

University of Toronto

Learning Analytics Initiative Report

Strategy Paper – April 2021

Prepared by U of T Learning Analytics Initiative Strategy Table



UNIVERSITY OF
TORONTO

Learning Analytics Initiative Report – Green Paper

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Membership of the U of T Learning Analytics Initiative Strategy Table

The Strategy Table convened four times between August 2020 and March 2021 as the Green Paper evolved to its current shape. We thank the members who collectively contributed ideas and insight and meticulously reviewed and revised each part of the paper. These efforts were informed by thoughtful input from the members of the Steering Table and other individuals who provided specialized feedback to the Strategy Table.

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Preamble

There is growing interest across the University of Toronto (U of T) community in using data to inform and enhance activities related to the teaching and learning mission of the university. These include pedagogical enhancement and innovation within course contexts, academic success support at the program and degree levels, and strategic decision-making for the institution. It is also anticipated that engagement of students in the shared exploration of the potential of learning analytics can lead to the identification of tools and resources to empower their decision-making and support them in their learning journey. While early initiatives are occurring at all organizational levels within U of T, there are several barriers to maturing our ability to access, analyze, and interpret data in service of institutional goals. These challenges include:

- **Data quality issues:** While U of T is rich in data, information needed to inform decisions may be incomplete, inconsistent or difficult to access.
- **Lack of integration:** Local efforts are often siloed, resulting in duplicate manual solutions to similar problems, which are often labour intensive and frequently unsustainable, and non-transferable across disciplines.
- **Need for nimble data ecosystem:** We require agile, transparent methods for community members to access the right people, processes, and technology to harness the power of learning analytics.

To overcome these challenges, the university has initiated planning aimed to accelerate and increase our capacity to leverage learning analytics. Within the context of this initiative, the scope of learning analytics is defined as “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.” (Conole et al., 2011).

Following a consultation process initiated by the Vice-Provost, Innovations in Undergraduate Education in August 2020, opportunities and general recommendations for areas for development have been articulated in this report. A multi-level engagement structure has facilitated collection of community input from a range of stakeholder groups (Figure 1):



Figure 1. Multi-level engagement structure steering the U of T Learning Analytics Initiative Report

Based on input from these stakeholder groups, this *U of T Learning Analytics Initiative Report* outlines a potential institutional learning analytics strategy and activity pathways for consideration by the university’s Learning Analytics Steering Table and other stakeholders.

List of Acronyms

ACORN: Accessible Campus Online Resources Network

ACT: Academic and Collaborative Technologies

API: Application Programming Interface

BOA: Berkeley Online Advising

CTSI: Centre for Teaching Support & Innovation

D3:QA: Data-Driven Design: Quercus Analytics

DLI: Digital Learning Innovation Portfolio

FASE: Faculty of Applied Science & Engineering

FIPPA: Freedom of Information and Protection of Privacy Act

IRDG: Institutional Research and Data Governance

ISTEP: Institute for Studies in Transdisciplinary Engineering Education & Practice

IT: Information Technology

ITIF: Instructional Technology Innovation Fund

ITS/EASI: Information Technology Services Portfolio/Enterprise Applications and Solutions Integration

LEAD: Learner Engagement Analytics Dashboard

LEAF: Learning & Education Advancement Fund

LME: Learning Management Engine

LMS: Learning Management System

MyLA: My Learning Analytics

NGSIS: Next Generation Student Information Services

SoTL: Scholarship of Teaching and Learning

SNA: Social Network Analysis

UF LEAD: University of Florida Learning Analytics Dashboard

VPIUE: Vice-Provost, Innovations in Undergraduate Education

U of T Learning Analytics Initiative Report

The output of several months of research and consultation, this report highlights program initiatives that support the advancement of shared priorities identified by the Learning Analytics Steering Table through the planning process. The information is structured in the following sections:

- Part 1: Environmental scan of current learning analytics activities external and internal to U of T
- Part 2: Identification of organizational enablers
- Part 3: Discussion of strategic opportunities
- Part 4: Recommendations to advance strategic priorities

Goals and Scope

The overarching purpose of this initiative is to benefit student learning and success. The goals driving the development of the U of T *Learning Analytics Initiative Report* include:

- Improving student learning experiences and outcomes
- Empowering students to plan and manage their learning paths
- Enabling instructors and staff to access and leverage learning data in support of teaching and learning activities
- Optimizing structure and support of digital learning environment

Data sources considered within scope include Canvas (Quercus) activity, academic toolbox applications, registrarial data, co-curricular records, academic success activities, data from approved research ethics boards applications, and other environments relevant to learner experience at the University of Toronto.

In this Green Paper we are cognizant of the distinction between data and information (Zins, 2007). *Data* are unprocessed sets of values obtained through information technology systems or other means. Without context, data do not convey meaning. *Information* is processed and contextualized data that can be used to provide insight or evidence for planning.

