

Enhancing retention interventions with predictive analytics

Track - Technology, big data and the future of higher education

Andy Jaffrey
Head of the Office for Digital Learning
Ulster University
@andyjaffrey

Menti.com (code 352657)

ulster.ac.uk



Aims

- To introduce Ulster's historical approach to retention data and interventions
- To describe the vision for better data informed decision making in particular enhancing the annual cycle of reporting with real time, actionable data
- To demonstrate how Predictive Analytics supports this vision
- To introduce the solution - Blackboard Predict - and explain how the predictive model functions
- To share some experiences from the implementation phase of our predictive analytics project

and.....

- To recognise the academic discomfort about neoliberal surveillance and compliant student populations.



Learning analytics is also a layer on top of deeper, often hidden layers, assumptions, and beliefs regarding the function of higher education; how we define 'learning'; how we measure and validate 'learning'; the enclosing/capture of 'learning' on institutional learning management systems (LMSs); and how we see data, and the gender/race/epistemologies of those who develop the algorithms.

Responsible Learning Analytics, Paul Prinsloo,
University of South Africa

<https://www.slideshare.net/prinsp/responsible-learning-analytics-a-tentative-proposal>



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Opinion

A machine learning algorithm is capable of predicting student success



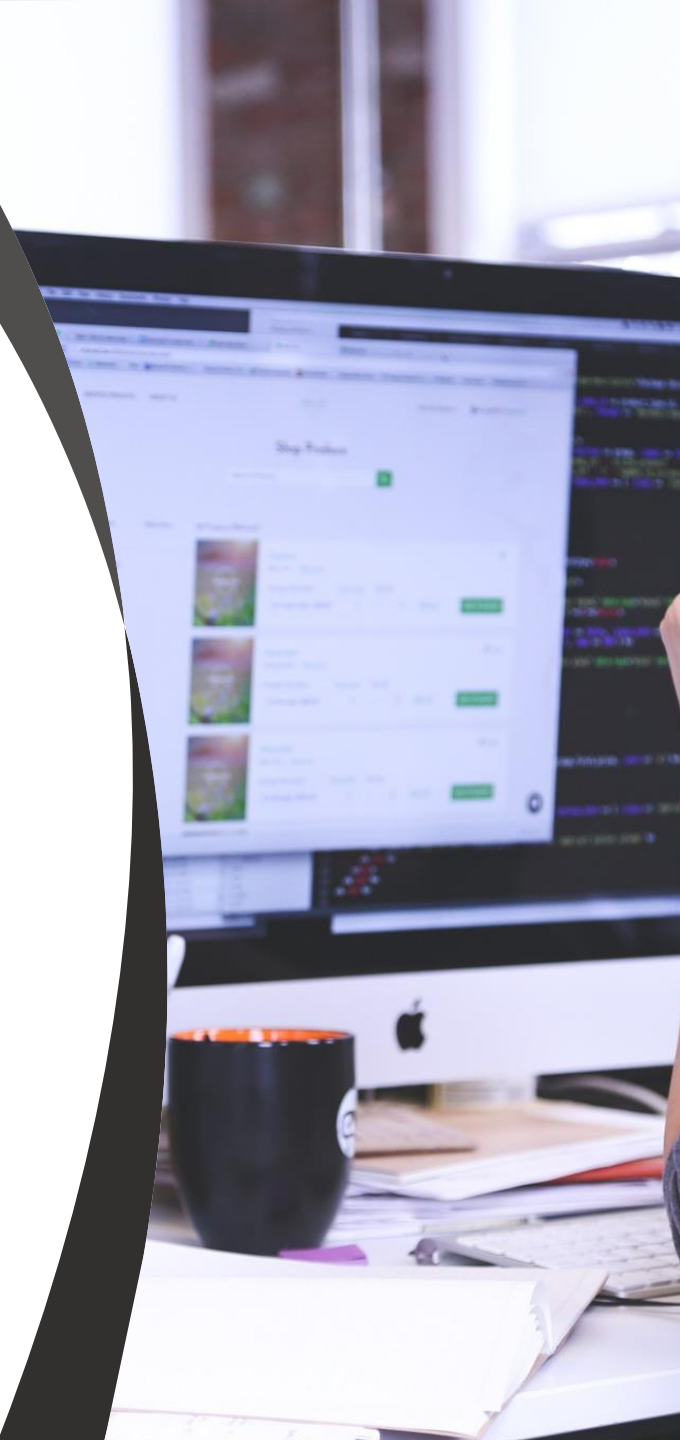
Strategic context at Ulster

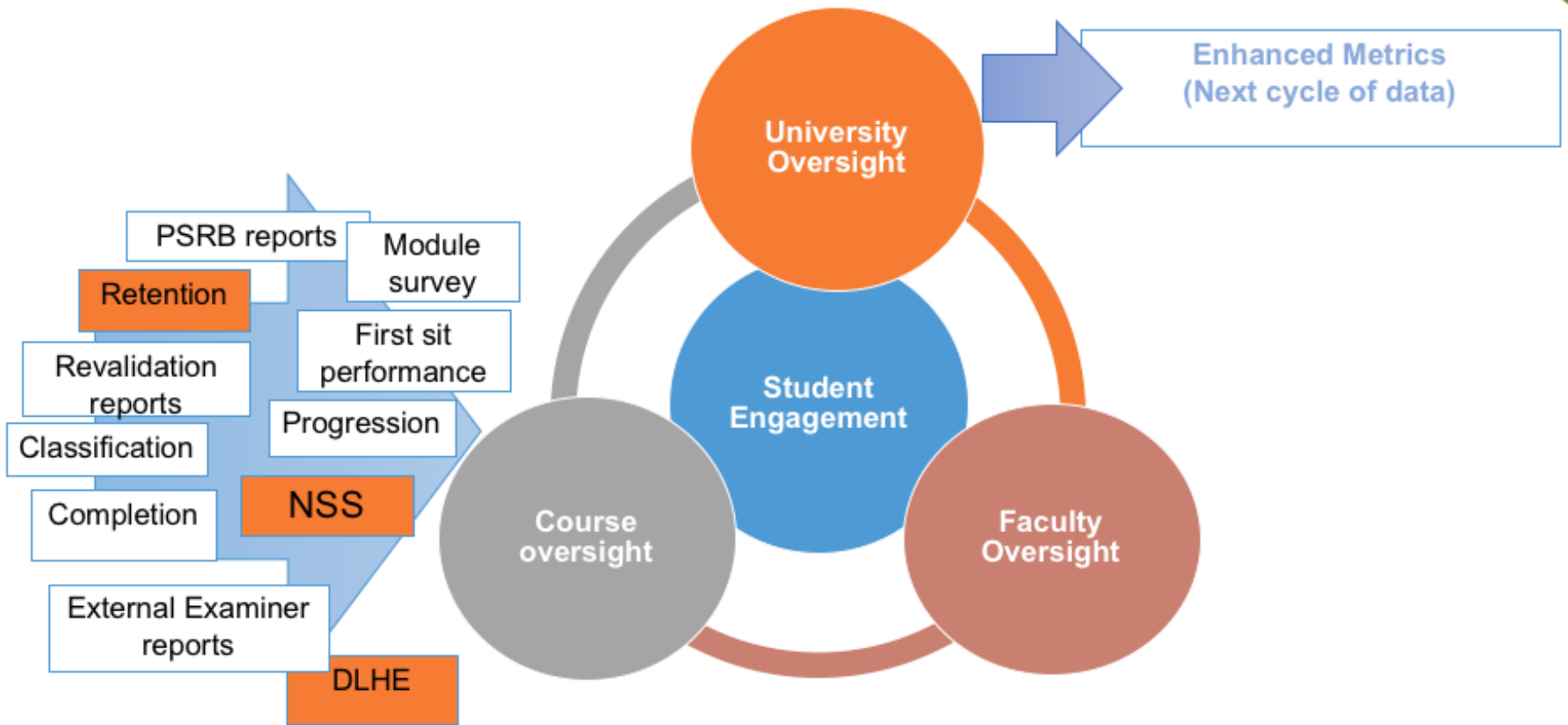
- New Vice Chancellor (2015)
- New strategy – Five and Fifty (2016)
- New PVC Education (2016)
- Curriculum re-design processes
- New targets for retention, progression and attainment
- New course review processes
- Emerging focus on data based decision making and data democratisation.
 - Sharing tools
 - Sharing skills
 - Sharing responsibility

“The research and education sector is used to an annual reporting, decision-making and budgeting cycle centred on the academic year. This has served us well, but limits our ability to respond in an agile way to developing events.

There is huge potential gain from being able to respond quickly to an emerging opportunity, or to proactively address a developing problem.”

