

LEARNING ANALYTICS AT UBC

Establishment of Institutional End-to-End Learning
Analytics Capability

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Learning Analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of **understanding** and **optimizing learning** and the environments in which it occurs.

UBC LEARNING ANALYTICS PROJECT

- Two year innovation project with sustainment funding
 - Currently in year two
- Areas of focus
 - Community engagement
 - Ethics and policy
 - Technical and solutions architecture
- Project structure
 - Steering Committee
 - Learning Data Committee
 - Project team
 - Collaborators and partners

TYPES OF QUESTIONS WE CAN ANSWER WITH LEARNING ANALYTICS

STUDENTS



How long did students who got an A+ in this course last term spend on online readings?

INSTRUCTORS



What course resources are students using?

DEPARTMENTS



How can we better predict how many students will want to register for a particular course?

ADVISORS



Which courses taken in first year are correlated with a higher GPA in second year?



PROGRESS TO-DATE



ENGAGEMENT

- Call for proposals generated **46** submissions
- **12** pilot areas selected by adjudication committee for a variety of
 - *Audiences*: students, instructors, administrators
 - *Data sources*: Canvas, edX, other learning tools, and SIS
 - *Purposes*: real-time monitoring, reflection, prediction
- Working with end-users to identify the issues that are **answerable**, **actionable**, and **common**



Pilot Topic: Analytics for Teaching

An instructor-facing dashboard for Canvas that displays student activity »

VizIT: An instructor-facing dashboard for edX that shows student activity »

OnTask: Providing timely, personalized, and actionable feedback to learners »

Strategies and data requirements for effective student team formation »

Threadz: Network analysis and visualization of Canvas discussions »

Pilot Topic: Analytics for Learning

A student-facing dashboard for Canvas that displays anonymous, comparative activity data »

A student-facing dashboard for edX that provides personalised feedback based on previously successful learners' activity »

Pilot Topic: Analytics for Program Planning and Advising

Data-driven curriculum analysis »

Predicting success in UBC program specializations to inform admissions criteria »

Registration dashboard showing real-time enrolments »

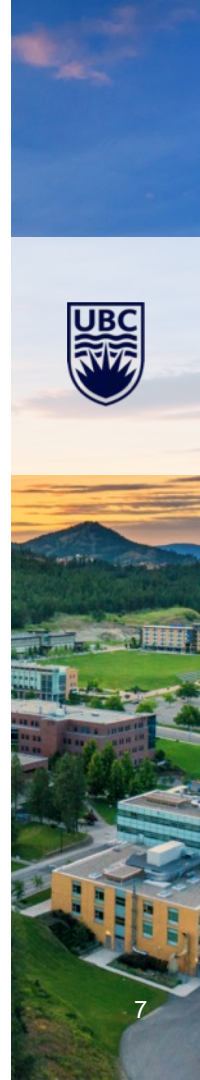
Student success dashboard for Canvas »

Visualizing and reporting on student enrolment pathways to inform curriculum review »