Guiding Principles

Use of learning analytics is not a goal in itself, but rather a steppingstone in service to the goals of the initiative described above. The data assets available to instructors, students, researchers, division, unit and/or program administrators, and professional staff will be used to inform our collective academic and professional activities by providing information for evidence-based planning and creating opportunities for guidance to improvements in support of the teaching and learning mission. Respect for students and instructors will inform all actions and processes related to the use of learning analytics, as it is anticipated that their engagement and agency will be critical to the effectiveness and sustainability of work in this domain.

The following principles underpin all University of Toronto activity in this domain:

- **Beneficence and Non-Maleficence:** Learning analytics will be used to enhance the learning experience and opportunities of our students. Learning analytics employ statistical models to predict behaviours and outcomes and are intended to inform or assist decision-making. They are not intended to define or limit individual students. Therefore, analytics that may have a significant impact on an individual student's encounter with the university must not be used without human intervention or learner agency.
- **Equity:** Our student population is highly diverse. Learning analytics must support the learning needs of our entire student body and not just those at risk academically. We will use learning analytics to enhance equity-driven outcomes and reduce systematic barriers to student learning and success.
- **Privacy, Confidentiality, and Security:** Any use or processing of student data for learning analytics will meet or exceed the requirements of the Freedom of Information and Protection of Privacy Act (FIPPA) and its regulations, and university policies and guidance for the secure management of the data. Uses of student data that fall outside

the purview of FIPPA may require individual consent. Any user of the data will be subject to a written confidentiality agreement.

- **Transparency:** The university will be transparent regarding its conduct of student analytics. Student notices of data collection and use will include a clear description of learning analytics uses. These notices will be readily accessible at critical points where students are providing that information.
- **Community Engagement:** Involvement of those who are the subjects of learning analytics – chiefly students and course instructors – has the potential to enhance the quality of the learning analytics. This may be through their complementary insights (gained through their lived experience) into what may affect the learning process and outcomes, and their perspectives on the policy implications of the findings. Therefore, students' and instructors' involvement will be sought as appropriate at key stages of learning analytics initiatives.

These guiding principles will inform shared exploration of the use of learning analytic data at the University of Toronto as we establish ethical practices and promote insight into effective approaches across institutional stakeholders.

Part 1: Environmental Scan of Learning Analytics Activities

To foreground the potential dimensions of exploration, the Strategy Table reviewed current learning analytic activities at U of T and selected universities from Canada, US, UK, and Australia. While learning analytics activities obtain data from different sources, this Environmental Scan focused on universities that use Instructure’s Canvas platform as their learning management system (LMS) as this is also U of T’s LMS. The Environmental Scan provides a descriptive review of learning analytics activities at the comparator institutions and does not represent an evaluation of the effectiveness of those activities.

The identified learning analytics activities were categorized under two types of opportunities, listed in Table 1 as “Areas of Application” and “IT Infrastructure Development”. The main stakeholders for each activity, i.e., students, instructors, or unit/division/institution are tracked. The full report of the environmental scan is available as Appendix 1.

Table 1: Categories of learning analytics opportunities identified in the Environmental Scan

Opportunity	Theme	
	Description	Label
Areas of Application	Evaluate student engagement and performance in course activities	Evaluate Engagement/Performance
	Provide individualized feedback to improve student success	Personalized Feedback
	Enable access to data for academic advising & coaching functions	Advising/Student Success
IT Infrastructure Development	Present dashboard data in standard format for course statistics and LMS use statistics. Dashboard output may not be highly customizable	Dashboard Data
	Create access channels for customized or integrated use of LMS data through application development and/or data base queries	Data Access/Custom Integration

Within the Environmental Scan process, 37 implemented learning analytics projects were identified. Table 2 shows a heatmap summary of the search results. Darker colored cells indicate higher number of activities and stakeholders in each theme. More learning analytics activities identified in the scan addressed “Evaluate Engagement/Performance” and “Dashboard Data” themes. With regards to stakeholders, instructors are the main users of Learning Analytics activities in “Evaluating Engagement/Performance” and “Dashboard data” themes.

Table 2. Summary of learning analytics Initiatives identified in the environmental scan

Opportunity	Learning Analytics Activity Theme	# of Activities	# of Activities by Stakeholder Group		
			Unit-Division-Institution	Instructors	Students
Areas of Application	Evaluate engagement/performance	15	2	15	4
	Personalized feedback	8	0	6	4
	Advising/student success	7	7	3	1
IT infrastructure development	Dashboard data	21	6	11	8
	Data access/custom integration	7	3	4	1

Following is a summary of learning analytics activities under each opportunity/theme.