<https://www.jisc.ac.uk/reports/the-future-of-data-driven-decision-making>





Vision for Predictive Learning Analytics at Ulster

- To improve retention rates, progression rates and attainment.
- But also to improve conversations
 - To enhance the conversations we are having about learner data and to have these conversations sooner
 - To challenge ourselves to deal with institutional barriers, ethical, policy and governance issues around the use of learner data
 - To provide actionable data to any member of staff who supports a student
- to learn more about our own data, capacity and capabilities
 - Review the quality of our own data and begin to cleanse and understand it better. “Data hygiene”
 - To test and stretch our IT policy & governance
 - To talk more about causation and correlation and challenge some of our tacit assumptions – the myth of the incrementing student number

Partnership with Blackboard

- Ulster partnered with Blackboard to be the first EU institution to implement Blackboard Predict. **Why?**
- Alignment with JISC Learning Analytics initiatives through Blackboard's involvement with the sector wide project.
- Alignment between Ulster's SRIS and the Predict data manifest.
- Make best use of the existing data already within Blackboard's managed hosting infrastructure.
- Integration with Blackboard Learn. Accessible dashboards embedded within existing workflows.
- Rapid deployment opportunity due to managed hosting project.
- Trusted and recent collaboration with Blackboard consultancy on the managed hosting project, which was well received by senior management.
- Complementary skills



The Prediction

The question:

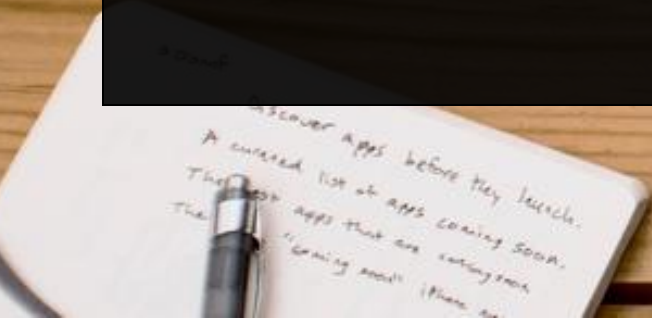
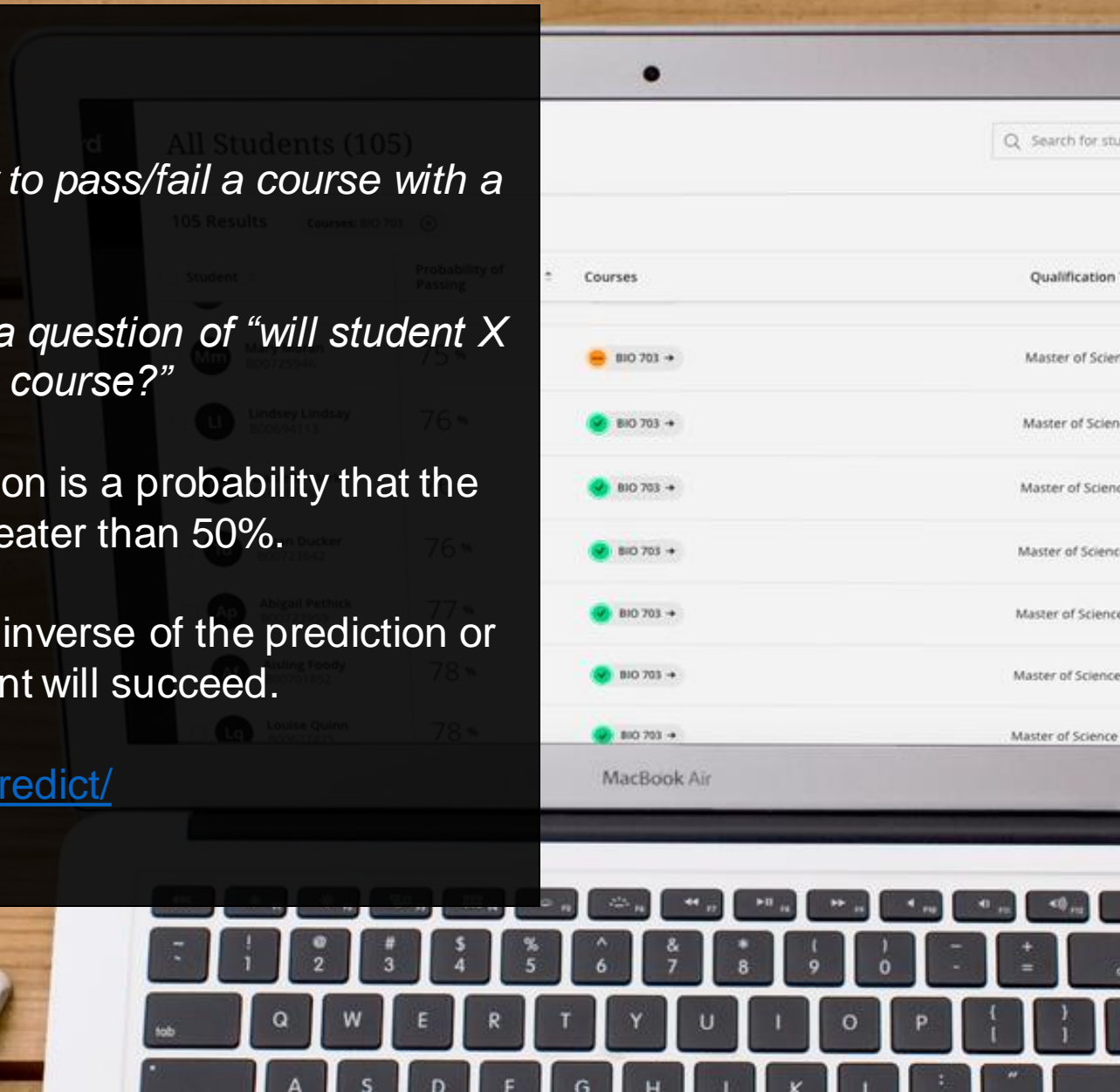
What students are likely to pass/fail a course with a 50% grade or higher.