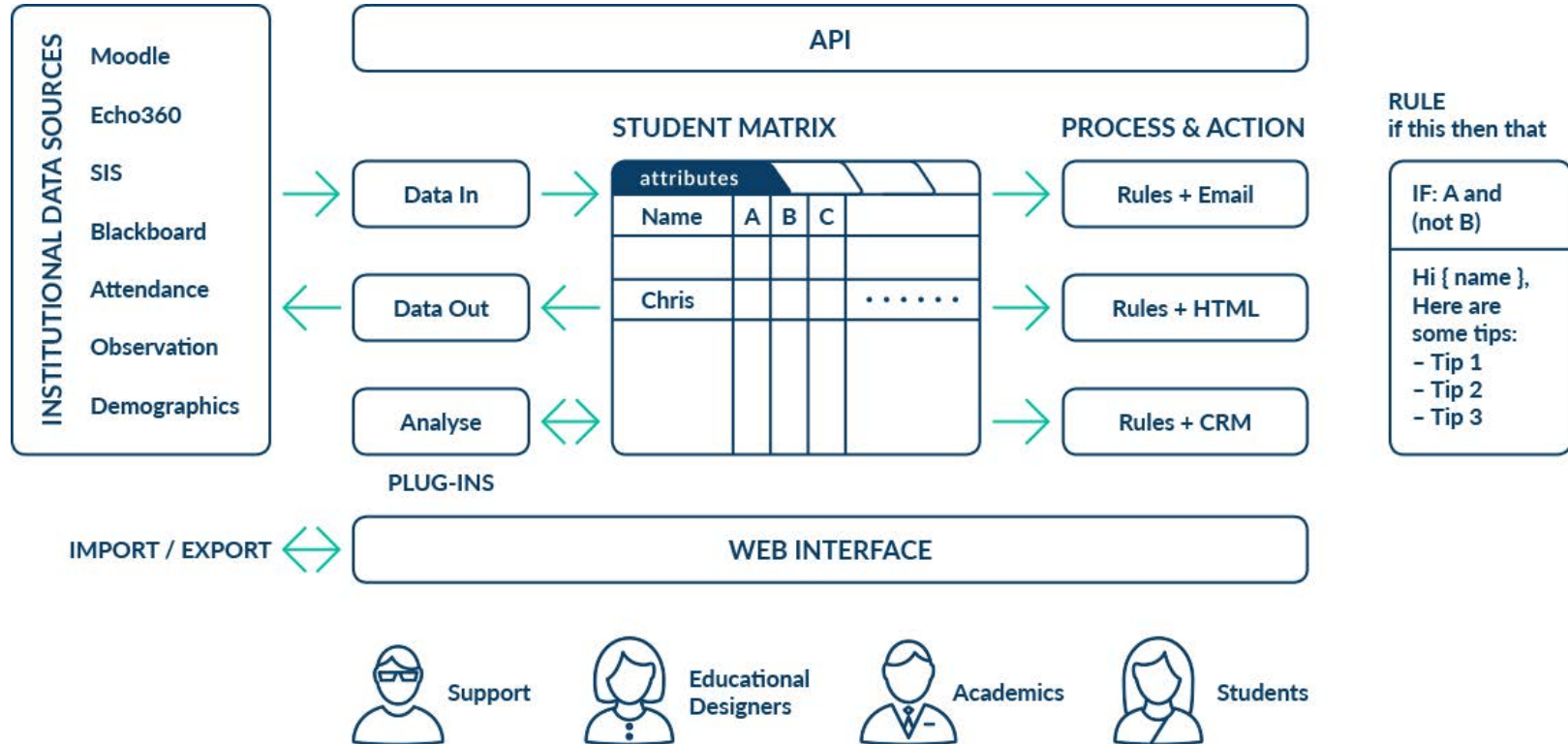


ETHICS AND POLICY

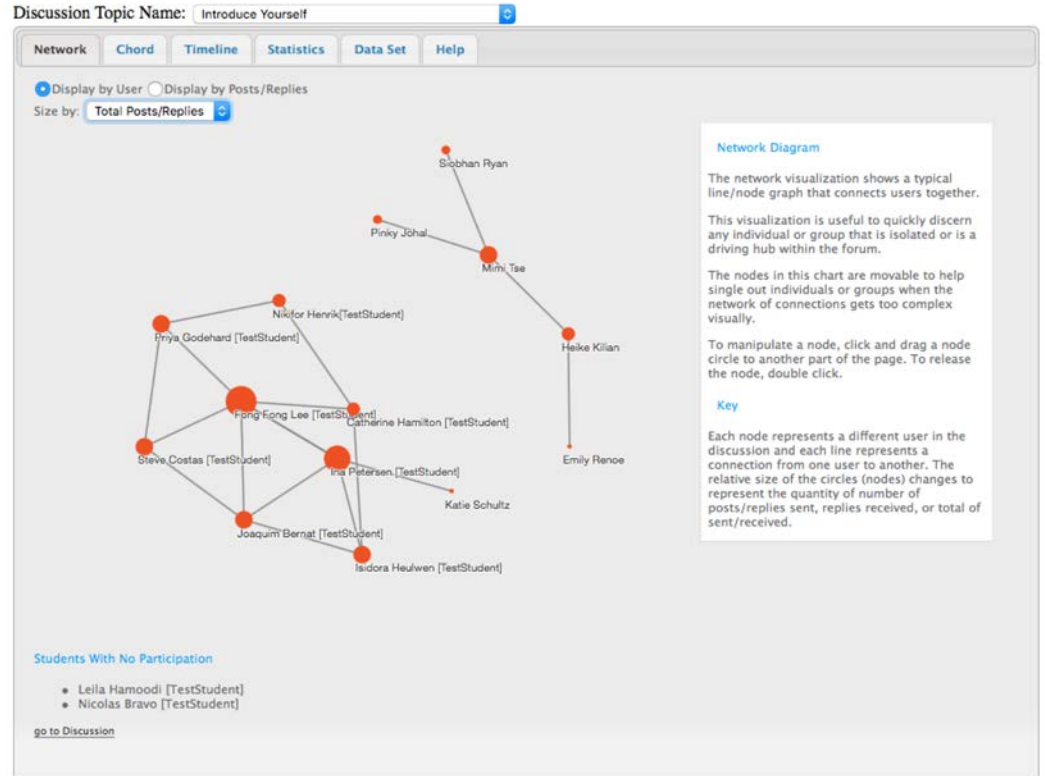
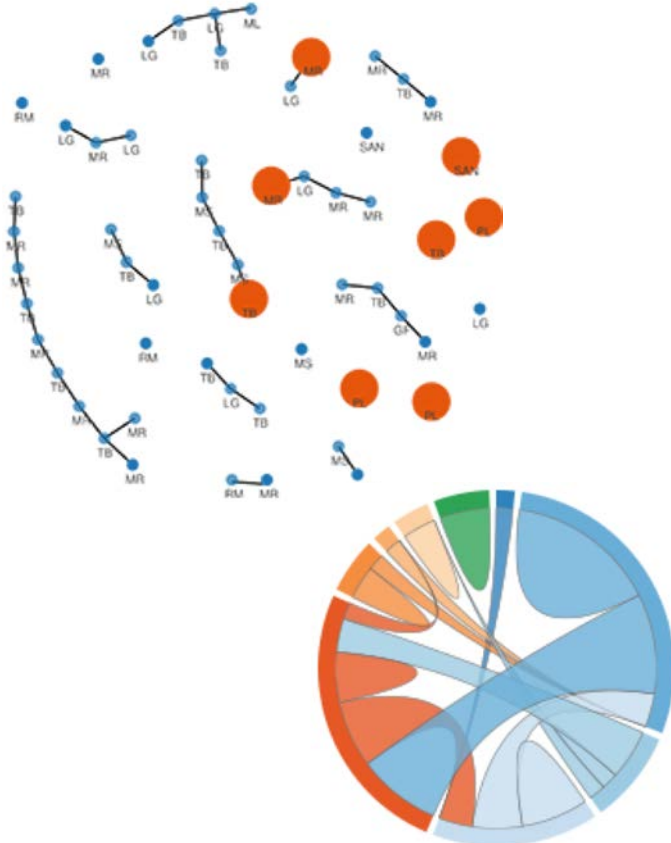
- Purpose and Principles
 1. Respect for persons
 2. Learners as autonomous agents
 3. Responsibility
 4. Equity
 5. Stewardship and privacy
 6. Accountability and transparency
 7. Evolving and dynamic
- Process for requesting access to learning data