Area of Application: Tools to Evaluate Student Engagement/Performance

The environmental scan highlighted 15 learning analytics activities supporting instructors in evaluating learner engagement and/or learner performance in course activities. Three examples of these institutionally implemented initiatives are:

- **Learner Engagement Analytics Dashboard (LEAD):** Available at the University of Wisconsin, LEAD dashboard generates course-level visualization of students’ active presence, behavior, and performance using Tableau. Canvas provides one source of data for LEAD.
- **Threadz:** A Social Network Analysis (SNA) tool currently piloted at the University of British Columbia, Threadz, applies SNA to Canvas discussion forum threads in a course. This tool also includes data visualization capabilities.
- **Data-Driven Design: Quercus Analytics (D3:QA)** project at U of T is organized by Online Learning Strategies portfolio and funded by Vice-Provost Innovations in Undergraduate Education. Ten U of T instructors have joined the project to (re)design their hybrid or online courses informed by data provided by Canvas New Analytics tools.

Area of Application: Personalized Feedback

Learning analytics activities that provide personalized or tailored feedback to students are mostly instructor-facing. At this time, U of T is not using any specific learning analytics tool for this purpose.

- **OnTask:** Used at Adelaide University and piloted at UBC, instructors can use OnTask to send learning analytics data informed personalized feedback to students and guide them to act on the received feedback.
- **eCoach:** Developed at the University of Michigan, eCoach is a student-facing dashboard used in large courses to prompt students about upcoming tasks and how to prioritize them, illustrates students’ progress and performance in relation to their pattern of course activity, and scaffold the development of effective learning strategies.

A related topic is adaptive learning that promotes personalized learning. According to Becker et al. (2018) “Adaptive learning tailors educational content and activities to the particular needs of each student, increasing the likelihood of progress for all learners.” (p. 42). **Smart Sparrow** is one adaptive learning tool in use at the University of Sydney that enables instructors to use data from students’ interaction with course components in their

instructional design to respond to students' needs and increase students' success through customization of course content.

Area of Application: Advising/Students Success

These tools are unit/division/institution-facing although students and instructors have access to some functions. We identified three initiatives at U of T that aim to use data to improve students' experience:

- **NGSIS Academic Advisor** (Salesforce Student Advisor Link): Currently piloted as a proof of concept, Student Advisor provides academic advisors with tools for booking appointments, recording and tracking notes, making and tracking referrals, notifications, communications, reporting and analytics.
- **ISTEP Data Analytics Project**: A two-year pilot project (2019-2021) to demonstrate the power achievable by linking different types of student data collected at U of T through anonymized student identifiers to support analysis of curricular, co-curricular and experiential activity relationships and impacts.
- **FASE advising portal**: This project initiated to support academic advising in 2017 and has moved forward with integration of Quercus data as an additional data point.

From other universities:

- **Berkeley Online Advising (BOA)**: Developed at the University of California Berkeley, BOA is cohort-based student success and learning analytics platform that integrates analytical insights with relationship and planning tools for advisors of large cohorts and the students they support.
- **Student Explorer**: Using the University of Michigan's Student Explorer, academic advisors can identify at-risk students. Student Explorer uses Canvas data.

IT Infrastructure Development Opportunity: Dashboard Data

Most learning analytics activities fell under this category and the three stakeholder groups are more evenly represented as users of dashboard data learning analytics tools. D3:QA project at U of T is a local example that relies on Canvas New Analytics dashboard to inform course design/redesign.

A number of learning analytics activities identified are used at more than one institution. Others served more than one stakeholder group including the following two examples:

- **UF LEAD** is an application developed at the University of Florida to improve and expand Canvas dashboard functionality. At the time of writing this report UF LEAD is instructor-facing. However, it is being extended to serve the other two stakeholder groups.
- **My Learning Analytics (MyLA)** is a student facing dashboard used at the University of Michigan, Indiana University, and the University of Minnesota. MyLA uses Canvas course data to create visualizations of students' access to resources, engagement in assessments, and course performance. This dashboard is designed to facilitate self-regulated learning.

IT Infrastructure Development Opportunity: Data Access/Custom Integration

In addition to the U of T project mentioned above, early work is underway on smaller scale projects using Canvas data to provide insight into students' learning experience. The Centre for Teaching and Learning at UTSC has prototyped analytic methods using data sets exported from Canvas courses through manual processes. At peer institutions, Data Access and Custom Integration tools are mostly oriented towards unit/division/ institution and instructor stakeholder groups.

- **Canvas Usage Dashboards** at Harvard University allows the Academic Technology team to monitor Canvas use across all university divisions using aggregate Canvas data.
- **Assessment Mapping** aggregates planned assessments the University of Adelaide to facilitate scheduling and to increase administrative efficiency.

Learning Analytics Research Activities

Search results in the Environmental Scan included 30 examples of research activities. The resulting collection of literature references describes methods and findings that may be used in the future to inform U of T's approach when investigating specific areas of opportunity. Across the three strategic opportunity themes 37% of all results related to the Evaluate Engagement/Performance theme, 40% related to the Personalized Feedback theme, and 50% addressed the Advising/Student Success theme. Some of the research activities addressed more than one theme.