The actual prediction is a question of “will student X get less than a 50% in a course?”

The result of the prediction is a probability that the student will not score greater than 50%.

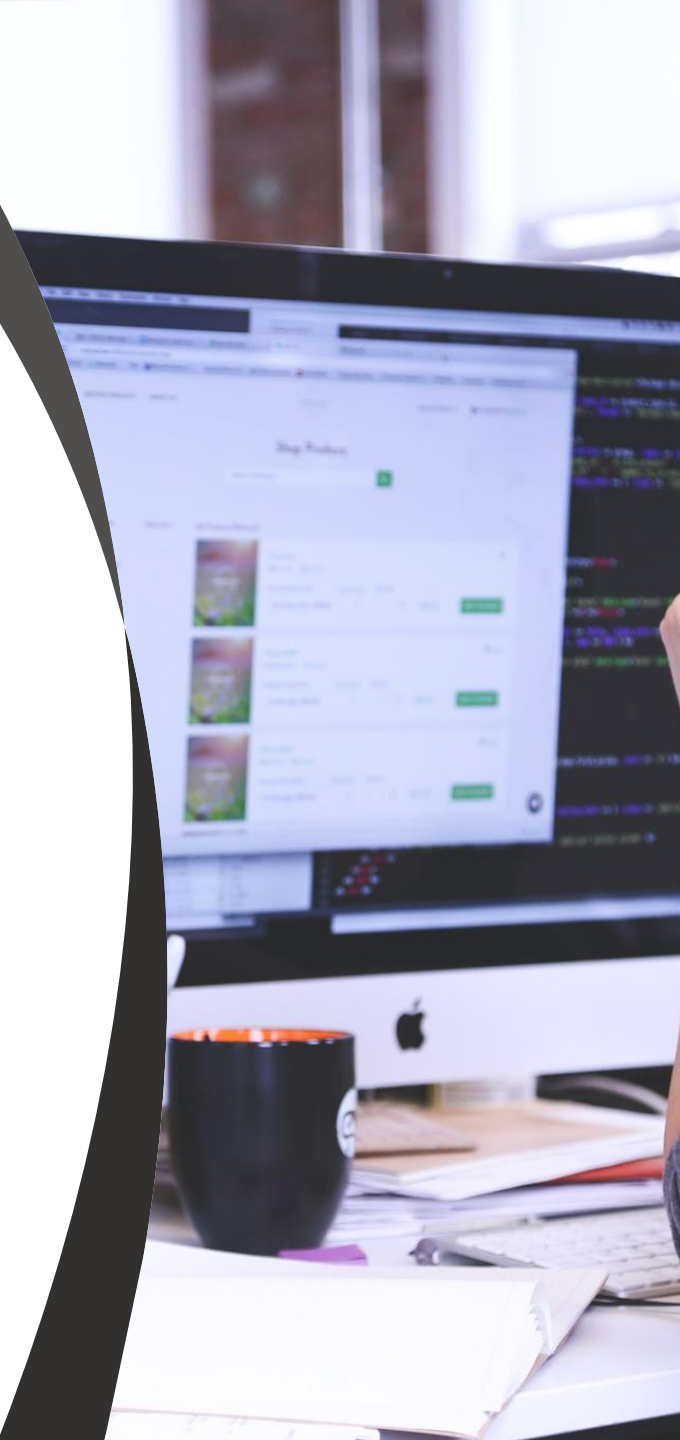
What is displayed is the inverse of the prediction or the probability the student will succeed.

<http://addl.ulster.ac.uk/predict/>



Ulster's Predictive Model

- Uses Random Forest machine learning algorithm
 - Result is a set of decision trees created using a random subset of features/attributes.
- For any given prediction, the data is passed through each tree in the forest, the resulting predictions are averaged to determine the final prediction for the case.
- None of these features/attributes are necessarily causal.
- Predict isn't capable of telling you why the student will fail the course, just that it is likely to happen.



Model Segmentation

It is entirely possible, and indeed likely, that different students will be at risk at different times in the semester.