PERSONALIZED FEEDBACK AT SCALE (ONTASK)



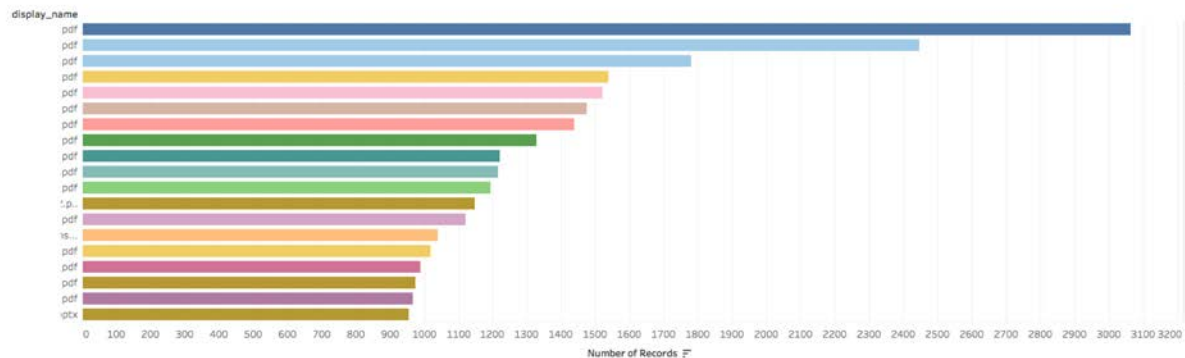
SOCIAL NETWORK VISUALIZATION AND ANALYSIS