Organizational Capacity-Building Activities

A range of institutional capacity-building strategies were identified in the Environmental Scan, often linked to strategic planning documents. Many of these initiatives aim to enhance stakeholder support through targeted resourcing to meet specific program goals or strategic objectives. Table 3 shows examples of organizational capacity building learning analytics activities.

Table 3. Types of organizational capacity building learning analytics activities

Category	Examples
Grant Programs	Innovation and impact grants Fellowship programs Research initiatives (faculty and student engagement)
Faculty & Professional Development	Workshops Examples and guides Consulting support Specialized staff/skill development
Communities of Practice	Institutes and centres Research groups Cross-functional project teams Consortium participation
Infrastructure	Infrastructure development Licensing of tools/platforms

For a complete list of search results on organizational capacity building activities, see “Appendix F. Organizational capacity-building Learning Analytics activities” in the Environmental Scan report.

Through the Environmental Scan, existing learning analytics activities, research activities, and areas of capacity development were identified that could support the goals and priorities of U of T going forward. Next, the strategy table focused on identifying existing initiatives at U of T that act as enablers of the learning analytics Initiative.

Part 2: Current State of Learning Analytics Enablers at U of T

Institutional enablers that will allow us to promote data literacy at U of T fall across three dimensions of capability, identified by Gartner (2017) as people, process, and technology. Within the context of maturing our learning analytics capacity, these dimensions can be expressed as community, governance, and infrastructure (Figure 2).

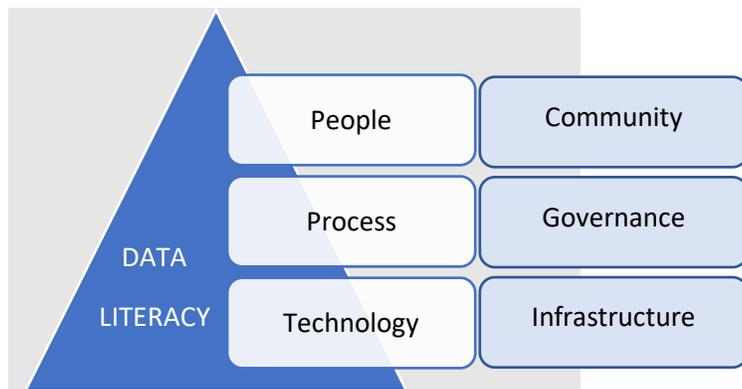


Figure 2. Three dimensions of capability to promote data literacy.

As noted in Part 1: Environmental Scan, various learning analytics-focused initiatives from across the U of T community have been identified in each of these categories, reflecting potential for further development. Here, we provide examples of current and upcoming initiatives and projects at U of T that can support or enable learning analytics activities, with a more detailed list included in the environmental scan full report (Appendix 1).

Engagement of Community Stakeholders

A number of learning analytics-related capacity building/development enablers are in progress or in planning at U of T and engage community stakeholders such as instructors and staff members.

Learning Analytics Community of Practice

Community events planned by ACT across 2021-22 will aim to develop a common forum for skill-building and project ideation among U of T faculty and staff with an interest in learning analytics. Workshop sessions with expert facilitators will be geared towards technical leads and pioneering instructors seeking an introduction to the functionality available through Canvas Data Services. Outcomes will include:

- Identifying potential projects, use cases, and case studies that can leverage Quercus learning data to support teaching and learning.
- Building of skills required to conceptualize and implement learning analytic initiatives
- Understanding of needs of the community with regard to resource and support programs

The work of the learning analytics Community of Practice can potentially intersect with the IRDG community empowerment initiative described in the “Institutional Research and Data Governance at U of T” section below.

ISTEP Data Analytics Project

As mentioned in Part 1, the Institute for Studies in Transdisciplinary Engineering Education & Practice (ISTEP) data analytics project led by Professor Greg Evans, in collaboration with ITS/EASI and IRDG, is conducting a two-year pilot project (2019-2021) to demonstrate the power achievable by linking different types of student data collected at U of T through pseudonymized student identifiers to support analysis of curricular, co-curricular and experiential activity relationships and impacts.

Centre for Teaching Support and Innovation (CTSI): Learning Analytics-Related Faculty Development

Results of a Scholarship of Teaching and Learning needs assessment survey conducted by the CTSI in Fall 2020 signaled instructor interest in use of learning analytics to improve course design and teaching effectiveness. In response to this interest, CTSI is integrating data and analytics related topics in their faculty development programming in the coming terms. For example, in spring of 2021 CTSI hosted a workshop titled *Interpreting Data in Teaching & Learning Studies*.

Data Driven Design: Quercus Analytics Project

The university's Digital Learning Innovation (DLI) unit has led the Data-Driven Design: Quercus Analytics (D3:QA) project from 2019 to 2021. Ten U of T instructors in the project cohort received funding from VPIUE to re/design their hybrid or online courses informed by Canvas New Analytics reports. DLI has facilitated professional development workshops, webinars, and individual consultations on course design for significant learning and on data informed course design decision making. One outcome of this project, which culminated in April 2021, is a poster session at the Teaching and Learning Symposium where D3:QA instructors shared their course design decisions including design context, instructional challenge, design strategy, data sources used, and insights gained to inform next steps.

