OfLA Project
2018-1-UK01-KA203-048090

O9 – Evaluation of the second cycle of studies

The impact of reducing the alert time period from 14 to 10 days in the NTU Student Dashboard

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Output 9 – Evaluation of the second cycle of studies

These reports will map the process of data-informed advice in the second year of the study.

A1. We will confirm with the new study subjects how we will work alongside them. This time however, we will have selected a new group of courses or degree programs to work with, or will be testing a new approach to using institutional data/ learning analytics in the advising and supporting process. This may include group tutorials, different types of alert or early warning, or advising using a particular pedagogical methodology.

A2. We will monitor and project manage the operation of the learning analytics resources.

A3. We will map how data (on each course and/or centralized) is used to firstly spot students at risk, how students are communicated to and how they are supported. Importantly, this year the reports will also include a summary of how we communicated with staff to set up the new round of interventions and challenges associated with the new cycle of interventions. The reports will also include recommendations for conducting the final cycle or research in 2020-2021.

A4. We will publish the resources to the website. AHS will take the overall responsibility for editing together the reports.

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1. Executive Summary

This study analyses the impact of changing the time frame for 'no-engagement' alerts in the NTU Student Dashboard. The researchers investigated the impact of dropping the alert period from the existing 14 days of no activity to a different period and made changes accordingly. The researchers took the existing 14-day period as a benchmark and modelled the impact of reducing the alert time or increasing it. Given that the risk of non-progression changes between academic years (i.e. first year students are more likely to leave early), the team modelled different alert periods for the different years.

Following the modelling exercise and consultation across the institution, the team changed the alert period to the following

- First year students – alert generated after 10 days of no engagement
- Second & final year students – alert generated after 14 days

2. Introduction and Methodology

2.1 Background Information

No University has 100% progression/completion. Students leave early for a range of reasons, often factors such as poor initial course choice, or due to problems encountered whilst studying. At NTU as a rule of thumb, each year around 80% of students progress 'cleanly' from first to second year and another 10% repeat or progress needing to repeat some modules. This study looks at the issues of efficacy of early warning alerts and interventions.

The NTU Student Dashboard learning analytics resource produces two main automated outputs. Firstly, a daily engagement rating based upon each student's academic activity and, secondly, an automated alert generated when there is no engagement for 14 days during term time, i.e. no activity in any of the activities measured by the Dashboard (attendance, use of online resources etc.). The University uses a three-term model; alerts are normally only generated during the first two terms as the teaching period is short during the final term and it was felt to be inappropriate to send alerts whilst students were revising and points of engagement were fewer. Prior to the start of the 2019-20 academic year, these alerts were sent to personal tutors. In 2019-20, a pilot was conducted to test the impact of sending alerts direct to students (see O9 case study).

The 14-day alert period was originally chosen because:

- There was a strong correlation between the alert and non-progression, therefore the alert was 'serious', less staff interpretation was required. For example, in 2014/15, fewer than 50% of first year students who generated a no-engagement alert progressed to the second year of study.
- Interventions were felt to still be achievable after 14 days
- 14 days is a comprehensible number, more usable than 13 or 16 for example
- The alerts were sufficiently infrequent that tutors would not be overwhelmed by 'spam' emails

However

- 14 days was a relatively long time period for students to have had no engagement with the University with no intervention
- Research for O6 found that some staff felt that the alert came too late, they were often already trying to support the student and so the alert was not a useful prompt

Therefore, it was agreed to study the relationship between the alert period and student progression and, if necessary, implement changes.

2.2 Introduction and Aims

The NTU Student Dashboard is designed to provide actionable intelligence to the user, be it students themselves, their personal tutors or other university staff (See Appendix 1). Automatic alerts are one way to generate actionable intelligence. However, there are challenges. The Dashboard uses only engagement data to drive the algorithm and generate alerts, essentially students who are more engaged are more likely to succeed, those engage little or not at all are far more at risk of not progressing to the next year, or achieving lower grades. Clearly, this calculation cannot begin to understand why students are not engaging; at NTU the system generates intelligence but still requires academic colleagues to work alongside students to understand and support them as individuals.