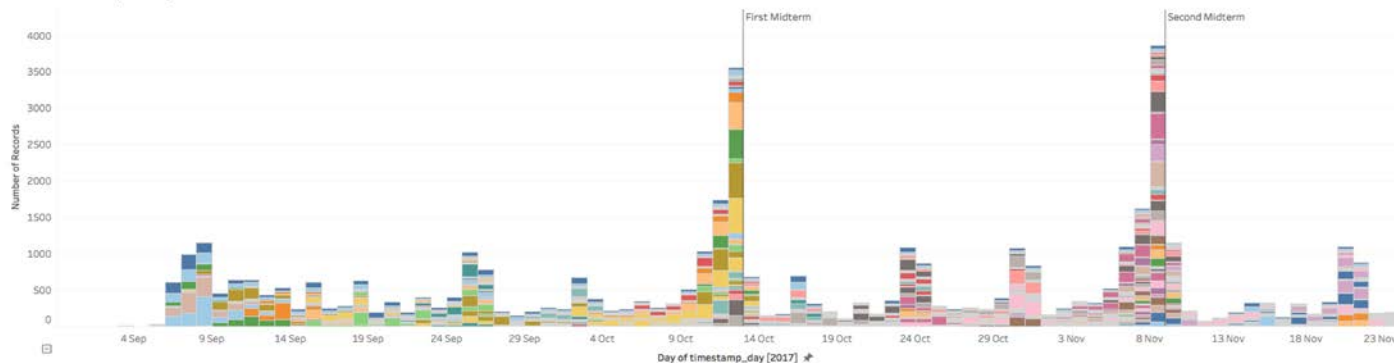
INSTRUCTOR-FACING DASHBOARDS



Total file access

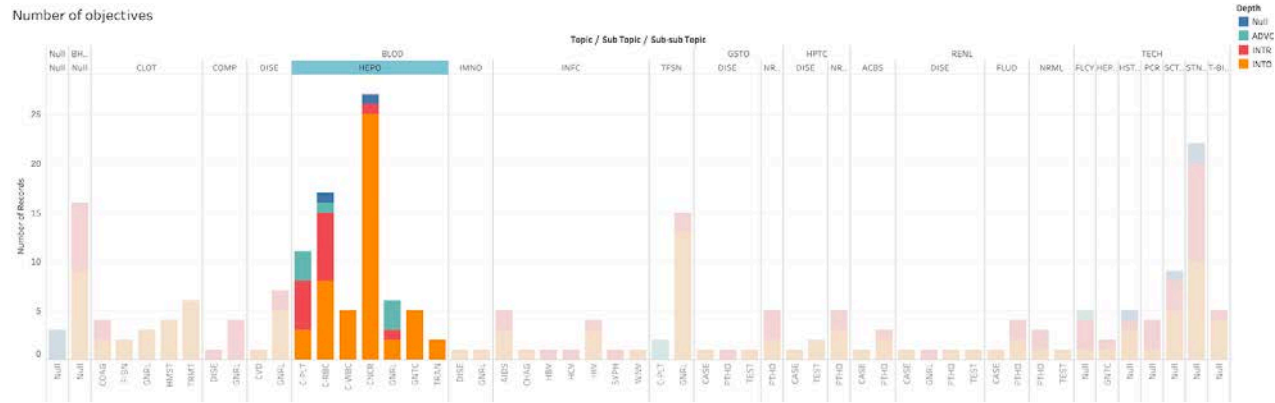


File accesses per day

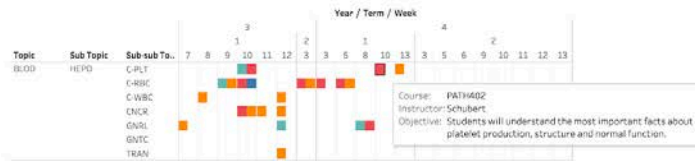


CURRICULUM MAPPING

Number of objectives



When are topics covered?