Learning analytics initiatives that involve community stakeholder engagement rely on student data collected at U of T. An institutional data governance framework, described below, will assure ethical use of such data.

Institutional Research and Data Governance Processes

The Institutional Research and Data Governance (IRDG) unit, formed in 2020, has a critical role to play in the development of appropriate processes to support ethical and policy-compliant access to data assets. Located within the Planning and Budget portfolio, the IRDG has the following mandates with significant relevance to learning analytics at U of T:

- Provide reporting and analytics services within IRDG's distributed institutional research model: lead institution-wide analysis projects, provide training opportunities for divisional analysts, implement new analytics tools and platforms, and improve access to curated institutional data sets;
- Implement an institution-wide Data Governance program to support the university in strategically harnessing data to achieve institutional goals; and
- Support external reporting of institutional data (government reporting metrics, key performance indicators for institutional governance, international rankings, and data exchanges with peer institutions)

IRDG Key Initiatives

While a data strategy is not yet finalized, IRDG aims to deliver several flagship initiatives, many of which have a clear link to ongoing and future learning analytic initiatives:

- **Data Curation:** A range of activities and processes to create, manage, validate, and detail the university's institutional data will be undertaken. This will support learning analytics work by ensuring those proposing or implementing initiatives are using the most appropriate data sources, with a common understanding of their definitions and at a quality that is fit for purpose.
- **Review Process for Non-Routine Data Requests:** A common review process can support faculty and staff awareness of the steps involved in making a non-routine data request. For learning analytics this could include projects relating to research, involving sensitive analysis, or requiring linkage of data sources for which there is no or little precedent.
- **Student Notice of Collection and Use Review:** U of T is subject to the Freedom of Information and Protection of Privacy Act 1987. As the IRDG review of current student notification practice at U of T begins, ensuring that potential learning analytics projects are appropriately anticipated in our notice of collection will be key. This process will also support discussions about how to increase transparency in the collection, processing and use of learning analytics data.

- **Data and Analytics Platform:** This initiative will improve our ability to efficiently store, process and access institutional data from a range of sources at U of T. A platform may support access controls, enable data discovery, offer tools and reporting functions, and ensure secure access to learning analytics data to optimize analytics practices and processes moving forward.
- **Community Empowerment:** Given there are data and analytics professionals dispersed throughout the university, activities and processes that increase knowledge sharing between divisions will increase alignment, improve knowledge sharing and encourage collaboration. The aim is to promote a culture of good data governance while creating a sense of community through training, learning opportunities and sharing of assets and practices. For learning analytics this intersects with a planned community of practice to be facilitated by ACT, as well as other initiatives that will help connect those with learning analytics interests with learning analytics experience.

Canvas (Quercus) Infrastructure

Following the licencing of Canvas (Quercus) as our institutional Learning Management Engine (LME), a number of learning analytics-related supports became available to leverage access to the rich learner data now available to us. While not the only source of learning data available for analysis, it is an important opportunity for the early stage of exploration. Current infrastructure-related enablers of learning analytics at U of T exist at two levels: direct instructor-level access to course data and institutional access to Canvas data stores enabled by ACT application development.

Instructor Level Access

The existing Quercus dashboard provides default access to course data through Quercus Course Analytics and Quercus New Analytics to all instructors at U of T who use this platform to support their courses. Available data is determined by the capabilities of the analytics tools provided by the vendor, Instructure Canvas. Informal feedback from instructors who participated in the Data-Driven Design: Quercus Analytics (D3:QA) initiative reported that available Quercus dashboard data functions lack the expected granular detail needed to address their instructional challenges.

Beyond the default dashboard tools, instructors can also access more detailed course data exports using manual methods. As well as dashboard analytics, new downloadable Reports on Course Activity were made available by Canvas in November 2020. Using the new Reports functionality, instructors can implement a rolling Course Activity report generation option to receive data exports in comma separated values (CSV) format. Data included in the CSV reports are more extensive than dashboard data, including elements such as log files, content type, content name, student name, cumulative page-views count, and cumulative participation count. However, in order for the downloadable reports to be useable for all instructors, new instructor guides, spreadsheet templates or visualization tools that improve ease of data use for analytic purposes would be beneficial.

Another method for learner data access available to Quercus divisional administrators involves use of an Application Programming Interface (API) to export data based on customizable database query parameters. As noted in the Part 1: Environmental Scan, UTSC has been exploring this method to facilitate analysis of data exports and report generation to address specific course planning and management needs.

Academic and Collaborative Technologies (ACT) Application Development

Academic and Collaborative Technologies, ITS, has a long-term goal of providing customized or role-based agile access to key data sets and reports for various stakeholders. Current activities include exploration of Canvas learning analytics infrastructure proof of concept at an application development level. Through initial prototypes, ACT has explored the ability to deliver data for consumption in a format optimized for queries and reports. Examples of analysis tools and reports that could be available through this service are:

- Interactive query service generating non-standard reports for research, academic integrity cases, or support.