We would argue that achieving accuracy is not particularly challenging. Any extended period of low or no engagement is highly likely to correlate to non-progression. An alert based on 9 months of no engagement is likely to be almost 100% accurate, but it's effectively useless. No meaningful intervention is possible at the very end of the academic year. The challenge is far more about balancing the accuracy of the alert with efficiency or actionability. An alert generated too early is likely to generate many false positives, take up excessive staff time and ultimately undermine confidence in the accuracy of the alert. This study was conducted to see if it was possible to create a better balance between accuracy and actionability.

This study is therefore:

1. A statistical analysis of the association between no engagement and progression
2. An investigation of the impact of reducing or increasing the time span for an alert
3. A case study of the process of implementing a data-based decision.

The OfLA project is analyzing the use of learning analytics to support interventions using a three-stage model: the 'trigger/ alert', 'communication' and 'intervention'. This case study is focused primarily on the first step, the **trigger** or **alert**.

2.3 Overview of Methodology

The study was conducted in Summer 2019 using the following methodology.

Choice of students

Data for first, second and final year undergraduate students in 2017/18 academic year was analysed.

Students must have been full-time, undergraduate students and met the following

conditions:

- The student is fully, temporarily or conditionally enrolled
- The student is studying at a University
- The student is studying on a non-collaborative course
- The days of no-engagement occur during term time

Alert period

The researcher's prior experience suggested that the significance of the no-engagement alerts varied by time of year. Early gaps may be a stronger indication of risk compared to later in the year. Therefore, the analysis has been split into sections: no-engagement alerts sent over different time periods (terms 1,2 and 3 and whole year) and no-engagement alerts sent for different year groups (first year, second year and final year students).

The dates used were as follows:

- Term 1: 2nd Oct – 8th Dec 2017
- Term 2: 29th Jan – 29th Mar 2018
- Term 3 (to start of assessment period): 14th Apr – 14th May 2018
- All year (to start of assessment period): 2nd Oct – 14th May 2018

Where alerts have been reported on a per student basis for different terms, students who generated alerts in multiple terms will appear in the statistics for each term e.g. a student who generated alerts in terms 1 and 2 will appear in the statistics for both terms. The figures provided for 'all year' includes students who generated an alert at any point in the year. Each student is only represented once in the 'all year' figures regardless of the number of times they generated alerts throughout the year. Where results are reported on a per-student basis, they have been grouped into those not generating an alert at all and those generating one or more alert. The counts of alerts generated are a total count of the alerts that would be generated during the time period, and includes multiple alerts sent about the same student. The latter statistics are provided to give a sense of the absolute number of alerts that would be generated.

Modelling

The original 14-day alert period was initially analysed to create a benchmark. The team then modelled the relationship between no engagement and progression if the alerts were sent after a 7, 10 or 21-day period.

Methodological note

Due to problems with the alerts calculated in the first term of this year, the alerts were calculated using a complete set of data and applying the rules as they should have been. This analysis is a theoretical exercise, not a record of actual alerts sent.

3. Findings

3.1. 14-day baseline analysis

The researchers analysed the data for the 2017-18 year. Using the default 14-day no-engagement period outlined above, 1,361 undergraduate students (6% of the total cohort) generated at least one alert. However, slightly counterintuitively, despite the fact that most students withdraw in their first year, first year students did not generate the largest number of alerts (See table 1).

Baseline Analysis – 14-day no-engagement alerts				
Year group	1st year students	2nd year students	Final year students	**Total**
Total students who generated an alert	448	546	367	**1361**
% of cohort who would have generated an alert	5%	8%	6%	**6%**

Table 1: Proportion of students who generated 14-day no-engagement alerts (All full time, undergraduate students studying on NTU campus, 2017-18)

Of the 1,361 students who generated an alert, only 583 (43%) would have progressed to the next year or successfully completed their studies. However, as laid out in table 2, there is significant variation between years. Only 22% of first year students who generated a 14-day no-engagement alert progressed, whereas 64% of final year students with a no-engagement alert did so. This strongly suggests that the same alert period for all years is problematic. It may be that there are structural reasons for final year students disengaging, for example short term placements or time allocated to working on extended projects, but it is likely that as years progress, students are more 'invested' in their course. It may be a rational decision to drop out in the first year after an extended period of illness, but less so in the final year where there are fewer options for starting again.