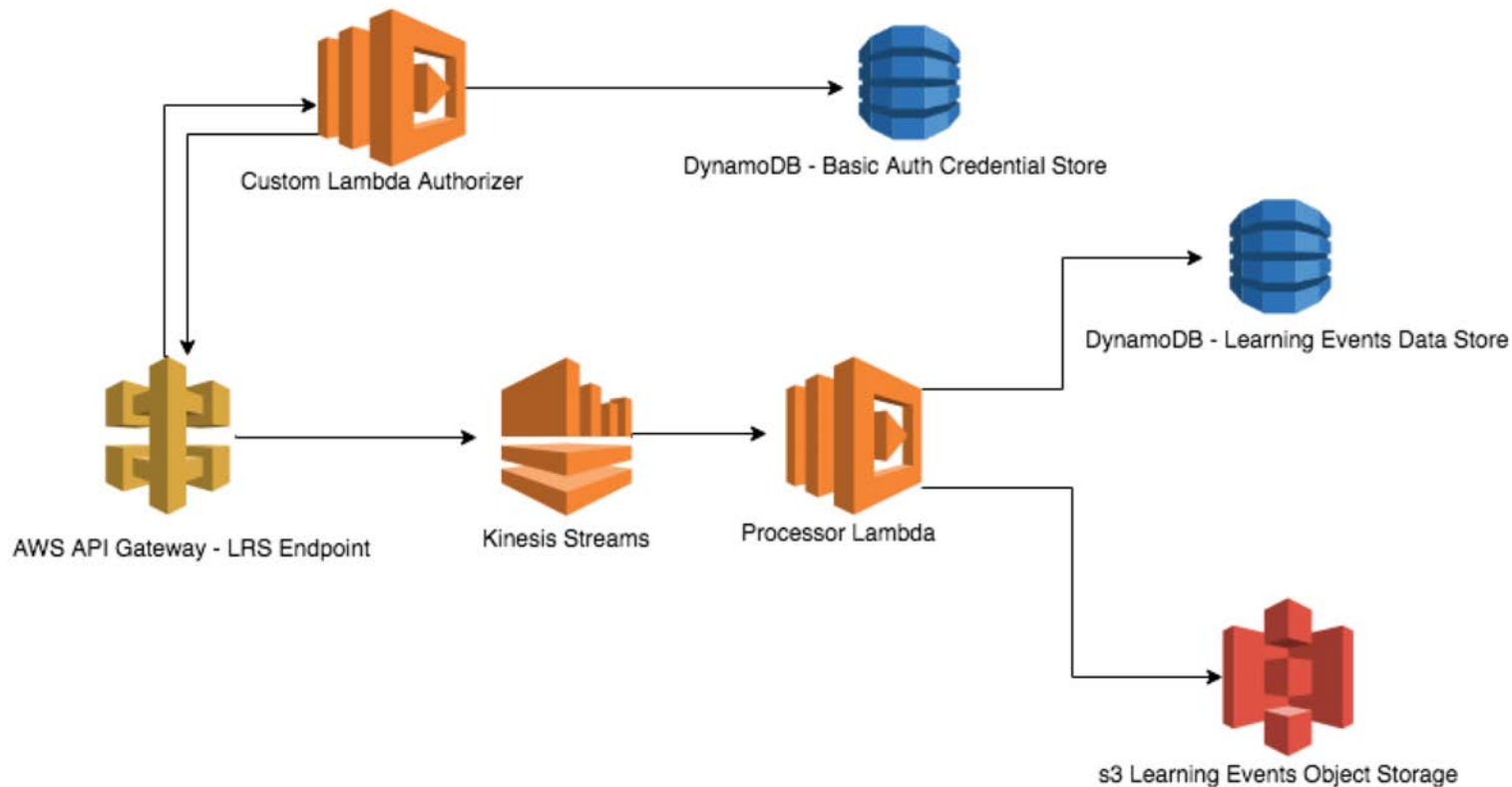


Objectives

Course	Title	Objective
PATH300	Anemias I	<ol style="list-style-type: none"> 1. Megaloblastic Macrocytosis 2. Non-megaloblastic Macrocytosis 3. Myelodysplastic Syndromes (MDS) 4. Hemolytic Anemias 5. No Objectives Given
	Anemias II	1. No Objectives Given
	Blood Gases	<ol style="list-style-type: none"> 1. Draw the hemoglobin O2 dissociation is 2. Outline O2 and CO2 diffusion and transport 3. Provide examples of physiologic or clinical
	General Hematopoiesis	<ol style="list-style-type: none"> 1. Given case studies, interpret test results in order to explain 2. Recognizing hematopoietic cell morphology 3. Understanding mechanism of hematopoiesis
	Hematologic Malignancies Part 1	<ol style="list-style-type: none"> 1. Define 'leukemia' vs 'lymphoma' 2. Differentiate the 2 major types of acute leukemia 3. Provide framework to start understanding hematologic malignancies 4. Show classic examples of acute leukemia
	Hematologic Malignancies Part 2	<ol style="list-style-type: none"> 1. Broadly classify lymphoma, MPN and MDS 2. Define and differentiate mature lymphoid neoplasms, myeloid 3. Diagnose classic examples of lymphoma, and MPN
	HLA system	<ol style="list-style-type: none"> 1. Lymphocyte phenotype and function 2. Human leukocyte antigens (HLA) 3. Hematopoietic stem cell transplantation 4. Solid organ transplantation
	Platelets	<ol style="list-style-type: none"> 1. Platelet basics - Describe how and where platelets are produced 2. Platelet basics - Describe the hemostatic function of platelets 3. Platelet basics - Describe the immunologic function of platelets



LEARNING RECORD STORE PROTOTYPE





LEARNING ANALYTICS + CANVAS API HACKATHON



0:05 / 1:59



WHAT LIES AHEAD?