- Custom applications such as Q-Reports web application for staff to extract activity reports on user logins and interactions within date ranges.
- Custom reports that serve educational technology purposes such as storage quota management and integrated Academic Toolbox application use reports.
- Data visualizations created with third-party tools including learning analytics dashboards showing Quercus course status, quiz question usage or assignment submission cycles across academic calendar.

Data from Quercus Data Services can be imported into Tableau or other visualization tools to provide reports on resource usage and activity patterns to inform planning for either academic program areas or IT administrative purposes. Examples of presentation formats include bar charts showing course status (i.e., unpublished, available) or specific Quercus tool use (i.e., quiz questions distribution across multiple choice, matching, short answer format). Visualizations in bubble chart, network graph and line graph formats to show usage patterns over time are also possible.

Ongoing initiatives at U of T that act as enablers for learning analytics activities may be impactful across the three dimensions of Community, Governance, and Infrastructure. The Governance and Infrastructure dimensions are more institutionally led while the Community dimensions are distributed among offices and units from across the university. The process of identifying current learning analytics enabling activities at U of T took place in parallel with the Strategy Table's discussions to determine emergent strategic opportunities for learning analytics, discussed in Part 3 of this report. Additionally, we explore the value of networking and communication among existing and upcoming initiatives to foster a coordinated approach towards gathering, management, and using learning analytics data. Further discussion of priorities for coordination and capacity development through support of these enabling activities are included in Part 4: Recommendations.

Part 3: Strategic Opportunities at U of T

Review of the observations described in Part 1: Environmental Scan and Part 2: Learning Analytic Enablers at the University of Toronto served as a foundation for further discussion. The three thematic areas of strategic opportunities used to categorize initiatives included in Part 1 were again applied as a framework for identification of specific areas of exploration, based on “key questions” related to student learning at U of T that the learning analytics initiative might inform. The following are the observations and insights drawn from the review of data and strategy discussions with members of the Strategy Table:

Theme 1: Evaluate learner engagement/performance in course activities to improve pedagogical design

Support for instructor access to learning analytics in order to improve learning materials, tools and strategies was identified as a key area for exploration with the potential to significantly benefit instructors in all discipline areas. Guiding questions such as “How can we use learning analytics to measure student engagement with content and with peers?” and “How can learning analytics inform course instructors about how learners are interacting with specific tools and the related impact on learning activities?” illustrate the drivers in this area of opportunity. Given access to this information, instructors can be supported in increasing the effectiveness of course content or activity design in relation to learning outcomes and understanding student engagement with content and peers. In addition, there is potential to evaluate and demonstrate institutional efficiency through measuring the use and learning impact of tools.

Capacity development initiatives in this domain could include enhancements to instructors’ access to student data to inform instructional practices and materials within their own courses. Faculty development activities might focus on learning analytics application to improve curriculum, course content and activities, as well as support related Scholarship of Teaching and Learning (SoTL) and scholarly research. An improved Canvas dashboard would enhance instructional quality and evidence-based resource planning.

Program level analysis to optimize student experience and curriculum coherence is a second target opportunity and related priority within this theme. Deans or chairs might ask “How can we use learning analytics to gather data on the effectiveness of pedagogical techniques or strategies across delivery modalities or program cohorts?” or “Are we noticing differences based on demographic factors or prior academic experience?” Learning analytics can support program planning through analysis of student learning activity in particular groups and provide insight into diverse student populations by testing or challenging assumptions. Program review, curricular mapping, and targeting resources for student academic success may also have beneficial access to information through integrated data analysis.

Data sharing beyond an individual course at an aggregate or program level will require IRDG support for establishing appropriate learning analytic data access processes and stewardship guidelines. Cross-functional teams to develop and support meaningful analysis of multiple integrated datasets will be critical. Examples of useful outputs include curriculum mapping and analysis dashboards and visualizations, yearly or cohort comparison, and socio-demographic and registrarial data integration. The current U of T Student Academic Success data analytics project is an example that effectively leverages academic and registrarial data yet could be further enhanced by adding LMS learning data records.

Theme 2: Provide individualized and tailored feedback to improve student academic success

Automation of personalized feedback to support academic success is a compelling vision as a potential application of learning analytics. Pertinent questions include “Can we use integrated data to support students at risk?” or “Can we use learning analytics to automate feedback mechanisms for students?” As described in the Environmental Scan, peer universities have implemented “early warning” systems through either custom developments or commercial products that use learning analytics and/or artificial intelligence to tailor messages for students who might benefit from early referral to additional resources or academic supports. At the course level, adaptive learning or personalized learning paths to customize learning materials have been the aim of many initiatives. These strategies maybe beneficial to all students, including high performing students.

