Students’ Learning’, *Learning and Teaching in Higher Education*, no. 1, pp. 5–33.

Koskinen, I., Zimmerman, J., Binder, T., Redström, J. and Wensveen, S. (2011) *Design Research Through Practice*, 1st ed. Waltham, Elsevier Inc.

Lotz, N., Jones, D. and Holden, G. (2015) ‘Social engagement in online design pedagogies Conference Item’, Zande, R. V., Bohemia, E., and Digranes, I. (eds), *Proceedings of the 3rd International Conference for Design Education Researchers*, Aalto, Aalto University, pp. 1645–1668 [Online]. DOI: 10.13140/RG.2.1.2642.5440.

Moore, M. G. (1973) ‘Toward a theory of independent learning and teaching’, *Journal of Higher Education*, vol. XLIV, no. 12, pp. 661–679.

Thomas, E., Barroca, L., Donelan, H., Kear, K. and Jefferis, H. (2016) ‘Online conversations around digital artefacts: the studio approach to learning in STEM subjects’, Cranmer, S., de Laat, M., Ryberg, T., and Sime, J. (eds), *Proceedings of the 10th International Conference ISBN 978-1-86220-324-2 on Networked Learning*, pp. 1–8.

Unsworth, J. (2000) *Scholarly Primitives: what methods do humanities researchers have in common, and how might our tools reflect this?* [Online]. Available at http://people.lis.illinois.edu/~unsworth/Kings.5-00/primitives.html (Accessed 3 August 2013).