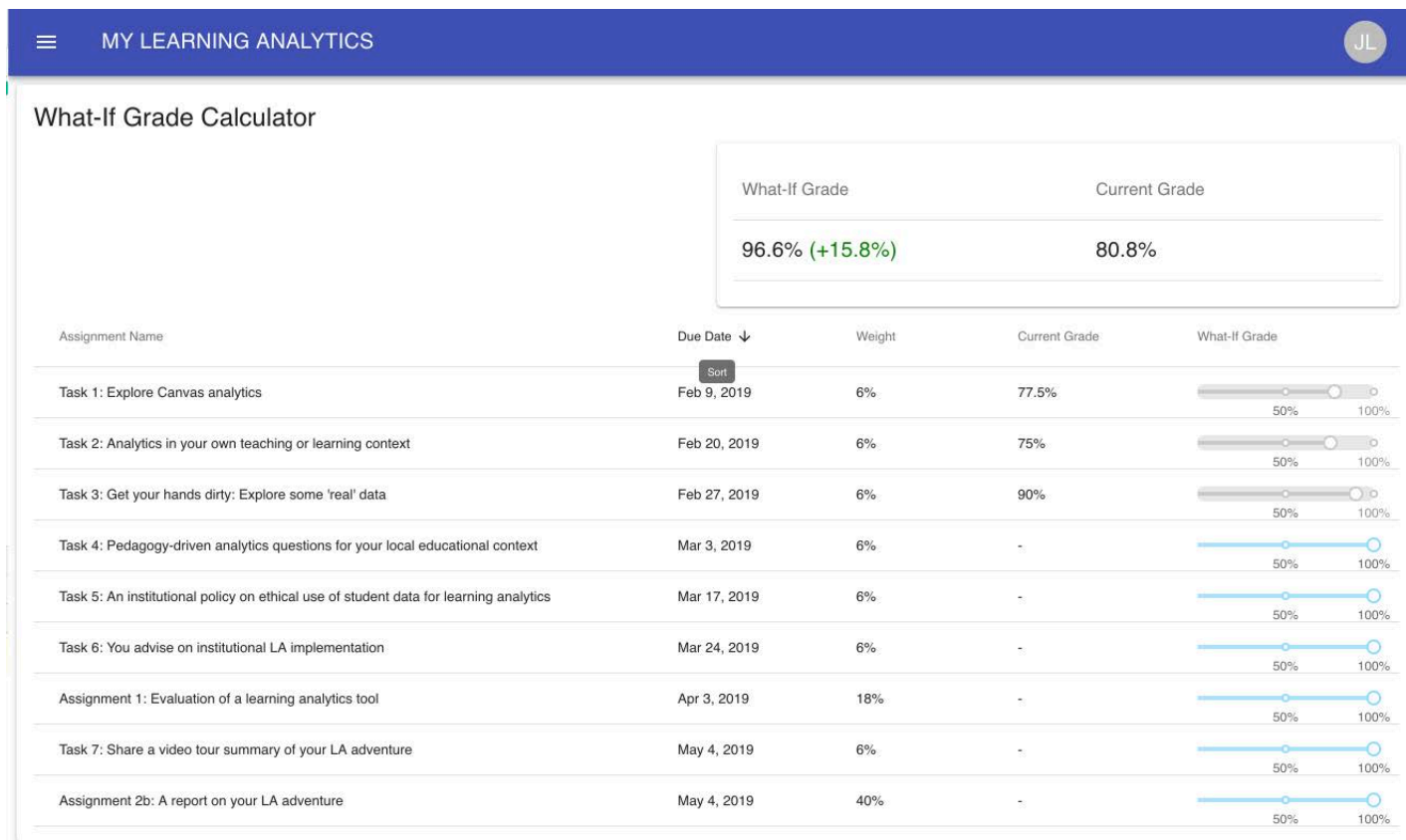


YEAR TWO

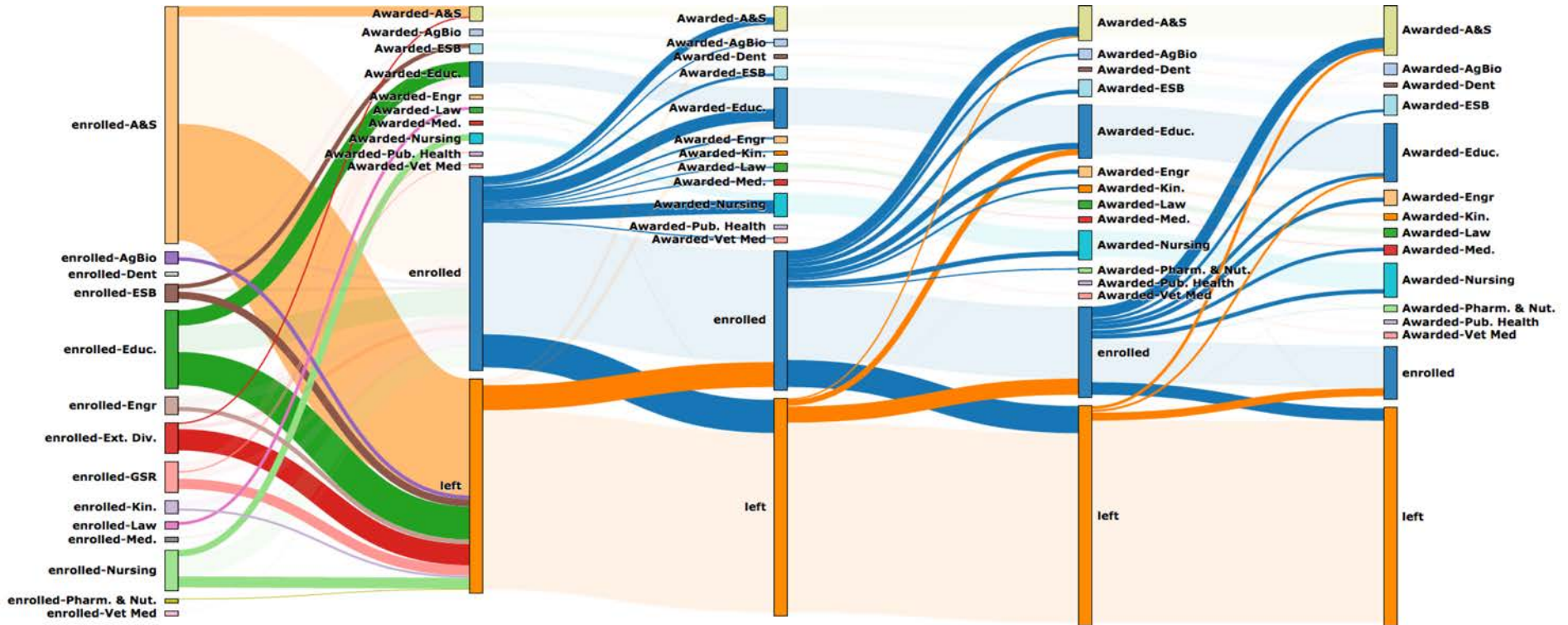
- Prioritizing our pilots
 1. Student-facing course dashboards
 2. Instructor-facing course dashboards
 3. Mass-personalized student feedback (OnTask)
 4. Analytics for Program Planning & Advising
 5. New student-facing pilot
- On-going community engagement with students, instructors, campus community, and beyond
- Moving beyond prototypes and building an infrastructure solution
- Developing a service model to transition from project to sustainment



COURSE DASHBOARDS: MY LEARNING ANALYTICS



ANALYTICS FOR PROGRAM PLANNING & ADVISING



ANALYTICS FOR PROGRAM PLANNING & ADVISING

Pre-enrollment

This list shows the most common courses students took before taking this course.