While conceptually attractive, exploration of early warning systems requires particular attention to consent and ethical use of data given potential implications or interpretations of using predictive and prescriptive analytics to provide interventions or direct students to specific resources. In this context it is essential that the appropriate expertise is brought to bear on interpretation of data and translation into appropriate support action. Respecting students as individuals and ensuring that support informed by learning analytics is not defining or limiting student potential are foundational principles for projects in this domain.

Empowerment of students through agency to plan and manage their own learning was identified as an important opportunity to support academic success. The Strategy Table explored questions such as “How can we enable student access to transparent information about their own learning journey to support their agency?” and “Can analytics be used to scaffold, facilitate, and reinforce students’ self-regulated learning skills?” Initiatives that address these questions aim to support students’ self-awareness of their own learning skills and behaviours. Examples include applications or tools developed to surface predictive data and recommend learning activities, specific academic courses, or program pathways.

Ideally such platforms would enable broad and transparent student access to information to facilitate mapping of their own learning path. Student engagement would be particularly important in fora aimed at generating student user stories and identifying learner needs, requiring a cultural shift to prioritize empowerment of students. A future example initiative might be a student-facing dashboard or ACORN tools to enhance the use of student data for learning support or pathway planning.

Theme 3: Enable access to data for academic program planning, advising & coaching functions

Support for student success and increased effectiveness of the student advising functions have been identified as inter-related strategic opportunities to leverage learning analytic data at U of T. Key questions explored included “How can we improve communication between different sectors of advising?” and “How can we leverage integrated data to gain insight into student program choices and progress?” A critical success factor for initiatives in this area will be improving stakeholder access to current data, both for individual student consultations and for planning at the program level. For the latter, an example could be optimization of program components and resources to support student success as a significant benefit.

Improving access to data carries with it the responsibility for clarity in data stewardship processes to ensure roles and responsibilities are clearly articulated by the IRDG as initiatives advance integration and sharing of data assets. A culture shift to shared ownership of systems and services that integrate data sources related to student advising and success is needed as a range of stakeholders will have previously managed segmented data assets and

processes (e.g., Registrar, Dept. Advisors, International Education). An example of this, noted in Part 1, is an initiative currently underway to implement an enterprise student advising platform, with the potential to integrate learning analytics data to support more robust academic advising.

Identification of curricular and co-curricular activity relationships and impacts on student experience may provide a unique opportunity for a deeper understanding of student learning beyond academic program contexts. “What are the factors that create a coherent educational journey?” and “how can we facilitate greater intentionality in the blend of learning experiences provided?” These are questions being addressed within FASE as the ISTEP Analytics Project is introducing a conceptual framework for student development that spans life-wide and integrative learning. The aspiration is to help students identify and navigate their own personalized pathway across curricular, co-curricular and experiential learning opportunities.

Within this area of exploration, there is potential for innovation through prototyping of platforms or tools that support student expression of their co-curricular interests and referral to suggested activities based on data analysis. Early development of adaptive models that suggest to students’ activities based on data they provide on their past interest and activities can inform the type of computational processing that would be required and provide insight on feasibility and effectiveness. Students interested in data analytics might be engaged to support this exploration through related research projects or hackathons.

The Strategy Table reviewed these and many other possible activities that might become elements of our program of learning analytics initiatives. The amount of effort required to implement new activities and the potential for transformative impact among stakeholders within the community were lenses of analysis applied to support the process. These factors informed the prioritization of recommendations for short- and long-term timeframes.

Part 4: Recommendations

As an output of the strategy formation process, the following are recommendations to the learning analytics Initiative Steering Table:

1. Learning Analytics Program

In order to meet the goals established at the start of the paper and to increase our capacity to leverage learning analytics at the University of Toronto, the following is recommended.

1.1 An integrated Learning Analytics Program be initiated to coordinate efforts across academic divisions, departments and administrative units.

The program will encompass activities supporting data literacy across the dimensions of community engagement, data stewardship processes, and technological infrastructure under a coordinating body that will have responsibility for oversight and stewardship of data to be used for learning analytics purposes.

A governance body can ensure that vision and resourcing align with University of Toronto's strategic priorities and enable targeting of investments to optimize our progress. At the same time, coordination can support alignment across all levels of planning, including meta (institutional), meso (divisional and academic program), and micro (instructor) activities. Through collaborative program oversight, the integration of activities with interdependencies, prioritization of the sequence of activities, and consultation on integration of service areas can be achieved. It will also help to identify areas of focus that will be most impactful in achieving our shared goals of improving the learning experience, empowering students, and enabling instructors and staff to make effective use of the data.

Below are specific recommendations across key areas of opportunity:

2. Foundational Data Frameworks

Develop processes and practices that ensure appropriate management and access to high quality data to support learning analytics initiatives, learner engagement and use of data.

2.1 Engage stakeholders in planning and implementation of initiatives related to learning analytic, ensuring inclusion of the student voice in the development of the culture and practices that respect learner perspectives.