Baseline Analysis – 14-day no-engagement alerts			
Year group	**Count of students who would have generated an alert & did NOT progress/ complete**	**Count of students who would have generated an alert & DID progress/ complete**	**% of students who would have progressed after generating an alert**
1st year students	349	99	22%
2nd year students	298	248	45%
Final year students	131	236	64%
Total	**778**	**583**	**43%**

Table 2: Students who generated 14-day no-engagement alerts progression (All full time, undergraduate students studying on NTU campus, 2017-18)

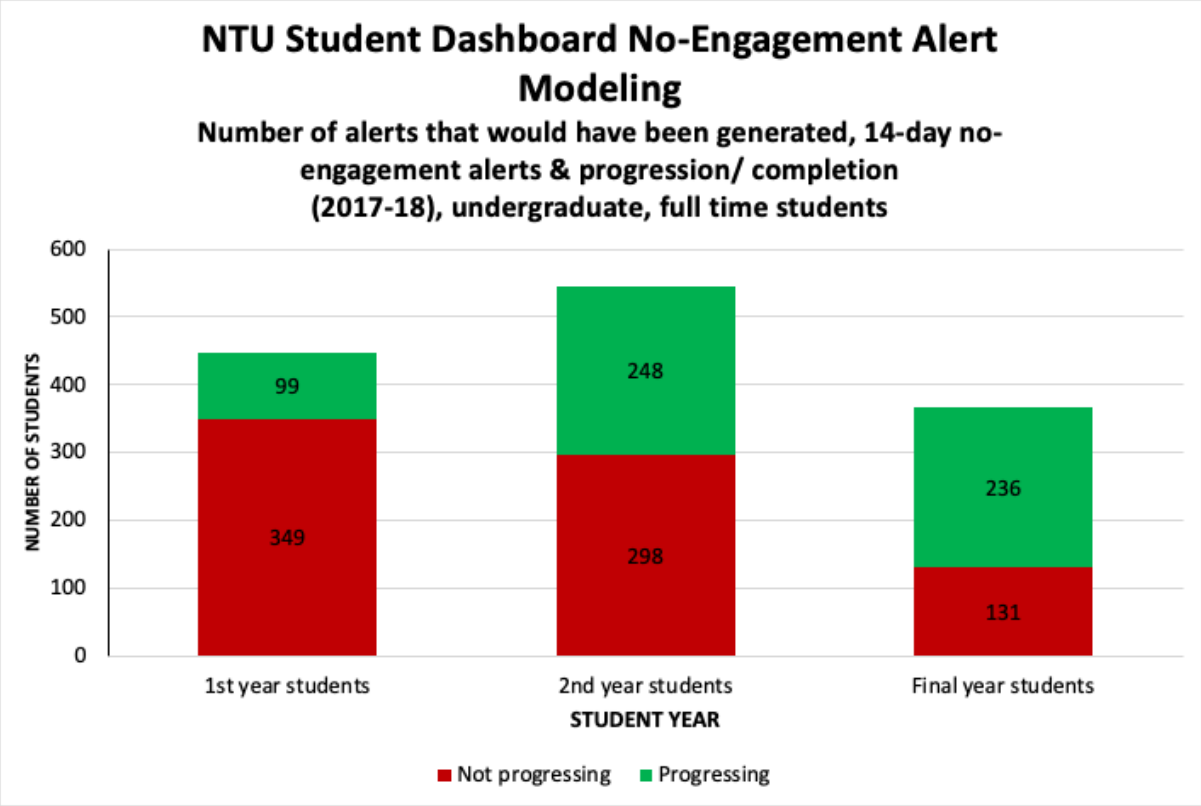

Figure 1: 2017-18, relationship between 14-day, no engagement alert and progression completion for full time undergraduate students

The researchers concluded that a single time period for all students was not appropriate given the disparities between the progression rate for different year groups (See table 2). If final year students were three times more likely to progress after generating an alert than first years, the alert was at risk of appearing meaningless. However, the 14-day period **was** felt to be an appropriate time measure for 2nd year students. If a second-year student generated an alert, there was over a 50% chance that they would not complete the year. This was felt to be sufficiently high risk, generated alerts for 8% of second-year students, was easily explainable and didn't overload tutors with alerts.

The next phase of the investigation was to test changing the length of alert period for first year and final year students.

3.2. Changing the alert time for first year students

The implication of the initial analysis was that first-year students needed a shorter alert period: 78% of first year students who generated a 14-day alert did not complete the first year. A shorter, more responsive alert was needed.