<u>STATS 250</u>	64%
<u>CHEM 210</u>	60%
<u>CHEM 211</u>	59%
<u>BIOLOGY 173</u>	57%
<u>ENGLISH 125</u>	49%
<u>BIOLOGY 171</u>	47%
<u>CHEM 130</u>	45%
<u>PSYCH 111</u>	44%
<u>CHEM 125</u>	42%
<u>CHEM 126</u>	42%

Co-enrollment

This list shows the most common courses students took while also taking this course.

<u>STATS 250</u>	15%
<u>PSYCH 240</u>	13%
<u>CHEM 215</u>	11%
<u>BIOLOGY 225</u>	11%
<u>CHEM 216</u>	10%
<u>BIOLOGY 226</u>	8%
<u>BIOLOGY 173</u>	8%
<u>CHEM 210</u>	8%
<u>UC 280</u>	8%
<u>CHEM 211</u>	7%

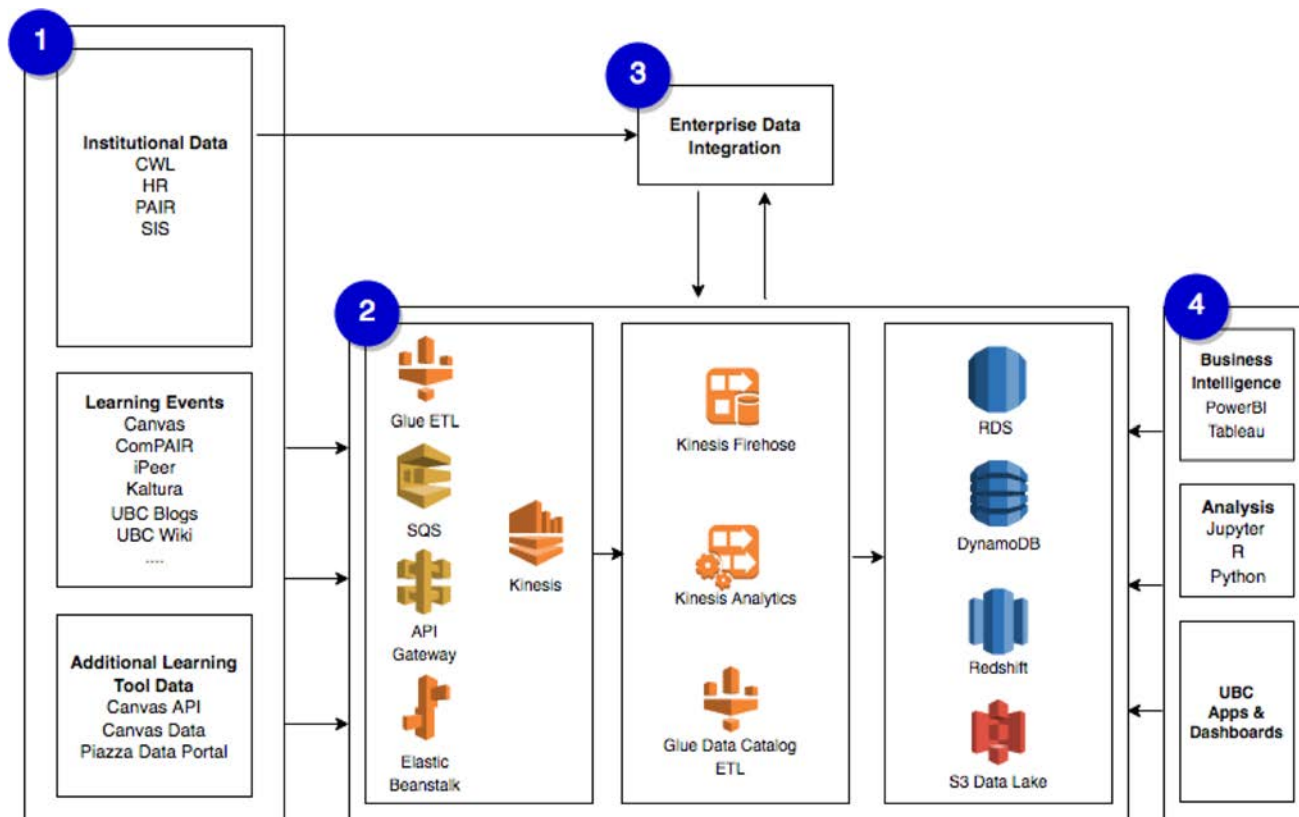
Post-enrollment

This list shows the most common courses students took after taking this course.

