

## Harnessing Student Engagement Data for Personalised Feedback

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**Module discipline:** Science

**Approximate module size:** 300 students

**Level of module:** First year Undergraduate

### Reasons for using analytics in the module

We began using analytics to investigate if we could offer meaningful, personalised feedback to students early into their first year of study. In the School of Science and Computing, first year students engage in weekly active learning activities such as participation in lectures, quizzes, practical work, and assignments. Interactions are captured on Moodle (VLE) which leads to large amounts of data relating to their engagement, time spent, performance, and disengagement.

The goal was to package this data for the students into a format that offered a snapshot of how they were progressing. The data was extracted from Moodle and collated using excel IF statements to produce automated responses which offered encouragement and strategies for success. The output was a printed personalised feedback sheet which was delivered to students in a practical/tutorial class. This lecturer gives the feedback sheet to each student while also briefly discussing its content with each student in the class.

The purpose of this intervention was to:

1. Encourage students and offer an opportunity to see how their efforts are contributing to their final mark
2. Flag to students' areas that we would like them to engage with more fully and offer actionable suggestions to do this
3. Provide lecturers with a more holistic view of student's performance in a wide variety of activities and highlight at risk students early in their first year of study.

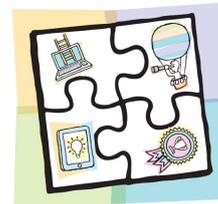
### Data sources/modelling approach

Data was obtained entirely through Moodle by downloading gradebook and attendance reports. The process of converting the data into useful feedback has three stages.

Step 1: Extract data from Moodle

Step 2: Cleanse the data and apply Automated Personalised Feedback Algorithm

Step 3: Generate Personalised Feedback Forms (*see Further Resources section below for videos and further resources detailing the process*)



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These steps can easily be achieved using accessible tools such as MS Excel (step 2) and MS Word (step 3).

Step two includes several stages. The first involves producing a rubric like grid of responses to each result. Initially a limited set of five responses was produced for each factor i.e. accumulated weekly quiz performance, attendance, lab grades, assessment grades and stand-alone quiz performance. Once the grade ranges warranting each response were identified the responses and grades were matched up.

This second stage involves the use of nested IF statements within excel to match the response to the student achievement. Once step two was completed, the completed excel sheet was used as a source to mail merge in word to produce personalised feedback forms for each student.

In step 3: the forms were printed and handed to students. By tailoring the sentences used as feedback it was possible to create a feedback letter which in the first instance looked at five simple aspects using a simple matching function. This has 3,125 possible outputs meaning that students are unlikely to receive identical feedback to their peers.

In subsequent versions, additional aspects of student performance were reviewed, and two extra features were added. Firstly, hypothetical scenarios were created based on past performance to identify possible goals for students relevant to their work by identifying where they had lost marks. Secondly, multiple factors could be examined to provide feedback to distinguish between e.g. a student with high attendance and low marks compared to a student with high marks but infrequent attendance. With the addition of these feedback features, there are over 1 million permutations possible. In addition, the sheets can provide actionable suggestions for students to change how they engage with the course leading to long term positive changes in student behaviour.

The students reviewed this personalised feedback sheet with their lecturer. This ensured that the data is meaningful and offers opportunity to ask questions and discuss learning strategies or interventions.

### Impact of using data

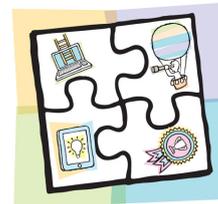
Student surveys collected data mid-way and at the end of the year to assess the impact of the system in maths and chemistry for first years.