2.2 Support institutional review and revision of University of Toronto student notices of collection to promote transparency in the collection, processing, and use of our institutional learning analytic data.

2.3 Apply campus privacy, data governance and security standards and practices to all learning analytic initiatives and infrastructure to ensure the privacy and confidentiality of the learners' personal information.

3. Stewardship of Data Assets

3.1 Identify appropriate Data Trustee(s) to manage the access and use of learning analytic data holdings

3.2 Establish high-level curation guidelines for datasets relevant to learning analytics purposes

3.3 Develop data access framework that include guidelines on roles and responsibilities for use by project leads including oversight on use of project learning analytic data, project access guidelines, and project data stewardship.

3.4 Explore use-cases and engage institutional processes to evaluate and record non-routine data requests including new uses of data that support program improvement, in addition to research requests for learning analytics data

Recommended Areas of Exploration

The following are recommended areas of strategic opportunity that will provide impactful outcomes:

4. Short Term Strategic Opportunities (1 – 2 years)

4.1 Support for instructor and staff access to learning analytic data and dashboards to improve learning materials, tools and strategies.

- Improve Quercus dashboard functionality to enhance instructional quality and evidence-based planning.
- Support provision of customized exports for common course report requests to provide more granular data in formats that can be manipulated and analyzed.
- Expand faculty development activities related to use of existing Quercus tools to enhance course design and teaching activities, as well as support of scholarly research leveraging learning analytic data.

4.2 Program level analysis tools to optimize student experience and curriculum coherence.

- Continue current prototyping of institutional and program level dashboards, including exploration of needs related to integration of learning analytic data from learning systems.
- Establish cross-functional teams to identify useful data assets for curriculum mapping and program analysis dashboards and visualizations using learning analytic data (i.e., cohort comparison; student engagement, learning activity patterns, etc.).
- Explore functional and technical requirements for program level dashboard and report prototypes.

4.3 Improve student experience and effectiveness and impact of the student advising functions.

- Continue current implementation of the enterprise level student advising platform, including exploration of needs related to integration of learning analytic data from learning systems.
- Engage in change management initiatives related to a culture of data sharing to support student advising functions (e.g., Registrars, Dept. Advisors, International Education).
- Explore analysis of aggregate data from the advising platform to inform resourcing and student success support enhancements.

5. Long term Strategic Opportunities (3 – 5 years)

5.1 Empower students through agency to plan and manage their own learning.

- Engage students in collection of user stories and potential areas of development for student-facing tools and services to support mapping of their personal learning journey.
- Enable access to transparent information about their own learning in combination with predictive data analysis to recommend learning activities, academic courses or program pathways.
- Continue exploration of curricular and co-curricular activity relationships and impacts to optimize choices and enhance student experience.

5.2 Automate personalized feedback to support academic success.

- Undertake closer review of existing research and examples of early warning systems with attention to learner consent and ethical use of data for predictive and prescriptive analytics.
- Consult with students on foundational principles and learner perspective before advancing any new tool or platform implementation in this area of exploration.

Institutional Capacity Development

Expansion of institutional capacity is dependent on development of appropriate skills, processes and technologies across the university organization. Suggested opportunities to direct resources and facilitate growth include:

6. Community Engagement

6.1 Facilitate ongoing communities of practice.

- Engage interested stakeholders in shared exploration of learning analytic uses and strategies to improve learning outcomes and learner experience.
- Expand faculty development related to use of learning analytic data through facilitated programs in CTSI, ACT and DLI as well as divisional centres and institutes.
- Participate in consortium and higher education community events and activities related to development of learning analytics tools and use of learning analytics data.

7. Innovation Initiatives

7.1 Provide targeted support through alignment of funding programs.

- Support and incentivize strategy and initiative development for programs, project teams and individual instructors through targeted themes for annual funding programs (i.e., LEAF, ITIF, Fellowships) or through introduction of new programs.

7.2 Facilitate innovation in controlled experimental and research contexts.

- Encourage and recognize research initiatives that prototype architecture development and analytic process experimentation.
- Engage students as researchers and active participants in the discovery process.
- Ensure research activities are compliant with university data governance practices and processes as outlined by IRDG.

8. Technology Infrastructure

8.1 Enable agile access to learning analytic data across macro, meso and micro levels.

- Develop and operationalize appropriate infrastructure and tools to enable approved uses of learning analytics data.
- Leverage resource infrastructure development and staffing to support extension of current services, including data acquisition, data store strategy, access and analysis support.
- Facilitate integration of learning analytic data between ACT Canvas Data Services, IRDG data lake, and other relevant service providers.
- Partner with other institutions or consortiums to further explore opportunities for collaboration and/or adaptation of tools and platforms.

Next Steps

We look forward to further direction from the UofT Learning Analytics Steering Table on the confirmation and implementation of priorities identified through this process.

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Appendix

Appendix 1. [Learning Analytics Environmental Scan: Full Report](#)