Two alert periods were tested, 7 days and 10 days. Both were chosen as they were explainable rather than searching for a 'perfect' day count.

	Total count of students' alerts generated for			**Proportion of students generating alerts who WOULD have progressed**		
Programme Year	**7-day**	**10-day**	**14-day**	**7-day**	**10-day**	**14-day**
1	1,625	870	448	58%	40%	22%

	Total count of alerts generated		
1	4,798	2,318	1,033

Table 3: First year full time undergraduate students, total count of students who would have generated alerts by 7-, 10- & 14-day lengths and relationship to progression.

The team discussed the options for the different time periods

Length of alert period	Advantages	Disadvantages
7 days	Would generate large numbers of alerts (nearly 5,000)	Capacity to cope with high volumes of alerts. 5,000 alerts would be emailed to tutors, potentially the volume would mean that some critical students may be missed
	Easily understandable time period	Relatively weak association between alert and non-progression. Over 50% false positive alerts. This risks undermining confidence in the alert and makes conversations with students more difficult.
10 days	Generates a more manageable volume of alerts (2,318)	10 days is a slightly longer time period before action takes place, particularly if tutors took a few days to respond.
	Association between the alert and non-progression is strong (60% of students would NOT have progressed).	
14 days	Discounted as already too long a period	

Table 4: Advantages & disadvantages of reducing the alert period from 14- to 10- or 7-days

The team therefore recommended that the alert period for no-engagement alerts should be dropped from 14- to 10- days for first year students.

3.3. Reviewing the needs of final year students

Alerts for final years presented the opposite problem. If anything, 14 days was too short a trigger, almost 2/3 of students who generated a no-engagement alert would have progressed. The rate of final year completion is higher than the 80% progression for first years. However, if a tutor responded to a 14-day alert, two out of every three students they spoke to would go on to complete their programme.

The researchers therefore agreed to test a longer alert period. They considered 15-days, 20-days, but in the end chose to test the relationship between a 21-day alert period and the risk of non-progression.

	Total count of students' alerts generated for			Proportion of students generating alerts who WOULD have progressed		
Programme Year	**14-day**	**21 day**		**14-day**	**21-day**	
Final	367	192		64%	49%	
	Total count of alerts generated					
1	1,074	508				

Table 5: Final year full time undergraduate students, total count of students who would have generated alerts by 14- & 21-day lengths and relationship to completion.

The team then reviewed the advantages and disadvantages of extending the alert period from 14 to 21 days.

Length of alert period	**Advantages**	**Disadvantages**
21 days	Ensured that the association between alert and risk remained high (51% of students who generated this alert would NOT have completed their course in this year)	3 weeks during term time is effectively 1/3 of a normal teaching term. This represented a very long gap between alert and potential intervention.
	Easily understandable time period	

Table 5: Advantages & disadvantages of extending the alert period from 14- to 21-days for final year students.

The team reviewed this finding with senior managers. Following discussion, it was agreed that whilst mathematically the 21-day alert provided a better fit for the alert, it was deemed inappropriate to leave students for three weeks before generating an alert. It was therefore agreed to leave the alert period for final year students as 14-days of no-engagement.

4. Discussion and recommendations

Discussion

Alerts are the first stage of the OfLA model. They are the basis for all subsequent communication and interventions. This study showed that the existing 14-day period used to generate a no-engagement alert balanced well enough the seriousness of the alert against operability for second year students, but was less effective for first and final year students. The team therefore reduced the alert time period for first year students and left the time period at 14 days for final year students for organisational, not statistical reasons.

4.1. Further considerations

4.1.1. Change the alert by term

There is an additional dimension not explored in this study: time of year. For example, in the revised first year model (alerts after 10 days of no-engagement) the relationship between alert and progression is as follows:

- Term 1: 38% of students who generated an alert would have progressed
- Term 2: 39% of students who generated an alert would have progressed
- Term 3: 26% of students who generated an alert would have progressed

This is perhaps because later in the year it's too late to actually make up missed work, or may indicate that a sustained pattern of disengaged behaviour has set in. The logical conclusion of this work is to shorten the timeframe for alerts in the final year. However, this is an operationally difficult action to take. At NTU there are typically only three weeks of teaching in the final term and the Dashboard team may not even turn alerts on during this time.

This will be considered further in future work.