Predictions are therefore segmented by percent course complete.

This results in six segments, or different models for predicting the student success.

Week 0 - before the course starts

0-20% (ex: weeks 1-3)

20-40% (ex: weeks 4-6)

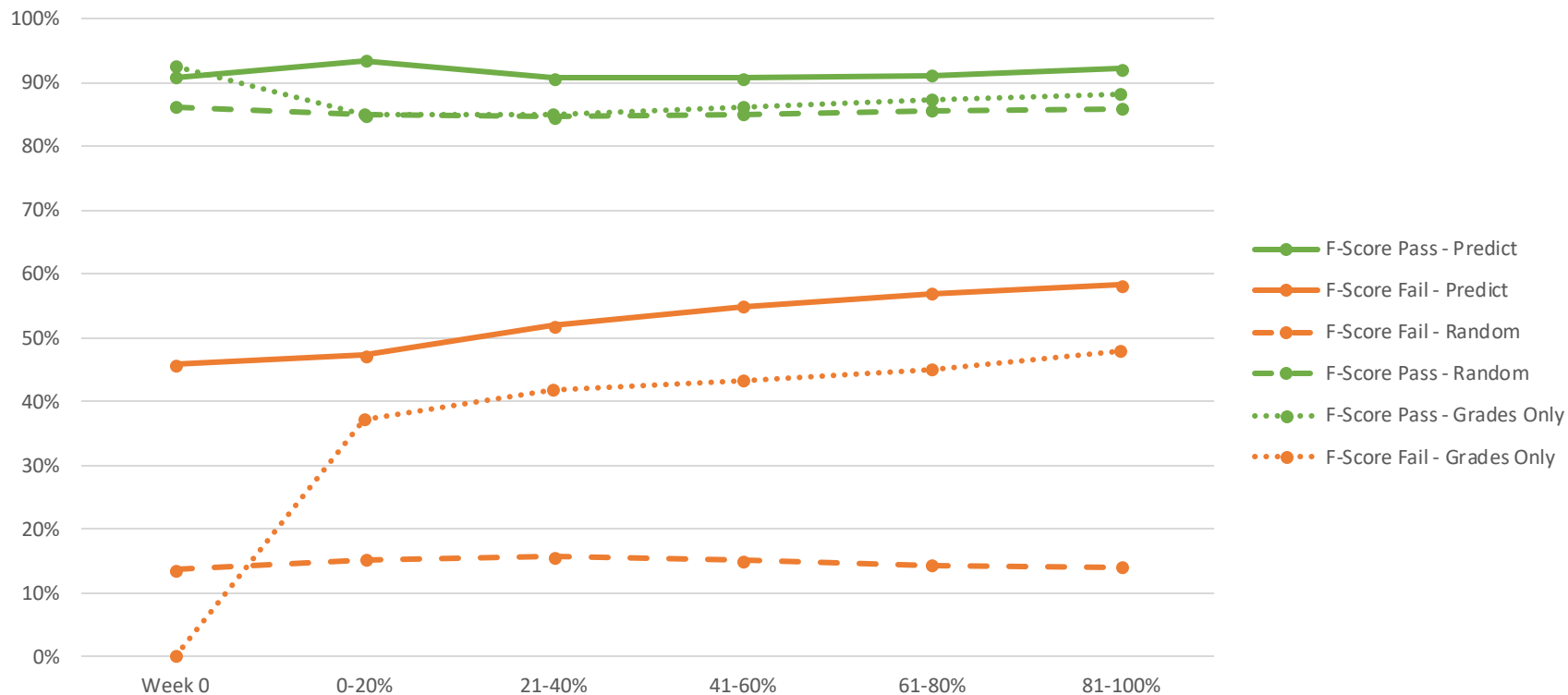
40-60%

60-80%

80-100%



F-Score Comparison (Benchmark)



What we have learnt at Ulster

- Ownership of a learning analytics project is contested.
- The benefits of the project are not necessarily those that we defined at the start of the project.
- It is possible to get a pilot project established without the optimal team configuration.
- Dashboards really focus discussion.
- There is functional overlap between aspects of Predict and other reports and tools but the simplified UI is starting to change engagement patterns.
- Human judgement is essential – ‘intuition or experience’?
- Predict helps start the conversation with a student, it can never hope to provide a 360 degree view of a human. Importantly we should not expect it to.
- Predict is part of a process and it is changing how we think about interventions and who has responsibility. The tool is only constructive when accompanied by intervention.

Global Advisor (University wide)

The screenshot displays the Blackboard Global Advisor interface. The browser address bar shows the URL `ultra-predict.int.bbpd.io`. The page title is "Students" with a dropdown menu set to "My Students (215)". A search bar is available for finding students by name or ID. The main content area shows "201 Results" for the "Current Term". A table lists student performance data, including their names, IDs, probability of passing, failed courses, and class levels.