Module	I found the Feedback form:	% Students
Chemistry	Useful	94% (n = 162)
Maths	Useful	95% (n=229)

In addition to this, free responses were elicited from the students with comments such as:

*"I received a lot of feedback regarding my performance and grades which was helpful in knowing how well I was doing in the module. It made me less anxious to know I was doing well",*

*"[the feedback] helps you to see what you can do to improve your grade."*



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*"I felt it was good to see my progress early on in the year, it gave me more confidence that I was on the right track".*

Module	I agree that the Feedback form:	% Students
Chemistry	"changed my approach to studying chemistry".	72% (n = 159)
Maths	"changed my approach to studying maths".	68% (n=229)

### Suggested Change in Behaviour by Students

Students were asked to give an example of a change/ practise they were likely to do as result of receiving the feedback. Below is a snapshot of some these responses:

*"Do the journal work in a rough work copy before putting it in the journal copy so that it is neater. Go over the journal work again to check for mistakes before correction."*

*"I am going to focus more on the quizzes and aim to get 100% weekly and also I am more encouraged to challenge myself in the quizzes."*

*"I will keep going over semester 1 quizzes as this will keep the material in my head also I will keep attending the lectures and tutorials. I will keep my journal work up to a high standard".*

For some students it was a motivating factor to continue working hard:

*"Well I will personally keep working hard to try keep getting really good marks, I was never good at maths but hard work and persistence will pay off in the end".*

### Feedback from Lecturing Staff and Management

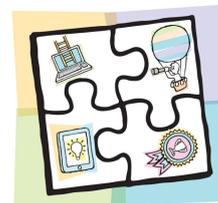
Feedback from lecturing staff has also been positive with lecturers giving feedback such as *"Student performance is ready at a glance and facilitates an honest one on one discussion"*.

It was noted during earlier iterations that critical to the success of the feedback was the presence of accurate data in Moodle.

At a wider departmental and institute perspective, the feedback is targeted to provide students with feedback and encouragement at times of the year where drop-out rates are known to be at their highest. This aims to encourage students to reengage with their programme, improving student outcomes by empowering students to make informed decisions about their engagement with their course and keeping as many students on track to achieving their academic potential as possible.

### Gathering further data

One of the most immediate lessons was that, more important than the quantity of data is the quality of data. It was important to make sure that the data being recorded was accurate and that both attendance and grades were up to date in Moodle to ensure the feedback generated was useful. The



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modules have changed in tandem with the implementation of this feedback system rather than changing than because of it however the generation of feedback elicits a much stronger and more well-informed response from the student with regards to assessments and marking.

The transparency of the system is also favoured by students as it offers an error correction mechanism for inaccuracy in gradebook, allowing opportunity for discussion. The early timing of the intervention offered students an opportunity to make changes within the first semester. This was seen as very positive strategy by the students. It was decided to try to ensure that feedback forms were produced within the first eight weeks of term.

### Advice for colleagues interested in using a data-enhanced approach

- 1) Before thinking about using any data take stock of the data that you have already – in many cases there is a large amount of data stored. Often it is a case of improving the quality of what you have rather than looking for new data sources.
- 2) When thinking about how to use the data or generate reports, for many tasks a spreadsheet such as Excel is sufficient to get everything you need out of the data. Having a clear question in mind when processing your data can help you make specific and useful observations
- 3) Offer personalised feedback as early as possible to both motivate students and offer them an opportunity to change behaviour if required.
- 4) Data analytics is no substitute for high quality teaching! Sharing the results of the data analysis is as important as the analysis itself. Consider how students will be given any analytics – will they have an opportunity to query any results? Will the meaning of each output be clear or require clarification? Might the outputs be misleading or demotivating?
- 5) Accept that there is a big initial investment but that once set up analytics becomes a time saver and offers worthwhile rewards.

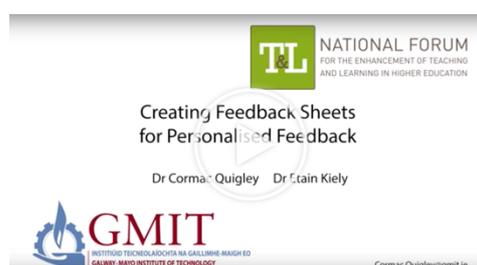
### Further Resources



Harnessing Student Engagement Data for Personalised Feedback - <https://youtu.be/wtmWWWUKRbA>



Sample Data  
Sample-data.xlsx



Creating Feedback Sheets for Personalised Feedback - <https://youtu.be/d0jaNu-XZjQ>



Sample Data  
Comment-sheet.xlsx