4.1.2. Evaluation of the project

The researchers implemented this change to the alert period at the start of the 2019-20 academic year. As progression data is unavailable until autumn 2020, it will not be possible to fully evaluate the impact of this work until 2020-21. Furthermore, the impact of the covid-19 pandemic may make this a difficult year to evaluate. This is therefore primarily a case study of a change management process outlining the decisions taken to bring about a change in practice.

It is important therefore to reiterate that some of the changes were made based on an analysis of risk and others were made taking into consideration both the practical application of the resource and, to some extent, how appropriate students and staff would view the decisions made. Student views about receiving alerts directly are analysed in the separate O9 case study.

4.1.3. Relative priority

The alert is an important first step. But it is only the first step. The team felt that the balance between alerts and progression was maintained as was the staff workload. Much more work could be carried on alerting including:

- Changing the alert frequency by term;
- Generating 'critical incident' alerts, for example non-submission of coursework;
- Escalating alerts – changing the tone and seriousness of subsequent alerts.

However, whilst alerting is part of the process, it is almost the precursor of action. The team was satisfied that the alerting process was accurate and balanced. The subsequent priorities are to understand better the impact of communications and alerts.

Recommendations

Recommendations for Staff & Students

The main recommendations for both staff and students from this study is the importance of keeping the alert comprehensible. The team struck to maintain a balance between a high association between the alert and the risk of non-progression and the need for actionable data. This was specifically to make it easier for students' and staff members to understand, therefore reducing the need for higher levels of data literacy.

Recommendations for Managers

Algorithms reflect the prejudices and beliefs of their programmers. Therefore, it is important for assumptions to be challenged and publicly discussed. Ultimately, one of the decisions about the alert period was a judgement about how the time span would be perceived, not the best mathematical fit.

Recommendations for institutions

Decisions about algorithms need to balance a range of factors. Chief amongst these is accuracy; does the alert identify students at risk of early departure? However, accuracy is not enough. The alert needs to be efficient. Tutors or other staff members need to have sufficient alerts with which to act, but they also need to avoid being swamped with alerts, ultimately risking missing those at most risk of early departure. Finally, the most important issue is that institutions need to effectively resource the actions associated with the alerts. If there are hundreds of alerts generated, but all this does is swamp already busy staff, this is a worse situation than not generating alerts at all.

Senior managers therefore need to resource the following.

- Time for a staff member to receive the alert
- Time for them to communicate with the students, multiple times may be required
- Time and potentially space for a tutor to intervene

Recommendations for the final year of the project

Considerations for O12

We do not plan to further nuance this research in 2020-21. There are useful lessons from this work, but we feel that the priority remains on looking at the communication and intervention stages. Further work on the algorithm requires fundamental redesigns that are beyond the scope of the project.

Considerations for O13

The main issue for staff development from this work is that the data needed for an intervention to be comprehensible and acceptable to staff. This is quite an important point for any staff development activity given that it will require a degree of trust that is different to most staff members normal position of intervening based on a concrete event (e.g. failed assessment), or their lived experience of working with students.

Considerations for O14

Triggers need to be accurate, but they also need to be timely and usable. Moreover, we recommend that they are developed in a transparent way in conjunction with the end users.

Considerations for O15

We feel that it is important to reiterate the importance of data choice for any triggers. Alerts need to be based on data sources that are proven to demonstrate the relationship between the algorithm and the intended end result. Data sources need to be reviewed periodically as do the algorithms that analyse them.

Considerations for O16

This case study reinforces some of the core issues for the project. Data needs to be reliable and usable and it needs to be comprehensible to the end users.

O17

Further discussion about the use of algorithms for alerts can be found in:

FOSTER, E., SIDDLE, R., CROWSON, P., BONNE, P., (2020), It's All About the Intervention: Reflections on Building Staff Capacity for Using Learning Analytics to Support Student Success, in IFENTHALER, D. & GIBSON, D., (Eds) Adoption of Data Analytics in Higher Education Learning and Teaching, New York, Springer

SIDDLE, R., FOSTER, E., (2020, March 27th), Considerations for amending a whole-institution early-alert system, paper presented at LAK2020, Frankfurt/virtual, Society for Learning Analytics Research

5. Appendix

It's only one page, it doesn't seem worth having a separate document

Appendix 1 – The NTU Student Dashboard using the lens of the OfLA model