<input type="checkbox"/> Student	Probability of Passing	Courses	Class Level
<input type="checkbox"/> Matt Donohoe 10247169	27 %	CMSC-206C CMSC-205	Fourth Year
<input type="checkbox"/> Ruth Martinez 10015227	28 %	GERM-0201 BIOL-0201	Second Year
<input type="checkbox"/> Marvin Grayson 10486617	32 %	ENGL-0201 PHYS-0201	Fourth Year
<input type="checkbox"/> Travis Leppert 10688415	37 %	BIOL-0201	First Year
<input type="checkbox"/> Jose Bleau 10596334	38 %	GERM-0201 ENGL-0201	Third Year
<input type="checkbox"/> Stanley Paris 10490626	38 %	GERM-0201 PHYS-0201 HIST-0201	First Year
<input type="checkbox"/> Jenette Williams 10627443	39 %	HIST-0201 GERM-0201 BIOL-0201	First Year
<input type="checkbox"/> Daniel Constant 10229535	39 %	HIST-0201 GERM-0201	Third Year
<input type="checkbox"/> Barbara Goodwin 10262823	41 %	BIOL-0201	Non Degree
<input type="checkbox"/> Neal Carter	41 %		

Global Advisor Filters

The screenshot shows the Blackboard Global Advisor interface. The main area displays a table of 201 results for 'My Students (215)' for the 'Current Term'. The table has columns for 'Student', 'Probability of Passing', and 'Courses'. A sidebar on the right is open to the 'Filters' section, which includes options for 'Courses', 'Risk', 'Risk Trend', 'Risk Level', 'Study Load', 'Degree Programme', 'Cumulative Average Grade', and 'Average Grade (High School)'. The browser window title is 'ultra-predict.int.bbpd.io' and the system clock shows 'Thu 11 Jan 19:26'.

Student	Probability of Passing	Courses
<input type="checkbox"/> Matt Donohoe 10247169	27 %	<input checked="" type="checkbox"/> CMSC-206C <input checked="" type="checkbox"/> CMSC-205
<input type="checkbox"/> Ruth Martinez 10015227	28 %	<input checked="" type="checkbox"/> GERM-0201 <input checked="" type="checkbox"/> BIOL-0201
<input type="checkbox"/> Marvin Grayson 10486617	32 %	<input checked="" type="checkbox"/> ENGL-0201 <input checked="" type="checkbox"/> PHYS-0201
<input type="checkbox"/> Travis Leppert 10688415	37 %	<input checked="" type="checkbox"/> BIOL-0201
<input type="checkbox"/> Jose Bleau 10596334	38 %	<input checked="" type="checkbox"/> GERM-0201 <input checked="" type="checkbox"/> ENGL-0201
<input type="checkbox"/> Stanley Paris 10490626	38 %	<input checked="" type="checkbox"/> GERM-0201 <input checked="" type="checkbox"/> PHYS-0201
<input type="checkbox"/> Jenette Williams 10627443	39 %	<input checked="" type="checkbox"/> HIST-0201 <input checked="" type="checkbox"/> GERM-0201
<input type="checkbox"/> Daniel Constant 10229535	39 %	<input checked="" type="checkbox"/> HIST-0201 <input checked="" type="checkbox"/> GERM-0201
<input type="checkbox"/> Barbara Goodwin 10262823	41 %	<input checked="" type="checkbox"/> BIOL-0201
<input type="checkbox"/> Neal Carter 10022116	41 %	<input checked="" type="checkbox"/> GERM-0201 <input checked="" type="checkbox"/> PHYS-0201