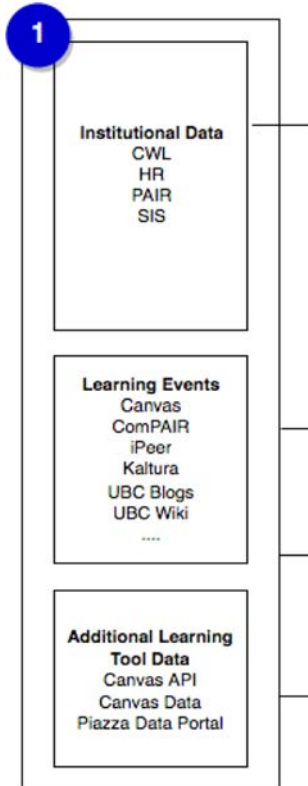
<u>BIOLOGY 226</u>	33%
<u>BIOLOGY 305</u>	28%
<u>PSYCH 240</u>	25%
<u>PSYCH 326</u>	22%
<u>BIOLOGY 225</u>	22%
<u>CHEM 230</u>	21%
<u>PSYCH 303</u>	21%
<u>MCDB 310</u>	21%
<u>PHYSICS 236</u>	20%
<u>PHYSICS 235</u>	19%



INFRASTRUCTURE SOLUTION



INFRASTRUCTURE – DATA SOURCES



Data Standards

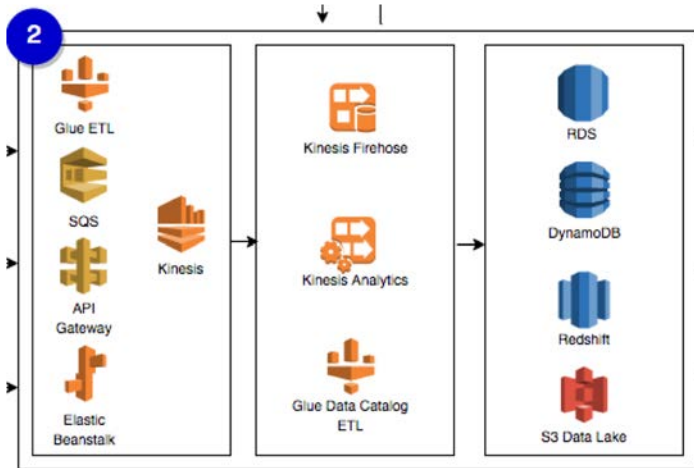
- Contribute to Caliper and/or xAPI specifications
- Design logical and physical models for learning data in the UDM
- Determine approach for non-standard data

Data Sources

- Continue to instrument applications to generate events in Caliper or xAPI
- Determine whether EDI or point-to-point solutions will be used for batch data access to institutional ERPs (e.g. SIS)



INFRASTRUCTURE – DATA INGESTION, PROCESSING & STORAGE



Data Ingestion

- Develop endpoints & process for receiving real-time learning events
- Implement Kinesis Streams to store data

Data Processing

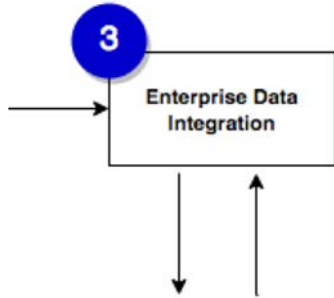
- Enriching and transform events from Kinesis Streams using AWS Lambda.
- Develop jobs to extract, load and transform batch data using AWS Glue.
- Develop jobs to anonymize sets of data

Data Storage

- Design and implement data lake for raw, staging and final data using S3.
- Design and implement a data warehouse using Redshift and Redshift Spectrum.
- Design and implement data stores using RDS and DynamoDB for use cases where querying Redshift is impractical.



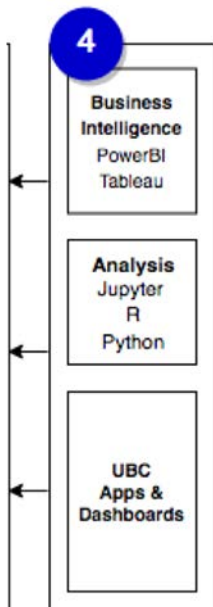
INFRASTRUCTURE – DATA ENRICHMENT



As learning events are received, they need to be enriched and/or transformed in order to be joined with institutional data for analysis. Enterprise Data Integration will be used to enrich events with institutional data.



INFRASTRUCTURE – DATA ACCESS AND ANALYSIS



Data Governance

- Develop integration between learning data request workflow and Collibra to track data lineage
- Implement granular data access control based on EDG guidance

Analysis and Reporting Tools

- Data access from data warehouse, data stores, or directly from the data lake for exploration
- BI tools like Tableau or PowerBI as self-service tool to build dashboards and reports
- Detailed analysis can be undertaken using Python and R, independently or with in a nothebook tool like Jupyter
- Pilot tools for data analysis, reporting and visualization.



I'M HERE, BUT THE TEAM DESERVES THE CREDIT



Andrew Gardener
Programmer Analyst



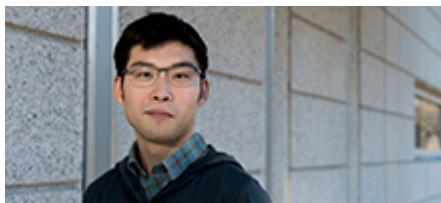
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Management Lead



Justin Lee
Programmer Analyst



Scott McMillan
Systems Analyst

2019 Learning Analytics Summer Institute

June 17-19, 2019
University of British Columbia



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