Filters

Clear filters

Courses

Search by Course Name, Number or ID

Risk

Risk Trend

Increasing Risk

Decreasing Risk

No Change

Risk Level

Low Risk

Medium Risk

High Risk

Study Load

All

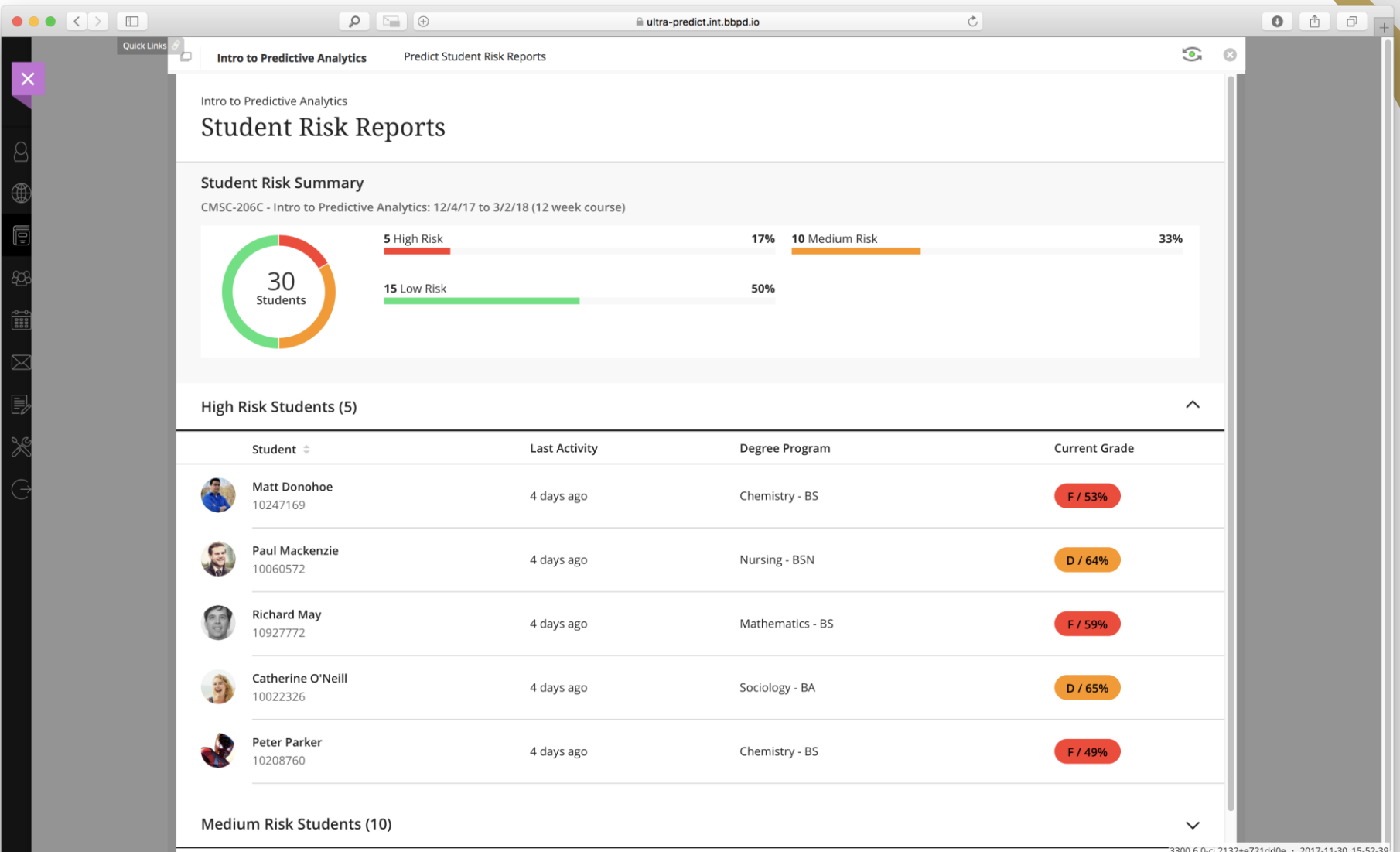
Degree Programme

Cumulative Average Grade

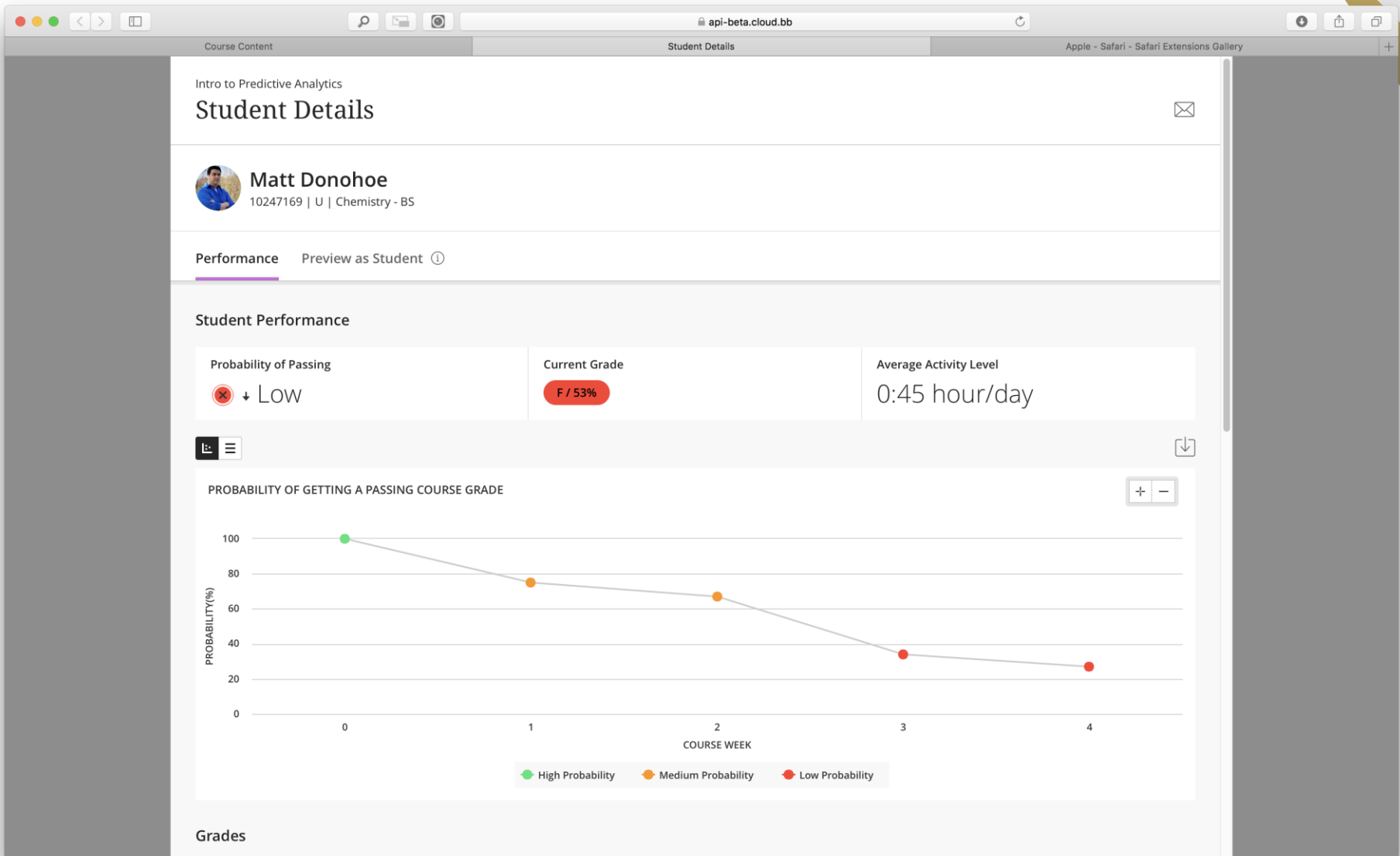
Average Grade (High School)

Cancel Apply

Student Risk Reports (Module)



Student Risk Report (Individual)



Student Risk Reports (intervention)

The screenshot displays a web application interface for student risk reports. The main content area shows the details for a student named Matt Donohoe, including his profile picture, name, and ID (10247169). Below this, there is a 'Performance' section with a 'Preview as Student' link. The 'Student Performance' section features a 'Probability of Passing' indicator showing a downward trend and a 'Current Grade' of 'F / 53%'. A line graph titled 'PROBABILITY OF GETTING A PASSING COURSE GRADE' plots the probability over three course weeks. The probability starts at 100% at week 0 (High Probability), drops to approximately 75% at week 1 (Medium Probability), and further to about 65% at week 2 (Low Probability). A legend at the bottom of the graph identifies the probability levels: High Probability (green dot), Medium Probability (orange dot), and Low Probability (red dot). An 'Email Student' modal window is overlaid on the right side of the screen. It contains fields for 'Recipients' (with a search input and a selected recipient 'Matt Donohoe <MattDonohoe@fakeemail.co...>'), a checked checkbox for 'cc academic advisor: Paul Temple', a 'Subject' field with the text 'Assignment support', and a 'Message' field containing the text: 'Hi Matt, I've noticed that you do well in in-class tests but struggle with some of the assignments. I have some additional learning materials which I think may help. Please visit the "Further Reading"'. At the bottom of the modal are 'Discard' and 'Send' buttons.

Course Content | Send an Email | Apple - Safari - Safari Extensions Gallery

Intro to Predictive Analytics
Student Details

Matt Donohoe
10247169 | U | Chemistry - BS

Performance | Preview as Student ⓘ

Student Performance

Probability of Passing
⊘ ↓ LOW

Current Grade
F / 53%

PROBABILITY OF GETTING A PASSING COURSE GRADE

Course Week	Probability (%)	Probability Level
0	100	High Probability
1	75	Medium Probability
2	65	Low Probability

Legend: ● High Probability ● Medium Probability ● Low Probability

Email Student

Recipients

Type a name or email address

Matt Donohoe <MattDonohoe@fakeemail.co...> ⊗

cc academic advisor: Paul Temple

Subject

Assignment support

Message

Hi Matt,
I've noticed that you do well in in-class tests but struggle with some of the assignments. I have some additional learning materials which I think may help. Please visit the "Further Reading"

Discard | Send

